UNIVERSITY OF TECHNOLOGY, SYDNEY

Successful Transition to Mobile Government (m-Government) An Adaptive Framework

A thesis submitted by **Shadi Al-khamayseh**

in fulfilment of the requirements for the award of the degree

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Certificate of Authorship/Originality

I certify that the work in this thesis has not previously been submitted for a degree nor has it been submitted as part of requirements for a degree.

I also certify that the thesis has been written by me. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

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Shadi Al-khamayseh



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Publications supporting this research

The following publications published in peer-reviewed conferences are directly related to this research:

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Abstract

Over the past decade Governments all over the world have been moving towards providing services to their citizens via the web, with varying degrees of success. These e-Government initiatives have been the subject of extensive research. This research is concerned with the transitioning from e-Government to mobile government (m-Government). Mobile government implementation is still in its very early stages - indeed a perfect m-Government Framework/model has not yet been created. This research aims to contribute to the field by developing a successful m-Government framework as a basis for a transition methodology, either from e-Government to m-Government or directly to m-Government.

Transitioning from e-Government to m-Government requires researching the integration process between e-Government and m-Government. It also requires investigation of all the pressures, obstacles that hinder the transition process and m-Government success factors. Such obstacles and success factors differ between nations, such as a nation's technological and information infrastructure, mobile device penetration and acceptance, public and social pressures, and security. Finally an m-Government initiative must be developed followed by an m-Government strategy.

Mobile devices have the potential to become ideal access devices because they are small, light, personal, convenient, and many people carry them all the time, everywhere. Mobile devices have a number of connectivity options, and their own display and input capabilities. They are already widely used around the world.

Mobile Government, despite its potential, has not reached anticipated adoption levels. While there may be many reasons for this, limited previous research has focused on only a few topics, mainly technology and consumers. The main aim of this study is to discover what is necessary to improve the adoption and implementation of mobile government systems. Specific objectives that were proposed to help achieve this aim included: a) identifying all the factors that may influence adoption and implementation of mobile services, b) integrating such factors and relations between them in a framework, and c) providing specific recommendations and guidelines in all the various perspectives.

Case studies were the methodology employed to fulfil these objectives. A qualitative approach was found to be most suitable to this study, and open-ended Web surveys, as well as various kinds of interviews, including email, face-to-face, and phone, were used to obtain detailed, in-depth information from industry and user participants.

The main contribution of this study is the adaptive theoretical framework that explains the specific factors that influence the adoption, diffusion and implementation of mobile government systems. It provides interesting findings on each of the identified factors, and at the same time integrates such investigations as one coherent whole that forms a framework of success factors for mobile government systems.

Some of the discovered factors have never before been proposed. Others have been proposed in fragmented explanations that focused on several influences only. Yet other factors have been proposed before, but this study offered more

accurate or understandable interpretations or names for them. In addition, this study integrated all the factors in a framework, pointing out the important contexts and conditions that need to be understood and fulfilled.

Another contribution can be found in the multitude of specific guidelines and recommendations that have been discovered in the participants' data. This study additionally devoted much attention to studying international mobile governments. The proposed framework with its well explained success factors can be used by traditional or electronic governments to improve their current work processes through the new mobile and wireless technologies.

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PART I

Introduction

&

Literature Review

CHAPTER 1

1. Introduction

This chapter introduces the mobile government topic along with the main purposes of conducting the research. It begins by defining the mobile government, and then lays out the research framework in an organised fashion and briefly discusses the choices made for this study in all levels of the framework. It concludes with an overview of the thesis chapters.

1.1. Mobile Government Defined

Most governments around the world wish to decrease cost and corruption, and to increase efficiency, effectiveness, transparency, convenience, and revenue. Thus, many governments in developed and developing countries have seen an

opportune way to achieve their aims through the evolving Information and Communication Technologies (ICTs), and in particular, the Internet technologies.

The use of the wired Internet created what is known as 'Electronic Government' (e-Government). The term e-Government has various definitions. In this research the author has adopted the World Bank definition:

> E-Government refers to the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government. (The World Bank Group 2009)

Recent advances in wireless ICTs has allowed the transfer of information over distance wirelessly (i.e. Wi-Fi spots, third generation (3G) networks, NextG networks). The use by government agencies of wireless and mobile technologies to conduct their business created what is known as 'Mobile Government' (m-Government).

m-Government has acquired various definitions since its creation. In this research the author has adopted the definition given in the first mobile government edited book which was published in 2007 (Kushchu 2007), and was originally published in 2003 by the same authors . According to them:

> m-Government may be defined as a strategy and its implementation involving the utilization of all kinds of wireless and mobile technology, services, applications, and devices for improving benefits to the parties involved in e-Government including citizens, businesses, and all government units. (Kuscu, Kushchu & Yu 2007a, p. 1)

Through investigation into the available literature and exploratory discussions with experts and researchers in the field, the author became aware of the variety

of definitions of m-Government. Different definitions of m-Government, along with a newly-formed definition, will be discussed in Chapter 5 'Fundamentals of m-Government'.

1.1.Research problem

According to Kuscu, Kushchu and Yu (2007, p. 8) 'while e-Government was an important step taken by many governments provision of services through mobile technologies is now inevitable'. Despite the potential of mobile government, the uptake so far has been rather disappointing. Mobile government services have not reached the expected adoption levels. The gap between what a mobile government service can become and where it is now highlights the importance of research in this area.

An extensive literature review in the area of research was conducted before the study commenced to review all the relevant literature in the mobile government arena and to find out the state-of-the-art in this area. The literature review also helped in identifying research gaps that would offer research questions for this study, and to make sure that the research would indeed provide a new and original contribution.

The literature review was very insightful and showed the state-of-the-art of mobile government research, what is missing and what needs to be investigated. Along with the literature review findings, experts and researchers in the field were contacted to find out what they believed was missing. Reviewing the literature along with surveying the experts revealed the lack of a mobile government framework to guide a successful implementation of mobile

government services. This helped to narrow down the research and identify the research questions.

1.2.Research Questions

Over the last few years, a minority of governments has taken advantage of the tremendous increase in mobile penetration. This extensive penetration should attract governments to exploit the technology country-wide and indeed, global reach. Nearly all m-Government constituents such as Businesses (G2B), Citizens (G2C), Employee (G2E) and other Government agencies (G2G) may be better served through this channel, yet the adoption has been slow and the question remains as to why only a few countries have advanced in the implementation of mobile government services.

Numerous questions may be posed. What are the barriers to success of m-Government? What issues need to be addressed before successful initiatives are launched? Why are constituents not adopting m-Government systems/services? What would make them accept them? What fails an m-Government system? How can new m-Government system be implemented to provide most value to all stakeholders? What technologies can best fulfil constituents' requirements? The questions prompted the need for research to understand the multitude of success factors in m-Government.

The knowledge of m-Government success factors is an essential ingredient for a thriving m-Government implementation. Such information has the potential to help governments better understand the essential requirements and prerequisites of effective exploitation of recent advances in wireless and mobile technologies.

This will lead to a planned roadmap towards successful m-Government planning and implementation. This has prompted the following research question that this study will set out to answer:

What are the factors contributing to successful transition to and implementation of mobile government system? How? Why?

This research question underpins the current study, and shapes the research purpose described in the next section.

1.3.Research Purpose

As the previous sections have revealed, although mobile government is inevitable, its adoption and implementation are disappointing due to the lack of a framework to guide governments through the process of change. Thus, the research aims to find out what is necessary to improve adoption and implementation of mobile government systems and services.

The overall research goal includes not only identifying all the factors that may improve adoption and implementation of mobile government, but also integrating the factors and any relations between them in a holistic adaptive mobile government framework. Additionally, specific recommendations and guidelines in all the various perspectives will be identified.

1.4.Research importance: significance and implications

The conclusions of this research may benefit many governments since mobile government is 'inevitable' and the demand for it will only increase. Along with government departments, mobile government serves many other stakeholders such as Employees, Citizens, and Business. The need for public information and services is an unavoidable part of our everyday lives, and helping to provide a better, faster and more efficient way to obtain them would be an important contribution.

The conclusions will be of interest to many stakeholders because mobile government systems bring new forms of revenue, mainly to governments, but also to mobile operators, third-party systems providers, and mobile device manufacturers. In a fully-interactive mobile government where mobile payments are involved, additional stakeholders such as banks and credit card companies will also benefit.

Mobile government systems could reduce customer turnover in government departments, add revenues and attract new customers for mobile operators. Governments could offer new, differentiated services to their customers and increase their transparency, efficiency and effectiveness. Stakeholders could benefit from faster services and improved convenience. For the duration of this research, there has been strong interest from the government departments studied when they were contacted for research purposes, which suggests that the results of the studies are important to them, and many have asked to receive the conclusions of this study when it is published.

Some quotes from such requests may illustrate the interest in this research: 'We are very interested to see the results of your research', (Federal Government staff member) or 'We would be pleased to cooperate and support your project and any projects that aim to advance the implementation of mobile government' and 'there is lack of knowledge in the m-Government field and such research should be of great benefit to us' (State Government staff member).

Understanding what is going on in the field and discovering the multitude of success factors will hopefully provide concrete and useful explanations and recommendations to interested stakeholders to enable them to proactively design their systems to account for the success factors.

1.5.Research motivation

The high potential of mobile government is confirmed by the available literature has motivated this research. It also seemed an important topic as it explores a new dimension of already much researched e-Government. There have been enough gaps in existing mobile government literature to warrant further studies in the field, but at the same time the emerging importance of mobile government as a research topic is evident. For example, a dedicated yearly mobile government conference started in the year 2005 where the researcher published two papers in year 2006; additionally, the 5th International Conference on Electronic Government had a special session on mobile government in 2006 where the author has published one of his papers. Personally, it was also important to the author to research something that improves the quality of our everyday lives, so this research concerns something that is immediate and around us all the time.

The potential of mobile government, combined with the significance and possible impact of this research, has provided a personal motivation. As a member of the younger generation who is obsessed with latest mobile and wireless technologies - research shows that the younger generation are au fait with the wireless world and are comfortable with it. It is therefore a natural extension of my interest in matters mobile and in government in particular.

1.6.Research Scope

It is important to highlight the scope of this study as a preparatory step for defining the area where the research problem exists. According to El-Kiki (2008, p. 3), 'The provision of mobile government services may be classified in four dimensions: Mobile Communication, Mobile Service, Mobile Governance and Mobile Administration. These dimensions interact with three types of mobile government constituents: Citizens, Businesses and Government Officials. The relationships between the four dimensions and three constituents create a vast field of research.'

This research concentrates on mobile government services as a dimension and government officials and citizens (or end users) as constituents. This study explores the success factors for the mobile government service dimension as viewed by experts in the field, via online surveys, email contact and case study interviews with people from two states in Australia and two overseas countries, namely Jordan and the UAE (United Arab Emirates). The interviews focussed on local government services in Australia as well as country wide government services in Jordan and the UAE. The integration of the success factors will form a

leading holistic framework to achieve successful implementation of mobile government services to best serve end users.

1.7.Research overview

To achieve the aim of this research, an extensive literature review was conducted to identify the research gaps in the mobile government field and to ensure that this study would provide an original contribution. As discussed in Chapter 3, it was found that qualitative research is the best method to tackle the problem of finding all possible success factors. Due to the nature of the research, the data collection and analysis happened in parallel as discussed in Chapters 4 and 5. As explained in Chapters 3, 4, and 5 domestic and international case studies were analysed in Chapters 7, 8, and 9 to discover all the practical factors. Finally, the research concludes in Chapter 10 with an originally devised mobile government adaptive framework. In order to devise a holistic mobile government framework, the chapter combines both the findings from the case studies and the online surveys, along with the findings from the literature. The next section will outline the thesis chapters, together with a short abstract about each one.

1.8.Thesis Outline

This section explains the structure of this thesis. It demonstrates how the chapters are organised, and provides an overview of the contents of the thesis.

The thesis starts with an **Introduction**. This chapter explains what is meant by mobile government, and presents the research problem. It briefly discusses the

research purpose along with its significance and implications, as well as the personal motivation of the researcher. The scope of the study is also considered by clarifying the four dimensions of mobile government. The chapter concludes with the research overview and an outline of the thesis chapters.

The second chapter, **Literature Review**, explores all the available literature relevant to the purpose of this research. It summarises the previous research on mobile government in terms of its volume and topics as at the beginning of 2005, which is when this study started; this has revealed research gaps in the field and led to the formation of research questions and objectives that are then discussed. The chapter ends with the hypothesis to be investigated through the research. The literature review has also been updated in Chapter 10 to reflect the changes that have occurred since the author began his research in 2005. Any relevant changes have been taken into consideration when analysing the data.

The following chapter, **Theoretical Background and Methodology**, examines the theoretical assumptions that guide this study, and clarifies how these assumptions have informed the choice of methodology and research methods. The theoretical background is discussed first, and includes an epistemology (constructionism), and a philosophical stance (interpretivist symbolic interactionism). The chapter then deals with the research methodology on which the whole study is based: Case study. Studies that are based on the interpretivist approach tend to use qualitative methods, and therefore the suitability of such methods for this project is explored. The choices debated in this chapter, including a theoretical perspective, methodology, and methods, influence the subsequent chapters of the thesis, directly affecting the procedures that deal with quality and rigour, data collection, analysis, and reporting.

Although data collection and data analysis occurred simultaneously, they are discussed in two separate chapters for clarity of explanation. The **Data Collection** chapter (Chapter 4) situates various kinds of open-ended surveys and interviews as the main strategy for collecting data in this study. Subsequently, it explains the sampling process in detail. This includes information on the people who were interviewed, the kinds of questions that were asked, and how the open-ended surveys and various types of interviews (email, face-to-face, and phone) fit together in the project. Data management is also explained, followed by ethical considerations which conclude the chapter.

The **Data Analysis** chapter (Chapter 5) commences with a discussion of the basics of a coding process, and proceeds to describe specific coding techniques used in this study. The data analysis chapter explores this process, discussing such concepts as the constant comparison method, open versus selective coding, categories, properties, core category, or memos. Both substantive and theoretical coding stages are explained, with a number of relevant examples from the study. The issue of computerisation of the data analysis process is also discussed.

The following chapter, Chapter 6 '**m-Government Fundamentals**', analyses the online survey of experts in the field. The chapter presents the results of the survey analysis in the form of success factors and mainly discusses the level of e-Government needed prior to planning for m-Government.

Chapter 7, '**Case study analysis: The Queensland state, Australia**', analyses two Australian case studies from the state of Queensland. The chapter presents the results of the data/interviews analysis in the form of success factors. The identified success factors identified in the chapters are categorised and presented

in a table. Numerous representative quotes are used to provide evidence for the emerging theory.

The following chapter, Chapter 8, '**Case study analysis: The New South Wales (NSW) state, Australia**', continues with Australian case studies. It analyses three case studies from the state of New South Wales (NSW). The chapter presents the results of the data/interviews analysis in the form of success factors. The identified success factors identified in the chapters are categorised and presented in a table in the conclusion section. Numerous representative quotes are used to provide evidence for the emerging theory.

Chapter 9, '**International Case Studies: Jordan and the United Arab Emirates**', analyses two case studies from the country of Jordan and two case studies from two states in the UAE. The chapter presents the results of the data/interviews analysis in the form of success factors. The success factors identified in the chapters are categorised and presented in a table. Numerous representative quotes are used to provide evidence for the emerging m-Government framework.

The final chapter, Chapter 10 '**Mobile Government Framework**', is based on the analysis carried out in Chapters 6, 7, 8 and 9. It summarises, reviews, and concludes the whole study. The chapter presents the mobile government framework reached from the analysis of all collected data along with a revisited up-to-date literature to refine and/or reinforce the framework. The chapter also provides a thorough and comprehensive review of existing theories on the adoption and diffusion of technological innovations, and on mobile government success factors proposed by other researchers. The reviewed findings are compared to the research findings, and the similarities and differences are

highlighted. The main contributions of this research are discussed in relation to the research questions and objectives stated in the Introduction chapter, followed by a summary of the main findings, their implications and significance. The limitations of this study are examined, and future research directions proposed. Finally, the strengths of this research are outlined.

CHAPTER 2

2.Literature Review

This chapter reports on the review of literature that explores the emergence of mobile government services as a natural development of electronic government maturity. It outlines the phases of mobile government emergence and discusses the types of electronic government features that have shaped the mobile government mission and vision. It concludes by discussing the pressures facing governments that intend to implement mobile government services.

2.1.Introduction

In this chapter, the results of an extensive literature review conducted at the beginning of this study are presented. An up-to-date version of relevant literature is discussed in the conclusion chapter to refine and reinforce the devised framework. Since this study will also survey and interview experts in the field, the principle has been adopted that 'the early stages of a survey should

include a careful review of the literature and talks with experts in the country. This helps conceptualize potential problems' (Iarossi 2005).

Advances in the Information and Communication Technology (ICT) sector worldwide have influenced many areas in many countries. One of the most important segments is government, which has gained many benefits from this ICT revolution. A major deployment of ICT takes place in delivering governmental information and services to citizens via the Internet, and is known as e-Government. The Government of Western Australia (WA), for instance, has launched the onlineWA website to be a doorway to WA's services and information, including health, business, law, community, education, recreation, tourism, transport and bill payment. Other information that can be accessed includes local traffic or surf reports, latest sports scores, news, weather, TV and cinema guides, and current events for WA (Government of Western Australia 2005).

e-Government has been evolving over the last few years to an extent that citizens in some areas do not have to visit any government agency to conduct government transactions. They simply need to visit the government department's website and follow the online procedures. Online governmental services have changed the citizen's visit from one of physical attendance to virtual attendance in which the citizen interacts with an online application rather than a human agent. This sort of interaction has many acknowledged benefits such as saving time and money for all stakeholders. Indeed, the following quote from Howard Rheingold, futurologist, illustrates perfectly what is occurring:

> *Each generation has a defining technology - the baby boomers were defined by the television . . . We will have a cohort of people around the world who have mobiles giving them togetherness. And we can expect this identification to have consequences for how we constitute and carry ourselves politically. (RHEINGOLD 2005)*

e-Government depends mainly on the wired Internet as the medium between the government and the constituent who can be a citizen, known as Government to Citizen (G2C); a business, known as Government to Business (G2B); or a government agency known as Government to Government (G2G).

Although the Internet is expanding rapidly and continuously, the number of users is still fewer than many observers of the Internet's development envisaged. To achieve e-Government goals, different communication channels need to be considered. e-Government needs to become mobile, offering the ability to engage with government services 'anytime, anywhere' (Heeks & Lallana 2008). 'After E-Government comes mobile government (M-Government); the idea of permanently streaming data to and from a user's mobile phone may be some people's nightmare. In Sweden, it is already reality' (Cross 2004). Although the lower-than-expected uptake of m-Government in many countries/cities, some have been advancing. A good example is the city of Sacramento which received an award for Mobile Government Leadership in year 2007 (Government Technology Magazine 2009).

2.2.m-Government Defined

Although there is number of m-Government definitions available in the literature, this study has its own definition that emerged from analysis of expert surveys along with the literature. The author has defined m-Government as:

m-Government is a strategic system that extends stationary e-Government systems to enable interoperability with heterogeneous wireless and mobile technologies through applications for constituents (Governments, Employees, Businesses, and Citizens). This allows them to interact within/with their government(s) or any government regardless of time and location, and to enhance the delivery of service in order to support government's operations and decision making, and to support constituents' business with the government.

2.3.m-Government Drivers

There are many drivers that contribute to the genesis of mobile government, but Carroll (2005) refers to the wireless technology evolution and the need for more effectiveness and efficiency in government service delivery as the two main factors. Extensive investigation of m-Government drivers resulted in categorizing them into human and socio-economic, technological, and business factors. Table 1 illustrates these drivers.

Table1: m-Government Drivers (Al-khamayseh & Lawrence 2005)

<table>
<tr><th>Factor</th><th colspan="2">Reasons</th></tr>
<tr><td>Human and Socio-economic</td><td colspan="2">• Travelling.
• People cannot afford to buy computers and subscribe with an Internet service providers (ISP) to access the Internet, while majority can afford to own a mobile device
• Number of wireless Internet users around the globe is rapidly exceeding the number of wired Internet users.
• Young generation prefer to do everything with own wireless mobile device.
• Demands for efficiency, reduce cost, increase revenue, improve customer services and better delivery of government services.</td></tr>
<tr><td rowspan="4">Technological</td><td>Technology</td><td>Examples</td></tr>
<tr><td>Radio-based</td><td>• Two way radio</td></tr>
<tr><td>Cellular phone based</td><td>• Mobile voice
• Short Message Service (SMS)
• Wireless Application Protocol WAP (1 and 2)
• General Packet Radio Service GPRS
• Universal Mobile Telephone Services (3G) UMTS
• CDMA (Code Division Multiple Access
• EDGE (Enhanced Data for GSM)
• CDMA2000 1xEV (Evolution)
• i-mode</td></tr>
<tr><td>Mobile device based (enabling tools)</td><td>• Notebook Computer
• Tablet Computer
• Personal Digital Assistant
• Bluetooth
• Global Positioning System GPS
• Pager</td></tr>
<tr><td></td><td>Network based</td><td>• Wireless LAN
• WiFi (Wireless Fidelity)
• Voice over IP
• Satellite
• Wireless Sensor Networks (MOTES)</td></tr>
<tr><td rowspan="3">Organization</td><td>Type</td><td>Reasons</td></tr>
<tr><td>Business</td><td rowspan="2">• Improve business productivity and workforce efficiency.
• Instant access to critical information for decision making.
• Cut cost.
• Enhance customer relationship and satisfaction.
• Lessen corruption in Government.</td></tr>
<tr><td>Government</td></tr>
</table>

2.4.Why should governments adopt m-Government?

In advocating the existence and importance of mobile government, the following are two basic but crucial facts to be considered that represent the essence of the need to create m-Government:

Firstly, the number of mobile phones in use is escalating. Mobile phones have become the most common communication devices on earth (Oakland County 2005), and according to Wireless Intelligence (2005), there were more than 2 billion mobile connections in the world in 2005, despite the fact that this number was not expected to be reached until 2007 (Biz/ed 2004). More surprisingly, the number of mobile subscribers doubled in only three years when it hit 4 billion in December 2008, according to the (International Telecommunication Union 2008b). Figures 1 and 2 below depict the worldwide rapid increase in wireless connection and subscribers. This rapid increase means that government services will be more accessible by mobile users through the wireless Internet than by Personal Computer (PC) users through the wired Internet (The Institute for eGovernment 2004). Accessing governmental information and services take place through the wireless Internet, and Table 2 shows the percentage of wireless Internet usage percentage among Internet users all over the globe. According to (International Telecommunication Union 2008a) "global SMS traffic over the 2007/2008 New Year period increased by 30 per cent compared to the same period last year."

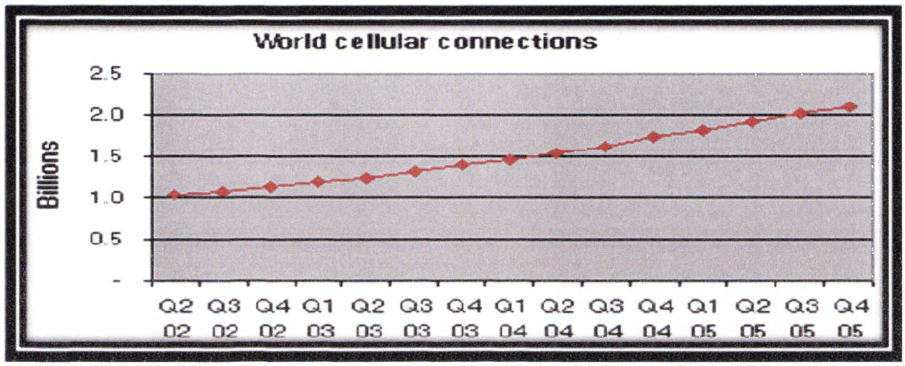

Figure 1: World cellular connections (Wireless Intelligence 2005)

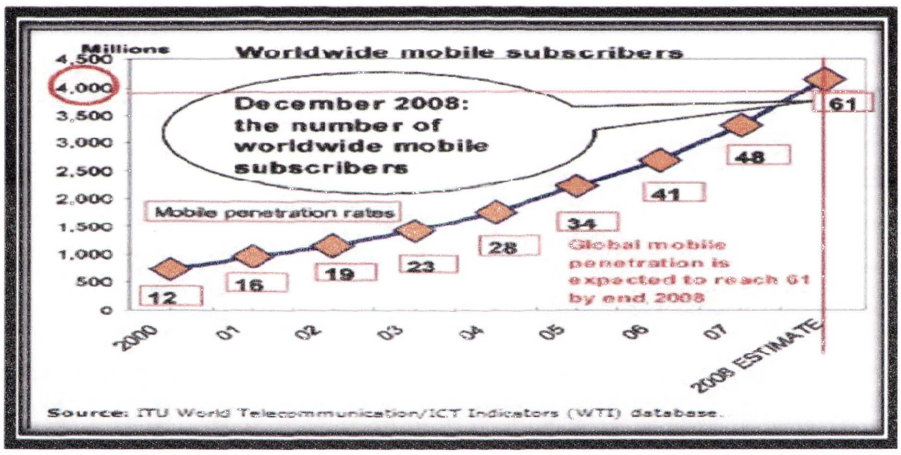

Figure 2: Worldwide mobile subscribers (International Telecommunication Union 2008b)

Table 2: Worldwide wireless Internet usage and projections (Greenspan 2002)

Year-End	2001	2004	2007
Internet users(millions)	533	945	1,460
Wireless Internet users share	16.0%	41.5%	56.8%

Secondly, the world nowadays is considered a small village. Citizens can travel anywhere within hours, but not everyone carries their PC unless it is a Notebook. However many carry their mobile phones, PDAs, and laptops. Although citizens

are far from home, they still need their government services and information to be available at their destination, so m-Government will be the easiest and fastest solution for travelling citizens (The Institute for eGovernment 2004).

Thirdly, although m-Government is a subset of e-Government and complements it (Goldstuck 2003; Lallana 2004), countries are moving towards establishing it very quickly, even before completing the e-Government infrastructure. . Research is needed to find out which e-Government component elements to build on as a robust basis for transition to successful m-Government. This means that it is necessary to continue with e-Government initiatives and complete its infrastructure, but it is also important to concentrate more on m-Government initiatives.

Lastly, the existing m-Government is still in its very early stages. A perfect m-Government has not yet been created; thus, this study will contribute to the field by devising an m-Government framework. The research examines Australia, Jordan and the UAE as country case studies for mobile government services. Jordan and the UAE represent typical examples for developing countries where a high mobile penetration phenomenon is pronounced; 'even relatively poor economies like the Philippines can have a high mobile penetration' (Public Sector Technology & Management - IT-enabled government in Asia 2005). Australian mobile government case studies reflect on the work being done in a developed country where again, mobile penetration is high.

2.5.m-Government vs. e-Government

e-Government is defined as the transformation of government work through the use of wired ICTs, such as the wired Internet, for faster delivery of governmental services to constituents (Australian Government Information Management Office (AGIMO) 2007) and to improve government efficiency, effectiveness, transparency and accountability (The World Bank Group 2005).

m-Government is a subset of e-Government that complements it by delivering services through wireless channels (Kuscu, Kushchu & Yu 2007b; Lallana 2004). Both electronic and mobile governments share the same objectives of improving government efficiency, effectiveness, transparency and accountability, and facilitating constituents' access to government information and services. Table 3 compares and contrasts the features of electronic and mobile governments.

Table 3: e-Government vs. m-Government (Carroll, 2005; Kushchu and Kuscu, 2003)

Criteria	e-Government	m-Government
Access devices	PCs, Laptops, telephones	Mobile devices; mobile phones, PDAs, Laptops and pocket PCs (Lallana 2004)
Personalization	e-Government access devices could be used by many users, and are not personalised in a way that allows sending personal information to the constituent's device (Yu & Kushchu 2004)	Mobile devices are usually used by a single user. This facilitates sending personalised information to a specific constituent at any time through his/her mobile device (Yu & Kushchu 2004)
Always on	e-Government access devices are often switched off when they are not in use. When the device is switched off it can neither receive any information nor	m-Government devices, especially mobile phones and PDAs, are always switched on. These devices transform to an inactive mode when not in use, but immediately

Criteria	e-Government	m-Government
Always on (Cont)	switch on to do so.	get activated by applications or information sent to the device (Yu & Kushchu 2004)
Mobility	e-Government access devices such as PCs are location fixed, so the citizen has to find the access device along with an Internet connection to access the services	m-Government access devices are mobile and designed to provide instant access to the users, such as receiving warning SMS
Accessibility	**24x7** fixed location access (Carroll 2005)	**24x7** with the advantage of access anywhere due to the mobility of the accessing devices (Carroll 2005)
Limitations	The ICTs related to e-Government, such as computers, have no limitations.	Small screen size limits the volume and type of information accessed (Carroll 2005)
Service coverage	Many rural areas cannot access e-Government services because of lack of land-lines (Hossan, Chowdhury & Kushchu 2005)	Nearly 100% country coverage in many countries (Kushchu & Kuscu 2003)

The advantages offered by m-Government over e-Government will increase its acceptance. By contrast, Carroll (2005) argues that some differences could increase the acceptance of m-Government and therefore leapfrog e-Government.

2.6.m-Government development requirements

Government responses towards m-Government should be centralised within a government ICT department that is responsible for creating and overseeing a

development mechanism. The development mechanism needs to address the following issues before starting the development process.

2.6.1. m-Government vision

m-Government has to contribute to providing easier and faster access to governmental information and services anytime, anywhere in order to improve citizens' quality of life. In consequence, m-Government could be used in many different governmental fields, and could vary in size of implementation. Thus, the vision for m-Government should be clearly defined.

An m-Government vision should result from the participation of all constituents. Consulting constituents before developing the m-Government vision will result in relevant and usable m-Government programs. In their report Roadmap for E-Government in the Developing World, the Working Group on E-Government in the Developing World (2002) strongly warns against setting 'money saving' as the broad e-Government vision. This also applies to m-Government.

Taxation is always a vexed issue with citizens and in Norway in year 2004, the Norwegian Inland Revenue introduced SMS tax returns. Any Norwegian who received a tax return in the post that required no editing could simply SMS their acceptance of the document by sending a text message with a code word, their identity number and a pin code instead of returning it by post. In the year 2004, 1.5 million Norwegians had no changes to make, so the potential for uptake was huge (ANANOVA 2005).

2.6.2. m-Government mission

m-Government should make communication among all constituents as fast and easy as possible through decentralisation. The following model shows decentralised communication among all constituents. For example in Business to Business (B2B) cases there would be no need to go through the government to the other business to get the required service. This will cause more transactions resulting in more network traffic and thus slower service which contradicts with the m-Government's goals (Al-khamayseh & Lawrence 2005).

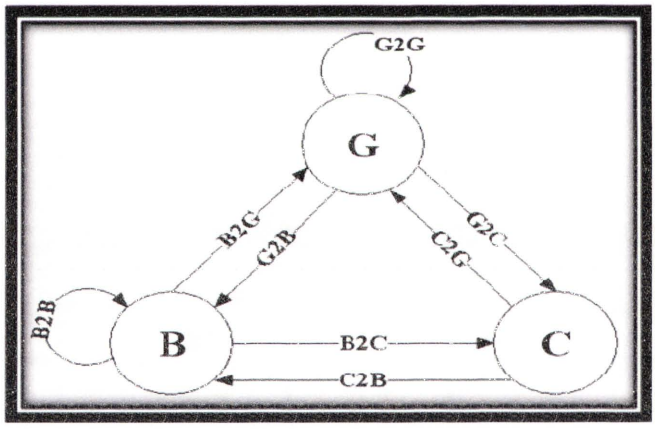

Figure 3: Decentralised m-government communication model (Al-khamayseh & Lawrence 2005)

In the Australian state of NSW, the Education department has sent out the Higher School Certificate (HSC) results for students over the Internet since 1998, but in 2003 over 10,000 students received their results via SMS (Board of studies New South Wales 2005). This transaction represents a Government to Citizen (G2C) service. The state government department won the Premier's Public Sector Award for this excellent service. The government is recognising the importance of the

mobile phone to their young constituents and are communicating with them via their preferred mode of communication (Grenville 2005).

In Jordan, however, which is applying the latest in mobile technology available in the world according to the (UNITED NATIONS Economic and Social Commission for Western Asia ESCWA 2003), the examination results service is delivered to citizens through private mobile service providers by a 'middle man', who get the results from the Ministry of Education. This case represents a Business to Citizen (B2C) service, in which a governmental service is delivered to citizens through a private mobile operator.

2.6.3. m-Government objectives

m-Government is subset of e-Government, so they share objectives such as providing fast, reliable and more convenient ways to access government information and services and ensuring better participation from all constituents: citizens, businesses and other government departments. The wireless channel enables delivery of services to disadvantaged rural areas which the wired e-Government is not yet able to reach. m-Government also aims to fight against bureaucracy and corruption by strengthening the legal system and law enforcement (The Working Group on E-Government in the Developing World 2002). m-Government objectives are achieved by setting goals to accomplish them.

The South African Department of Justice identified the following scenarios where mobile government objectives could be realised (Goldstuck 2003):

a) Reporting crime on pre-programmed numbers - the location based identification advantage of mobile phones would assist call centres to divert emergency calls to a vehicle or a policeman in the area.

b) Alerting potential witnesses when a case is being heard to save wasting the witnesses' time.

2.6.4. m-Government Goals

Successful m-Government requires the achievement of the following potential goals (Oakland County 2005):

1) Improve the access to government information and services. The State of California, for example, has a free wireless service for its citizens who may sign up via the portal http://www.my.CA.gov.

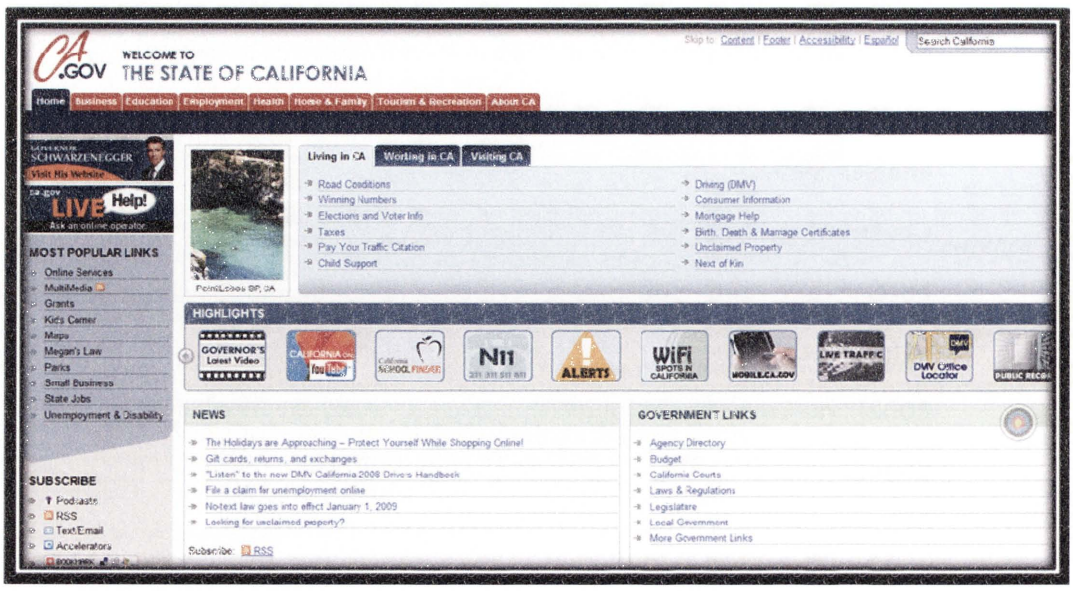

Figure 4: California state e-Government portal (http://www.my.CA.gov)

2) Address concerns and issues in m-Government such as security and privacy. For example wireless access points must be secure or data could be compromised - in a government department, loss of data could have severe repercussions for the government and its departments (Goldstuck 2003).

3) Attract sufficient funds to ensure continuous development of m-Government functions. Moon (2004) recommends allocating enough funds to m-Government initiatives, as mobile technology is developing rapidly, is becoming an important way of communication and is part of government operations. Without appropriate funding, the benefits of the technology will be out of reach.

4) Reduce cost by the effective use of technology. For example, the IBM (2004) e-Government solution team reported that the New York Division for Parole expects cost savings and better efficiency from its use of mobile technology (Moon 2004).

5) Develop and adopt functional models that suit the nation's special characteristics. Goldstuck (2003) has provided a framework that could be useful for this development and this is discussed further in section 2.7.2 'Coherent and Adaptive m-Government framework'. Kushchu and Borucki (2004) have also created a mobility response model for m-Government which has been enhanced by Borucki, Arat and Kushchu (2005). The enhanced model shown in Figure 5 specifies basic m-Government issues.

6) Develop m-Government strategy that depends on the functional models created.

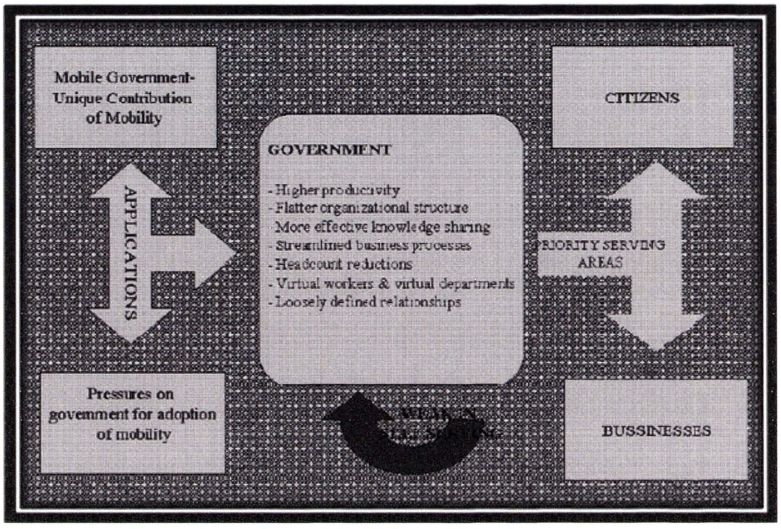

Figure 5: Kushchu and Borucki's Enhanced Response Model (Borucki, Arat & Kushchu 2005)

2.6.5. Successful m-Government strategy

'Despite its infancy, mobile government (M-Government) is a growing and important set of complex strategies and tools that will change completely the roles and functioning of traditional governance' (The Institute for eGovernment 2004).

A successful strategy should do the following to ensure accomplishment of the goals and objectives:

- Consider the nation's distinct characteristics, such as its technological infrastructure. This requires a major survey of the connectivity issues of the particular nation and is concerned with Wireless LANs (Local Area Networks) and Cellular coverage.

- Develop a **framework** that is used for future decision making and provides the basis for future planning. Such a framework should be established and implemented through defining the m-Government initiatives and specifying the government's concept of, and plans for, m-Government. This means that departments should examine personal communications, information management, logistics, positioning and identifying stakeholders and transactional opportunities (Goldstuck 2003).
- Prioritise m-Government initiatives.
- Identify risks and work on solutions.
- Create successful m-Government business models. Models so far proposed include Goldstuck's *Guide to Action*, which has been referred to above, and Kushchu and Borucki's *Mobility Response Model* (2005).
- Create plans to implement the strategy.

2.6.6. m-Government plans

Successful and well defined plans that correspond to the strategy should be found and used in adopting m-Government. Partnership with m-Government customers and the private sector is an important step towards success in planning and putting m-Government into existence. Fund collection plans should be developed to ensure there are sufficient funds to keep the m-Government potentials going, as well as marketing plans to ensure its use by constituents (Moon 2004).

2.6.7. m-Government success factors

Knowing the m-Government success factors is an essential ingredient of successful m-Government implementation. Such knowledge has the potential to assist governments to better understand the essential requirements and prerequisites of effective exploitation of recent advances in wireless and mobile technologies. This understanding plays an important part in developing an m-Government framework which will lead to a planned, systematic and smooth transition to implementation of m-Government services. To better understand such issues, as a first step, this study will rely on previous research findings and recommendations concerning success factors identified for the effective implementation of ICT in general and mobile technologies in particular. Table 4 shows some of these suggested factors. Secondly, the research methodology discussed in the next chapter suggests surveying experts and analysing case studies to reach a comprehensive understanding of the success factors, using real case studies to build an original, adaptive mobile government framework.

Table 4: m-Government success factors

Source / Factor	Infrastructure	Infrastructure management	Coherent m-Government framework	IT literacy	Strategy	Privacy and Security	Standards and data exchange protocols	m-Gov awareness	Quality & user friendly applications	User needs & preferences applications	Partnership with private sector	e-Government	High mobile penetration	Legal issues deregulation of telecommunicati on/sector	m-Government portal& exclusive GW	Acceptance	Access	Cost
(Antovski & Gusev 2005)	x		X	x	x	x	x	x	x	x		X						
(Foghlú 2005)	x	x																
(Santos 2005)	x			x				x		x								
(Al-khamayseh & Lawrence 2005a)	x		X	x	x	x					x							
(Abanumy & Mayhew 2005)	x							x				X	x	x				
(Patel & White 2005)			X						x									
(Goldstuck 2003)	x			x	x	x	x	x	x	x	x	X	x	x				
(Germanakos, Samaras & Christodoulou 2005)								x	x									
(Chang & Kannan 2003)	x			x	x	x	x					X						
(Kim et al. 2004)						x					x	X		x	x			
(Sharma & Gupta 2004)						x			x									
(Sandy & McMillan 2005)	x			x		x	x				x	X		x		x	x	x
(Carroll 2005)										x		X				x		
(Scholl 2005)			X									X						
(Bassara, Wisniewski & Zebrowski 2005)									x	x							x	

2.7.Discussion of the Success factors:

This section discusses the success factors found in the analysis of literature review.

2.7.1. Infrastructure

Mobile government requires a specific infrastructure that is available nowadays in most countries of the world. According to Foghlú (2005) m-Government infrastructure is made up of wireless networks and mobile access devices (e.g. mobile phones, laptops, PDAs) that can access software services. Researchers refer to infrastructure in many ways; the report compiled by Goldstuck (2003) uses the term 'connectivity' to refer to infrastructure and considers it as the cornerstone of m-Government applications.

The rapid evolution of wireless technology is biasing officials' decision to defer m-Government adoption because of infrastructure immaturity, or because of waiting for a better technology to emerge. Such a decision will cause loss to the government. Goldstuck (2003) acknowledges such cases and recommends not waiting for any perfect technology. In such cases, Intel (2003) states that choosing technology that can be compatible with the expected new technologies is a key factor to alleviate worry and prevent waiting for the perfect technology to arrive. The back-office systems such as databases represent an important part of the whole m-Government infrastructure, so it is necessary to make sure that these systems can support the new technology being implemented.

Infrastructure sophistication controls the level of m-Government services functionality. Sandy and McMillan (2005, pp. 350-351) draw attention to five functionality levels in digital service delivery: 'initial, enhanced, interactive, transactional, and fully interactive.' The authors also report that infrastructure sophistication differs at each functionality level and rank success factors according to these levels. As a result, the research will investigate all the success factors required for transitioning to a fully interactive m-Government.

2.7.2. Coherent and Adaptive m-Government framework

An m-Government framework should be developed as a decision making guidance tool for m-Government adoption and development (Patel & White 2005). Antovski and Gusev (2005) argue that an m-Government framework is an essential factor, and suggest 'that a coherent M-Government framework should incorporate interoperability, security, openness, flexibility and scalability which they describe as the essentials for the success of M-Government'. The adaptive m-Government framework devised in this study covers these factors and more.

According to Al-khamayseh & Lawrence (2005), an m-Government framework should be developed to use for future decision making and to form a basis for future planning. Such a framework should be established and implemented in m-Government through defining the m-Government initiatives and specifying the government's concept of, and plans for, m-Government. Departments should examine personal communications, information management, logistics, positioning and identifying stakeholders and transactional opportunities.

2.7.3. e-Government

According to the extensive study of mobile government success factors in the literature review, it is obvious that electronic government (e-Government is the cornerstone for m-Government (Abanumy & Mayhew 2005; Antovski & Gusev 2005; Chang & Kannan 2003; Goldstuck 2003; Kim et al. 2004; Scholl 2005). Many developing countries' governments are therefore focusing on computerising their backend processes to achieve e-Government, a first step that is slowing them in their adoption of m-Government services (Public Sector Technology & Management - IT-enabled government in Asia 2005).

2.7.4. Access

Sandy and McMillan (2005) state that access is a vital infrastructure factor for successful m-Government. In order to achieve m-Government potential benefits, all constituents at any location and from any demographic or socio-economic group should have easy access to the service.

2.7.5. Acceptance

Technology acceptance plays an important role in a government's decision to adopt m-Government, and for constituents to use the m-Government services. The Technology Acceptance Model (TAM) suggests that a user's decision when presented with a new technology about how and when to use it is influenced by two technology acceptance measures: ease of use and usefulness (Davis 1989). Another acceptance measure added to TAM in 2001 is the perceived availability of resources (Mathieson, Peacock & Chin 2001).

Perceived usefulness: 'the degree to which a person believes that using a particular system would enhance his or her job performance' (Davis 1989).

Perceived ease-of-use: 'the degree to which a person believes that using a particular system would be free from effort' (Davis 1989).

2.7.6. Perceived availability of resources

Measuring technology acceptance is the first step to starting an m-Government project in order to protect governments from spending money to launch services that might not be used if not accepted. A low acceptance index should not necessarily stop governments from adopting m-Government; on the contrary, governments should analyse the reasons behind the low acceptance index and plan appropriate solutions. Chang and Kannan (2003) recommend planning for m-Government acceptance by following certain steps to improve acceptance.

Training is essential for understanding the benefits of technology and is a prerequisite that results in accepting it rather than resisting it. Both the (The Working Group on E-Government in the Developing World (2002) and Chang and Kannan (2003) agree that the first step in creating acceptance is to train and educate staff, starting with superiors who influence staff down through the bureaucracy. Chang and Kannan (2003) also suggest that training technology-receptive employees will encourage them to play a key role in supporting their peers.

Technology benefits and inhibitors could be intangible before the actual launch. A favourable action in such a situation is launching a pilot application to introduce the technology and measure its acceptance, and to minimise inhibitors

before the full-scale launch (Chang & Kannan 2003). An immediate step after the technology launch is providing support through a technical support team to overcome the discomfort or insecurity that might result from adopting the new technologies. Providing help is a critical factor for technology success particularly when technology readiness is low (Chang & Kannan 2003).

Government agencies could help by providing subsidies to staff to buy personal wireless devices and offering incentives for staff who suggest improvements to the system, to increase their interest in using the technology (Chang & Kannan 2003).

2.7.7. Deregulation of telecommunications sector

According to Abanumy and Mayhew (2005) liberation of the telecommunication sector and privatisation contribute to the increasing the number of mobile service providers and motivate competency. This competency results in providing quality services for affordable prices and increases mobile penetration - 'a major facilitating factor' (Goldstuck 2003). Thus, governments wishing to implement m-Government should revise their ICT policy; according to the Maltese Ministry of Public Administration and Information (2003), deregulation of the telecommunication sector is highly desirable.

2.7.8. Privacy and security

m-Government services raise significant privacy and security challenges that concern constituents and affect their behaviour in accepting or refusing its adoption (Chang & Kannan 2003). Overall secure m-Government requires secure

networks, secure software applications, and secure devices (Chang & Kannan 2003).

Providing secure m-Government applications is an essential m-Government pillar. Goldstuck (2003) recommends following the fundamental standards of wireless network security as the solution, to strictly ensure controlled and managed access to the services.

According to Kim et al. (2004), m-Government is exposed to security breaches because of the fact that it is based on an important component of m-Government infrastructure which is the private wireless carrier. Governments contemplating embarking on m-Government need partnerships with the private sector, especially with mobile service providers, to use their built networks to deliver the services. This partnership poses a potential threat to m-Government security and privacy and is an issue that needs to be investigated thoroughly in order to find appropriate solutions. One possible solution would be to form appropriate policies and regulations that govern the relationships among the government and its partners.

Other security risks that should be considered are the various types of hacking, such as on-the-air security breaches, and device loss or theft (Chang & Kannan 2003). The latter risk could be handled by destroying the data on the device and immediately blocking the device to prevent any possible use. Also, a dedicated m-Government gateway helps in keeping the service secure (Kim et al. 2004).

2.7.9. Cost

Cost is a significant issue that has to be investigated from two perspectives: governments adopting the technology and paying to build it, and constituents using it and paying for its use. Governments should consider the fund allocation and resources required before starting the m-Government project (Al-khamayseh & Lawrence 2005). It is not desirable for governments to set up an ambitious plan for a huge m-Government project and then stop before its completion because of a budget shortage.

It is recommended that governments utilise the private sector's infrastructure rather than building a standalone m-Government infrastructure, due to the specialty of m-Government roaming users who require the extended network coverage which has already been built by the private mobile operators. Foghlú (2005) states that utilisation of private mobile operators' infrastructure through partnership helps to reduce the initial cost.

The Working Group on E-Government in the Developing World (2002) warns governments against adopting e-Government for the sake of saving money, although this is an expected outcome in many cases; as e-Government includes m-Government, this also applies to the latter. Goldstuck (2003) argues that adopting m-Government should be justified by the benefits it will bring to constituents, such as time saving and convenience, and not by the possibility of saving money for the government.

Information Technology literacy plays a big role in increasing or decreasing the initial cost. It increases when the government has to spread technological literacy

by running user training sessions and decreases when constituents have the knowledge and technology readiness (The Working Group on E-Government in the Developing World 2002).

Cost correlates to acceptance. From the perspective of m-Government constituents, the cost of owning the access devices should be affordable (Ghyasi & Kushchu 2004) and the cost of accessing services should be low. The survey analysis conducted by Carroll (2005) shows the participants' bias towards SMS rather than voice calls because of lower cost.

For the above-mentioned reasons, this research will investigate funding and marketing methods, partnership with private mobile service providers, estimation of the expected high initial cost, and cost reduction methods.

2.7.10. Strategy

'M-government is itself a complex business strategy for the efficient utilization of all wireless devices in providing services to all involved parties for better benefits' (Mukherjee & Biswas 2005). Thus, transitioning to m-Government requires as a first step, revising a country's IT strategy to include wireless and mobile technology if it lacks such technology. Al-khamayseh and Lawrence (2005) argue that a successful m-Government strategy should be developed depending on functional models. Al-khamayseh and Lawrence (2005) also discuss whether an m-Government strategy should consider a nation's special characteristics, such as its technological infrastructure, as this will contribute to the prioritisation of m-Government initiatives and will result in identifying expected risks, leading to work on solutions. For example, Australia, which according to the (Australian

Government Information Management Office (AGIMO) 2005), ranked among the top five countries in the world in terms of e-Government maturity, has developed a national e-Government strategy that has helped agencies to meet the requirements and to set up plans for funding projects (AOEMA 2003).

2.7.11. IT literacy and m-Government awareness

Both Santos (2005) and (The Working Group on E-Government in the Developing World (2002) agree that IT improves government efficiency; on the other hand, lack of IT awareness is a vital factor in resisting technology and, in this case, m-Government applications. Unfortunately, this is a severe problem in developing countries where officials resist technology. Officials' resistance has been referred to in the report by (The Working Group on E-Government in the Developing World 2002), which lists a number of reasons for this resistance, such as: fear of power limitation as technology limits corruption and bureaucracy; fear that technology might cause more work burden or job loss because of lack of technology awareness in countries with unstable economies and few job opportunities; and a belief that technology will add nothing to work efficiency. As a result, Goldstuck (2003) reports that officials' non-awareness of the benefits of m-Government results in recognising only obstacles that will bias their decision towards refusing the idea. An enlightenment or education campaign should therefore be carried out to educate officials about m-Government. The campaign is one of the key findings and recommendations of Chang and Kannan (2003), who found that training programs can have an effect on employees' acceptance of wireless technology. An essential preliminary step also recommended by Chang and

Kannan (2003) that should be carried out before starting the educational campaign is evaluating staff technology readiness.

2.7.12. Standards and Data exchange protocols

Goldstuck (2003) reports that m-Government must be based on standards, and failure to do so will result in higher costs in future redevelopment. The report also states that governments can rely on a number of standards that have been accepted globally, such as the Global System for Mobile Telecommunication (GSM) as it is compatible with current and upcoming technologies and applications such as Short Message Service (SMS), Wireless Application Protocol (WAP), General Radio Packet System (GPRS), and Universal Mobile Telecommunications System (UMTS). The technological factors in Table 1 (p. 18) present the global accepted standards to be adopted.

2.7.13. User needs and preference applications

Constituents are the m-Government experts. According to Goldstuck (2003), applications should be driven by needs, that is, the needs of the potential m-Government constituents who will access the services and use them. Determining constituents' needs is critical, particularly with services designed to directly serve the public.

An initial step towards achieving successful m-Government services is to address constituents' needs, prioritise them, then pilot them (Bassara, Wiśniewski & Żebrowski 2005). The m-Government development process should pilot each service, test it, and solicit constituents' feedback before a full-scale launch (The

Working Group on E-Government in the Developing World 2002). Thus, developing an m-Government service without preliminary pilot-citizen involvement could be risky. A European city had not involved any pilot project or citizens in designing a complex online procedure for registering children for school. The service was launched at a great cost but was not used by the parents because they preferred to visit the school to register their children (The Working Group on E-Government in the Developing World 2002).

2.7.14. Quality and user friendly applications

Developing quality applications comes after defining urgently needed useful applications. Quality applications are simple, user friendly and robust applications. Goldstuck (2003) considers quality and user friendly applications as a key to retrieving quality information from the back-office systems and thus quality m-Government, while Carroll (2005) argues that a convenient m-Government application is a key success factor (e.g. using SMS results in faster and easier correspondence than email), and Sandy and McMillan (2005) state that consistent user interface guarantees more constituent access.

2.7.15. Partnership with private sector

Al-khamayseh and Lawrence (2005) and Sandy and McMillan (2005) agree that partnership with the private sector is one of the most important steps towards bringing m-Government into existence.

By definition, a Public-Private Partnership (PPP) is a contractual agreement between a government entity (public sector) and a for-profit corporation (private sector). Together, these entities agree to provide services to the public by combining their assets and skills and share the risks and rewards (Snabe 2005).

The partnership with the private sector, such as mobile service providers, will help in sharing risks such as project failure, and rewards such as Return On Investment (ROI). It will also allow all parties to broaden their reach - such as government partnership with the right private mobile provider's network enabling contact with constituents anywhere in or out of the country - and will accomplish better results (United Nations Foundation 2003). Goldstuck (2003) points out that partnership with the private sector contributes by taking the burden of the initial cost related to infrastructure provision.

2.7.16. High mobile penetration

According to Wireless Intelligence (2005) the number of cellular connections globally had reached 2 billion connections on Sunday the 18th September 2005. '*the total number of mobile connections is now equivalent to nearly a third of the estimated world population of 6.5 billion,*' said Martin Garner, director of wireless intelligence, *'and although total connections are higher than the real number of users due to multiple connections, or inactive pre-paid connections, this is still a significant landmark for the industry.*' Figures 1 and 2 show the remarkable increase in connections since the second quarter of 2002, and surprisingly the International Telecommunication Union's (ITU) latest data suggests that the number of mobile subscriptions world-wide approached 4 billion by the end of

2008 (International Telecommunication Union 2008b). Figure 2 depicts the increase in mobile subscribers since 2000.

Goldstuck (2003) indicates that high mobile penetration is a key facilitating factor to reach an m-Government system, but he also discusses that the continuing increase in mobile penetration does not mean that constituents are willing to use their mobile devices for more than making personal calls or using SMS. Thus, another important factor in addition to high mobile penetration is the constituents' acceptance of using the new m-Government services.

The fact that most m-Government services are delivered using SMS corresponds to the high interest in SMS. For example, Malta has launched many M-Services through SMS notification such as: notification of acknowledgements and status change of customer complaints; notification of court deferrals; notification for license-renewal to the holders of licenses; notification of exams results; and notification for Direct Credit Payments from the Department of Social Security (Ministry of Information Technology and Investment 2003b).

Citizens in Malta wishing to use m-Government services have to register through a dedicated online website as a first step. Once the government system validates the citizen's information, it triggers the m-Government infrastructure which in turn sends a notification to the citizen's mobile service provider, which sends it as an SMS registered citizen (Ministry of Information Technology and Investment 2003a). Figure 6 depicts the mobile interaction between the citizen and the government.

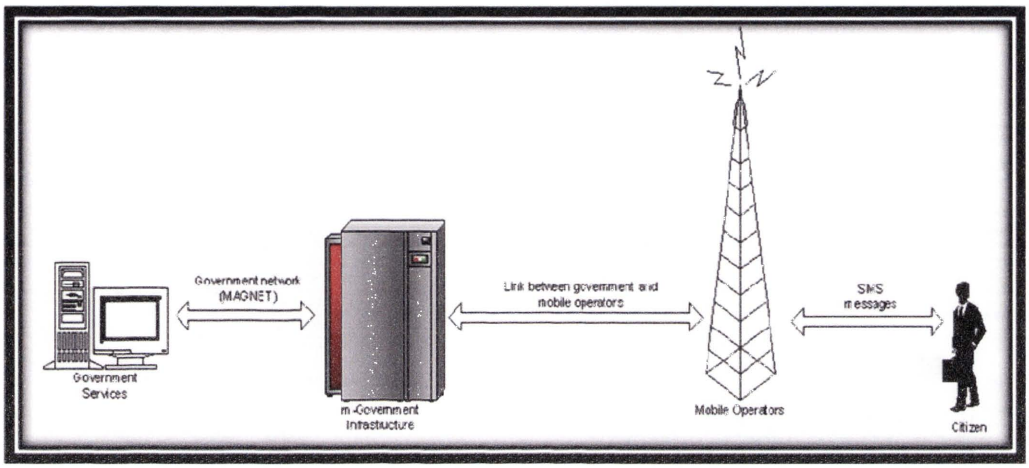

Figure 6: Citizen's interaction with m-Government in Malta (Ministry of Information Technology and Investment 2003a)

2.8.m-Government benefits

According to Sandy and McMillan (2005), the benefits that m-Government brings to governments seems endless, as wireless infrastructure technologies are advancing at a rapid pace, enabling many opportunities and benefits for governments and their customers. The main and most important benefit of e-Government and thus also m-Government is reforming governmental work and information management to better serve government itself, citizens and businesses (Lallana 2004).

Cost reduction and increased revenue for both governments and constituents is a big potential (The World Bank Group 2005). m-Government involves the existence of e-Government as a prerequisite, and according to Chang and Kannan (2003), 'government websites in the United States attract more visitors than commercial websites'. This means that commercial organisations will target government

websites to advertise and market themselves, which will result in increased income for the government agency.

Instant access to information and constituents helps critical decision making. Chang and Kannan (2003) states that the characteristic that the wireless mobile device is associated with a particular constituent helps in instant interaction with him or her.

m-Government has many benefits in disasters. A country like Bangladesh, for example, suffers annual natural disasters such as cyclones and floods which claim thousands of lives and cause billions of dollars' worth of damage (Hossan, Chowdhury & Kushchu 2005). The lack of electronic services in Bangladesh is pronounced, as only 30% of Bengalis have access to electricity and a lesser percentage has access to TV or radio, whereas mobile phones are widespread and always turned on, so citizens can receive information 24/7.

Since m-Government delivers information and services through the wireless infrastructure, Kushchu & Kuscu (2003) argue that m-Government could be the solution for reaching citizens, and for the exchange of communications, especially in remote areas. This is a major factor that affirms the need for m-Government. Hossan, Chowdhury and Kushchu (2005) define four major life saving uses of m-Government applications in Bangladesh through disseminating pre-disaster and post-disaster warning SMS; through exchanging SMS with citizens to enable them to request relief needs; and government-citizens interaction to exchange information about health hazards.

2.9.m-Government cost

Cost is a big issue that governments have to analyse in order to allocate the required funds and resources before starting the project (Al-khamayseh & Lawrence 2005). Evaluating the cost of m-Government is not an easy task as it depends on many factors, such as the existence of m-Government key players in the country and/or components in the country wishing to implement m-Government. Having any key player and/or component missing necessitates the government finding a way and allocating a budget to provide what is missing before even planning for the project. A cost analysis should be done and revisited at all stages through the life of the project.

Human factors play a big role in increasing or decreasing the initial cost. They increase when the government has to spread technological literacy by running user training sessions and decrease when the constituents have the knowledge and technology readiness.

The Working Group on E-Government in the Developing World (2002) warns governments against adopting e-Government for the sake of saving money, though this is an expected outcome in many cases, and as e-Government includes m-Government the author believes that the same should apply for the latter. Goldstuck (2003) also argues that adopting m-Government should be justified by the benefits it will bring to constituents such as time saving and convenience and not by money saving for the government.

2.10.The problem

Through the literature review, the researcher explored m-Government drivers, benefits, success factors, and development requirements. It has been noted that many researchers believe m-Government to be a subset of e-Government (Lallana 2004), thus there was a tendency to assume the existence of e-Government as a prerequisite of m-Government (Abanumy & Mayhew 2005; Antovski & Gusev 2005; Carroll 2005; Chang & Kannan 2003; Goldstuck 2003; Kim et al. 2004; Sandy & McMillan 2005). Although these authors claim that e-government should be present before m-Government, others contradict this claim. For example, Lallana (2004) contradicts his first claim by indicating that 'mGovernment is particularly suited for the developing world where Internet access rates are low but mobile phone penetration is growing rapidly, particularly in urban areas'. That contradiction leads to the following question: Could a fully-interactive m-Government be best suited for developing countries while many of them are suffering insufficient telecommunication infrastructure - the basic infrastructure for e-Government?

Although the literature review revealed many success factors, it did not disclose enough to devise a broad organising structure that could be used to solve or address the complex essential knowledge and skills required for a successful m-Government. Thus, more research needs to be done in order to explore all possible set of concepts (success factors), methods, technologies, and cultural changes necessary for a complete m-Government framework. Such a conceptual framework forms the skeleton of the m-Government setup and serves as a

guideline or foundation upon which any country may build its current and future m-Government strategy.

This study aims to answer the research question by surveying international experts in the field along with studying developed and developing countries case studies as the case in developing countries is very different from developed countries. In the latter, e-Government and mobile services and infrastructure are mature and successful, which facilitates the transition to m-Government, while many developing countries lack successful e-Government infrastructure, strategies and services. The lack of e-Government infrastructure and the advancement of mobile technologies in these countries led the researcher to study the following hypothesis:

Hypothesis: Those developing countries with poor e-Government infrastructure can leapfrog this factor and develop successful fully interactive m-Government. If proved this will be a breakthrough and will contribute in helping governments to better serve their citizens, businesses and other governmental agencies, and as a result will contribute to bridging the digital gap between developing and developed countries.

The research will target Jordan and the UAE as developing countries, and Australia as a developed country.

2.11.Conclusion

The aim of this literature review is to provide a clear and comprehensive survey of the literature in the field of mobile government, in particular the success factors of m-Government, in order to enable an understanding of what is required for a successful transition to m-Government. The researcher investigated m-Government research and applications developed to discover what is needed to achieve successful m-Government. That evidence was used as a basis to build the research questions and hypothesis.

2.11.1. Where to now?

The next chapter 'Methodology' will discuss the research theoretical perspectives, methodology, and methods suitable for this research.

PART II

METHODOLOGY

DATA COLLECTION

DATA ANALYSIS

CHAPTER 3

3.Methodology

This chapter introduces the research methodology used throughout all levels of the research framework. It begins by explaining the research design, and then sets out the research framework in an organised fashion. The researcher briefly discusses the choices made for this study in each level of the framework. It concludes with a review of the chapter's main points.

3.1.Introduction

Although literature on research methods defines research as a series of clearly delineated stages, Gorman and Clayton (2005) argue that, at the beginning of a qualitative research, most novice qualitative researchers (and even experienced ones) have no clear planned course for tackling the topic under investigation. That is, 'they do not have a clearly set out, step-by-step design' (Gorman & Clayton 2005, p. 34). This allows the process to be open to the setting and

subjects of the study, who inform the process and allow modification of the general research plans, which makes the process more iterative (moving forward and backward) rather than linear (only moving forward). Thus, the research design has been often revisited and refined to finally reach a suitable research design for this study.

In this study, the researcher followed the qualitative research pyramid model as a general guide to tackle the mobile government topic. Figure 7 below depicts the pyramid.

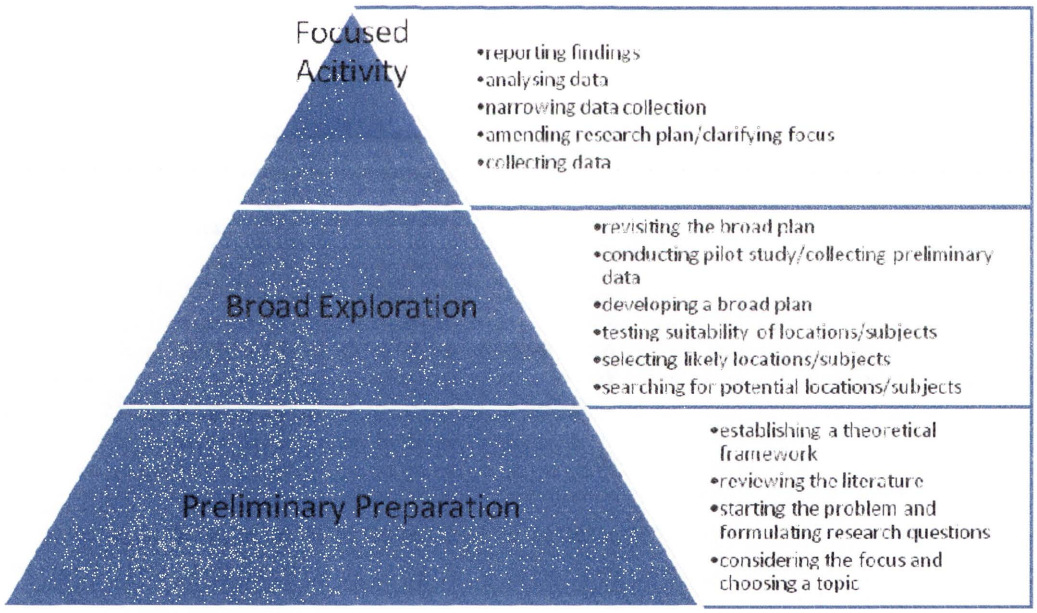

Figure 7: Qualitative research pyramid model (Gorman & Clayton 2005)

Clayton (2005) explain the pyramid process as follows:

> At the base 'preliminary preparation' forms the foundation on which subsequent stones are laid...When these components have been addressed sequentially and recursively, the second stage, a broad exploration involving field activity, begins with a general casting about for potential

> locations and subjects...with this in hand the researcher is then able to move into the third main phase, focused activity. (Gorman & Clayton 2005, p. 38)

The next section discusses the final research design. The researcher attempted to achieve a neat design which proceeded logically and without major issues. The iterative nature of the qualitative research process 'requires data analysis to be undertaken through the project and not just in the concluding stages' (Gorman & Clayton 2005, p. 36). This will be discussed in the 'Data Analysis' chapter.

3.2.Research Design

All research is about knowledge and is based on philosophical perspectives. According to (Creswell 2007), 'the research design process in qualitative research begins with philosophical assumptions that the inquirers make in deciding to undertake a qualitative study'. Yin (1994) explains that the research design is 'the logical sequence that connects the empirical data to a study's initial research questions and, ultimately, to its conclusion'. This logical sequence determines the type of data needed, data collection techniques, and methodology to reach the research objectives (Hair, Bush & Ortinau 2006).

According to Hussey & Hussey (1997), there are three agreed research principles: inquiry, investigation, systematic and methodical process. Within the three research principles, researchers need to make choices about four basic elements before a research project commences. These include research methods, methodology, theoretical perspective, and epistemology (Crotty 1998). The choices of the four elements have been laid out in an organised fashion that suits the purposes of this particular research and clarifies how they inform and relate

to one another in order to provide a sense of direction. According to Crotty (1998), 'we need a process capable of fulfilling those purposes and answering that question'" Thus, Crotty (1998, p. 2) suggests that we should answer the following four questions to guide our research design:

- *What methods do we propose to use?*
- *What methodology governs our choice and use of methods?*
- *What theoretical perspective lies behind the methodology in question?*
- *What epistemology informs this theoretical perspective?*

These questions represent the chronological order of any research that starts with the researcher finding a problem to investigate, then determining the research question(s) and objective(s) that lead to choosing the research methods and the methodology that governs the use of methods. These choices must be justified. According to (Crotty 1998, p. 2), 'Justification of our choice and particular use of methodology and methods is something that reaches into the assumptions about reality that we bring to our work. To ask about these assumptions is to ask about our theoretical perspective'.

The sequence of questions put by (Crotty 1998) requires the determination of methods and methodology first, but starting the research design by having to choose methods and methodology confuses the researcher because of the plethora of available methodologies. This requires the researcher to acquaint themselves with a range of methodologies to compare and contrast their presuppositions, strengths and weaknesses to discover the one best-suited to the unique objectives of their research (Crotty 1998). This may result in finding an established methodology that suits the research; alternatively, the researcher

might find themselves drawing on different methodologies to mould or invent a new one to suit the research purposes (Crotty 1998).

Eventually, research should contribute with valid outcomes that bear scrutiny. The outcome(s) either '**objective**, valid and generalisable conclusions' or '**suggestive** rather than conclusive' are 'certainly not any "one true way" of seeing things' (Crotty 1998). Either way, the researcher needs to be more concerned about the inquiry process. It is the theoretical perspectives and epistemology that defend a research as a serious human inquiry. The answers to the above questions form a research framework which is depicted in Figure 8 below.

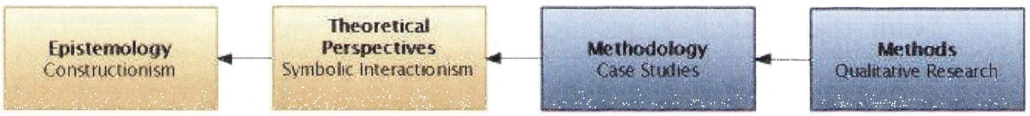

Figure 8: Right to left research design

Although the progression depicted from right to left in Figure 8 represents chronological events, Crotty (1998) points out that 'In terms of what informs what, going from left to right would seem a logical progression' (see Figure 9). Crotty (1998) justifies this as being less confusing to the researcher than going from right to left.

Starting the research design with methods and methodology confuses researchers with the plethora of available methodologies, which requires them to compare and contrast to establish the one that suits their unique research objectives. Figure 9 depicts the logical progression followed in this study.

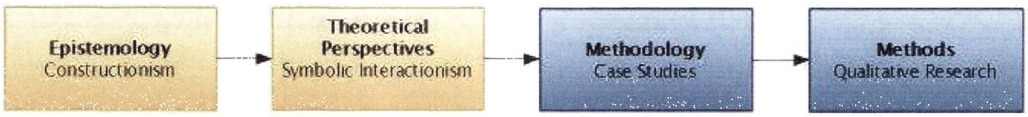

Figure 9: Left to right research design

According to Myers (1997), valid research is based on the conscious and/or unconscious use of philosophical perspectives. These perspectives guide the research and determine appropriate research methods. Research design determines the type of data needed, data collection techniques required, and a methodology to reach the research objectives (Hair, Bush & Ortinau 2006). Thus, it is crucial to cautiously make the choices for any research as they shape the research and affect the conduct of inquiry (Creswell 2007).

The purpose of the research question justifies the choice of the research methods and methodology, but there is more to it than that. Justification also reaches into assumptions about reality, and asking about these assumptions leads to asking about the theoretical perspectives, which also reaches to the understanding of knowledge and what kind of knowledge will be gained by the research (Crotty 1998). Thus, each element in Figure 10 is related to another and embedded within it.

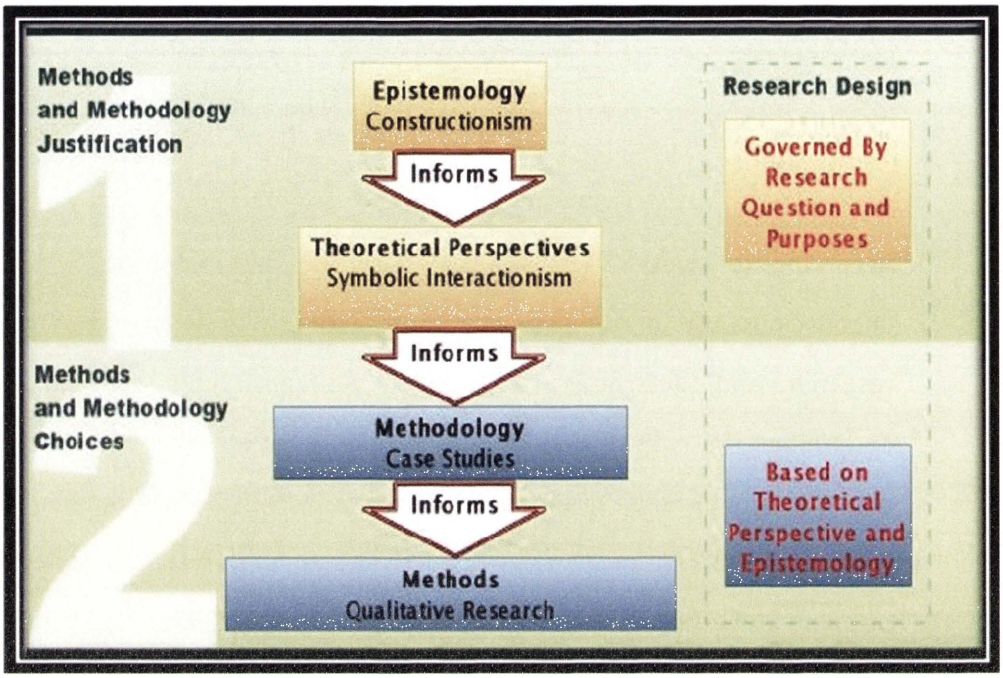

Figure 10: Research design

According to Crotty (1998) the choice of research epistemology and theoretical perspectives is governed and justified by the research question and purpose. This guarantees a valid inquiry that fulfils that question and purpose. Thus, the following sections will lay out the purpose and questions as they apply to this research.

3.3.Research Purpose

According to Bouma (1996) the research design aims to answer the research question and meet the research objectives. This research is addressing the main research question - What are the factors contributing to successful transition to and implementation of mobile government system? How? Why?

Since mobile government is still a new field of research with few heterogeneous studies, projects, and literature, this research attempts to clearly **define** mobile government, and to discover mobile government **success factors**. Further, it aims to devise an adaptive **framework** that could guide any government in adopting wireless and mobile technologies to successfully implement mobile government services for its constituents.

The researcher aims to find what is necessary for the adoption of mobile and wireless technologies in the public sector to improve diffusion of mobile government services. The researcher aims to discover the subjective truth about mobile government and extract evidence from subjective perspectives of mobile government departments that have already implemented mobile services and experts who have worked on mobile government projects.

Based on the above discussion, the goals of this study include an exploration of the (a) success factors and (b) economic aspects of the acquisition of wireless and mobile technologies in the public sector. The objectives deriving from those goals are:

- An assessment of the categories of use of mobile and wireless technologies in the public sector.
- The establishment of a basis for understanding the current and future success aspects of mobile government.
- An evaluation of mobile government adoption issues, including managerial issues and the centralisation or decentralisation of decision making.

- The establishment of a basis for understanding the current and future economic aspects of mobile government.

The research questions arising from the above objectives were as follows:

- Objective 1 above is addressed by the question: What patterns of acquisition emerge from current wireless and mobile technologies and the perceived needs for mobile government?
- Objective 2 is addressed by the question: What characteristics of the categories of mobile government use contribute to the patterns of acquisition?
- Objective 3 is addressed by the question: What issues arise from the rapid acquisition of mobile and wireless technologies and how important have those technologies become to the organisation?
- Objective 4 is addressed by the question: How will the organisation balance the need for technological changes with the need to continue the accomplishment of routine tasks?

The above questions along with the main research question: '*What are the factors that contribute to successful mobile government? How? Why?*' reinforce the exploratory nature of this research. This is a justifiable rationale for conducting an exploratory study (Yin 1994).

According to (Crotty 1998), 'we need a process capable of fulfilling those purposes and answering that question'. Since research design should determine the type of data needed to understand a phenomenon, it is crucial to select an appropriate philosophical assumption. According to Creswell (2007), there are

'five philosophical assumptions: ontology, epistemology, axiology, rhetorical, and methodological assumptions' to choose from.

The following sections will make explicit the philosophical assumptions, and the paradigms and frameworks selected for this study. The sections will answer one of the four questions suggested by Crotty (1998, p. 2), thus they will drive the reader through the logical sequence of the process. Each section will relate to the one prior.

3.4.Epistemology

- *What kind of knowledge will be attained by this research?*
- *What epistemology informs this theoretical perspective?* (Crotty 1998, p. 2)

According to Crotty (1998) epistemology 'is the theory of knowledge embedded in the theoretical perspective and thereby in the methodology'. This research is based on epistemological assumptions that guide the research. Myers (1997) sees valid research as based on the conscious and/or unconscious use of philosophical perspectives. These perspectives guide the research and determine appropriate research method(s).

Myers (1997) points out that the most important philosophical perspective is the underlying epistemology. Epistemology, according to (The American Heritage Dictionary of the English Language 2000) means 'the branch of philosophy that studies the nature of knowledge, its presuppositions and foundations, and its

extent and validity'. The definition according to the Modern Language Association is:

> 'theory of knowledge', 1856, coined by the Scottish philosopher James F. Ferrier (1808–64) from Gk. *episteme* 'knowledge', from Ionic Gk. *epistasthai* 'know how to do, understand', lit. 'overstand', from *epi-* 'over, near' + *histasthai* 'to stand'. The scientific (as opposed to philosophical) study of the roots and paths of knowledge is *epistemics* (1969) (Online Etymology Dictionary 2001)

According to these definitions, epistemology is about ways of acquiring knowledge to reach understanding. According to (Wikipedia 2007) three questions need to be raised:

1.'What is knowledge?'

2.'How do we obtain 'valid' knowledge?'

3.'What do people know?'

3.4.1.Constructionism as the Epistemology

From amongst the various epistemologies: Objectivism, Constructionism, Subjectivism, the design of this research is based on constructionism (or constructivism) as its epistemology. Constructionism is 'the view that all knowledge, and therefore all meaningful reality as such, is contingent upon human practices, being constructed in and out of interaction between human beings and their world, and developed and transmitted within an essentially social context' (Crotty 1998, p. 42).

According to (Merleau-Ponty 1962), objects in the world have potential meanings; to discover them requires human inquiry (the conscious) to relate the subjectivity and objectivity together through constructionism. Accordingly, to discover success factors (meaning of truth) of mobile government (object) they have to be associated with government departments (subjects). Constructionism has contributed to the search for and selection of suitable subjects to from whom to obtain valid knowledge.

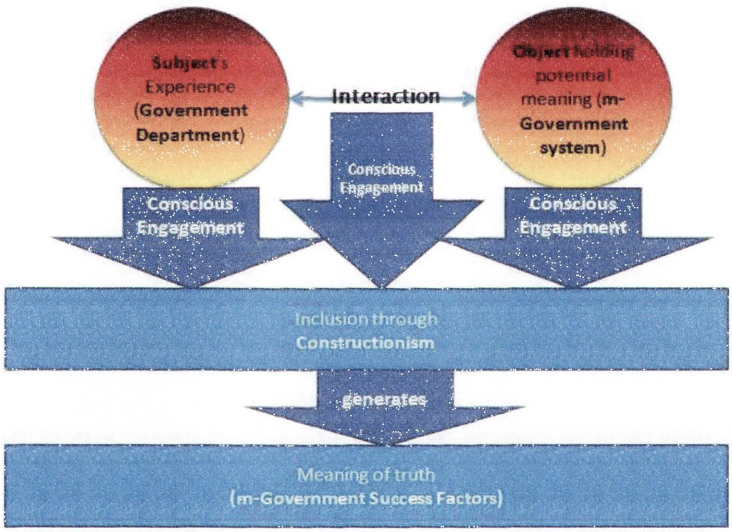

Figure 11: Researcher's conduct of Constructionism.

According to the above definition, constructionism concerns the researcher's interaction with participants (subjects) in understanding the mobile government (object) to discover the meaning of truth (success factors). Creswell (2007) points out that 'conducting qualitative research means that the researchers try to get as close as possible to the participants being studied'. Figure 11 above depicts the researcher's interaction to obtain knowledge to understand the mobile government phenomenon.

As explained in the Introduction, mobile government is a new topic of research in its infancy with little literature available. This fact implies that the researcher must go out to the field and interact with as many participants as possible to acquire knowledge (i.e. government departments that have implemented mobile government applications and experts in the field).

According to Creswell (2007), prolonged stay in the field is important: 'in short, the researcher tries to minimise the "distance" or "objective separateness" between himself or herself and those being researched'. Creswell (2007) also points out that 'the inquirer and the "object" of inquiry interact to influence one another; knower and known are inseparable'. Thus, the data collection took place over a prolonged period (years 2005 to 2008) - nearly the whole period of the research - surveying participants from all over the world, interviewing IT managers in government departments and meeting with experts in the field in international conferences and workshops. According to Creswell (2007), 'The longer researchers stay in the "field" or get to know the participants, the more they "know what they know" from firsthand information'. Accordingly, the collected data does not reflect opinions or practices at a single time.

The suggested elements of the research framework inform one another. Thus, there are rules to govern the choice of elements and the validity of the relationship. The main limitations apply to the relationship between the epistemology and the theoretical perspectives; for instance, constructionism and subjectivism epistemologies could not inform a specific theoretical perspective such as positivism because it is objectivist by definition (Crotty 1998). Crotty (1998) also points out that there are no limits on the choice of methodology and/or methods, saying that 'Certainly, if it suits their purposes, any of the

theoretical perspectives could make use of any of the methodologies, and any of the methodologies could make use of any of the methods'.

Crotty (1998) believes that 'there are typical strings' and demonstrates typical relationships between epistemology (data from web survyes and interviews) and theoretical perspectives (meanings that participants assign to m-Government concepts/factors) such as constructionism informing symbolic interactionism.

3.5.Theoretical Perspectives: Symbolic Interactionism

- What theoretical perspective underlies the research methodology? (Crotty 1998, p. 2)

The previous section has situated constructionism as the suitable epistemology for the purpose of this research. Once epistemology (origin, nature and validity of knowledge) is determined, it is natural to elaborate on the theoretical perspectives - that is, how we understand knowledge and make sense of it (Crotty 1998). This section describes the philosophical stance that lies behind the chosen methodology. According to Crotty (1998) theoretical perspective is 'the philosophical stance informing the methodology and thus providing a context for the process and grounding its logic and criteria'. Amongst the available theoretical perspectives: positivism, interpretivism, critical inquiry, feminism (Crotty 1998), this research is based on interpretivism, specifically symbolic interactionism. According to (Crotty 1998, p. 5) 'constructionism informs symbolic interactionism'.

Burrell and Morgan (1979) state that interpretivism seeks 'explanation within the realm of individual consciousness and subjectivity, within the frame of reference of the participant as opposed to the observer of action'. According to Myers (1997), interpretive studies aim to understand phenomena through social constructions such as language, consciousness and shared meanings that people assign to them. Walsham (1993) points out that interpretive methods of research in information systems are 'aimed at producing an understanding of the context of the information system, and the process whereby the information system influences and is influenced by the context'.

Since this research studies the mobile government experts' perspective, it does not search for specific variables, Kaplan & Maxwell (2005) argue that interpretive research does not predefine dependent and independent variables, but focuses on the full complexity of human sense-making as the situation emerges. Although there might be many interpretations of reality, these interpretations are in themselves a part of the scientific knowledge.

The researcher aims to discover reality through understanding meanings to reach a deep understanding of the phenomenon. Thus, the researcher is interested in aspects that are unique, individual, and qualitative. This links the research to interpretivism as the theoretical perspective rather than others such as Positivism, Critical inquiry, or Postmodernism.

> Interpretivism emerged in contradistinction to positivism... and is often linked to the thoughts of Max Weber (1864-1920) who suggests that in the human sciences we are concerned with Verstehen (understanding) (Crotty 1998).

In this research, for example, we are engaged in exploratory inquiry and data collection through interviews with experts. This process raises assumptions related to language, communication, community, interrelationships and intersubjectivity. Symbolic interactionism, one of several Interpretive approaches, is concerned with the genesis and evolution of meaning and identity to deal with these issues (Crotty 1998). Thus, from amongst the different interpretive approaches within the interpretivism theoretical perspective such as phenomenology and hermeneutics, symbolic interactionism has been chosen as the stance guiding this research. Blumer (1969, p. 2) sets forth three symbolic interactionism core assumptions:

- that human beings act toward things on the basis of the meanings that these things have for them;
- that the meaning of such things is derived from, and arises out of, the social interaction that one has with one's fellows;
- that these meanings are handled in, and modified through, an interpretive process used by the person in dealing with the things he encounters.

Again, interviewing experts in the field means studying participants' perceptions and meanings. According to Denzin (1974), methodologically symbolic interactionism directs the investigator to take, to the best of their ability, the standpoint of those studied. Thus, the theory of 'symbolic interactionism' underpins Descriptive Exploratory methodology.

3.6.Research methodology: Case Studies

The selection of symbolic interactionism as the theoretical perspective brings with it the following assumptions which inform the methodology:

- Use of descriptive exploratory methodology;
- Interpretivism seeks explanation;
- Understanding context through interaction with subjects.

Crotty (1998) defines the methodology as 'the strategy, plan of action, processor design lying behind the choice and use of particular methods and linking the choice and use of methods to the desired outcomes'.

The above-mentioned assumptions should be reflected in the chosen methodology. Thus, the assumptions informed the researcher of the criteria the methodology should have. According to Tellis (1997), 'Case study can be seen to satisfy the three tenets of the qualitative method: describing, understanding, and explaining'. Thus, this forms the rationale behind selecting case studies as the research strategy.

The research question type also led to choosing the case study methodology. The core research question - '*What are the factors contributing to successful transition to and implementation of mobile government systems? How? Why?*' - includes three categories of the inquiry questions series: 'What', 'How', and 'Why' (Yin 1994). The 'What' part here is aimed at developing a proposition for further inquiry, and thus suggests an exploratory nature and favours the case study approach. The 'How' and 'Why' parts 'are more explanatory and likely to lead to the use of case studies' (Yin 1994).

Gorman and Clayton (2005) define case study as:

> An in-depth investigation of a discrete entity (which may be a single setting, subject, collection or event) on the assumption that it is possible to derive knowledge of the wider phenomenon from intensive investigation of a specific instance or case.

Yin (2003) advocates that case study methodology is appropriate for exploratory, explanatory and descriptive research, and Tellis (1997) acknowledges that case study methodology has been extensively used in many fields such as 'law, medicine, government and in evaluative situations'. Tellis (1997) points out that 'The government studies were carried out to determine whether particular programs were efficient'. In this research, mobile government programs are investigated to determine its success factors.

Yin (2003) has identified three main case studies: exploratory, explanatory, and descriptive. Case study research calls for selecting a single example, or a few examples, of the phenomenon to be studied and then intensively investigating the characteristics of those cases. However the case study methodology has been criticised in the past because its 'dependence on a single case renders it incapable of providing a generalizing conclusion'. This study investigates multiple case studies. According to (Tellis 1997) 'multiple cases strengthen the results by replicating the pattern-matching, thus increasing confidence in the robustness of the theory'.

Gerring (2007) points out the thoughts of others that a work could be considered as case study if it has the following characteristics:

- Qualitative method,

- Comprehensive study,
- It utilises a particular type of evidence,
- Naturalistic method of evidence gathering,
- The topic is diffuse,
- It employs triangulation,
- Investigates the properties of a single observation,
- Investigates the properties of a single phenomenon.

The above characteristics are valid and presented in this study as will be seen throughout the thesis.

According to Gerring (2007) considerable confusion surrounds the case study method because of an abundance of related terms. Thus, there have been many arguments around the case study method and a great number of proponents and opponents. Platt (1992) notes that 'much case theorizing has been conceptually confused, because too many different themes have been packed into the idea "case study"'.

Yin (1994, p. 64) recommends 'the use of case-study protocol as part of a carefully designed research project that would include the following sections':

- *Overview of the project (project objectives and case study issues)*
- *Field procedures (credentials and access to sites)*
- *Questions (specific questions that the investigator must keep in mind during data collection)*
- *Guide for the report (outline, format for the narrative)*

The above criteria have been followed in this research and the case study design is discussed in the 'Data Collection' chapter.

3.6.1.Case study quality & rigour

Most researchers, especially in the Information Technology (IT) field, tend to consider quantitative research as by some means superior to qualitative research, and they would not consider a qualitative study a rigorous one. As Creswell (1998) points out however, qualitative research 'shares good company with the most rigorous quantitative research, and it should not be viewed as an easy substitute for a statistical or quantitative study' (Creswell 1998, p. 16).

Case study research has faced traditional prejudices. Thus, in order to ensure rigorous, quality research, the author has reviewed and applied a number of techniques and procedures in this research to reach these objectives:

- Multiple data collection methods (triangulation) were utilised in this study in order to reach in-depth understanding and thus achieve better results. According to (Beck 1993) triangulation is 'used to determine the congruence of the results' which enhances outcomes validity and credibility. This study has used open-ended web-based surveys of a large number of experts, semi-structured face-to-face interviews with a smaller number of key subjects in different countries, email and phone interviews, and an extensive review of literature. According to (Yin 1994), 'a major strength of case study data collection is the opportunity to use many different sources of evidence'. Triangulation also eliminates bias and distortion and ensures confidence in the conclusion when 'all sources

point to the same answer' (Yin 1993). This is presented in the 'Data Analysis' chapter where all sources of information were reviewed and analysed. Figure 12 depicts the convergence of multiple sources of evidence (Yin 1994, p. 93).

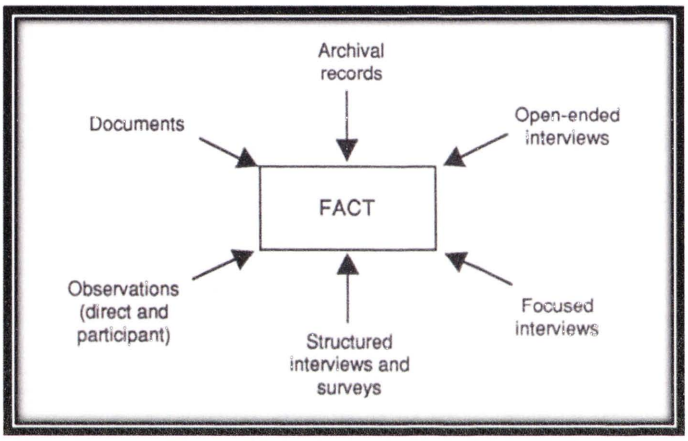

Figure 12: Multiple sources of evidence (Yin 1994)

- The author has been extremely careful not to allow evidence to bias the truth and/or influence the direction of the findings. This has been achieved by using triangulation, conducting multiple case studies and ensuring that the researcher's presence had no effect of the nature of the data collected.

- A minimum of two government departments were investigated in three different countries to achieve deep understanding of the phenomenon and to provide a basis for generalisation.

- Allowing participants to guide the data collection and thus allow them to move in new and perhaps unexpected but relevant directions to

incorporate their views. This enhances research credibility through redeveloping the interview questions in order to identify and describe the mobile government phenomenon from the perspective of the participant (Beck 1993). Beck (1993) affirms that 'credibility in qualitative research measures how vivid and faithful the description of the phenomenon is'. To ensure credibility of this research the author followed Beck's guide (Beck 1993, p. 255).

- **Subjects' validation**: transcriptions of the case study interviews were securely emailed to the participants for confirmation, editing if needed, consistency assurance and approval, before starting the analysis process. According to Guba & Lincoln (1989, p. 239), subjects' checking is 'the single most critical technique for establishing credibility'. This is presented in the 'Data Collection' and 'Data Analysis' chapters. Findings were also validated by the participants to ensure credibility (Beck 1993).

- **Low inference descriptors** in the reporting stage through using the subjects' actual words (Chiovitti & Piran 2003) and utilising direct quotes from the respondents' extensively to link the data to the emerging results improves validity and credibility of the research. Beck (1993) advises providing the readers 'with rich excerpts from the transcripts'. This is presented in the 'Australian Case studies', 'International case studies' and m-Government Framework' chapters.

- **Transparency, communicability and coherence** of data collection and analysis procedures. This is presented in the chapters on data collection and analysis.

Finally, regardless of the lack of consensus on the quality criteria in qualitative research, the author of this study at all times aimed to produce high quality and rigorous research that would be true to the actual phenomenon; trustworthy, defensible, free of bias, understood by others, and significant to both researchers and practitioners.

3.7.Research Approach: Qualitative Research

- What methods do we propose to use?

The previous section has situated case study as the suitable methodology (research strategy) for the purpose of this research. Once the methodology is determined, it is necessary to elaborate on the specific qualitative research methods that suit the selected methodology.

Crotty (1998) defined methods as 'the techniques or procedures used to gather and analyse data related to some research questions or hypothesis'.

According to Creswell (1998), 'Qualitative research is an inquiry process of understanding based on distinct methodological traditions of inquiry that explore a social or human problem. The researcher builds a complex, holistic picture, analyses words, reports detailed views of informants, and conducts the study in a natural setting'. Auerbach (2003) also defines qualitative research as 'research

based on analysis and interpretation of texts and interviews in order to discover meaningful patterns descriptive of a particular phenomenon'.

This research investigates the mobile government (m-Government) phenomenon, and it was decided that qualitative research would be the most appropriate research method for the investigation because of the purpose of the research, and the exploratory nature of the research problem due to lack of theory. According to Strauss and Corbin (1990), 'Qualitative methods can be used to uncover and understand what lies behind any phenomenon about which little is yet known'. Another important reason for doing qualitative research is to become more experienced with the phenomenon the researcher is interested in by accessing details that enable the researcher to answer the research question. Strauss and Corbin (1990) define qualitative research as 'any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification'. Also, the open-ended nature of the research question - '*What are the factors influencing the success of mobile government systems?* - imposed a qualitative environment on the study. Lydia (2000) claims that the nature of the research question is a driving force in determining the research methodology, and states that: 'In a qualitative study, the research question often starts with a how or a what'. Thus, as mobile government is a new area of research with little available literature, the demand to discover new information was the rationale for engaging in qualitative enquiry.

A number of options were considered on how to collect the data. Due to the lack of literature, the researcher decided to become the instrument of data collection by consulting researchers and experts in the field to gather data from their expertise. Qualitative research techniques are especially useful for gathering and

analysing exploratory data, which gives the researcher a direct experience of the phenomenon. According to Trochim (2006), qualitative research certainly stands out at generating information that is very detailed, to obtain a deep understanding of the phenomenon. Also the final product of a qualitative research 'hypotheses/theories' is presented in a descriptive or narrative manner, incorporating expressive language and the 'presence of voice in the text' (Eisner 1991, p. 36).

According to Trochim (2006), there are a number of questions that need to be addressed in order to assist in deciding to conduct qualitative research:

1- **Do you want to generate new theories or hypothesis?**

YES.

While quantitative methods are based on hypothesis testing, qualitative research is often used to generate hypotheses (Auerbach 2003). Since, the mobile government phenomenon is a new field of research with little available literature; this favours a qualitative approach that does not require a hypothesis to begin with, but one to reach. This triggered a personal and professional motivation to investigate and understand the phenomenon. Thus, the research aims to explore the mobile government phenomenon and its potential to reach a hypothesis or theory that benefits stakeholders (governments, citizens, businesses). The final result could be later tested using quantitative methods of hypothesis-testing research by choosing dependent and independent variables to define the phenomenon of mobile government and making them measurable, in order to validate the qualitative analysis findings. Hypothesis testing is of less interest to the researcher. Thus, it is left out in this study as the researcher believes it is

more important to reach a detailed hypothesis first, before quantifying variables, as some concepts might lose their meanings when they are quantified (Myers 1997).

2- Do you need to achieve deep understanding of the issue?

YES.

Deep understanding and description of phenomena are important considerations that are facilitated by qualitative research in order to discover concepts and relationships. Again, since little is yet known about mobile government, the research aims to achieve deep understanding of the phenomenon to reach solid findings. Qualitative research makes it possible to obtain in-depth details about phenomena as processes and emotions that are difficult to learn about through quantitative methods (Strauss & Corbin 1998). This deep understanding contributes to a better description of the phenomena. Lincoln and Guba (1985) point out that 'If you want people to understand better than they otherwise might, provide them information in the form in which they usually experience it'.

3- Are you willing to trade detail for generalisability?

YES.

Table 5 lists the reasons that justify or explain how the study of the mobile government phenomenon lends itself to qualitative research methods.

Table 5: Qualitative research criteria this research meets

Qualitative Research Criteria	m-Government research
Exploratory Nature	YES
Little is yet known	YES
Reaching details that answer the research question(s).	YES
Achieve deep understanding of the issue	YES
Open-ended nature	YES
Generate new theories or hypothesis	YES

3.7.1.Qualitative Research Components

This research studies the mobile government phenomenon. Based on the discussion in this chapter, it was found that qualitative research through conducting case studies would be the most suitable to investigate the phenomenon. Strauss and Corbin (1990) affirm that qualitative research consists of the following components:

a. **Data**: collected through different methods such as surveys and interviews. This will be discussed in the next chapter 'Data Collection'.
b. **Analysis** (coding): the analytic procedures result in theorising. This will be discussed in the 'Data Analysis' chapter.
c. **Research reporting**: this presents the research findings. This will be presented in the 'm-Government Framework' chapter.

3.8.Chapter Review

This chapter discusses the theoretical perspectives that underlie this mobile government research. It has laid out the research design and discussed the philosophical perspectives that underpin the research framework.

Based on the discussion in the literature review chapter, which shows that mobile government is a new area of research with little available literature and an existing demand to discover new information, the author has explained the rationale for engaging in qualitative enquiry. The researcher examined the proposed methodology for the development of mobile government framework based on the logical flow of the theoretical perspectives. Thus, the chapter has illustrated the distinctive characteristics of case study methodology and the rationale behind choosing it. It also outlined the importance of the case study as a research strategy.

Finally, the chapter has introduced some of the major criticisms of case study research and has reviewed a number of techniques and procedures which have been and applied in this study in order to achieve rigorous, quality research.

3.8.1.Where to now?

After choosing the most suitable philosophical perspectives to underpin this research, the next step, based on the pyramid model (Gorman & Clayton 2005), is to collect the data. Data collection will be discussed in the next chapter.

CHAPTER 4

4.Data Collection

This dissertation so far has introduced the mobile government topic and discussed the theoretical and methodological perspectives that guide this study. This chapter introduces the data collection principles, methods and procedures used throughout the study. It starts by explaining the rationale for using the literature review, open-ended web surveys and semi-structured interviews as multiple sources for data collection to meet the triangulation. It then discusses the sampling technique used, followed by the participants' characteristics and the type of questions they were asked. The chapter also demonstrates the saturation level where the data collection stopped. Ethical approval, transcription of interviews and data management are also explained in the last section. It concludes with an overview of the chapters findings that lead to the next step in this mobile government study journey.

4.1.Introduction

Data collection started in the last months of 2005 and lasted until September 2008 when the saturation level was reached. According to Crotty (1998), prolonged stay in the field is important. Thus, the researcher stayed in the field for approximately the whole period of the research, surveying participants from all over the world, interviewing IT managers in different levels of government departments (i.e. local, state, and federal) and meeting with experts in the field in international and national conferences and workshops. According to Creswell (2007), 'The longer researchers stay in the "field" or get to know the participants, the more they "know what they know" from firsthand information'.

During this period, data collection was an ongoing process being undertaken simultaneously with the data analysis. As explained previously, the literature review indicated the necessity for an exploratory study which also necessitates employing different data collection methods to find the truth. Thus, this study utilised the following as the main data collection methods: the limited available literature, web-based surveys and case study interviews. It also considered the following as secondary data collection techniques: phone calls, and email correspondence.

4.2.Data Collection Methods

The suitability of qualitative research for this study was explained in the methodology chapter, where suitable techniques for gathering and analysing rich data were explained. Such methods should accord with the chosen methodology, 'the strategy or plan of action'. According to Crotty (1998), 'methodology guides

the researcher in choosing methods, and shapes the use of methods chosen'. Thus, methodology limits the data collection methods, as each methodology has its methods of preference.

There are many data collection and analysis methods such as: Questionnaire, Observation, Interviews, Focus groups, Case studies, Life history, Narrative, Visual ethnographic methods, Statistical analysis, Data reduction, Theme identification, Comparative analysis, Cognitive mapping, Interpretative methods, Document analysis, and Conversation analysis.

This study is based on the interpretivist symbolic interactionism as the theoretical stance. Thus, specific data collection techniques could be used that accord with the qualitative nature of the research in general and the interpretivist research methods specifically, such as interviews (i.e. face-to-face, or over the phone) and web-based surveys. This section presents the triangulation through discussing the main data collection methods used in this study:

- The available literature;
- Open-ended web-based surveys;
- Semi-structured interviews that formed the case studies.

4.2.1.Literature review

The literature review often becomes the basis for the entire thesis or dissertation as it serves as a basis to establish the research theoretical framework and methodological focus. According to Ridley (2008), the literature review is an extensive reference to previous research studies and theory about the topic under investigation which contributes to the field in a manner similar to that proposed

by the dissertation, and thus influences the choice of the research topic and the chosen research methodology. Blaxter, Hughes and Tight (2006, p. 122) also point out the importance of the literature review by stating that 'The purpose of the literature review is to locate the research project, to form its context or background, and to provide insights into previous work'.

According to Bruce (1994, p. 218), 'typically, the literature review forms an important chapter in the thesis, where its purpose is to provide the background to and justification for the research undertaken'. Thus, the literature review should justify the reason for the research through highlighting its importance and benefits.

Another purpose for the literature review is to demonstrate the researcher's knowledge of the field. It should comprehensively and thoroughly demonstrate 'a full grasp of the background' (Phillips & Pugh 2005, p. 57). The literature must show a thorough, deep connection to the area of study and the researcher must know what the main points, findings, and issues are and their relevance to the investigation. Also, a literature review highlights the controversies in the field, recognises what has been neglected, shows where previous studies have gone, and may anticipate future directions. According to Nunan (1992, p. 217) the literature review 'extracts and synthesises the main points, issues, findings and research methods which emerge from a critical review of the readings'.

The above-mentioned definition and purposes ascribed to the literature review justify its importance as a data collection method and demonstrate that if little academic writing exists on a given subject, composing the literature review will be a very difficult task. This also justifies the choice of exploratory study.

A comprehensive literature search was conducted to cover all available sources of information such as published literature and grey literature (e.g government technical reports, white papers). According to Gash (2000, p. 1) a literature search is 'a systematic and thorough search of all types of published literature in order to identify as many items as possible that are relevant to a particular topic'. The information sources may comprise books, journal articles, reports, dissertations and theses, statistics, manuscripts, dictionaries, conference and workshop literature (proceedings), handbooks and periodicals or journals, and magazines and newspapers.

Many tools were used to find relevant sources, such as:

- Bibliographical databases;
- Catalogues;
- Internet search engines;
- Open access databases.

The following databases listed alphabetically were consulted for the literature search:

- Academic Search Elite (EBSCO)
- Business Source Premier (EBSCO)
- Computer and Information Systems Abstracts (CSA)
- Computer Science Index (EBSCO)
- Computer Source (EBSCO)
- Expanded Academic ASAP (Gale)
- IEEE Explore
- INSPEC (OVID)

- JSTOR
- ProQuest 5000 1999 to CURRENT
- Science Direct (Elsevier)
- Wiley Interscience

4.2.2.Web-based Surveys

The decision to utilise the web-based survey instrument provided by the Institute for Interactive Media and Learning (IML) at the University of Technology, Sydney (UTS) was based on the high global Internet penetration and the fact that the Internet is a 'simple and immediate mechanism for sending questionnaires' (Kent & Lee 1999). Although using the Internet as a research tool could pose some problems such as 'sampling, response rate' and 'self selection', Kent and Lee (1999) identified 'low cost, speed, accuracy, and scope' as key benefits of using the Internet as a research medium.

Kent and Lee (1999) describe a web-based survey as an 'HTML survey' usually hosted in-house by the organisation running the research. HTML surveys invite participants to 'complete a questionnaire' on a specific topic prepared by the researcher (Kent & Lee 1999). Many surveys were designed for this study and invitation emails were sent to experts from around the globe to participate in the web-surveys. The surveys were closed web-page questionnaires, which means that they were open only to invited respondents. The surveys were carefully designed to be compatible with any computer with below-average capability and/or configuration. Figure 13 shows the front page of the first mobile government survey that was designed.

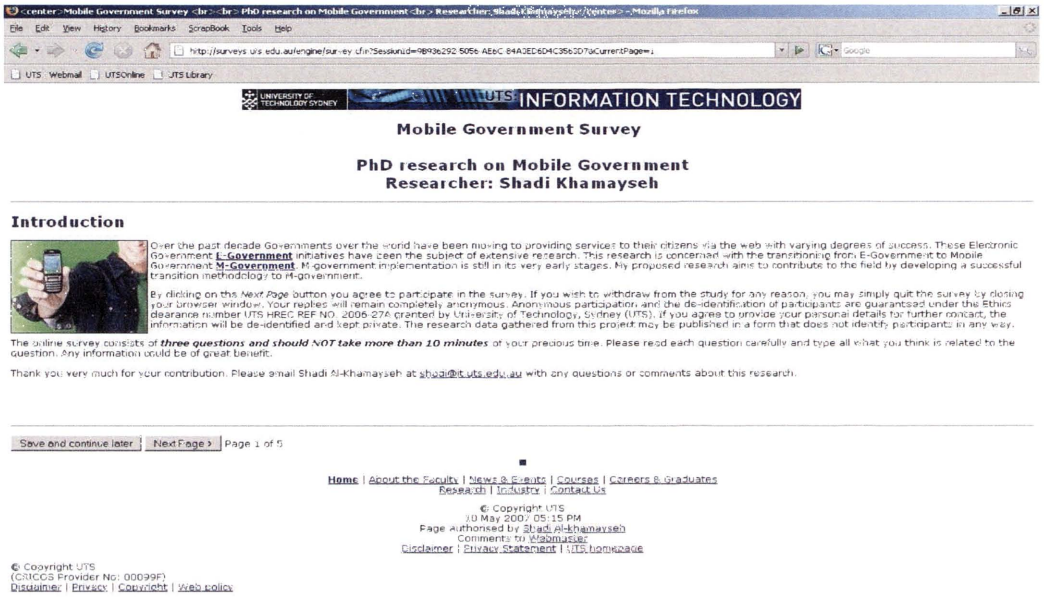

Figure 13: Screen shot of the welcome screen of the first launched mGov web-survey

The **rationale** behind collecting data or 'empirical materials' (Myers 1997) through open-ended online surveys is:

- 'The Internet is unconstrained by geographical or national boundaries' (Kent & Lee 1999), thus, the rationale is to reach as many international experts as possible and make them aware that a research study on mobile government is under way.
- To capture as many various perspectives as possible to obtain a representative view on the issue under study.
- According to Schaefer and Dillman (1998) 'respondents were significantly more likely to answer open-ended questions in the email questionnaire'.
- The ability to provide anonymity to the respondents as opposed to e-mail surveys (Kent & Lee 1999).
- Ease of use and completion, which contributed to higher response rate.

The online survey included general open-ended questions of an exploratory nature, in order to prevent any influence on the experts' point of view (Strauss & Corbin 1990). The general open-ended questions elicited rich data which is analysed and discussed in the next chapter, 'Data Analysis'.

4.2.2.1.Web-surveys Sampling

This section discusses the methods of selecting participants for the web surveys. The main objective of this research is to devise a holistic mobile government framework through investigating its critical success factors. The researcher firstly identified a survey population which is expert in the field. According to Sue and Ritter (2007), after identifying the population the researcher needs to 'find a list of the population members...*the sampling frame'*. Since there is no readily available sampling frame, creating one was done by the researcher through the literature review. The data collection process using web-based surveys commenced in 2006, just after reviewing the literature available at that time and receiving the ethics clearance to start collecting data. The data collection using web-surveys continued until September 2007. The literature review contributed to harvesting and creating a 'sampling frame' made up of a mailing list of potential participants, which was considered a huge asset to the researcher.

Due to the exploratory nature of this research and the infancy of the mobile government field, 'convenience' samples are sufficient (Sue & Ritter 2007). Thus, the main inclusion criterion for potential participants was their relevance to the mobile government field. The author deemed people as expert if they had authored or co-authored at least one published paper, journal article, magazine or paper material on either m-Government or on managing mobile government

projects. The generated sampling frame - 'a list or set of directions for identifying the target population' (Malhotra 1999) - targeted experts in the mobile government field such as:

- Academics (i.e. 'Professors', 'Assistant Professors');
- Researchers (i.e. 'a Research Director');
- Industry experts (i.e. 'e-Government Programs Manager', 'a service design consultant', 'Business Development Manager', 'Mobile Portal Project Manager', 'e-Government consultant', 'e-Service Provisioning Officer').

Although the sampling list includes 89 members, the targeted sample, 'a subset of the population' (Sue & Ritter 2007), was the final sampling list. According to Sue and Ritter (2007), 'a good sample is one that is representative of the population from which it is drawn'. Thus, the researcher invited all members of the sampling list (the 'population'), but only 43 responded to the survey invitation. The rest of the population was either unreachable (the 'minority') or were non-respondents.

The Snowball sampling technique was used in the online survey, where respondents were asked to refer other experts who meet the inclusion criteria. According to Sue and Ritter (2007), this method is popular in small populations and 'where the members know each other'.

Sampling errors such as *coverage error*, *nonresponse error* (i.e. *unit nonresponse and item nonresponse*), and *sample error* were not an issue in this study. Although Kent and Lee (1999) identified 'sampling, response rate, and self selection' as potential issues, they were not an issue in this study. Sampling could

be an issue when the targeted respondents 'are not yet likely to be representative of the population at large' due to varying Internet penetration because of socio-economic reasons (Kent & Lee 1999). Dillman and Bowker (2001) also highlighted the lack of computer knowledge as a frustrating factor for the researcher. In this study, sampling was not an issue because all the targeted respondents were computer literate and had Internet access due to the nature of their jobs.

4.2.2.2.Web-surveys Questions

The web-surveys incorporate open-ended questions due to the exploratory nature of this research. According to Sue and Ritter (2007) open-ended questions are:

> those for which response options are not provided...which allow participants to answer in their own words by typing into an empty text box...they are particularly useful when investigating new topics and offer an opportunity to learn unexpected information. (Sue & Ritter 2007)

The research aims to devise a holistic mobile government framework, thus the researcher is interested in finding experts' opinions based on their context. The author believes that providing closed-ended questions with a list of response options from which to choose would bias the outcome. Sue and Ritter (2007) assert that responses to open-ended questions are more valid than those to closed questions 'because respondents are not forced to select from a list of response options created by the researcher' (Sue & Ritter 2007). Figures 14-17 present screenshots of the open-ended surveys and the sequence of questions.

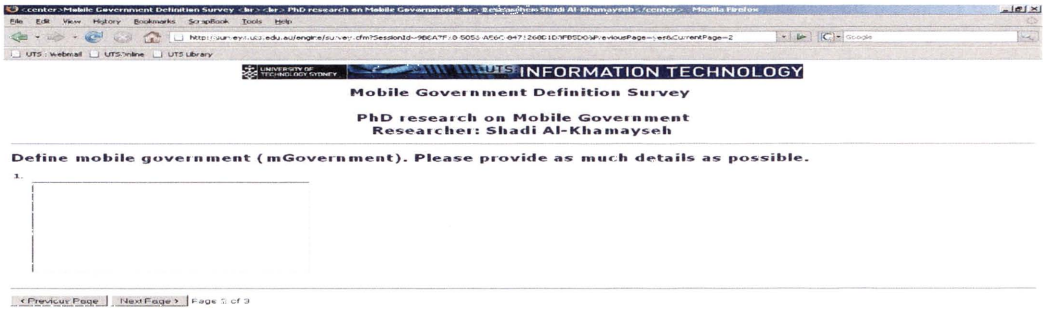

Figure 14: Screenshot of mGov definition survey

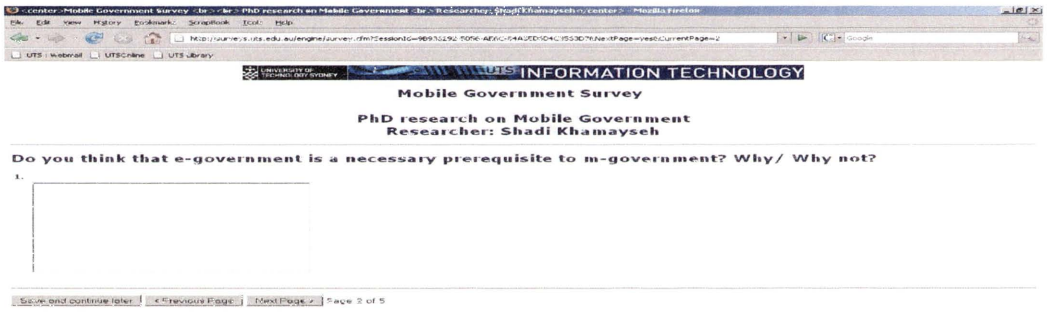

Figure 15: Screenshot I -- open-ended mGov survey

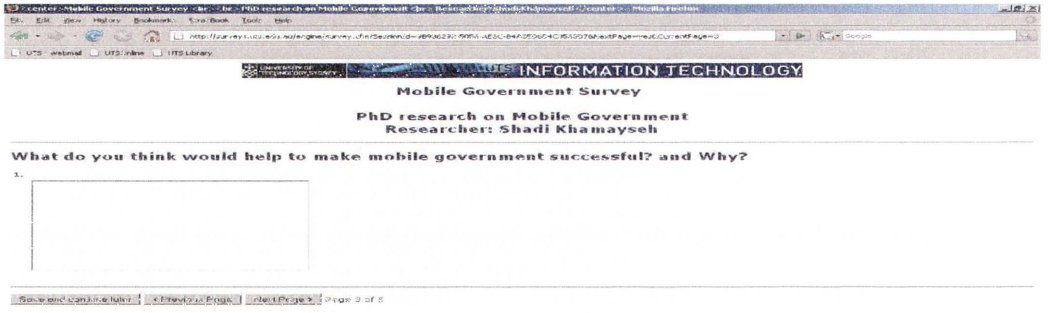

Figure 16: Screenshot II -- open-ended mGov survey

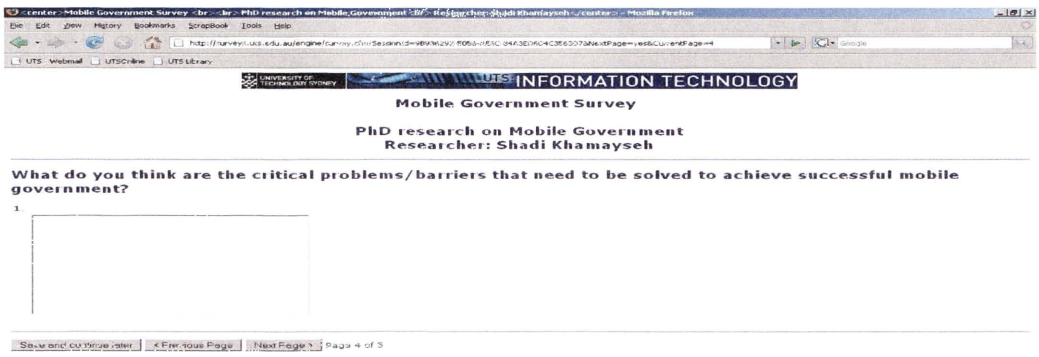

Figure 17: Screenshot III – open-ended mGov survey

4.2.2.3.Web-surveys Design

The quality and simplicity of the design of the web-based surveys aimed to attract and encourage experts to participate. According to Sue and Ritter (2007) the best survey questionnaires are 'inviting not intimidating'. Dillman and Bowker (2001) also acknowledge the importance of questionnaire design. This section presents how the design principles for web-based questionnaires were met.

First, the *welcome screen* depicted in Figure 13 briefly introduces the research and its objectives. It also emphasises the ease of use and instructs the respondent on the actions needed for proceeding with the survey or opting out of it. The welcome screen does not discuss the conditions of anonymity and confidentiality issue as they were discussed in the invitation email sent to the sampling frame (Sue & Ritter 2007).

Second, *access control* provides a password to the participants as the survey was closed to the selected participants (closed population). Simple and not too lengthy passwords were selected and were sent in the invitation email. This measure was followed to ensure that only those who met the inclusion criteria

and were invited could access the survey. This prevents distorting the survey results (Sue & Ritter 2007).

Third, the *first question* was selected to motivate the respondent to continue with the survey. It was carefully worded, as it set the tone for the rest of the questionnaire (Sue & Ritter 2007).

Forth, *conventional formatting* was used such as 'numbering questions, left justifying text, and presenting response option directly below the questions to which they refer' (Sue & Ritter 2007).

Fifth, appropriate *colours* were cautiously used in the surveys to enhance its appearance and attract the respondent. To ensure the survey's compatibility with any computer with less than average capability and/or configuration, a standard 256-colour palette was used.

Sixth, the size of the *open-ended text boxes* was relatively small in order not to intimidate the respondent into thinking that they had to provide a lengthy answer to the question. This measure motivates respondents to continue with the survey. The text box automatically extends to accommodate lengthy answers.

Seventh, the surveys did not obligate the respondent to provide an answer for every question. According to Sue and Ritter (2007), demanding answers to all questions 'is frustrating and poses ethical issues'.

Finally, fast response and the ability to save the survey for completion later were among the quality and simplicity design measures. The open-ended questions

were designed to be as broad as possible to get as many perspectives as possible, and cover the main mobile government issues.

4.2.2.4.conducting the survey

There are several electronic methods that can be used to recruit participants. In this study the researcher invited the potential participants using an e-mail invitation. Each member of the sampling frame was personally emailed using the researcher's own email address: shadi@it.uts.edu.au which belongs to UTS. The e-mail invitation included the Unified Resource Locator (URL) of the surveys. According to Sue and Ritter (2007), this approach is preferable as it has the following advantages:

- *Makes the survey easily accessible;*
- *Is personal and can provide the respondents with anonymity;*
- *Has fast response time;*
- *Has easy to send reminders;*
- *Can contact the potential participant immediately after an interaction.*

In order to increase the response rate, the researcher chose an appropriate subject for the e-mail invitation, namely: 'Mobile government PhD research - invitation to online survey' to present the e-mail as legitimate and avoid it being classified as spam. The researcher also sent follow-up e-mails to those who participated thanking them for their time and response, so they would not feel ignored or unappreciated, and to assure them that their opinion would be taken seriously (Sue & Ritter 2007). This also encouraged them to refer others to be

invited (Snowball sampling). Reminders were sent to those who did not respond in the first instance.

Behavioural theory such as social exchange was also considered to increase the response rate. According to Sue and Ritter (2007), 'social exchange theory asserts that decisions to take action are evaluated in terms of costs and benefits'. Thus, the researcher in the e-mail invitations offered *nonmaterial incentives* to the respondents by offering the study results to them on publication.

The web-based open-ended surveys/questionnaires were designed and used as the second data collection method -part of the broad exploration stage[1]- after the literature review in order to move from the widest reach and broad coverage (literature review) at the beginning of the study - the preliminary preparation stage[1]- to a more tightly focused and selective enquiry to be used in the subsequent data collection method: the case study interviews - the focused activity stage[1]. This funnel-like method helped the researcher to narrow down the study, to decide what data to collect next, and where to find them in order to develop the proposed framework. Figure 18 depicts the data collection strategy.

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1 Stages of the qualitative research pyramid: Preliminary Preparation, Broad Exploration, and the Focused Activity. See figure 7

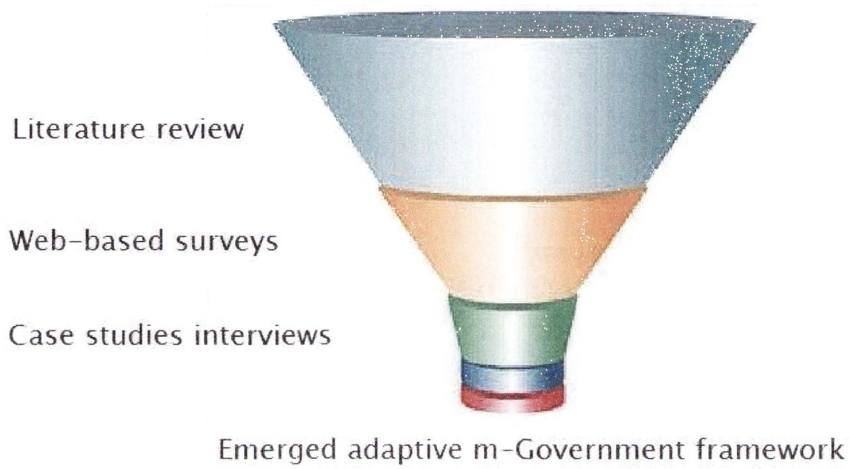

Figure 18: Data collection strategy

4.2.3.Interview Case Study

Interviews have been identified as one of the most important sources of evidence in case studies (Stake 1995; Yin 1994). Interviews played a central role in data collection in this study as they 'can obtain detailed, in-depth information from subjects who know a great deal about their personal perceptions of events processes and environments' (Gorman & Clayton 2005). Gorman and Clayton (2005) point out that when the interview is the most appropriate data collection method, then the 'result can be said to be an interview case study'.

The rationale behind using interview case studies as a data collection method has the following components:

- The researcher's personal involvement, where he enters the context to better understand it by collecting the subjects' personal perspectives and experience. According to Gorman and Clayton (2005), 'the task of the

qualitative researcher is to understand the meaning that people create in context and then to describe and interpret that meaning'.

- Obtaining in-depth data that aligns with the objectives of this study. Glesne (1999) extols the great value of using interviews as the data collection method in case studies He acknowledges the 'special strength of interviewing in qualitative inquiry' as it offers 'the opportunity to learn about what you cannot see and to explore alternative explanations of what you do see'.

An important point is 'enhancing these raw data collected first-hand through the insights gained from actually being on site' (Gorman & Clayton 2005). Enhancing the raw data occurs through interaction with the subjects and the additional questions that could arise in each interview. The self-perceptions and enhanced perceptions in qualitative research cannot be achieved without interviews (Gorman & Clayton 2005).

Interviewing subjects enables the researcher to 'ask questions about what cannot be seen or observed'. Using a number of 'WH' questions enables the researcher to collect factual data and the use of 'How' and 'Why' questions enables the collection of explanatory data that 'contribute to understanding the meaning of phenomena from those involved directly in events and processes' (Gorman & Clayton 2005, p. 49). See Appendix C: Interviews transcripts.

4.2.3.1.Nature of Interviews

Interviews range from the highly formal, structured type to those that are more casual and non-directive in style. In this study, semi-structured interviews with

open-ended questions were designed to meet the purpose of this study. The aim of this was two-fold:

- Firstly, 'the person being interviewed is encouraged, by the use of open-ended questions or by non-directive listening, to highlight self-perceived issues or relationships of importance' (Gorman & Clayton 2005).
- Secondly, additional questions could arise in each interview that could result in more in-depth information, adding more value to the final results. According to Gorman and Clayton (2005, p. 41), 'dialogue between researcher and subject allows the interaction to move in new and perhaps unexpected directions, thereby adding both depth and breadth to one's understanding of the issues involved'.

Gorman and Clayton (2005, p. 49) observed that 'generally an interview case study uses data collected from a series of individual interviews between researcher and subject'. The next section discusses the site and subject selection criteria for the interviews.

All interviews were recorded and then transcribed. The first few interviews were transcribed by the researcher. The transcription itself is a very tedious and time consuming process, and according to Gorman and Clayton (2005, p. 137) many postgraduate students consider giving up their research because of the transcription burden, as 'it is a time consuming and soul destroying task'. The recorded interview time average was one hour and fifteen minutes, and the average transcription time per interview was 18 hours. Thus, it was decided to use a professional transcription service which took an average of 4 days to transcribe one recorded hour.

The transcribed interviews were then revised by the researcher to code (de-identify) some information. The participants (councils' and interviewee names) were de-identified and codes were used in their place. Quotes from the interview transcriptions were used in this thesis to explain and justify findings. This assured compliance with the codes of ethics, ensured the quality of the transcriptions, and also identified any information that could potentially divulge the identity of the subjects.

Gorman and Clayton (2005, p. 6) point out that:

> because qualitative investigators are determined to portray the perspectives of their participants with absolute accuracy, they often provide some opportunity for participants involvement in or comment on what is being recorded and said about them. (Gorman & Clayton 2005, p.6).

Thus, all interviews were securely emailed to the participants for confirmation, for editing if needed, for consistency assurance and approval, before starting the analysis process.

4.2.3.2.Interview Case Study Sampling: site and subjects selection

The methodology chapter discussed the theoretical perspectives underlying this research and these guided its design, leading the researcher to choose case studies as the most suitable methodology. The results of the data collection process in this chapter, starting from the limited available literature and the following web-based surveys, suggested more emphasis on in-depth details through going into the field to study mobile government projects in their natural setting a for better and comprehensive understanding of the phenomenon to

reach the research objectives. Thus, the case studies are the centre piece of this research, as a result of which, case selection/screening is a crucial step in the research process. This section discusses the case study (site) selection, and also the participant selection process.

Site selection

Creswell (2007) asserts that identifying the cases to be studied poses a challenge to the investigator. Yin (2003) also acknowledges that it is 'one of the most difficult steps in case study research', and points out that identifying sites on which to conduct interviews is not much of a hurdle but that finding a 'willing site' is the hurdle.

The study's objectives, according to Yin (2003), form an essential guidance in selecting the cases. As discussed in the research purpose section of the chapter on methodology, this study aims to explore mobile government success factors in order to devise a holistic mobile government framework.

The need to examine a series of case studies thus arises, but leaves the question of which kinds of cases would be relevant. According to Tellis (1997):

> it is a fact that case studies do not need to have a minimum number of cases, or to randomly "select" cases. The researcher is called upon to work with the situation that presents itself in each case.

Yin (2003) opposes selecting the most 'convenient or accessible site' from which data can be collected. In this study the researcher incorporated specific reasons forming pre-established criteria to test against the potential cases. The criteria

mainly linked the research objectives and quality and rigour measures to all potential cases. The rationale is explained below.

First, the objective for devising a holistic mobile government framework was the rationale behind the decision to examine a series of case studies. This also avoids lack of rigour in order to generalise the results of this study. Tellis (1997) explains that 'multiple cases strengthen the results by replicating the pattern-matching, thus increasing confidence in the robustness of the theory'. According to Creswell (2007) there is no set number of case studies to reach generalisability, but 'typically, however, the researcher chooses no more than four or five cases'. In this research, nine case studies were selected to investigate, which provides enough information to present an in-depth picture.

Second, the objective to investigate the relationship between e-Government and m-Government and how linkages between both can produce distinctive outcomes is another selection criterion. This objective emerged from the responses to the web-survey which is used as a second data collection method to guide the research design. The responses of the international experts to the web survey showed a variety of perspectives in terms of the need for an e-Government system and/or the maturity level of the e-Government system before going mobile (Appendix B: Web-surveys). Thus, studying one country with a certain level of e-Government system could bias the results and would not contribute to the main study objective of devising a holistic mobile government roadmap. This was the rationale behind the decision to investigate the mobile government program in more than one country with different levels of e-Government systems.

Third, the objective to study the mobile government critical success factors (CSF) formed the constraint to investigate exemplary cases. Yin (2003) points out that 'use of this rationale means that all of the cases will reflect strong, positive examples of the phenomenon of interest'.

Fourth, as presented in the introduction and in the literature review chapters, the advancement in wireless and mobile technologies, in addition to the high mobile penetration in most countries worldwide, was the main driver behind the mobile government phenomenon. Hence boundaries such as geographical distance and time are no longer major barriers. Mobile government offers the advantages of mobility and portability, both domestically and internationally, and thus it could become a global system that requires the cooperation of all mobile operators in different countries. The existing literature also indicated that the mobile government approach is different in different countries. This highlights that many of the complexities emerge from cultural differences; the researcher therefore understood that the unit of analysis would not necessarily be a single country, but more than likely, it would be more than. The unit of analysis will be discussed more in the 'Data Analysis' chapter.

Fifth, the cases were to cover different countries. The available literature is shallow with regard to mobile government in different countries and the researcher is interested in advancing knowledge about international mobile government programs to achieve the research objective of holistic framework. Tellis (1997) asserts that 'selecting cases must be done so as to maximise what can be learned, in the period of time available for the study'. This supported the rationale behind seeking to explore more than one country to broaden the results, but Stake (1995) cautions that a case study must have boundaries.

Although the case study boundaries in terms of time, events and processes pose a challenge to the investigator (Creswell 2007), this research investigates FIVE case studies in Australia, TWO in UAE, and TWO in Jordan. This constraint is also based on the theoretical issues because of the researcher's desire to investigate the dynamics of the mobile government phenomenon in different countries. A further constraint is the study's need to inform an international and adaptive holistic framework.

To sum up, the multi-case studies selection criteria can be represented thus:

- The objective of devising a holistic mobile government framework was the rationale behind the decision to examine a series of case studies;
- The objective to study mobile government critical success factors (CSF) formed the constraint to investigate exemplary cases;
- The objective to investigate the relationship between e-Government and m-Government informed the choice of method;
- The objective to avoid lack of rigor in order to generalise the results of this study;
- The objective of having an appropriate unit of analysis;
- The researcher's interest in advancing knowledge about international mobile government programs.

The above discussion presents the specific reasons that led to the selection criteria which led to a major effort in screening candidate cases. The researcher began the screening process by consulting the available literature and experts in the field to suggest candidates who fitted the selection criteria. This resulted in an array of nominees who were then contacted by phone and/or email. Although

the selection criteria led to a major effort for screening candidate cases, Yin (2003) cautions against 'permitting the case screening process to become a study in itself', which prompted the researcher to conduct the screening in a timely manner.

For this study, multiple cases were required, and many countries met the above-mentioned criteria resulting in seven nominees. The researcher screened these countries and several governments were contacted, of which the following three countries were willing to cooperate, providing the rationale behind the decision to investigate the following as case studies:

- Australian mobile government experience;
- Jordanian mobile government experience;
- United Arab Emirates mobile government experience.

The selected countries utilised wireless and mobile technologies in their public sector, and indicated that they had implemented exemplary mobile government programs. The case studies show different maturity levels of e-Government programs from poor (i.e. Jordan) to exemplary (i.e. Australia). The three countries have language and cultural differences. More about the selected case studies and how they met the selection criteria will be discussed in Part III.

Participant selection

Selected participants in the three countries needed to have theoretical relevance for further development of the topic under investigation (Glaser & Strauss 1967), namely, a mobile government framework. Thus, as discussed previously in the methodology chapter, to gain an understanding it is necessary to interact with

participants (subjects), who through their experience have developed subjective meanings toward the mobile government to understand the phenomenon (object) and to discover the meaning of truth (success factors). Thus, samples are deliberately selected by the researcher for what they can contribute to the research (Denscombe 2007).

Groups do not need to be comparable; they can be very different, as long as the data apply to a similar category or a property (Glaser & Strauss, 1967). The main advantage of theoretical sampling, according to Glaser (1998), is that the researcher is not collecting the same data repeatedly based on the same questions which ignore the interchangeability of indices. It also responds to the need for more data on new and emerging concepts.

The case studies reveal in detail how the selected government departments in the three countries have been planning, implementing, and testing their mobile government projects. They also reveal emerging thinking on how these government departments intend to use the wireless and mobile technologies to achieve business objectives. In developing this story, insights are provided into:

- The impact of wireless and mobile technologies on the government departments' internal and external efficiency, including on employment.
- The success factors.
- The problems being encountered in implementing mobile-based projects.
- The perceived role of the government in developing an m-Government strategy.

The case studies were undertaken predominantly over the years 2007 and 2008; they purposely range across a variety of experiences, but in nearly every case those experiences have been positive.

The case studies methodology was to use a consistent questionnaire to summarise the government departments' experiences and evaluate how they use the mobile and wireless technologies to support their operations.

The broad geographical and sectoral spread of case studies was facilitated through personal visits to each country to conduct face-to-face interviews in order to focus on the contexts in which participants work and to understand their cultural settings. At least two departments in each country were interviewed in order to verify the data collected. According to Tellis (1997), 'The researcher must avoid becoming dependent on a single informant, and seek the same data from other sources to verify its authenticity'. This formed the rationale behind having at least two case studies in each of the selected countries. The time and money constraints were the biggest challenges in terms of investigating more countries and also in terms of having more than two case studies in each country.

4.3.Case studies

4.3.1.Australian Case studies

In this case study research, the researcher decided to use a number of case studies in Australia (N=5). It was decided to concentrate on the local government level. The rationale behind the selection of local government level is based on the fact that there are many more community issues dealt with at local government

level than there are at either state or federal level. Thus, it has high interaction with all the different constituents (G2E, G2G, G2B, and G2C). Consequently, many local government councils in the states of New South Wales and Queensland (Australia) were contacted.

4.3.1.1.Government department selection

The councils selected for this study had to satisfy the following criteria:

1- Councils that implemented mobile government services.
2- Councils with dedicated IT departments.
3- Approval to interview the IT manager, and or the person in charge of mobile government services.
4- Council's location within 200 kilometres of the Sydney CBD or Brisbane CBD.

A list of all the local councils in the states of New South Wales and Queensland is available from the NSW Department of Local Government <http://www.dlg.nsw.gov.au>, and the local government directory in Queensland is available at <http://www.localgovernment.qld.gov.au>. All the local councils on these lists were tested against the criteria. Firstly, the councils were shortlisted based on the location criterion, and the council websites visited to check for any sort of mobile government services implementation. The second test filtered the councils and resulted in a shortlist of councils within a convenient distance of the researcher and implemented mobile government services. The councils were then contacted, informed about the research and asked to participate.

The aim was to interview the IT manager or the person in charge of mobile government services as they would be the best person in terms of information needed for the research. The interviewee selection was purposive rather than representative. Although the researcher offered incentives to the councils to encourage participation (i.e. by offering the research results to them after publication), many councils did not show interest and apologised for not participating.

The research concentrates on the (G2E) side of mobile government at the local government level (local councils) because all different levels of government interact within its backend systems. Nevertheless, the researcher also decided to look at the (G2C) side at the three government levels to make sure the research contribution would be as general as possible and thus adoptable by all government levels. The decision to select local councils for the study sample is based on the fact that they interact with all government constituents (G2E, G2G, G2B, G2C).

4.3.2.Jordan Case study

According to The World Fact Book (2005), the latest estimation of population in Jordan as at July 2005 was 5,759,732 million, with 34.5% of the population being less than 14 years old, and 61.7% being between 15 to 64 years. The median age is 22.62 and 91.35% of population is literate; in other words, Jordan's population is young and literate. A survey conducted by Amárach Consulting on behalf of Púca about Irish opinion towards m-Government services shows a significant difference between age groups. 61% of Irish people aged 15-24 would like to request m-Government services such as health services (Amárach Consulting

2004). This shows that young people are more interested in m-Government services; thus Jordan has the potential for acceptance of m-Government services with its median age of 22.62.

According to the Cellular News (2005), a report prepared by Wisam Francis shows that 8% of Jordan's population subscribed to the service in 2000 and 28% in 2004, while in 2005 a great rise in subscription reached 41% of the population. The report expecte the number of mobile service subscribers in Jordan to reach 4.5 million subscribers by the year 2008. The report also states that the number of mobile devices exported to the Jordanian market is anticipated to reach 1.5 million devices by the end of 2005 and rates the mobile revenue growth for the period from 2000 to 2004 in Jordan was four times that of the UAE and Israel.

According to Sandy & McMillan (2005), 'each jurisdiction is so unique that any model for planning, developing and implementing service enhancements must be developed individually, and targeted at the needs of that particular jurisdiction' As a result, the research will contribute by devising an adaptive m-Government framework to be followed to achieve successful m-Government service provision both in developing and developed countries.

According to Nuaimat (2006), 'Jordan's mobile telephony ranked as most competitive among Arab states' due to telecom liberalisation. Jordan e-Government portal (Jordan e-Government 2008a) reports that Jordan has developed an SMS Gateway to meet many objectives. The project aims to increase the channels of communication between citizens and government services users. The Short Message Service (SMS) has been chosen as the most effective channel to communicate with all segments of Jordanian society, which was likely to

increase the quality of governmental services and increase its efficiency and effectiveness (Jordan e-Government 2008a).

In Jordan, providing mobile government services is done through two types of SMS:

1. Push messages: sent by government entities to citizens, without being requested by the citizens, such as reminder messages, and awareness campaigns.

2. Pull Messages: sent by citizens to solicit a particular piece of information; the citizen then receives a message containing the information that he requested from the related entity. The citizen may inquire once only, or they may subscribe to the service to receive messages periodically from the related entity.

The service is accessed by citizens through a specified number: 94444. The citizen is able to send an empty message to 94444 to receive a listing of available governmental services by reply; the citizen must then follow the instructions in the message to obtain specific information. This number is accessible by all mobile users of all the operators (Zain, Orange, Umniah, and Express). Table 6 lists a number of SMS services in Jordan.

Table 6: Jordan SMS gateway services (Jordan e-Government 2008b)

Government Department	Service(s) provided
Civil Service Bureau	• Competitive Ranking
Driver and Vehicle License Department	• Vehicle license expiry date
Government Tenders Directorate	• Announcement for New Tenders • Inquiry about Specific Tender • Inquiry about Specific Contractor
Greater Amman Municipality	• Vehicle Traffics Complaints
Housing and Urban Development Corporation	• Notifications about housing & land tenders
Income and Sales Tax Department	• Tax balance / Individuals • Tax balance / Corporate
Jordan Meteorological Department	• Weather Forecasting
Jordanian Customs	• Inquiry about vehicle custom, • guarantee orders • Temporary Admission for goods • Transit Guarantees
Jordan Water Company-Miyahuna	• Water Bills
Royal Cultural Centre	• Activities of Royal Cultural Centre

4.3.3.United Arab Emirates Case study

The UAE is the most wired nation in the Arab World and one of the top nations in the online world, and according to the (Arab Advisory Group 2008), *'UAE recorded the highest cellular penetration rate by H1 2008, which stood at 198.6%'* meaning that in effect, every UAE resident has two mobile phones. Dubai e-Government launched its innovative mobile SMS portal in 2003, which makes Dubai e-Government the first in the Middle East to launch such a portal (AMEInfo 2005). Table 7 lists the SMS services in UAE.

Table 7: UAE early SMS services (Dubai E-Government 2008)

Pull Service			
Service	**Keyword**	**Parameter**	**Example**
Salik Registration/Payment	دفع	AccountNo	0261 دفع رصيد
Prayer Timing	ص	Keyword	ص
	متبقي	Keyword	متبقي
Trade License Fees	DEDFIN	Trade License Number	DEDFIN 510500
Trade License Status	DEDTRN	Trade License Number	DEDTRN 510500
DEWA Bill Enquiry	DEWA	AccountNo	DEWA BILL 123456789
Case Information	DPP	Service Number Case Number	Dpp e c01 501 2008 88
Traffic Fines	FINE	Car Plate Number - Car Type - Car Code	Car Plate Number - Car Type - Car Code
Help Information	HELP	Keyword	HELP FINE
	INFO		INFO
Salik Registration/Payment	MPAY	AccountNo	mpay activate 9178061166
Prayer Timing	P		P
Prayer Timing	PRAY		PRAY
Prayer Timing	PRAYE		PRAYE
	REG		REG

4.4.Data Management

The data in this study came from a variety of sources and methods (i.e. literature, web surveys, and interviews). It was important to store and organise the disparate data in an efficient way that allowed both secure storage and easy access, to enable the researcher to conduct data analysis as soon as data collection started.

The web-based survey instrument provided by the Institute for Interactive Media and Learning (IML) at the UTS makes the data collected from the web surveys available in a secured digital form (i.e. MS word document, or MS Excel sheet), which could therefore be easily retrieved and yet stored securely on the researcher's computer.

As was discussed earlier in the chapter, data analysis started as soon as the data collection process was begun. This narrowed the data collection sources as it guided what and from whom to collect next, which resulted in the funnel-like data collection depicted in Figure 18.

QSR NVivo (initially version 7, and then the upgrade, version 8) was used in this study. NVivo is software for qualitative data analysis that handles rich data and allows the importation, classification, sorting, arranging and coding of data. The software enables the immediate import of forthcoming data, dividing it into 'slices of data', and coding it into various themes. The emergent themes guided the subsequent data collection. The new data was constantly being imported into the software, and immediately coded into one or many themes. Such coding was by no means final, and themes and slices of data in them were constantly evolving. The details of the data analysis process will be explained in detail in the 'Data Analysis' chapter.

As mentioned previously, the study moved from open-ended Web surveys to more focused in-person interviews to gather more data about each category or its property. The face-to-face interviews were recorded and transcribed. Recording interviews collects more data than is theoretically necessary (Glaser 1998, p. 107). This research uses the case study methodology which needs transcribed interviews and descriptive completeness as complete evidence for verifying findings. Gorman and Clayton (2005) assert that 'If every word in the interview is likely to be important, or if you are likely to be challenged to produce your evidence, then you may have no choice'.

Recording and transcribing the case study interviews slowed down the research, and also made it harder to instantly analyse data while it was still being collected. The researcher thus relied on the adequate notes taken during and after interviews while it was fresh in mind to speed up the analysis process. This was another challenge to the researcher of creating a balance between being an attentive and active listener, and at the same time, thinking and writing.

The researcher followed Gorman & Clayton's (2005) advice in 'scheduling adequate time after the conclusion of each interview for the salient points to be recorded while they are most fresh in the researcher's mind' Another practice that was recommended by Gorman and Clayton (2005) and followed in this study to keep a record of all the interviews conducted. The resulting database mainly stored the interviewees' information (i.e. name, position etc.), and the date and time taken for each interview. As the interviews were digitally recorded, each interview recording was transferred to the researcher's computer, named properly and securely saved and backed up. Each interview file was also cross-referenced to its transcription (see Appendix C for interview transcripts).

4.5.Ethics Approval

It is a UTS requirement that all research involving humans and/or other institutions be conducted in accordance with guidelines established by the Human Research Ethics Committee (HREC) at the university (UTS HREC 2004). Since the research involved interviewing humans, it was necessary to obtain formal ethics approval and to adhere to the University's guidelines (See Appendix A: Ethics Approval).

4.6.Review of Chapter

This chapter has discussed the chosen data collection methods suitable for this study. It has explained the rationale behind selecting the literature review as a preliminary data collection method, followed by the open-ended web-based questionnaires as a complementary method of discovering the state of the art in the mobile government field and also of making selected participants aware that a research on m-Government is under way, with finally, the interview case studies as the main data collection method to obtain in-depth information. This research complied with all codes of ethics.

4.6.1.Where to now?

After collecting the data using the chosen methods, the next step is to analyse the collected data. Data analysis will be discussed in the next chapter. The interview transcriptions were analysed by the content analysis method, using the latest version of a qualitative data analysis software developed by QSR international (NVivo8). The content analysis resulted in the discovery of factors that influenced the successful transition to mobile government.

CHAPTER 5

5.Data Analysis

While the previous chapter explained the details of the data collection process employed in this study, this chapter introduces the data analysis principles, tools, methods and procedures used. The chapter begins with an overview of qualitative data analysis in general; it then discusses coding as the most important step in analysis, and proceeds to specifically discuss the substantive and theoretical coding stages used in this study. The chapter concludes by discussing the computerisation of the analysis process. This chapter leads to the next step in this mobile government study journey (the story), which exhaustively reports on the outcomes of the data analysis.

5.1.Introduction

In reading of scientific discoveries a reader is sometimes struck by the simple and apparently easy observations which have given rise to the great and far-reaching

discoveries which make scientists famous. In retrospect, however, we see the discovery with its significance established. The discovery at its point of origin usually has no intrinsic significance; the discoverer gives it significance by relating it to other knowledge, and perhaps by using it to derive further knowledge (Rapport & Wright 1963, p. 141).

According to Corbin (2008), 'a researcher cannot continue to collect data forever', and sooner or later has to start the data analysis. Corbin (2008, p. 45) defines analysis as 'examining a substance and its components in order to determine their properties and functions, and then using the acquired knowledge to make inferences about the whole'.

The sheer volume of data collected made the data analysis process a real challenge

As a result of triangulation and using different data collection methods (literature review, online surveys and semi-structured interviews), the sheer volume of data collected made the data analysis very challenging for the researcher (Yin 1994). Creswell (2007) also acknowledges that 'analysing text and multiple other forms of data presents a challenging task for qualitative researchers', and adds that data representation in *tables*, *matrices*, and *narrative* form adds to the challenge. According to Patton (1980, p. 297) 'The data generated by qualitative methods are voluminous ... Sitting down to make sense out of pages of interviews and whole files of field notes can be overwhelming'.

Data analysis 'is an extremely complicated process' (Corbin 2008)

Corbin (2008, p. 47) describes data analysis as an 'Interpretive act' and as 'an art and a science'. She explains that data analysis 'is an extremely complicated process' and concludes that it 'is many things, but it is not a process that can be rigidly codified', which Denzin and Lincoln (1998, p. 338) acknowledge when they state that 'Interpretation is an art that cannot be formalized'. Thus, the consulted qualitative data analysis material did not provide the researcher with a step-by-step process to follow, but assisted the researcher in 'how to think more self-consciously and systematically about data' (Strauss & Corbin 1990, p. 9) .

Creswell (2007) demonstrates that the data analysis process in qualitative research 'consists of preparing and organizing the data ... for analysis, then reducing the data into themes through a process of coding and condensing the codes, and finally representing the data in figures, tables or a discussion'.

'More than one story can be created from data' (Corbin 2008, p. 46)

According to Corbin (2008, p. 50), 'Qualitative data are rich of substance and full of possibilities'. Thus, different stories could be told by different data analysts investigating the same data (Corbin 2008, p. 50). All the data collected for this study has been analysed by the researcher. A reader might disagree with a finding because of their experience or knowledge, but this is expected in qualitative data analysis. According to Corbin (2008, p. 10) 'each person experiences and gives meaning to events in light of his or her own biography or

experiences, according to gender, time and place, cultural, political, religious and professional background. Corbin (2008) states that 'it all depends on the angle or perspective that the analyst brings to the data' and uses the following expressive example to explain this:

One only has to turn on the television and listen to a group of people discussing an event, such as a president's speech. There is much discourse and sometimes outright conflict about what was said, especially if politics are involved, but rarely a total agreement about the meaning of the event. What a viewer sees and hears are multiple viewpoints on the same topic with no apparent consensus. Add to this picture the notion that what is being seen and heard on the television is filtered through the viewer's interpretation of the event based upon his or her personal history and biography and we get a very complicated picture, one that at best can never be fully understood or reconstructed by the researcher. (Corbin 2008)

This study aims to devise a holistic m-Government framework through discovering concepts and ideas - from the collected data - that form the success factors; according to Schawndt cited in (Corbin 2008, p. 10) 'One can reasonably hold that concepts and ideas are invented (rather than discovered) yet maintain that these inventions correspond to something in the real world'.

The next sections discuss the appropriate data analysis terms and procedures, as well as the data analysis approach for this research and the analysis procedures used. The chapter ends with a section on using computer software (NVivo) in qualitative analysis and discusses its advantages, and the arguments against it.

5.2.Qualitative Analysis Fundamentals

This research aims to report on relevant and important findings, and thus the researcher intensively studied the data before reaching a theoretical interpretation level of data analysis. This level of data analysis challenges the analyst and requires him or her to be creative, think outside the box, and be willing to take risk to reach the outcome that 'feels right' (Corbin 2008). According to Corbin (2008, p. 45) the term 'feeling right':

> Indicates that after being immersed in the data for some time the researcher believes that the findings arrived at through reflective analysis express what participants are trying to convey through word and action and emotions, as seen through the 'eyes' of the analyst.
>
> (Corbin 2008, p. 45)

Developing a 'feels right' story relies on developing concepts. Concepts do not gush out of the data; the analyst has to dig deeply though the data to discover them. According to Blumer:

> Throughout the act of scientific inquiry, concepts play a central role. They are significant elements...; they are categories for which data are sought and in which data are grouped; they usually become the chief means for establishing relations between data; and they are the anchor points in interpretation of findings.
>
> (Blumer 1969, p. 26)

Corbin (2008, p. 51) acknowledges that, and emphasises the importance of concepts derived from the data. According to her, concepts are words that 'represent an analyst's impressionistic understandings of what is being described in the experiences, spoken words...expressed by participants' (Corbin 2008). The importance of concept is that it groups or classifies things of importance that

'share the same major common property(ies)' but Corbin (2008) clarifies the challenge to the analyst that *often* these shared properties are not so evident.

Concepts vary in levels of abstraction from basic-level to high-level concepts (Corbin 2008). In this study the researcher started the analysis with a basic-level abstraction to ensure specificity which forms a solid foundation from which to move up the 'abstraction pyramid' (Corbin 2008). High-level abstraction reached at the top of the pyramid ensures generalisability and broader explanation.

Early in the analysis, at the most basic level, Corbin (2008) recommends 'being open to all possible meanings in data, as well as potential relationships between concepts', as this prevents jumping to conclusions. Corbin also recommends that researchers take time to consider all possible meanings in their data to gain insights. This, Corbin asserts, 'helps researchers to become more aware of their own assumptions and the interpretations they are placing on data' (Corbin 2008).

Corbin (2008) sums up that qualitative data analysis 'is a process of generating, developing, and verifying concepts- a process that builds over time and with acquisition of data'.

5.3.Analysis strategy

> The purpose of an exploratory investigation is to move toward a clearer understanding of how one's problem is to be posed, to learn what are the appropriate data, to develop ideas of what are significant lines of relation and to evolve one's conceptual tools in the light of what one is learning about the area.
>
> (Corbin 2008, p. 65)

As recommended by both Glaser and Strauss, the data analysis process was started just after transcribing the first interview (Glaser & Strauss 1967; Strauss 1987). Myers (1997) explains that 'there should be a continuous interplay between data collection and analysis', and Denzin and Lincoln (1998, p. 322) acknowledge that 'meaning, interpretation, and representation are deeply intertwined in one another'. This method of parallelism in data collection and analysis which guides the researcher to identify concepts is termed 'theoretical sampling' (Corbin 2008). The data was thoroughly analysed immediately it was received, 'but without early jumping to conclusions' (Bazeley 2007, p. 16). This helps conceptualisation, detection of key themes and patterns in the data (Bazeley 2007, p. 16).

Although it is ideal to start the analysis just after an interview is finished, it is not always possible to do so because of time constraints. To meet the objectives of this study, the researcher had to conduct interviews overseas in Jordan and the UAE where there was little time between interviews to allow for immediate analysis.

The analysis strategy included the use of a number of analytic tools and software programs to assist in the analysis process. These include NVivo 7 and 8. As Gilbert has said, 'Tools extend and qualitatively change human capabilities' (Bazeley 2007, p. 7). The following section discusses the analytic tools used in the analysis process of this mobile government study.

5.3.1.Analytic tools

Corbin (2008, p. 65) defines analytic tools as 'thinking techniques used by analysts to facilitate the coding process'. Analytic tools are used to facilitate interacting with the overwhelming amount of collected data to derive codes. According to Creswell (2007, p. 148), coding the data is 'reducing the data into meaningful segments and assigning names for the segments'.

Corbin (2008, p. 67) summarised the purposes of using the different types of analytic in ten main points. These points highlight the fact that if the tools are used properly, they stimulate creative thinking and assist the researcher to see all possible meanings in the data, and to develop proper concepts.

Corbin (2008, p. 69) lists a number of analytic tools, but in this study only the following were used:

- *The use of questioning (Blumer 1969) cited in (Corbin 2008, p. 69);*
- *Making comparisons;*
- *Thinking about the various meanings of a word;*
- *Using the flip-flop technique;*
- *Drawing upon personal experience;*
- *Waving the red flag;*
- *Looking for words that indicate time;*
- *Looking for the negative case;*
- *'So what?' and 'what if?'*
- *Looking at the structure of the narrative and how it is organised in terms of time or some other variable.*

Asking questions is a fundamental tool in all stages of a qualitative research as it enables the analyst to 'probe', 'develop provisional answers', 'thinking outside the box' and become 'acquainted with the data' (Glaser & Strauss 1967). Asking questions allows for constant comparison for similarities and differences which aids in classifying data. Corbin (2008, p. 73) clarifies that comparison is 'essential to all analysis because it allows the researcher to differentiate one category/theme from another and to identify properties and dimensions specific to that category/theme'.

While doing the comparison, the different meanings of a word should be taken into consideration, but the analyst should spend time only on selected words that have the potential to further the analysis (Corbin 2008, p. 78). These selected words and phrases should be studied carefully from all angles, and even thought of from their extreme opposites (flip-flop technique) to bring out their significance (Corbin 2008, p. 79). The researcher examined the respondents' language as recommended by Corbin (2008, p. 82) who asserts that this 'can tell us a lot about a situation'. She also recommends noting words that indicate time, explaining that 'time words help us frame events, indicate conditions, and are important when we are trying to identify context and process' (Corbin 2008, p. 83).

Examining words and phrases helps us develop concepts. To better explain these concepts, Corbin (2008, p. 84) recommends looking for a case that does not fit the pattern of a 'negative case' and affirms that 'looking for the negative case provides for a fuller exploration of the dimensions of a concept'.

5.3.2.Coding the Data

The qualitative analysis, according to Auerbach (2003), includes: a) reading all text to identify the relevant; b) reflecting on the related text to discover repeating ideas; c) conceptualising the ideas; d) linking and organising them in themes. Strauss and Corbin (1998) define coding as 'as conceptualizing, reducing, elaborating, and relating' and a code as 'an abstract representation of an object or phenomenon'. In this research the analysis process followed Auerbach's steps:

- Conceptualisation involves labelling codes (ideas) and storing its supporting data. In NVivo7, this step is done by creating free nodes;

- Categorisation involves classifying the codes into groups (linking ideas). This step was done concurrently with conceptualisation.

According to Struass and Corbin (1990), 'we can take each concept as we go along with our labelling process, and ask to what class of phenomenon does it seem to pertain, and is it similar or different from the one before or after?'.

Categorisation has two sub-steps:

- *Connecting nodes* (Bazeley 2007). In NVivo7, this step is done by creating trees. According to (Bazeley 2007), this step is 'organisational rather than theoretical'.

- Locating *patterns of association in nodes* (Bazeley 2007). This sub-step is the core to theory development

(theorising), as it gets the researcher to sense the connections between concepts.

- Themes involve constructing 'meta- or more abstract codes to reflect either overarching ideas or higher order concepts, or to identify broader, more complex themes running through the data' (Bazeley 2007).

According to Creswell (2007) the general five-step data analysis is common to different approaches (i.e. Narrative research, Phenomenology, Case Study research, Grounded Theory Study, and Ethnography) and varies in terms of analysis steps and procedures, resulting in many similar and different processes. Although data analysis processes may differ based on the approach, they all agree on *coding the data*, *generating themes*, and *representing data* as the central steps in qualitative research and beyond these elements different approaches suggest different phases in the process (Creswell 2007).

To sum up, the analytic strategy in this study uses the analytic tools discussed above, such as asking questions and making comparisons to aid in the coding process which forms the heart of the qualitative analysis.

5.4.Coding Phases

The coding phase of the analysis process deals with interpreting the data. Boehm (2004) and Corbin (2008, p. 159) describe the coding process as interpreting raw data to extract, group and conceptualise ideas, and explaining and discussing properties and dimensions in more detail.

New data is immediately analysed and compared to the previously analysed data. According to Strauss and Corbin (1990), 'data collection, analysis, and theory stand in reciprocal relationship with each other'. Common incidents are the results of the repetitive comparison process known as the 'constant comparison method of data analysis' (Strauss & Corbin 1990; Strauss & Corbin 1998).

Conceptualisation - the first step in data analysis - was done slowly and cautiously, as it is very easy to get trapped by describing (summarising) data instead of properly labelling them (Strauss & Corbin 1990). Figure 19 depicts a screen shot of code in Nvivo7.

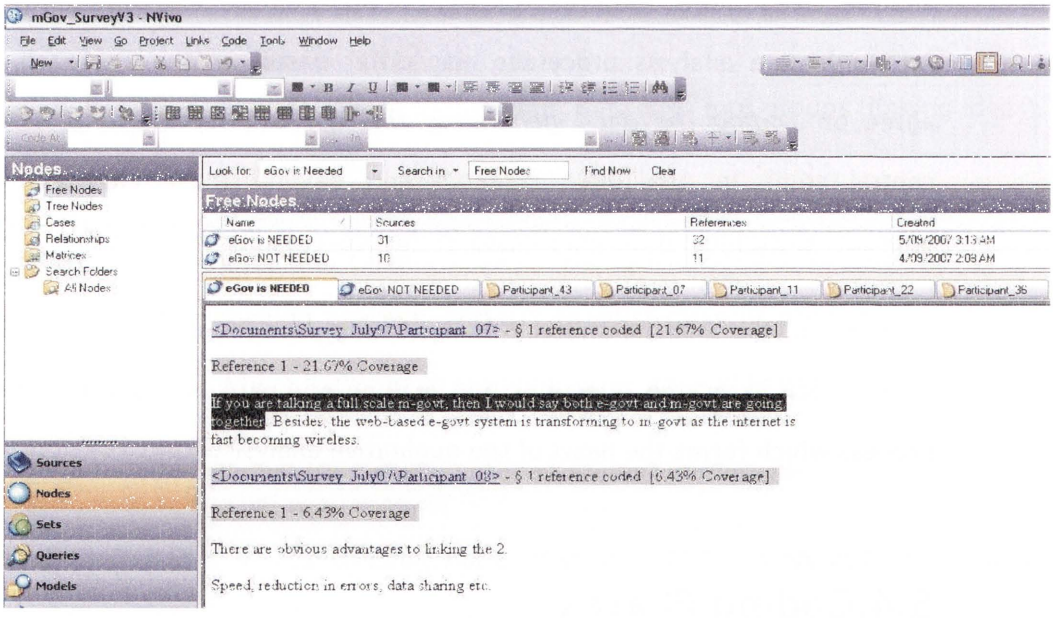

Figure 19: Screen shot of code supporting the need for e-Government

The coding in this study followed Glaser's (1978) method where coding is divided into two distinct phases: substantive and theoretical.

5.4.1.Substantive coding

Substantive coding is concerned with producing categories and their properties (Walker & Myrick 2006). Categories are produced using the constant comparison of incidents, and according to Glaser (1998), incidents can be anywhere in the data. Slow, careful and thorough reading extracts detailed incidents that contribute to reaching significant findings (Glaser 1998). Thus, the researcher has focused on detailed incidents. Glaser (1998) suggests that incidents generate codes along with supporting data (empirical indicator) that form properties to denote the concepts.

The substantive coding method is based on the constant comparison analytic tool. The constant comparison of 'one incident of data' to another incident will show a pattern which will be named a 'category'. Substantive coding is further divided into open and selective coding (Glaser 1978). The following sections discuss these sub-methods.

5.4.1.1.Open coding

Corbin (2008, p. 195) defined the first stage of substantive coding (open coding) as 'breaking data apart and delineating concepts to stand for blocks of raw data'. According to Travers (2001, p. 44) coding is the most important procedure in data analysis and it always starts with open coding. Gibbs (2002, p. 167) suggests that open coding is used to 'examine the text for salient categories of information by making comparisons and asking questions. These categories are labelled'.

The main advantage of open coding is that it allows the researcher to see where to take the study further by gathering data based on concepts, namely 'theoretical sampling' (Glaser 1978). According to Strauss and Corbin (1990), 'data collection, analysis ... stand in reciprocal relationship with each other'.

A constant theoretical comparison tool implies that new data is immediately analysed and compared to the previously analysed data. This comparison is based on similarities, differences and degrees of consistency of meaning among the indicators. Thus, when an incident was coded for a category, it was always compared with the previous incidents in the same category (Glaser & Strauss 1967). This constant comparison could also show characteristics of concepts (properties), and the constant comparison of discovered incidents in the data could generate either a category or a property of a category (Glaser & Strauss 1967).

Corbin (2008, p. 159) defined categories as 'higher-level concepts under which analysts group lower-level concepts according to shared properties'. She also pointed out that categories are sometimes referred to as themes, and their main advantage is that 'they represent relevant phenomena and enable the analyst to reduce and combine data' (2008, p. 159).

The open coding process was assisted by asking the following questions about each incident of data, as recommended by Glaser (1978):

- This data forms a part of which study?
- What category/property of a category and what part of the emerging theory, does this incident indicate?

- What is actually happening in the data? What is the basic problem in the action scene?

The second stage of substantive coding, termed 'selective coding', refines categories produced by open coding so that it focuses on a particular category. Finding a core category is the first step in integration, and the importance of the core category is substantial, as it represents the theme of the research, illustrating the importance of the selective coding (Corbin 2008).

To find the core category the researcher must look through all the developed categories produced by the open coding that satisfies the condition: 'the category that appears to have to [the] greatest explanatory relevance and highest potential for linking all of the other categories together' (Corbin 2008). This condition ensures that the core category with its analytic power ties together all different categories to create a coherent story.

Corbin (2008, p. 105) listed the following criteria for choosing a central category:

- It must be abstract; that is all other major categories can be related to it and placed under it.
- It must appear frequently in the data. This means that within all, or almost all, cases there are indicators pointing to that concept.
- It must be logical and consistent with the data. There should be no forcing of data.
- It should be sufficiently abstract so that it can be used to do research in other substantive areas, leading to the development of a more general theory.

- It should grow in depth and explanatory power as each of the other categories is related to it though statements of relationship.

In this research, it was the identification of common themes and patterns both within and across the case studies that identified the central category. Conditions of success and successful m-Government characteristics are all examples of the selective coding which is represented in tree nodes in the NVivo package.

5.4.2.Theoretical Coding

While substantive coding is used to generate categories and their properties, theoretical coding occurs at a conceptual level, weaving the substantive codes (categories and properties) together into a theory (Walker & Myrick 2006). According to Glaser (1978, p. 72) the advantage of theoretical coding is to 'weave the fractured story back together again'. Integrating the different categories is not simple, and the integration was done many times by sorting and re-sorting the categories many times to find the best fit.

5.5.Computerisation: NVivo 7 & 8

> *The data generated by qualitative methods are voluminous. I have found no way of preparing students for the sheer massive volumes of information with which they will find themselves confronted when data collection has ended. Sitting down to make sense out of pages of interviews and whole files of field notes can be overwhelming.* Pattorn cited in (Creswell 2005, p. 150).

The detail in most qualitative research is both a blessing and a curse. On the positive side, it enables the researcher to describe the phenomena of interest in great detail, in the original language of the research participants. It is not so simple in most qualitative research, where the data are more 'raw' and are seldom pre-categorised. Consequently, the researcher needs to be prepared to organise all the raw detail, and the rationale behind using a computer program is to aid the analysis process. According to Corbin (2008, p. 310) computer programs are 'helpful for organizing, storing, and shuffling data and memos, they play an important role in evaluation'. Figure 20 depicts an example of a category code with all the relevant text that has been coded into it displayed on the right-hand side.

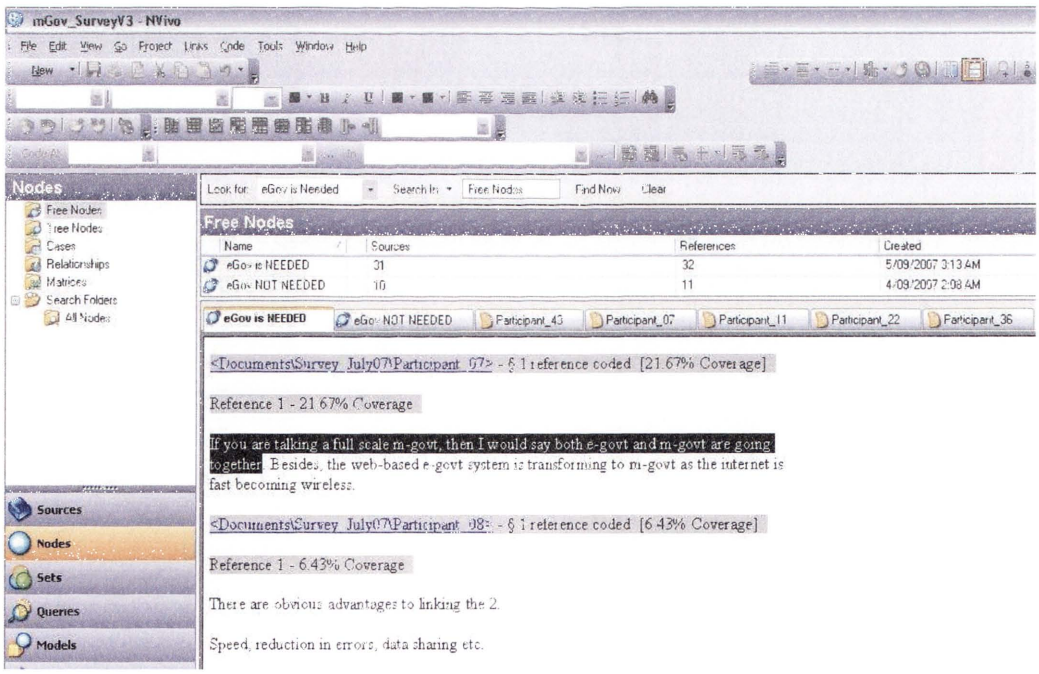

Figure 20: An example of a category code with all the relevant text that has been coded into it displayed on the right-hand

Although there is a debate about using qualitative analysis software (Charmaz 2000; Miles & Weitzman 1994; Corbin 2008; Bazeley 2007), there is also a 'wide held perception that use of a computer helps to ensure rigour in the analysis process' (Bazeley 2007). Corbin (2008, p. 310) defends using a computer when she states that 'I know the time has come to recognize the place of computers in the future of qualitative research'. In this research, the NVivo (versions 7 and 8) software package was used to aid the analysis process. NVivo is 'an intelligent application that helps to manage, shape and analyse virtually any information' (QSR International 2007).

The researcher did not completely depend on NVivo, but used it as an assistant for data storage, coding, linkage and analysis. According to Bringer, Johnston and Brackenridge (2006) 'a good researcher will use the computer as a tool to aid quality analysis'.

The researcher defends his decision to use computers as he agrees with (Corbin 2008, p. 163) that 'thinking is the heart and soul of doing qualitative analysis' and 'thinking is the engine that drives the process and brings the researcher into the analytic process'. Although computers can be used to do coding, they 'don't do the thinking ... but despite their limitations computer programs can enhance the creativity of analysis because they enable researchers to try things first one way and then another' (Corbin 2008, p. 310).

5.6.Review of Chapter

The chapter discussed the strategy adopted in analysing the data of the mobile government case studies which were collected through face-to-face interviews and surveys. The chapter explained concepts relevant to both open and selective coding, including the constant comparison method, categories, properties, and core categorisation. Both substantive and theoretical coding stages were explained, with a number of relevant examples from the study. The degree of computerisation of the data analysis process was also discussed.

5.6.1.Where to now?

Next chapter will discuss the results of applying the data analysis techniques to the collected data through the online surveys.

CHAPTER 6

6.m-Government Fundamentals

This chapter reports on the experts web-based surveys. The surveys aimed at collecting data about the definition of m-Government and the need for e-Government. The chapter concludes with outlining a new m-Government definition and relating the need for e-Government to the functionality level of the m-Government system to be implemented.

6.1.Introduction

As the business domain has advanced in electronic commerce (e-commerce), and because of demand, governments have adopted Internet technologies to implement electronic government (e-Government).

Mobile commerce (m-commerce) has extended e-commerce. Thus, some governments such as those of Malta, Australia, California state and Canada

started to consider adding the m-Government extension. The many reasons behind this transition will be discussed in later sections in this chapter.

In the following section the author will consider the definition of m-Government. The definition arrived at is extracted from a web-survey (see Appendix B: Web-surveys) that targeted experts and researchers in the field. The survey analysis result was refined using an extensive mobile government and mobile commerce literature review to reach the best m-Government definition. Despite the author's definition of m-Government in the first part of this research, such a task can still be a semantic exercise in its own right. Using qualitative research methods, survey results are collected, analysed and used to develop a theoretical m-Government framework that will contribute to the successful adoption of m-Government. The results achieved and presented in this chapter are a synthesis of an analysis of both the experts' feedback, and the available literature. The concerns discussed in this chapter are directed towards raising a series of issues that to date have not been recognised in the literature.

6.2.Survey responses and analysis

A hundred and five invitations to this survey were sent out, but only 12 have responded. The web-survey responses of participants are detailed below.

Participant Def04 defined m-Government as: 'Government services delivered by mobile devices'. Here the participant described m-Government as a public/*governmental service*, but the participant concentrated on the delivery of this government service(s) to the *mobile devices*.

Participant Def12 defined it as: 'Wireless remote connectivity access capability to manage and work public services/jobs'. Here the participant concentrated on the location-independent connectivity as the main feature of m-Government in saying *Wireless remote connectivity access*. The participant also described m-Government as a tool 'capability' to manage public services, which also indicates that m-Government here is only used by the government to support its operations/work.

Participant Def01 defined m-Government as: 'The use of mobile technologies to support the operations of the public (government) sector'. This definition has two main characteristics: the *use of mobile technologies* in general, which references the mobile devices mentioned by participant Def04 but extends that to infrastructure and electronic technologies. The definition also clarifies that the goal of m-Government is to *support the operations of the government*. The definition agrees with participant Def12 that m-Government is used by the government constituent to *support its operation*.

Participant Def02 defined m-Government as: 'a system of public administration through mobile communication devices and networks. Instead of making off line contacts, people can take care of most of their businesses with local and national govt [government] through mobile network'. Participant Def02 shaped m-Government as a government *system* that utilises *mobile communication devices and* networks. While participant Def01 highlighted *supporting the operations of the government* as an m-Government goal, participant Def02 emphasised peoples' ability to *do business* with different levels of government.

Participant Def05 defined m-Government as: 'an approach that a Government may adopt [to] interact with citizens and provide them with services by leveraging [leveraging] mobile technologies'. The participant regards m-Government as an *approach*, which differs from the opinion of participants Def12 and Def02 who considered m-Government as a *Wireless remote connectivity capability* and a *system of public administration* respectively. The use of the word 'may' indicates that the adoption of m-Government is not obligatory and that not all governments should adopt the approach. The participant points out that m-Government adoption aims to *interact with citizens and provide them with services* and this is to be achieved by using *mobile technologies*. The participant implies that m-Government is only for citizens, but this raises the question about the other entities that deal with governments such as businesses and the government itself.

Participant Def08 defined m-Government as: 'The use of mobile technology to conduct governmental transaction in-between governmental entities, between governmental entities and businesses and between governmental entities and citizens'. Although this definition matches and supports others like Def01, Def02, Def04 and Def05 and maintains the use of mobile technology as the delivery method, it adds more parties/constituents to the use of m-Government to interact with the government other than only citizens, as stated by participants Def02 and Def05, and only the government as asserted by participants Def01 and Def12. Participant Def08 argues that m-Government exists to serve three constituents: Government (G), Business (B) and Citizens (C) and its aim in conducting transactions between the constituents/entities and the government form three interaction domains: (G2G) - government to government, (G2B) -

government to business, and (G2C) government to citizen, with the government as the core entity.

Participant Def06 defined m-Government as: 'the extension of e-Government services to the mobile environment'. The participant claims that m-Government is just an extension of e-Government services, and conveys that it is just a service. This contrasts with participant Def05 who describes m-Government as an approach and participant Def02 who describes it as a system, but agrees with participant Def04 who describes m-Government as a government service.

Participant Def10 elaborated on the topic and said that: 'Mobile government requires the use of ICT technology for the explicit purpose of helping public workers do their jobs or helping citizens access government. Government is 'mobile' in the sense it is easily accessible to citizens wherever they are and have access to computer technology. It is also 'mobile' in the sense of government workers being able to access work orders, backend systems, other workers in real time using wireless technology when they are out in the field or community'.

Participant Def10 used the more general term of Information and Communications Technology (ICT) which encompasses all forms of computing systems, telecommunications and networks such as wired and wireless. The use of the term (ICT) is valid and adheres to what is stated by participant Def06, that m-Government is an *extension of eGovernment* which uses different forms of networks, computing systems and devices. Thus the use of ICT is justified.

The definition assumes a focus on helping government employees *do their jobs* or *helping citizens access government*. This adds the government employee (E) as a new m-Government constituent. Thus, m-Government constituents are:

Government (G), Government employees (E), Businesses (B) and Citizens (C). This constituent addition also results in (G2E) - government to employee - as a new interaction domain.

The participant also focused on the mobility feature of m-Government and the importance of the ease of accessing the government anywhere when the required technology, such as mobile device and wireless technology, is available.

Participant Def03 defined m-Government as: 'A public body which supports the mobility of its people, by providing its services when and where the people need them, and by supporting the development of whatever wireless technologies are needed, and the education of people in these'. The participant looks at m-Government from a different angle by describing it as a *public body*.

Participant Def09 in the web survey defined m-Government as: 'A move from the concept of 'service delivery' to one of 'delivery of service'. There is the ability, and/or desire, to take the interface with the citizen closer to them and further from the government. Often this will extend further from information exchange and data capture into direct decision making and service delivery'.

Participant Def09 described m-Government as a *move* which adds to the previous descriptions (i.e. public body, system, approach) but the participant raised an important issue by emphasising the core goal of *delivery of service* which should provide faster, easier, and more accessible services to constituents.

The participant shed light on the government's willingness to adopt/implement m-Government service and emphasised *the ability, and desire, to take the interface with the citizen closer to them and further from the government*. This

emphasises not only the government's willingness to adopt m-Government for delivery service through wireless and mobile technologies, but also places the constituents (i.e. citizens) in control of the interaction with government to support their business with the government.

Participant Def07 quoted the World Bank definition of e-Government to introduce m-Government: 'Some of the driving forces behind the adoption of digital government (e-Government) appear in one of its definitions (WorldBank, 2005) as "the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government. These technologies can serve a variety of different ends: better delivery of government services to citizens, improved interactions with business and industry, citizen empowerment through access to information, or more efficient government management. The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions"'.

This participant elaborated on m-Government: "M-government (mobile government) is a subset of e-Government that supports mobile environments and users. Related technologies include mobile and/or wireless technologies like cellular/mobile phones, laptops, and PDAs (personal digital assistants) linking to wireless networks (local area networks, cell phone networks, satellites, etc.). M-government can extend certain stationary e-Government capabilities by making them available "anytime, anywhere" to citizens, government employees, and officials'.

Participant Def11 asserted that: 'Mobile Government stands for the locally non-fixed use of electronic information and communication technology to allow communication with or within government and administration by means of mobile devices and without the application of regular installed access points'.

Here the participant agreed with the others and supported the idea that m-Government is about the utilisation of wireless and mobile technologies to extend the stationary e-Government through the mobile/*non-fixed use of electronic information and communication technology* (ICT). The participant highlighted the *communication with or within government* as the core goal of m-Government.

Participant Def11 continued: 'It seems to me very important to draw a distinct between the internal use of mobil [mobile] ICT and the use as a channel for communication between administration and citizens, business etc. The last is nothing more than the use of E-Government applications by mobile means. With the exception of location based services or the use of the possibility to fix the position an [and] to combine it with the transmitted information automatically. The internal use in contrast can change the administration's organisation, procedures and tasks deeply. We have been concerned ourselves in several ideas: the idea of mobile front offices (for social tasks concerning certain groups with special needs like immobilised people), the use of mobile ICT for on-site controlling tasks of the administration and the idea of supporting public private partnerships with mobile ICT (which could enable the transfer of administration [administration] tasks to privates where this seemed unpossible [impossible] before)'.

The participant raised another important issue about the use of m-Government which would reshape its definition. The participant highlights two usages of m-Government: as a communication channel to access government systems, and the internal use within the government itself.

If m-Government is only used as a *channel of communication* with government, then m-Government is just an access channel to *e-Government applications* through mobile devices. On the other hand, the internal use of m-Government requires deep *changes to the administration's organisation, procedures, and tasks.*

6.2.1.Derived Definition Based on Survey of Experts

From the definitions in Section 6.2, we can sum up that m-Government is a system that extends stationary e-Government by utilising the wireless and mobile technologies of the Information and Communications Technologies (ICTs) for constituents (Government, Employees, Businesses, and Citizens) to interact within/with their or any government regardless of time and location, to enhance the delivery of service in order to support government's operations and decision making and constituents' and employees' business with the government.

6.3.m-Government Definition: Literature review refinement

Since m-Government is a new topic, there is little literature available on the topic. In this section the author will review the m-Government definitions available in the m-Government literature and will also look at m-Commerce literature,

because of the similarity between the two. This section will examine whether the definitions can add to the previously derived definition in order to reach the best definition of m-Government.

According to the (World Bank 2008):

> m-Government is part of a broader phenomenon of mobile-enabled development (m-development) or leveraging the mobile revolution to enable development impact. It takes electronic services and makes them available via mobile technologies using devices such as mobile phones and PDAs. These services bypass the need for traditional physical networks for communications and collaboration.

The World Bank's definition still discusses the utilisation of mobile technologies to make eServices available anytime, anywhere through mobile devices. Thus, this definition does not contribute to the derived definition.

According to (Wikipedia 2008):

> Mobile government, sometimes referred to as m-Government, is the extension of e-Government to mobile platforms, as well as the strategic use of government services and applications which are only possible using cellular/mobile telephones, laptop computers, personal digital assistants (PDAs) and wireless Internet infrastructure.

This definition talks about extending e-Government services by utilising mobile technologies. Wikipedia's definition does not add anything to the derived definition.

Antovski and Gusev (2005) state that 'M-government is largely a matter of getting public sector IT systems geared to interoperability with citizen's mobile devices'. The definition sheds light on getting government systems ready to communicate with mobile devices, but does not mention extending e-

Government. The definition highlights 'interoperability' as an important issue when it comes to communicating with mobile devices that would probably be of different nature and capabilities and are located in large heterogeneous networks that belong to different service providers. According to Carroll (2005):

> m-government involves interaction where the use contexts are unknown, where accessing government services might be one of several activities being undertaken and where the physical constraints of interacting with mobile devices limit the amount and type of information that might be located and accessed. (Carroll 2005, p.79)

Thus, 'interoperability' is a keyword to be added to the derived definition. (Antovski & Gusev)'s definition considers citizens as the only m-Government constituent.

Kuscu, Kushchu and Yu (2007a, p. 1) defined m-Government as:

> strategy and its implementation involving the utilization of all kinds of wireless and mobile technology, services, applications and devices for improving benefits to the parties involved in e-government including citizens, businesses and all government units. (Kuscu, Kushchu & Yu 2007a, p. 1)

These definitions support the author's derived one as both agree on the main characteristics of m-Government such as the *utilisation of wireless and mobile technologies* and *improving benefits to constituents*. These definitions omitted the major characteristic of the 24/7, anywhere availability and accessibility to government. They identify m-Government as a *strategy*.

According to (Lallana 2008a):

> mGovernment is a subset of e-government. e-Government is the use of information and communication technologies (ICTs) to improve the activities of public sector organisations. In the case of m-government, those ICTs are limited to mobile and/or wireless technologies like cellular/mobile phones, and laptops and PDAs (personal digital assistants) connected to wireless local area networks (LANs). mGovernment can help make public information and government services available 'anytime, anywhere' to citizens and officials. (Lallana 2008a)

The definition agrees with and advocates the derived one.

6.4.m-Government definition: Final and refined

m-Government is a strategic system that extends stationary e-Government systems to enable interoperability with heterogeneous wireless and mobile technologies through applications for constituents (Governments, Employees, Businesses, and Citizens). This allows them to interact within/with their government(s) or any government regardless of time and location, and to enhance the delivery of service in order to support government's operations and decision making, and to support constituents' business with the government. Table 8 below explains the definition's keywords.

Table 8: m-Government emerged definition keywords

Keyword	Explanation / Examples
Stationary e-Government	Interaction with government systems from fixed locations in diverse geographical areas, through homogenous ICTs using fixed devices (i.e. desktops) and the wired Internet (Carroll 2005).
Wireless Technology	Electromagnetic waves that carry signals to provide connectivity for portable and mobile applications such as Global System for Mobile Communication (GSM), General Packet Radio Service (GPRS), Enhanced Data GSM Environment (EDGE), Universal Mobile Telecommunications System (UMTS)
Mobile Technology	Portable wireless devices such as cell phones, PDAs, laptops
Constituents	Governments, Government Employees, Businesses and Citizens
Interaction	Exchange and collection of information and/or services
Government	Public body/government department with which a constituent interacts
Delivery of service	Faster, easier, and more accessible to the general public
Support government operation	Quick interaction results in speed response to complaints, emergencies, crimes, disasters and so forth
Decision making	Critical decision making to while in the field
Business with government	Constituents business with any government department

Through the above investigation into the experts' responses to the survey, the available literature, and the exploratory discussions with experts and researchers in the field, the variety of definitions of m-Government became obvious. Some of these definitions stated that m-Government is part, or a subset, of e-Government. According to Al-khamayseh and Lawrence (2006), most researchers believe that electronic government (e-Government) is the cornerstone for m-Government. Zálešák (2002) describes mobile government (m-Government) as a functional subset of all-inclusive e-Government, and according to Ghyasi and Kushchu (2004), m-Government is an add-on to e-Government. Other definitions implicitly indicate that m-Government could be a standalone system, in which Mobile Government stands for the locally non-fixed use of electronic information and communication technology to allow communication with or within

government and administration by means of mobile devices and without the application of regular installed access points (Knopp 2005). This inconsistency sparked concern and resulted in the research question investigated in the next section, namely, *Is e-Government a necessary prerequisite to m-Government?* To the researcher's knowledge, the concern of this research question has not been addressed in the literature. In order to investigate, it was decided to invite m-Government experts and researchers to participate in a new online survey.

6.5.The e-Government requirement

As discussed previously, most m-Government definitions state overtly or covertly that m-Government is a subset of e-Government, which thus raised the need to investigate the research question: Do You Think That E-Government Is a Necessary Prerequisite to m-Government? Why/ Why Not?

This section describes experts' opinions on a key issue which could form a preliminary hypothesis that contributes to devising an m-Government development framework. Figure 21 shows the location of the 43 experts who responded to the survey about the e-Government requirement.

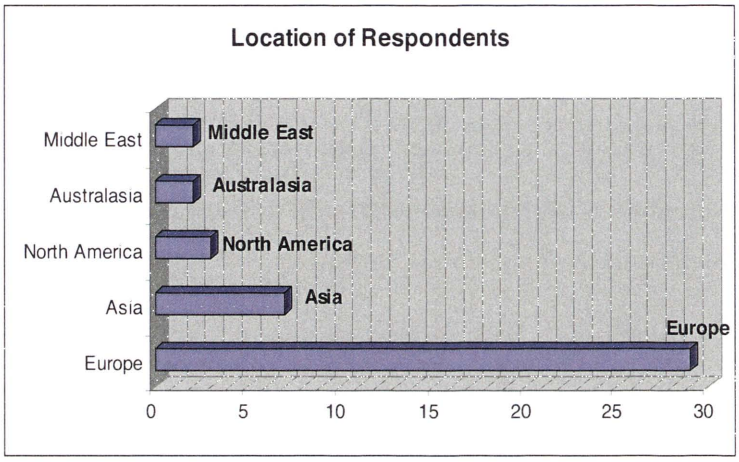

Figure 21: Location of respondents to the e-Government requirement survey

6.5.1.The Online Survey Discussion

The respondents' opinions were divided about this issue, with the majority agreeing with the question (69%). Some respondents were straightforward in answering 'yes' and did not add to that short answer, showing confidence that m-Government cannot happen without e-Government already in place. Some answered confidently in the negative (12%): 'No[,] e-Government is not a necessary prerequisite to m-Government'. Many others (19%) agreed, but added that 'm-Government is an alternative or further development of e-Government', which means that m-Government complements e-Government: 'They are complementary'.

According to one respondent, 'e-Government is about building Internet-based solutions', and m-Government 'is the same, but using wireless as well as fixed networking technologies,', so 'm-Gov is a complementary channel' and thus 'm-Government solution is therefore an e-Government solution'.

Another respondent shared the same opinion but stated that the previous existence of e-Government also contributes to awareness: 'you need the people's awareness of "E" Government to be familiar with the "M" Government'. Awareness is: 'important for experience in automation', generates trust and motivates people to try new methods. 'Once people use and trust e-Government services they will shift towards m-Gov.' Thus 'e-Government plays a [an] important role as a driving force'. This leads the author to conclude that awareness contributes to trust, and thus encourages constituents to use m-Government.

Another respondent sums up that: 'm-Government is a kind of e-Government service [where] users can use mobile (wireless) devices as an interaction device'. Additionally, e-Government programs contribute to devising successful m-Government programs and applications 'the e-Gov management will have a good idea of what services to provide through the mobile'.

According to the above comments, e-Government seems to be a core factor for m-Government 'e-Gov is the fundament [fundamental] for mGov' and 'Surely e-Government is a key enabler for m-Government' and therefore 'There should be first the backbone of e-Gov' which is the 'e-Government services in the back-end IT systems of the governmental agencies'. These systems support m-Government as 'm-Gov will often work alongside e-Gov, e.g. people using the Internet to register for an m-Gov service'.

These respondents see m-Government as a subset of existing e-Government infrastructure which it complements by adding a wireless channel. e-Government services contribute to awareness and trust which motivate people to use m-

Government applications devised by the e-Government management. Thus, e-Government is a driver and a core enabler of mobile government.

While most respondents recommended having an e-Government infrastructure, some did disagree with the idea of requiring e-Government as a pre-requisite to m-Government: 'No[,] e-Government is not a necessary prerequisite to m-Government'. A global government industry manager added that: 'Initially, the two initiatives did not require one as a prerequisite to the other'.

m-Government applications that do not rely on e-Government infrastructure have their own benefits too: 'There is no reason however why m-Gov apps [applications] on their own cannot increase efficiency and quality of service'. This means that: 'There are practical advantages to be gained from standalone m-Gov applications as an initial or pilot stage in development, particularly as they may be quicker to develop and introduce'.

It is also important to understand that although a standalone m-Government application is possible, 'not all government services can be rendered using mGovernment technologies'. Thus, some respondents did not provide a clear cut answer, but agreed with both views: 'yes and no'. As explained by an e-Government Corporate Programs Manager, 'm-Government can be achieved without e-Government, but somehow limited'; a researcher respondent added that: 'some innovative service can be accomplished without e-gov', although this depends on the functionality level of the service/application. 'It depends on what kind of m-govt you are considering', for example: '"Light" mobile applications might be implemented without a comprehensive e-Government framework'.

A professor added: 'If you are talking a full scale m-Govt, then I would say both e-Govt and m-Govt are going together'. A government industry manager recommended that: 'more effective m-Government has been enhanced by the combination of web centric servers and m-Government devices'.

As the findings indicate, some respondents were flexible about the issue, by relating the existence of e-Government to the level of m-Government service/application functionality. 'Light' or basic services are easy to develop and do not need the e-Government infrastructure. Such services provide 'efficiency' and 'quality of service' advantages.

To sum up, m-Government applications' functionality level determines the necessity of e-Government's existence. While full scale Government applications -providing secure transactions- need the e-Government backbone, light m-Government applications could be developed without it.

Based on the analysis of the web survey responses, a working conclusion/hypothesis is presented below:

The existence of e-Government as a prerequisite to m-Government is based on the functionality level of the m-Government service.

Figure 22 depicts the findings and percentages of participants supporting each stance.

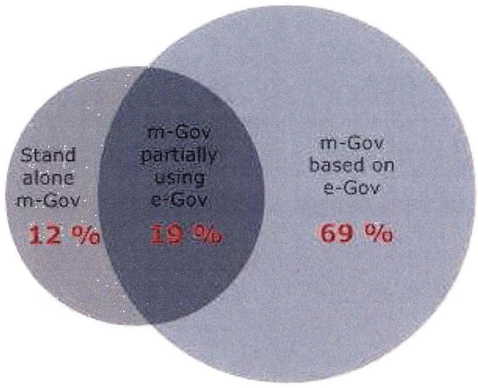

Figure 22 Percentages of participants supporting findings

6.5.2.Literature review Refinement

In this section we use the available m-Government literature to enhance the theoretical sensitivity in order to refine the preliminary hypothesis. Literature, according to Strauss and Corbin (1990), is categorised as technical and nontechnical. To avoid being locked into literature which might negatively affect creative analysis, it is not mandatory, in fact even not preferable, to review all the available literature before starting the exploratory research. Literature should, however, be thoroughly investigated after the preliminary hypothesis emerges, in order to become aware of mutual findings (Strauss & Corbin 1990).

According to the Australian National Audit Office (1999), the functionality level of service delivery increases depending on the level of technology sophistication. Thus, the author considered the success factor model in (Sandy & McMillan 2005) which is based on the level of functionality. According to the earlier discussion, e-Government infrastructure is a main driver, but its existence is not necessary in

specific cases. These cases depend on the functionality level of the m-Government service.

Based on the derived evidence and the literature review, Table 9 presents the added contribution to the success factor model developed by Sandy and McMillan (2005) and shows that the importance of e-Government as a prerequisite is relative and is not an inhibitor to an initial m-Government program.

Table 9: e-Government relevance to m-Government

e-Gov infrastructure	m-Gov Functionality level (Sandy & McMillan 2005)	Example
NOT NEEDED	Initial	Basic governmental agency wireless presence (e.g. local government parking rangers using wireless PDAs to book illegally parked cars.
	Enhanced	Australian Taxation Office's use of SMS to remind clients of their lodgement obligations (Australian Taxation Office 2007)
NEEDED	Interactive	Formatex, the mobile student (Bassara, Wiśniewski & Żebrowski)
	Transactional	USE-ME platform services (Bassara, Wiśniewski & Żebrowski)
	Fully Interactive	Secure phone, secure transactions over mobile phone using Biometrics (Europe's Information Society 2006)

A European senior researcher recommends 'a combination' of both m- and e-Government, explaining that this very much depends on existing infrastructure, specificities of a given government context, and advances in technology. Figure 23 depicts the contribution of this chapter into the research question.

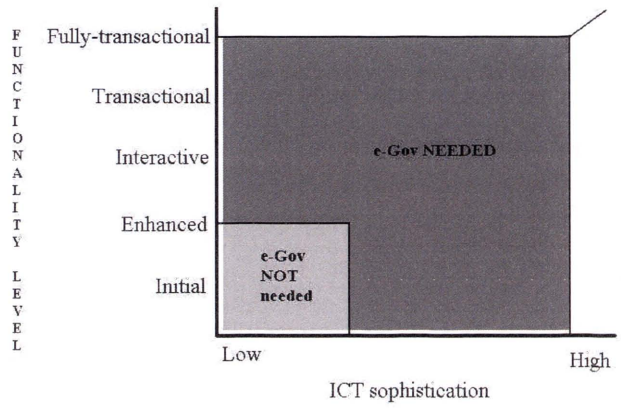

Figure 23: e-Government relevance to m-Government

6.6.Chapter Review

This chapter has defined m-Government and presented a synthesis of the experts' responses to the question *Do you think that e-government is a necessary prerequisite to m-government? Why/why not?* It has resulted in relating e-Government to the m-Government service functionality level: *The existence of e-Government as a prerequisite to m-Government is based on the functionality level of the m-Government service.*

This preliminary hypothesis identifies and explains how the e-Government factor affects m-Government adoption. Thus, the finding of this study contributes to the body of m-Government research by highlighting the issue of e-Government as a prerequisite. This finding should assist countries - mainly developing countries that lack e-Government infrastructure- in better planning for proper m-Government adoption based on their available e-Government infrastructure.

Since there is a lack of an agreed standard, our future research will analyse case studies to obtain a full understanding of current state-of-the-art of m-Government systems, in order to pin-point the proportion of government services that needs an e-Government infrastructure.

6.6.1.Where to now?

So far the researcher has discussed the theory, processes, methods and methodology supporting this research. It is time now to discuss the outcomes of the data analysis. These outcomes are exhaustively discussed in the next chapter and the final outcome of this thesis is presented in the 'Mobile Government Framework.

PART III

Australian case studies: State of Queensland

Australian case studies: State of New South Wales

International case studies: Jordan & UAE

m-Government Framework

CASE STUDIES ANALYSIS

This thesis so far has introduced the mobile government topic and discussed the theoretical and methodological perspectives that guide this study. It has discussed the rationale behind selecting a case study methodology and introduced the data collection principles, methods and procedures along with outlining proper data analysis techniques which were used throughout the study.

Part III discusses the data collected from the interviews and reports on them. It consists of three chapters: Chapter 7 which reports on two Queensland state case studies, Chapter 8 which reports on three New South Wales state case studies, and Chapter 9 which reports on four international case studies in the developing world in the countries of Jordan (two case studies) and the United Arab Emirates (two case studies). The chapters discuss the participants' perspectives and report on them. The chapters also demonstrate the saturation level where the data collection stopped. This section concludes with an overview of the findings that led to the last step in this journey - devising an adaptive mobile government framework.

CHAPTER 7

7.Australian Case Studies: State of Queensland

The TWO case studies discuss the mobile government systems implemented at two Australian councils in the State of Queensland. The rationale behind the selection of local government level is based on the fact that 'there are many more community issues dealt with at local government level than there are at either state or federal level. These community issues put pressure on local governments to improve their services through adopting the newest mobile and wireless technologies. The analysis of the case studies generated a number of success factors that must be considered in planning and implementing a mobile government system.

7.1.First Queensland Council Case Study (QLDCC1)



Figure 24 Map of Australia showing Queensland (Google Maps 2009; WorldAtlas 2009)

7.1.1.Introduction

For ethical reasons the information is de-identified; thus, the researcher will refer to this government council entity as **Queensland City Council1 (QLDCC1)**

Government level: City Council - Local Government Department
State: Queensland
Country: Australia
Population: Undisclosed to protect the department's identity
Number of Interviewees: Two
Interviewees' Position: IT manager and project manager

7.1.2.The council's current use of WIRED Internet

The council has utilised wired Internet technologies for several years. According to participant QLDCC1-01: '*We've got website**s**, and we've got a lot of online services, so if people want to pay their rates for example, they can go to council's website and pay their rates, we provide a lot of community services and information through 'ourQLDCC1.com'*[2] *which is a separate website'*. Along with its Customer Relationship Management methods, such as the call centre, the council also utilises email technology to communicate with its customers.

7.1.3.The council's current use of MOBILE and WIRELESS Internet

The council has recognised the benefits of mobile and wireless technologies and has used them in many of its units, such as libraries, and within many other different business units. According to participant QLDCC1-01: '*we have some of our libraries that are wireless enabled for public users to access the Internet, we certainly have a number of internal systems, that provide mobile capability, utilising wireless technology as well'*.

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2 The website URL has been de-identified for ethical reasons

The council has noticed the high mobile penetration within its community. Thus, they have ensured that their service dedicated website 'ourQLDCC1.com' is developed in a format compatible with mobile phones: *'we provide a lot of community services and information through "ourQLDCC1.com" which is a separate website, and that can be received and accessed via a mobile phone, because the formats ... are well suited to mobiles as well'*. The council also sends Short Message Services (SMS) to its customers for updates.

The council has developed a mobile service that utilises the current features of widespread mobile devices, such as cameras, and the services available through service provider, such as Multimedia Messaging Services (MMS). According to participant QLDCC1-01: *'most phones come with that these days'*. The name of the specific service cannot be revealed in this thesis for ethical reasons, thus we will refer to it as 'MMScouncil'[3] service. The 'MMScouncil' uses MMS technology which can combine text (i.e. instruction and/or location of problem), a picture (i.e. photo of the problem), audio (i.e. verbal instructions or information about the problem) and video (i.e. recording of the problem). Anyone can thus easily use the service to report problems *'rather than somebody ringing the call centre'* which has the following drawbacks:

3 The service name has been de-identified for ethical reasons

- The call costs would be high if made by a mobile phone, which might deter the caller from reporting the problem, or might cause them to delay the call until they can use a landline at work or home, by which stage they might have forgotten the incident.

- If the call is made by either mobile phone or landline, there is the possibility of a prolonged wait for a customer service representative to attend to the call and take the caller's complaint, due to the high number of calls. This might frustrate them and cause them to ignore the problem.

The council understood these drawbacks and recognised the opportunity provided by wireless and mobile technologies, such as the mobile phone's integrated camera and MMS technology, so they developed the 'MMScouncil' application.

The 'MMScouncil' service allows citizens to quickly report problems (such as rubbish, graffiti, park maintenance, road or foot path maintenance, or stormwater drain maintenance) on the spot. Participant QLDCC1-01 explained that it could be used *'where members of the public can take a photo of an asset that might be like a sign that might be damaged and send that through and council will pick that up and then log a job for someone'*. After reporting a problem using 'MMScouncil', the council might contact the reporter seeking more information, or to let them know if it will take more than 30 days to fix or inspect the issue. The 'MMScouncil' service is free of charge to *'to a number that council will pick'*.



Figure 25 Use of MMS technology to report problems (QLDCC1 2008)

A mobile government service such as 'MMScouncil' results in benefits to the council, such as the quick notification of any problem, and to the citizen, such as the convenience. It can be concluded that for the developed service to succeed it is crucial to acknowledge receipt of the complaint so that the citizen will not feel ignored. This would increase the trust in such services and would increase its usage. It is the nature of mobile and wireless technologies to enable rapid notification of issues that require a fast response to solve the problem. This is a crucial factor in gaining citizens' acceptance and convincing citizens to keep using the services.

7.1.4.Government to Employee (G2E) mGov Projects

This local government council has been utilising mobile and wireless technologies for nearly five years now. The council has implemented a number of mobile government applications and solutions, including the following examples:

- One business unit that belongs to this council *'does their work order, scheduling and dispatch with maintenance crews all via a wireless system out to their vehicles'*.

- *'Tree maintenance crews who also get their jobs in the field, for jobs of downed trees and things like that on the roads.'*

- *'Fleet managements and management of fleet trucks and sending jobs out to the fleet and getting status of locations of where those trucks are actually in the field.'*
- *'parking inspectors, who do the infringements of parking that's on a PDA device that's wirelessly connected for updates.'*

Over the last five years, the council has learnt a number of valuable lessons from their long and tough experience: *'we had a lot of learning along the way and ended up; we've ended up with a solution that works'*. Although the lessons learnt are not publicly published, the participants generously agreed to discuss them with the researcher in order to help others shortcut their road to successful mobile government solutions. Such lessons are of great importance, as they were harvested from tough practical experience. Participant QLDCC1-01 explained that: *'it was a tough learning experience as well for us and for the business to get it working effectively'*, and participant QLDCC1-02 acknowledged that: *'I would have to say we've had our fair share of experience'*, which resulted in *'a number of lessons that we learnt from the experience'*.

The lessons learnt were in different areas; participant QLDCC1-02 states that *'there were some that weren't related to technology as well, quite a number that*

weren't related to technology'. The analysis of this case study resulted in a number of perspectives that will contribute to the devising of an adaptive mobile government framework which will guide governments to a successful implementation of mobile government projects. The main QLDCC1 perspectives were:

- **Drivers**
- **Solutions**
- **Constituents (end users)**
- **Providers**

7.1.5.Drivers

The first perspective to be discussed is the drivers behind m-Government's inception. The case study has revealed a number of drivers pushing the use of wireless and mobile technologies in the public sector (m-Government). The participants emphasised the **cost** driver and highlighted that using the m-Government service *'is cheaper than coming in and dealing, doing business over the counter, so it's a **low cost channel** option for us'*. The participants also identified *'**quicker delivery of ... services** is a key, and **better productivity for staff** is normally a big driver in that mobile space where you get the benefits'*. Participant QLDCC1-02 also highlighted a number of drivers such as *'**the coverage**'*, *'**the volume of use**'*, and the **need** and/or demand. This highlights the end benefits of implementing mobile government systems as the main drivers for the adoption of mobile government. Thus, it is important that government gain a good grasp of the benefits of mobile government. Table 43 (p. 378) lists the benefits to be gained by implementing mobile government systems.

The need/demand for mobile government emerges from one or both constituents participating in the interaction channel with the government. For example, in the G2C case, participant QLDCC1-01 identified mainly youth citizens a source of demand to be responded to, when he noted *'younger generations coming through and using mobile phones a lot more than others'*. This suggests that the community's age structure provides key insights into the level of demand for services and facilities, as many services are age specific. The participant explained that *'we'll try and channel those through as well as the market changes that the people are wanting to pay their rates via mobile phones then, then we need to change accordingly to meet that'*.

Table 10: Community age structure in QLDCC1 (Australian Bureau of Statistics 2008)

Age structure age group (years)	2006			2001			
Enumerated data	number	%	South East Queensland %	number	%	South East Queensland %	Change 2001 to 2006
0 to 4	59,601	6.2	6.4	53,439	6.1	6.6	6,162
5 to 11	78,809	8.2	9.3	74,252	8.5	9.9	4,557
12 to 17	71,102	7.4	8.4	66,258	7.6	8.5	4,844
18 to 24	115,261	12.0	10.0	104,655	12.0	10.0	10,606
25 to 34	153,968	16.0	13.7	144,986	16.6	14.5	8,982
35 to 49	211,020	22.0	21.7	189,008	21.6	21.8	22,012
50 to 59	115,676	12.0	12.7	101,105	11.6	12.0	14,571
60 to 69	71,403	7.4	8.6	60,212	6.9	7.6	11,191
70 to 84	67,402	7.0	7.6	66,438	7.6	7.8	964
85 and over	16,328	1.7	1.6	13,427	1.5	1.3	2,901
Total	960,570	100.0	100.0	873,780	100.0	100.0	86,790

Based on the discussion and findings in the chapter on mobile government fundamentals, m-Government applications/solutions are developed by the government to serve different constituents: the Government (G), the Employee (E), the Citizen (C), and the Business (B). Thus, the following interaction channels are

generated: Government to Government (G2G), Government to Employee (G2E), Government to Citizen (G2C), and Government to Business (G2B). This case study reveals a difference in the originators of need/demand. For example, in the case of G2E, the need/demand is usually coming from the organisation itself, while in the case of G2C, the need/demand is coming from both the organisation and the citizen.

Participant QLDCC1-02 threw light on understanding the relationship between drivers and m-Government solutions when he concluded that *'drivers that we try and rectify with a technology solution...that increase the services to the business and reduce the costs for that particular business delivering that service'*.

To sum up, the participants emphasised the **relationship between the drivers and applications** in that the anticipated developed applications should meet the underlying drivers. The participants also acknowledged the importance of understanding the following m-Government drivers:

- Constituent's Need/Demand
- Low Cost of providing the services
- Network coverage
- Volume of mobile and wireless technologies usage within the community
- Fast service delivery
- Staff productivity

7.1.6.Solutions

The second perspective to be discussed is **solutions**. According to participant QLDCC1-02: *'mobile solutions are of great importance'*. The selection and

development of solutions is not an arbitrary task, but it is based on many factors such as *'business case(s)'* and *'costs'*.

The business case is based on needs and/or objectives and should *'specify what the high level objectives are"*, but *"not necessarily technology or solutions' objectives'*. The following are examples of the objectives of a mobile government project:

- *Faster and quicker service delivery*: 'Do we want to *increase the delivery* of the services we are providing quicker and faster?'
- *Increased productivity*: 'Do we want to get more *productivity* from staff, while making them being able to do their job wirelessly rather than having to come back into the office?'
- *Saving costs*: such as '*costs associated with...paper based solutions rather than wireless*'.

According to participant QLDCC1-02, the above business case objectives, *'are all drivers that we try and rectify with a technology solution'*. The participant points out that *'better productivity for staff ... is a big driver in that mobile space where you get the benefits'*.

The next step is determining the business case requirements to be reflected in the solution. According to Participant QLDCC1-02, requirements *'dictate a lot about what solution we went for in the end'*. For example, the participant mentioned *'continuous connection'* to enable immediate data exchange and synchronisation, and *'type of exchanged data'* as requirements to be met in the developed solution.

It is very important to question these requirements as they affect the solution in many ways. For example, the requirement of needing a high *'level of detail'* in the field triggers the issue of privacy, which requires a higher security level and thus requires implementing more security measures, which is an added cost. The need for a continuous connection also triggers issues such as computer failure wreaking havoc on a mobile network. For example, the Optus network in Australia failed three times in less than four months during 2008, leaving customers (e.g. airport, businesses, emergency services) offline for hours and causing chaos (Bingemann 2008). Such anticipated failures require set procedures to be followed in case they happen, for example, by re-routing the service to another provider's network, or investing in heavy clients where processing happen on the user's machine rather than on the backend systems.

The participant demonstrated the effects of requirements on the developed solution by discussing a business case that required continuous connection:

> ***another lesson*** *was the fact that* ***business specified*** *'always connected' as one of their* ***requirements*** *- they wanted to be able to work in the field, even if the network was down. They wanted the facility to continue to operate, so that when the network came up again, it would store and forward, but that* ***dictated*** *a thick client solution. You couldn't run it from a thin client, because you would lose the connection to the software, so this requirement* ***dictated the solution*** *we should go for, which meant that we had a heavier client than would be otherwise advisable.*

The participants highlighted the importance of this research, which is studying various governments' experiences in implementing mobile government systems.

The participants acknowledged the importance of learning from others due to the *'lack of information and experience in the mobile government field'*. Participant QLDCC1-01 stated that *'we look around to see what comparable organisations are doing with technology as part of our research'*. For example, the participant continued: *'we would love to see what they are doing at the Gold Coast City Council, and see if that's relevant to us'*. Finally, the participant showed high interest in knowing the results of this study.

After analysing the objectives and determining their requirements, the two interviewees stated that the process continues with *'looking at the architecture'* of the required solutions. Studying the application/solution architecture is of great importance *'in order to get realistic costs'*. The mobile solutions development could either be outsourced or take place in-house, with or without external partners. Thus, it is necessary to work out *'whether you want to go out to the market to put an RFP* [Request for Proposal] *together and go out and tender for solutions, or whether it was an in-house solution, or whether we needed external partners'*. Either way, a decision should be made for *'scheduling the work to go along'*.

If the decision is made favouring full or partial outsourcing to develop the solution, then the council needs to *'look for a solution provider'*. The selection of the provider is mainly based on their ability to provide solutions compatible with the wireless service provider's network. Participant QLDCC1-01 stated that solution providers should: *'provide specific mobile solutions that run over our network provided by our main provider* [wireless network provider]'. Participant QLDCC1-02 illustrated further that one of their business units *'use a solution provided by "ViriorNet", which is a mobile software/solutions Company and that*

would run over the Telstra NextG network, because Telstra is our provider for mobile services at this point'.

In terms of management of the solution development, the solution must be *'scheduled and managed as a project, through to delivery of the solution'*. The management of the project is *'typically a joint exercise between this division (the IT division) and the business unit'.*

To develop a mobile solution, there must first be a need for it. Thus, the business units interested in investing in technology to achieve predetermined goals need to prepare a proposal. The IT division often *'works with them* [business units] *in helping them put together a proposal'* or the *'business case'*.

Having a business case ready does not mean direct approval or an immediate start. Mobile government programs aim at saving money and costs, and technology offers the benefit of reusability that results in saving money, which justifies investing in one platform. In this case study, the participant QLDCC1-01 recommended following the *'aggregate approach'* or the *'one solution'* approach when investing in mobile and wireless technologies. He defined it as *'one solution providing multiple applications, multiple support to different business units'*. The participant QLDCC1-02 further explained that this means: *'more cohesion in the solutions that we would purchase, so we could support multiple business areas with one investment in technology, and then reuse a lot of the software that is developed for those different applications'*.



Figure 26 m-Government centralised platform

Participant QLDCC1-01 illustrated that: *'in the past we would have invested in multiple platforms for different applications for different business units'* but this **old method costs money that could be saved** by investing in *'one platform'*. Thus, *'now we look for an aggregated approach to this solution'*. Both participants acknowledged that is *'cheaper to support, if you have one platform'*. In other words, *'spend less and get more for the organisation as a whole'*.

After granting the approval on the business case, and if the solution is outsourced, then the IT division needs to test its feasibility and whether it fits within the organisation's environment. The testing process starts with *'proof of concept'*. According to the participant QLDCC1-02: *'the early stage is procuring a solution and we would possibly take two alternative solutions and run them through proof of concept to see how they perform in our environment'*. This is *'part of an evaluation process and selection'* which guides the decision making.

In terms of testing the developed application/solution, participant QLDCC1-01 explained that: *'when a solution has been implemented, there's a whole range of testing that would be applied from unit testing to systems testing, regression testing, end to end process testing, user acceptance testing, so that would be applied no matter what technology we are procuring in, the same for mobile'.*

Technology develops and is enhanced fairly quickly nowadays, so in terms of the best time to invest in technology, participant QLDCC1-01 explained that his council invested in mobile and wireless technology *'four and a half years ago, that they decided to go mobile and it was based on a business case'.* The participant discussed that at that time: *'The technology was obviously much more dated and not as sophisticated as you can get now, but we have implemented the technology that was selected four and a half years ago and that's still running'.* Applications and solutions get reviewed and maybe updated to further the benefits, and participant QLDCC1-01 acknowledged that: *'we'd be considering that and whether that would give them some further benefits to the business'.*

To sum up, the participants proposed a process to be followed to develop a mobile government application/solution. The process starts with a business unit in cooperation with the IT division proposing a business case that requires investment in mobile and wireless technology. The solution gets analysed in terms of architecture to determine the real costs. The participants highly recommended the *'aggregated approach'* which reduces costs. Figure 27 below depicts the process revolving around the one platform.

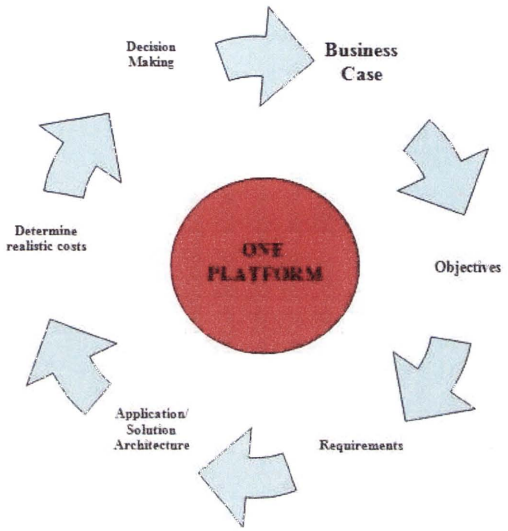

Figure 27: m-Government applications/solutions development cycle

7.1.7.Mobile Government Constituents

As discussed earlier in this case study, mobile government application/solutions are developed to serve Governments (G), Employees (E), Citizens (C), and Businesses (B) creating G2G, G2E, G2C, and G2B interaction channels, in which they all use the wireless channel but through a variety of mobile devices. This study is more focused on the success factors of G2E m-Government; it also discusses G2C services and their success factors, but will mainly report on the G2E part of mobile government.

7.1.7.1.Government to Citizen (G2C)

As discussed earlier, the council has utilised mobile and wireless technologies in various ways for public use, from the basic provision of wireless Internet at libraries (**Wi-Fi** spots), to designing and formatting a service-dedicated website

that is compatible with mobile phones. In addition, the council has also utilised the Short Message Service (**SMS**) and the Multimedia Message Service (**MMS**) technologies in various ways.

In spite of high mobile penetration and the wide spread of mobile devices that are able to access wireless Internet, the council limited their utilisation of such technologies to only a basic level. Participant QLDCC1-02 admitted that they *'haven't taken it to any great extent at this point in time'*, but due to the wide spread of mobile devices, he proposed that *'it's probably a future for us, to do more communication to the mobile phone'*.

The participants highlighted that in order to achieve convenience for citizens, it is advisable to consider mobile government (m-Government) as a **complementary channel** to the many other methods of conducting business between citizens and the department. Participant QLDCC1-01 explained: *'we'd look at it* [mobile services] *as a separate channel for doing business with council'*. The participant also warned against forcing people to use this new channel: he explained that: *'we wouldn't force people to use mobile phone or push mobile phone'*, and emphasised that a government council should be *'looking at supporting all the different channels, as opposed to forcing people down any one'*.

To develop G2C m-Government services, the council needs to conduct surveys to understand the need for such mobile services and mobile compatible websites. Participant QLDCC1-01 recommended taking *'a view of customer focus'*. This participant highlighted the need to determine which segment of people needed to use the channel, and suggested using *'market researchers and research around how customers would like to pay for services ... and if there is a growth and*

drive'. Based on the results, he explained that *'we'd open that up for people that wanted to use it'*. The implementation of the m-Government channel complements the current business channels and increases **citizens' convenience**.

To achieve the cost-saving objective, the respondents stressed the preference for **one platform** hosting many applications/solutions. Participant QLDCC1-02 explained that: *'We're working on looking at those types of technologies being able to be integrated into our current system as well'*.

In summary, based on the above discussion and the participants' recommendations, we can extract the following list as the G2C m-Government success factors:

- Consider the G2C m-Government application as a **complementary channel**, but not the only channel by which to conduct business with the government.
- Integrate the G2C applications/services within the **one platform** approach recommended earlier.
- **Survey the citizens** to understand their needs.
- Aim at achieving/increasing **convenience** to citizens.

7.1.7.2.Government to Employee (G2E)

The participants defined that the use of wireless and mobile technologies in the public sector (m-Government) within the one organisation *'is not government to government* [G2G]'. Participant QLDCC1-02 illustrated by example that: *'if Sydney Water say they will do mobile computing, they will have their **own system** for doing that; Brisbane Water will have its **own system** for doing it'*. The participant

continued with: *'we would do government to government type computing for things like, suppose, if it was purchasing, online purchasing of goods and services, there might be an online purchasing system that would connect to our suppliers'*.

The case study showed that the business unit along with the IT division should both consider all related success factors during the planning phase. One important success factor is to understand the challenges such as **staff opposition** and lack of ability to use the *'to be developed'* applications/solutions. Participant QLDCC1-01 advised that *'right from up front, getting the users or a representative group of the users involved in the planning stage'* and he affirmed that it *'is really, really important'*. The participant cited an occasion when they *'implemented a wireless solution for the tree maintenance crews'* and explained the difficulty of *'the guys who use chainsaws everyday to chop trees down and giving them a small PDA device to use when they have never used that type of technology before'* and concludes that it *'was a challenge for them and some of them were a little bit averse to trying it'*.

The participant illustrated a number of methods to overcome these challenges in order to succeed and gain the users' acceptance. However, he stated that *'once you took them through that and* ***changed management process*** *and* ***training****, they became quite familiar with it and they picked it up quite well.*"

Participant QLDCC1-02 conceded that *'there was a lot of resistance from field workers at first'* but acknowledged that the implemented solutions were fruitful and *'now, you probably couldn't take their laptops away from them, because they are that much weathered to the idea of using the technology'*. The participant

concludes that the secret lies within the developed solution itself; he explained that *'the technology has to be **simple**, you know, touch base **rather than anything complex**'*. The participant warned against underestimating the challenges: *'yes there was a big change, and that was probably underestimated, but it's worked through now'. He finally emphasised that 'the **training** was a major component of that'*.

To sum up, mobile government applications, specifically G2E applications/solutions, should take the following factors into account and never underestimate them:

- Staff technological **abilities**
- Staff **acceptance**
- End Users **involvement in planning**
- Technology **Literacy**
- **Training**
- **Change Management**
- **Simplicity** of application/solutions

7.1.8.Providers

'Providers' includes mobile service providers and solution providers, and many success factors play a role in this perspective. As discussed earlier, any perspective and its related success factors needs to accord with the main drivers behind the development of a mobile government project. Based on the discussion, cost saving so far forms a core component in the set of drivers. Thus,

the selection of providers is a process that should also be based on cost saving, along with the many others factors to be discussed here.

Participant QLDCC1-02 illustrated that his council provides a set of services that the selected provider should have the experience and the infrastructure to be able to deal with. The participant states that '*Obviously, when we go out to market we look for the* ***range of services that we are expecting to use'***. One or more providers could be found in the market and thus *'we* ***negotiate*** *through our procurement process,* ***the best deal*** *we can based on our size and diversity'*. Negotiation is not solely done by the IT division, the participant emphasised that it is *'**a joint effort** between this division* [IT division], *and the strategic procurement division'*, where the IT division provides the *'ICT expertise'* and the procurement division provides *'the procurement process expertise'*.

The participant also concentrated on utilising the ICT contracts entered by the state or federal government when he said *'We do get help in that we'll use GITC* [Government Information Technology and Communications] *contracts to a large extent, which are defined by the government for IT procurement, and we'll use their standard GITC contracts where possible'*.

According to the (Department of Finance and Deregulation 2008), GITC is 'a legal framework that has been developed as a cooperative effort between Australian industry representatives and the Australian Government'. GITC can be used for both simple and complex procurement of IT products and services, and was developed to achieve the following outcomes (Department of Finance and Deregulation 2008):

- *Simplifying the contracting process for the purchase of IT related products and services*
- *Introducing Terms and Conditions that are written in plain English*
- *Encouraging a more equitable distribution of risk between a customer and a contractor*
- *Fostering consistency and predictability in contractual terms*
- *Providing a web site that allows for dynamic creation of contracts for particular types of IT products and services.*

The participant again demonstrated the benefits of **joint efforts** such as that of *'panels that are set up for government or local government that we might use to go to for solution providers'*, and the participant concludes that *'there is a certain amount of **joint efforts**'*.

In terms of solution providers, participant QLDCC1-01 illustrated that their selection is partly based on a 'proof of concept' evaluation where the council *'would possibly take two alternative solutions and run them through proof of concept to see how they perform in our environment'*, and the participant suggests that to *'be a part of an evaluation process and selection'*.

To sum up, mobile government applications, specifically G2E applications/solutions and services, require a number of factors to be considered when selecting providers:

- Selection is a **joint** IT and procurement divisions **effort**
- **Research** the market
- **Providers' experience and infrastructure**
- **Negotiate** the best deal
- **Joint efforts** such as use of **GITC contracts**

7.1.9.Conclusion

The analysis of the QLDCC1 case study has revealed a number of mobile government success factors. Table 11 lists the different success perspectives and categories, and their success factors. In the next section the author will discuss the second Australian case study from the State of Queensland.

Table 11: Mobile government success factors – QLDCC1 Case Study

Success Category	Success Factors From OLDCC1 Case Study
Drivers	• Saving Costs • Staff productivity • Coverage • Volume of use • Constituent's demand • Fast service delivery
Solutions	• Business case • Clear objectives • Determine business requirements • Architecture • Managed as a project (IT project management skills) • One platform solution • Software reuse • Testing and evaluation
Constituents (Citizens)	• Acknowledge receipt of problems • Fast Response • Increase trust • Citizen's convenience
Constituents (Employee)	• Understanding staff abilities • Staff acceptance • Involvement in planning • Staff technological literacy • Training provision • Change management • Applications' ease of use
Providers	• Understanding of the provided services • Researching the market • Negotiate the best deal • Utilising government contracts • Provider's experience and infrastructure

7.2.Second Queensland Council Case Study (QLDCC2)

7.2.1.Introduction

For ethical reasons the information is de-identified. Thus, the researcher will refer to this government council as **Queensland City Council2 (QLDCC2)**

Government level: Regional Council - Local Government Department
State: Queensland
Country: Australia
Population: '300,000'
Number of employees: '1200-1300'
Number of mobile devices: 'bit over a hundred laptops' and '40 Blackberry handsets'
Interviewee: Team Leader of Technical Services

This case study reports on the department's current use of wired and wireless Internet and mobile technologies. It also discusses its mutual perspectives with case study (QLDCC1) and their success factors. The case study also adds a number of perspectives to those emerging from QLDCC1.

7.2.2.The council's current use of WIRED Internet

The council has approximately *'1300 employees'* and *'about 1200 desk tops; 99 percent of those are directly connected to our network, and there are some extra desktops and laptops and they are hard fixed, hard wired'*, according to the Team Leader of Technical Services at QLDCC2.

The council owns a website providing access to the latest news, council meeting information, updates on planning and development applications and more. According to the participant: *'the council has got a website and, you know, the public can find out a lot of information about the libraries, or about services provided, all the information is there on the council website'.*

7.2.3.The council's current use of MOBILE and WIRELESS Internet

The council is utilising *'40 Blackberry handsets*[4]' as they *'needed to provide some secure service for managers so they could get access to emails and their calendar, while they were out in the field'.* The council is also utilising the NextG wireless network so that the mobile workforce can communicate with the council's systems while out in the field. Furthermore, the participant explained that *'it's actually not just our mobile users that use NextG, we have about 5, 6 locations, that we use NextG at, one of them is the cemetery up the road, they use that, because they are out of the range for ADSL - they can't get the high speed ADSL, so we can provide high speed connectivity back into the network through the wireless NextG'.*

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4 At the time of the interview

Just like the first Queensland council (QLDCC1) discussed earlier, (QLDCC2) has also implemented Wi-Fi hotspots in their libraries. The participant noted that in their *'main libraries we provide free Internet access'*. QLDCC2 is a regional council that serves an area of 3,127 km^2, which is a larger area than that covered by QLDCC1. Recognising its diverse community, the council arrived at its 'Mobile Libraries' initiative.

The participant from QLDCC2 explained the mobile library: 'basically it's a bus, a *mobile library bus that drives around various sites'*. At first, the mobile library used to *'go to fixed stops, where there was a phone line which they plug into'*. Then, the council realised the benefit of the available wireless technologies, so *'now that we've extended that it's fully mobile, it uses the Telstra NextG service'*. The utilisation of the wireless technologies resulted in **saving costs,** such as the line rentals the council used to pay for many fixed lines, and an increased connection speed. The participant explained that *'it's **cheaper** doing that than it is previously having a fixed line at those 25 sites, which we were paying rentals for, and you know you go from providing a 64k service through to a 7.2 megabit service, so a huge **increase in actual performance**'*.

The participant demonstrated that the mobile library is more *'like a truck'* that *'has been set-up inside that, they've got books and everything inside, so they will pull up to designated stops, there's about 20 to 25 stops'*. The library *'visit areas like, outside retirement villages, schools, sort of locations where there ... isn't easy access to the fixed library'*.

The mobile library houses items covering a wide range of formats, including books, magazines, DVDs, music CDs, toys, large print and audio books –

something for all ages. The participant explained that the mobile library *'provides Internet access for the public when the library turns up and also it provides some online services for the library staff that work in that library, so they can online book, record, books that get loaned out and come back in, and it also provides several PC's* [Personal Computers] *in the bus, for the public to come and do online catalogue queries, and surf the Internet'*.

In terms of the benefits achieved, the participant explained that *'now in words of ability, it can now go to* ***anywhere*** *within our region and it's got full network coverage through Telstra, and we can* ***provide the service to the public*** *for Internet, online catalogue searching and also to our staff, that actually man that library'*. Figure 28 depicts the mobile library.

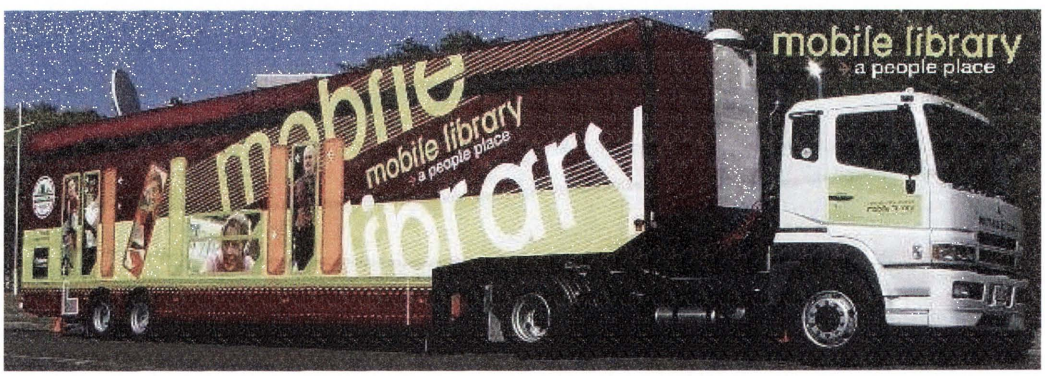

Figure 28: QLDCC2 mobile library (QLDCC2 2008)

7.2.4.Drivers

The participant explained that the main driver behind implementing the mobile government system was the fact that *'the technologies are out there'*, but this does not mean that all business units within a government council should utilise

the technology. Investing in technology should bring benefits and/or profits to the business unit to justify the need to invest. Thus, he explained that it is important to understand that *'we don't necessarily implement technology just for the sake of implementing technology.*.

7.2.5.Business Case

The business case perspective has been highlighted as an important factor by the participant from QLDCC2. While the business case has been considered as the solution's success factor in case study QLDCC1, the analysis of case study QLDCC2 highlighted it as a success theme rather than a success factor. Thus, business case category holds its own success factors.

Investing in technology should bring benefits and/or profits to the business unit and possibly to the organisation as a whole. The case study shows that it is the business unit that knows whether a new technology would offer them benefits based on their requirements. It is not necessary that the business unit is aware of or understands the new technologies, as it is the IT division's responsibility to *'liaise a lot with the business to find out what their requirements are and make them aware of these technology changes'*. The participant illustrated that *'we* [IT division] *work with the business to work out* ***what their requirements are, what benefits they'll get if we implement the technology'***. This highlights the importance of the **liaison between the IT division and all business units**.

The participant cautioned that *'there are costs and overheads, as we implement the technology, you are going to need more staff to maintain your system, there's cost to implement it, so it's done as a* ***case by case basis'***. This reinforces the

finding in the case study on QLDCC1 that developing a mobile government application requires a business case developed by both IT division and the business unit. So far, we can conclude that the business case should include the following:

- The business unit requirements
- How the requirements are met through technology
- The potential benefits to be achieved
- The costs involved in investing in the technology
- Justification of the needs to invest in technology

The business case assists in the decision making process to either invest in the technology or not. The participant argued that it is not up to the IT division or the business unit to make such a decision, but the process *'gets driven by the business'*, so for example, *'if the business requires to have mobile access out there, such as the requirement for the email system on Blackberries, that came from the business, so,* ***we*** [IT division] ***don't go to the business and say look, we are going to implement this*** *and you've got that, it's more or less, we work with the business, saying you know, if you need that level of access out in the field, yes we can do it, but this is the cost for it, and you can* ***justify your business costs'***. Determining the costs of implementing mobile government systems is a joint effort where the IT division provides its experience too. For example, the participant acknowledged that *'security costs were a big one'* and this is determined by the IT division.

The participant focused on justifying the business case to support the decision making. He generically summarised the process in that *'these business areas, we*

make them aware of what's available and the costs that are involved in providing different services, and if they can justify in their business model, saying, yes, well, spending a hundred thousand dollars to do this, is justifiable from a business sense, and then that gets done'.

To know the business group's needs and requirements and to make them aware of the available technologies, the participant also recommended *'surveying the business as well'*. Surveys help in figuring out interests through asking questions such as *'are you interested in video conferencing, mobile technology solutions? and so from those survey responses then that can ... lead onto further conversation with them'* and eventually liaise with the business group in developing the business case. To enhance cooperation, the participant emphasised the importance of having a *'good relationship with the business'* through maintaining open communication channels between the IT division and all business groups, so if *'they require new technology solutions, they might come to us... and we work with them to work out a solution'.*

To sum up, the case study shows that implementing mobile government systems through investing in mobile and wireless technologies is based on business case proposals which require:

- IT liaison with the business units to understand their requirements
- IT liaison with the business units to make them aware of the available technologies that meet their requirements
- A valid and justified business case that supports the decision to invest in the technology

7.2.6.Solutions

As mentioned earlier the council utilises *'40 Blackberry handsets'*. This was implemented *'about 3 to 4 years ago'*. To do so, the council *'looked at a few different technologies, and found Blackberry was ... the most advanced at that time, and they can provide a good comprehensive solution, that was secure and you could also* ***manage the devices*** *that you had from the central system'*. This highlights the importance of researching the market for an available, easy to manage, up-to-date solution that meets the requirements.

Although the council used Blackberries in their work, these devices still do not have the facility to access the department's CITRIX[5] systems. The participant explained that *'we looked at that facility and the* ***business need*** *for it and the business need wasn't really there'*. This highlights the importance of listing, clarifying and justifying all the business needs to guide the solution's selection and development process. This also reinforces the finding in the case study

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5 According to (The University of Sydney 2007), CITRIX is 'Citrix MetaFrame Presentation Server is a technology that can allow remote users to connect to applications that are actually installed on a remote computer. It uses a mix of technology that results in that remote application looking and behaving just as though it was installed on the local machine'.

QLDCC1 which highlighted the importance of the business case - detailing all business needs - and marked it as the initial phase in developing mobile government solutions.

The council has been utilising different mobile devices distributed to many different users, such as the *'standard normal size laptops used by the water operations'*, *'Blackberries used by the councillors and managers'*, and *'touch screen tablets for those who need more organiser devices'*. The participant justifies utilising the different devices due to the fact that *'the different business areas are defining requirements that they need'*. This highlights that the **requirements play a role in mobile device selection**.

These requirements stem from the objectives the business unit needs to achieve. For example, a business unit might need *'access to either online data when they're actually in the field doing GPS measurements or whatever ... so they can sign off jobs, out in the field'* and *'for others it might be to just record static information as they are moving around, now those guys ... don't have live connections to the network* ***because they don't need it'***.

Although some business units do not have a business need that requires live connection in the field, they still use the mobile technologies (i.e. mobile devices) to collect static data such as *'GPS locations'* of any asset *'that needs fixing'*, and *'when they* [the users] *come back to the office they just download the information, it goes straight into the system'*. The participant illustrated that utilising the wireless technologies through adding the live connection depends on *'what the requirements were and how they actually work'*.

The participant explained that the business unit in his council were without live connectivity: *'for those type of users it wasn't justifiable that it would be a* ***business benefit*** *in actually spending an extra $100 a month, for example, if providing live access back into the network for what they're doing'*. Thus, the requirements must justify the need for this facility *'because there is an overhead* ***cost to provide that live connectivity'***, *'it will cost you at least a hundred bucks a month, per device'*.

Although the business case justifies the requirement of utilising a form of technology, the council has to consider *'weighing up the costs to provide that service to the benefits'* gained. The participant illustrated that the *'live connectivity'* facility used by the *'plumbing inspectors'* and *'operations'* staff costs the council about a hundred dollars, but resulted in many *'tangible benefits'* such as saving *'a lot more down the track'*. The participant demonstrated this through the following example:

> *A good example is the plumbers, they were doing static, going out collecting data, but they'd spend several hours, and they'd come back to the office, updating all the systems typing it all in, so they benefited in a big deal by ... simply having a laptop, NextG connected out in the car and record the information as they do their job, and* ***saves them travelling****, gets synchronised straight away, it's* ***instantaneous****, so it's* ***live on the system****, it* ***saves them having to spend several hours in the morning or afternoon coming back in the office, to get Internet information and that.***

Another factor that plays a role in achieving a successful solution is the **access devices**. In this case, the selection of Blackberries was partly based on their ability

to house new applications for any future emerging business need. The participant illustrated that *'the primary use, initially for the Blackberries was to provide email and calendar access for councillors and managers'*, but *'the Blackberry platform we chose because you* ***can actually have applications written****, so you can get interface with the systems* [corporate systems]*'*, so *'if the business need was there, to actually provide some functionality* [i.e. to access the corporate systems] *that way, then we could deliver it that way'*.

In order to access to the department's systems, the mobile devices in the field are *'combined with CITRIX'*, and this provides *'a window so they've* [the mobile workforce] *got full access to email every corporate application out in the field'*.

The implementation of the mobile government systems in the council resulted in utilising *'a bit over a hundred laptops, which are now configured for that service and they've taken that up in about the last year, so there's been a real explosive growth and that goes through from directors, managers out into the field operation staff'*.

The participant also highlighted the **speed** of data transfer over the network as an important success factor for the mobile government system. He acknowledged *'certainly that the speed that we can get through that system just makes the whole thing much more usable'*. Thus, contrary to the case study QLDCC1 in which the council utilised the available technologies four and a half years ago at slow speed, QLDCC2 preferred to wait for the technology to become available. The difference in these case studies is that QLDCC1 did not see a new technology coming soon, they had the business need and thus they acted immediately, but QLDCC2 council knew that the technology was coming and *'waited for that*

technology to get switched on'. This shows that now, implementing a mobile government system could start at any time and does not have to wait for the 'perfect technology' to arrive, especially since the current technology has what is needed to build a successful system.

Even if the technology providing the best speed is not available, the participant's advice was still to consider what is available if the need is there. He illustrated that *'we were playing with ... the CDMA, and the GPRS systems, we tried that with the business a couple of times several years ago on different types of devices, and the idea is good, but the speed it was just too slow for us'*. Despite the slow speed, QLDCC1 utilised the CDMA technology more than four years ago and succeeded in developing a solution, *'and that's still running'*.

In advocating the importance of speed, the participant illustrated that *'because we're offering a fairly generic solution on a standard platform, then we can keep our overheads down, the costs'*. This highlights the importance of speed in supporting the mobile government one-platform. The participant also acknowledged that *'having a good speed makes life easier for the users as well, they can actually* ***work quicker*** *out there, and it becomes a* ***time saver*** *for them'*. Thus, since saving time and cost are main drivers to implement mobile government systems, speed is a major success factor in meeting those drivers and benefits.

Finally, the participant illustrated the features of the mobile government system the council is aims to achieve. He explained that: *'we're trying to implement a system that* ***doesn't add a large overhead in the back office systems****, and a system that* ***doesn't need specialised tailoring for every application*** *to make it*

sort of, device dependent, in that we're trying to ... implement a system that can ***operate generically on a range of devices****, and that we can* ***support cost effectively****'.*

The participant illustrated further that *'providing applications through a CITRIX window give different format devices, that might be large laptops, or smaller slimline laptop or tablet devices ... they can get access back into our CITRIX desktop, where they can see your normal applications, so we don't have to tailor applications for different screen sizes or dimensions, or different devices, like PDAs and so forth'.*

The system's features the council aimed at achieving suggested a 'one size fits all solution'. The participant discussed *'how we* [the department] *got to where we are, with our platform in providing different mobile technologies'* is a long process that started *'many years ago, when we worked with the businesses, working out what they need, their needs weren't that great'.* Different business units or groups have different needs and thus require different technologies to meet their needs. The participant elaborated that *'we went through the different technologies'*, but instead of investing in all of them the council *'tried to go for a bit more of a generic platform'.* Eventually, the council decided to invest in a 'Citrix NFuse' solution, and the participant illustrated that with *'CITRIX Nfuse solution, along with the NextG coverage and providing secure access to the network, we can cover ... a range of different requirements in different business areas with the one platform'.*

The participant acknowledged that *'with having a single platform, it's a lot* ***easier to support*** *than having different, a multitude of platforms'.* This reinforces the

finding in the case study on QLDCC1 that recommended the one-platform solution and highlighted it as a major success factor in mobile government systems.

To sum up, to provide the right information to the right people, whenever and wherever they need it, the following m-Government solution success factors should be considered:

- Weighing up the cost of technology utilisation against the benefits to be gained in the long run
- Coding and authentication procedures to ensure security
- Separate paths for data and Internet traffic
- Research available up-to-date solutions in the market
- Solution meets the primary requirement(s) and has the ability to upgrade and house new applications for new emerging business needs
- Awareness of the overhead cost of live connectivity and justifying the need for it
- One-platform: A generic system that is device independent
- One-platform: A central system to ensure cost effective support
- Available speed

7.2.7.Mobile Government Constituents

As discussed in the QLDCC1 case study and in the mobile government fundamentals chapter, mobile government has four main constituents (G, E, C, and B). In this case study, the council provides a number of G2C m-Government services or applications.

7.2.7.1.Government to Citizen (G2C)

In terms of developing mobile device compatible web pages to allow access through mobile devices, the participant stated that *'they haven't designed one yet'*, but he recommends that such web pages should be *'custom built to fit that format for the phone, so it's ... more easily readable'*. The participant explained that in order to develop such projects it is important to *'have the figures'* as they demonstrate that *'there's another service that could be done'*. For example, such figures could show *'how pervasive ... 3G web surfing technology is with the public'* which supports decision making. The participant illustrated that G2C m-Governement services *'hasn't been done'* yet, because *'we're not aware of our percentage of people that would surf or surf the web over a phone, compared to using it from a PC or a laptop at home'*.

The participant highlighted the availability of broadband as a factor that affects the usage of mobile services. The participant illustrated that in his area there are *'areas where they can't get broadband unfortunately, and I guess that's where the wireless NextG type services, they come into play'*.

The participant also highlighted that for a mobile project to succeed, it should mimic the real process as much as possible. For example, the mobile library solution: *'it's a free service to the public'* and the council has *'extended it now so they can provide Internet access'* because in the *'main libraries we provide free Internet access, to the public and this mobile library is now doing the same service'*.

Although a high mobile and wireless technology penetration amongst citizens results in more success for G2C m-Government services, the participant noted that it *'is not the local council role'* to market the mobile and wireless technologies to them, because the *'the council doesn't control the wireless market'*.

Currently the *'council has got a website and ... that works on* [the] *normal browser,* [but] *doesn't work on a phone'*. The participant explained that upgrading the website to be compatible with mobile devices *'is something that council probably does need to look at, probably needs to consider, as that penetration of the market expands'* which will be when *'more and more people have Internet enabled phones and they can afford to pay for the Internet access through the phone'*.

According to the participant, such G2C m-Government services *'could probably be provided quite easily'*, but deciding to develop them *'comes down to the penetration of the market'*. This highlights the importance of **knowing the penetration figures** and discovering citizens' needs according to these figures. The participant, while discussing the solutions, has referred to the importance of knowing the businesses' needs to make them aware of the available technologies that meet their needs *('we ask the business - do you have a demand for this?')*. Here we can conclude that in the G2C services case, the situation is slightly different, with surveying still the best tool for understanding citizens' penetration of the available technologies. This will reveal information about the adopted technologies in the community and thus the possible demands. The penetration figure could form a demand that would be *'taken seriously'*.

The participant explained that surveying citizens is not the IT division's responsibility as *'the IT group work with the business, they don't work with the community'*. He illustrated that *'it's the business works with the community'*, so it is their responsibility to *'be out there asking'* - for example, *'our libraries will be out there asking, you know, do you need this service? Do you want - do you need a mobile library here? Do you want to get an online catalogue on your mobile phone?'*.

The participant noted that this is not done in his department. This proposes having structured and periodical surveys as technology advances quickly and prices drop. The surveys will identify the penetration of technologies in the community and thus will assist in calculating possible G2C m-Government services to develop in order to increase convenience. So far, based on the discussion of the G2E m-Government services and the discussion above, it is concluded that **a loop of cooperation between the IT division and the businesses to survey the citizens** is required. In the loop, the IT division communicates with the businesses to understand their needs based on their work requirements and objectives. The businesses in their turn need to consult the community to appreciate their needs. Knowing the community needs through surveying them adds to the businesses' needs and objectives. In summary, the community needs add to the business needs, and eventually the IT division communicates with the business to learn their needs and make them aware of the available technologies that meet them and the relevant costs. The IT division and the business jointly propose a justified business case to develop the required service.

To sum up, the participant has recommended the following success factors for G2C m-Government services:

- Broadband availability
- Attain representative figures of mobile usage
- Broadband coverage over the network
- Easiness and readability of services on mobile devices
- Mimic the real process which people know and understand

7.2.7.2.Government to Employee (G2E)

The council has approximately *'1300 employees'* and *'has hundreds of different types of services it offers, from libraries to cemeteries, to water operations, inspectors, building inspectors, so there's a whole raft of different business groups out there, ... and ... different business needs'*. The participant focused on the G2E m-Government services, saying that the *'operations guys that are in vans, they have laptops to get back into the council's systems. ˜Now all those particular users are met with a laptop with a NextG card, which is configured with a corporate service, so it comes corporately back into our network'*.

The participant illustrated that the implementation of mobile government systems, especially the G2E m-Government services, has not affected jobs in terms of loss or growth. It has only resulted in benefits, such as increased productivity of the workforce. Benefits of the mobile government system have been discussed in previous sections.

In order to successfully implement the system, it is important to understand the users' skills, especially the fact that some users (e.g. plumbers) *'never used the computer before'* and after implementing the mobile government system, they will suddenly be dealing with a mobile device that might well be connected to the

corporate systems. Managing the transition from the old style of writing on paper to the most up-to-date technologies creates a challenge to the success of the system. The participant acknowledged the challenge and recommended that one should *'go through a training issue with the staff, they have to be* ***trained to get the benefit*** *from it'*.

Training starts as basic as *'teach them how to use a computer'*, then teach them *'how to use the applications as well'*' The participant noted that *'there is a great deal of learning in there'*, and concludes that it is essential to make changes to how things work.

The participant also highlighted *'getting that* ***acceptance*** *and* ***trust'*** as critical to achieving a successful mobile government system. He suggested that *'some of them* [mobile workforce] *are even thinking, oh well now they can track us with this gear and know what we're doing'*. To gain that trust is *'mainly just working through that issue with the people'*, to make them aware of the reason behind implementing the system, and its benefits. The participant recommended addressing their concerns and answering *'no we're not doing it so we can keep track of you; it's been done so you can be more effective'*, and make them aware that *'it's not because we want to watch exactly what you're doing from a time management thing, it's more from a resource management of where to deploy the resources'*. Thus, gaining acceptance and trust is *'something they have got to manage really carefully'*.

Talking to the staff to gain their acceptance and trust is *'the management's responsibility for the staff'*. This reinforces the role of change management raised

by the QLDCC1 case study. The change management then *'might involve us* [IT division]".

To sum up, achieving a G2E service depends on the following success factors:

- G2E m-Government solutions must be configured with a corporate service
- Staff trust
- Staff acceptance
- Training
- Change management

7.2.8.Providers

An important issue that the participant raised was the selection of providers. The chosen network plays a role in ensuring the security of the systems. The council has chosen Telstra's NextG network for their mobile services, such as the mobile library. Telstra was chosen for many reasons, but one reason was the *'GWIP* [Government Wideband Internet Protocol]" which is *'part of the Telstra Next Generation IP platform'.*

The participant explained that equipping the *'operations guys'* with *'laptops with NextG cards'* started *'last year* [2007] *as Telstra rolled out their NextG service'.* The participant explained that *'prior to that we did tests with their* [Telstra's] *old CDMA network and GPS - GSV network, but the speeds weren't really there'.* Here, the participant highlighted the speed factor as important *'to effectively deliver a corporate application out in the field, now from NextG, we can get good speeds'.* This highlights the importance of the available **speeds offered by the provider's network**.

The participant also argued for the compatibility of the council systems with the provider's offered technologies; for example, QLDCC2 council *'could go with 3G, it's just that technical difference, but, basically we go with Telstra, because Telstra provide us with their network infrastructure'*. Thus, the **provider's infrastructure and their implemented technologies** play a role in their selection for m-Government projects.

The participant demonstrated that the **provider's infrastructure** is a core selection criterion as it plays a role in the security of the systems. The participant justified his department's decision to go on with NextG from Telstra rather than 3G from other providers as *'going on with Next G* ... [from] *Telstra, we can have that* ***secure*** *VPN that* ***goes directly into our network, and it removes access through the Internet.*** *If we went with 3G, say provided by Optus or another provider, then we couldn't get that level of security that we have, because that service* ***would triple us Internet to get into our system'***.

In the solution section, the participant discussed the importance of data transfer **speed**, and this was selected as a success factor. This factor does not only affect the solution development and the decision to go ahead with the development or not, it also affects the selection of the provider. The participant illustrated that *'we started rolling out NextG services early ... very much when they* [the provider] *switched on NextG network'*, he explained that *'we had this business requirement to start providing ... remote services out there'* and *'in our* ***partnership*** *with Telstra we knew how we would do it'*. This highlights the importance of the **partnership** with the right provider. Partnership would depend on the provider's infrastructure and its ability to support the mobile government system.

'Since about 2001, Telstra have managed our network, as such, so we run our data network on Telstra infrastructure'. It has been highlighted that a successful mobile government system would highly depend on a partnership with the right provider. Thus, the participant advised considering ***'long term partnerships with the provider'***. However, to enter a long term partnership with the provider, it is essential to understand their abilities and future plans *'because even though we provide something now, we need to know that, you know, in 2 or 3 years time technology advances, so we need to be with a* ***provider that we know actually has a roadmap going out****, you know, 3 to 5 years ahead, and ...* ***can start providing faster services*** *as years go by, and that they are going to be there"*

The participant highlighted the provider's network coverage as an important success factor for the system as a whole, and a factor to consider when selecting the right provider. He said that *'for the data service with the NextG, we get it through Telstra for that ... they've got a really good coverage up here'*. Despite the wider coverage of NextG network, the participant also noted the problem that *'there are some ... black areas, for the Telstra NextG service/*. For these black areas, *'putting a High Gain aerial on the bus'* is a viable solution. The participant demonstrated that to achieve a successful solution, it is important to be proactive through anticipating problems and finding suitable solutions. For example, *'we did beforehand go out with a car, we had a laptop plugged in ... one of our NextG cards, ... find out where the black spots were, now, there were a couple of spots we found that wouldn't work just with normal little standard aerial, so we tried that with a High Gain aerial - about a metre high, it's attached to the back of the bus - and found we picked up reception without a problem'*.

Finally, the participant threw a light on *'the state government contract'* and noted the government's role in supporting mobile government systems, for example, where *'state government can negotiate far better call rates than what a council on its own could do'*. To illustrate this, one major result for QLDCC2 is that *'any Telstra mobile phone we have, a call to any other council mobile phone, it's free, there is no charge to it'*. Thus, state government negotiation with providers resulted in big savings, because *'if you looked at our bill you'd probably find that most of the calls in the mobile phones would be, or a large percentage would be, council to council'*.

In summary, based on the discussion, it is essential to enter a long term partnership with a reliable provider to achieve a successful mobile government system. It is necessary to understand the following providers' success factors to help in selecting the right provider:

- Ability to secure an access path to council systems
- Data transfer Speed
- Provider's infrastructure and its compatibility with council systems
- Provider's network speed
- Provider's future plans

7.2.9.Security

The security of mobile government is an important issue that was highlighted by the participant. To ensure security, the council has implemented many procedures, such as choosing the right provider with the right infrastructure to

provide secure access to the council's systems. The council also implemented other procedures.

The participant highlighted that catering for mobility might require updating current systems to ensure security. This update, as illustrated by the participant, should be planned carefully. The council has *'spent the last, about two years in going through planning for a network upgrade that can cater for mobility ... in a secure way'*.

In addition to the careful planning required to update the department's current network, the participant discussed the importance of identifying and understanding the risks, threats, and vulnerabilities that mobile government systems are subject to, such as *'viruses'*, *'spyware'*, 'Trojan Horses' and 'worms' that could find their way to the system when users access the Internet using council's mobile devices (i.e. PDAs and laptops). As operational countermeasures, the council does not *'allow connection on Internet to those unless it goes through our firewalls, and our Internet servers, so I can't take my laptop home, plug it into my Internet service provider at home, it doesn't work, we block it off, it's a security halt, because once that goes in, then you know, viruses and spyware and all that stuff can get on the machine'*. Mobile government is using the latest technologies, and this also exposes new vulnerabilities.

The participant highlighted that the major security issues arise when *'going back into the council network'*. For this, the mobile library solution incorporates *'two servers'*. To ensure security, *'staff PC's and the router, that's got a corporate card off, so that basically goes into the Telstra cloud and securely goes into a VPN* [Virtual Private Network], *that pumps it directly back into our corporate network*

and it's coded so you can only do it with that particular SIM [Subscriber Identity Module] *you need a SIM code as well to put through and there is authentication all the way through* [this means the user must already be logged in to 'Windows' to actually get connected to the network], *so it's fairly secure'*. The coding and authentication procedures ensure security of the data in case of device loss or theft.

In this case, the solution ensures security by providing separate paths for corporate data and Internet traffic. The public get direct access to the Internet, but staff can seamlessly interact and quickly transmit vital data through a dedicated path so that *'it doesn't go on the public Internet at all, it simply goes and hits the VPN gateway in the Telstra network and pumps directly back into our network, now, for it to come in on this side we've got a government 1IP, 10 meg, 20 meg service which we're upgrading to, and that takes in all those NextG cards and also some of our smaller remote sites that use government 1IP (GWIP)* [Government Wideband Internet Protocol]".

One of the main threats is the loss or theft of the access device. The participant assured that the occurrence of such an incident does not form a big risk, as the device in this case would become obsolete. The council, in conjunction with the provider, has set a number of procedures that ensure security. The participant demonstrated using the following example:

> *If the device gets stolen that might have a NextG card connected to it, simply turning it on wouldn't get them connection into the network. Every time the user turns on the laptop, they've got to* ***logon as a local user on the laptop*** *to start with, after they get through that security level, there is*

> ***then a 4 digit PIN code*** *which they must enter every time that the NextG device connects up to the network, ,,, they then have to* ***logon to the CITRIX desktop****, and that's the normal desktop or network logon, which they then have to enter,* ***so there's like three levels they go through.*** *Also, the actual service is keyed to that SIM card, so if they didn't have that SIM card they couldn't connect into the network.*

Based on the discussion of the security issues, and mobile government users and their level of computer literacy, it is concluded that most mobile users using the mobile government systems in the field might lack the required literacy to choose the best password to guarantee ultimate security to the system. Thus, we can conclude the following:

- Passwords should be randomly generated by the system and then given to the user who should understand its importance through training.
- The system should follow 'best practice' in password selection.
- The training should make users aware of all the risks (major and minor) that could result from revealing the password. The participant also highlighted that *'all the users that have those* [access passwords] *must understand that they are not to write down their passwords and not to write down their PIN codes or anything like that'.*

The participant also highlighted another security measure: *'No information is kept on a laptop; it shouldn't be kept on a laptop'.* The participant advised that CITRIX restricts data transfer, confirmed that *'when they work in the CITRIX environment, you can't actually transfer something in the CITRIX desktop to your local disks, local USB gears or whatever, and I'm saying you can't sort of stick in a*

memory stick and then transfer what's on that memory stick into a CITRIX desktop'. This measure ensures security and privacy of data.

The security measures taken depend on the access devices used in the field and the level of information they transfer or keep. For example, three security measures were implemented to ensure the security of laptops, but fewer measures were taken for PDAs. The reason for this is the difference in the data the devices retain or access. If the PDA is lost or stolen, then *'they probably have access to whatever has been recorded on the device'*, but this is not a great risk because *'there's* ***no corporate applications on it*** [the PDA], *most likely what they will get would be basic GPS entries ... they use the PDAs mainly to record GPS coordinates to feed back into the systems, such as doing inspections for potholes, or road signs'*. The fact that *'there are no documents that are stored on PDAs'* reduces the security measures that need to be taken.

To sum up, to achieve a successful mobile government system, it is crucial to consider the following success factors:

- Update the current networking solutions for securely catering for mobility
- Awareness of all the risks, threats, and vulnerabilities to mobile government systems
- Use as many security levels as possible to ensure the ultimate security of the access devices and the systems
- Follow password selection best practice to generate passwords
- No sensitive information to be kept on an access device

7.2.10.Government Role

The participant illustrated that the government so far has not pushed local councils to implement mobile government systems, but he highlighted that the government has a crucial role to play in helping them succeed in implementing the system. There are many *'ways they could help'*; one way is *'to bring the cost down and to bring the saturation even further'*. The participant argued that *'as the market gets saturated more and more uptake comes, and then you get more competitors, such as Optus rolling out their wireless networks, as that gets rolled out, that raises competition'*. This competition has already resulted in a drop in prices; for example, *'we pay a certain amount with Telstra now, for provision of the service, a couple of years ago it was more expensive, but now it's getting cheaper'*.

The government could also negotiate with service providers to get the best deals for its departments. The participant acknowledged the importance of such negotiation; one result was that *'we use the state government contract for mobile phone contracts'*. The government could also negotiate with providers in building the required infrastructure for such services, such as when it *'helped with ... the GWIP* (Government Wide Internet Protocol) *technology that I was talking about, they helped Telstra have a valid or have a business need to roll that technology out'*.

For the providers - usually a private sector, profit-making enterprise - building the infrastructure requires a guaranteed demand, and a commitment from the government to keep using it. The participant illustrated that Telstra provided the GWIP infrastructure *'because they demand that technology in schools and other*

locations, health, Queensland health and all those sites, ... [and] *that gives Telstra or whatever communications provider ... the income to go out, roll out that technology which costs money to put the infrastructure in place, because they know they've got people that are going to take it on, they're actually going to utilise it, and because they rolled that technology out ... state government and local government here could then go and utilise that'.*

The government negotiations with providers resulted in the creation of the *'Telstra Next IP Network, and it's basically made up of a couple of products like NextG, GWIP, Ethernet Campus, and it's all about providing ... faster data services and remotely integrated data services on a big platform'.*

7.2.11.Benefits

This case study highlighted a number of the potential benefits of implementing mobile government. According to the participant, *'those that do require that live access out in the field are really starting to benefit from this technology and they've started to pick up on it, quite a lot'.* According to the participant, *'there's a number of benefits'* for the mobile work force such as *'the exact recording of information'*, and *'they can actually* ***work quicker*** *out there, it becomes a* ***time saver*** *for them'.*

The participant identified a number of benefits in using the wireless network to connect some of the fixed locations into the council's network. This is usually needed when high speed ADSL is not available in the location, and the benefit is in *'providing high speed connectivity back into the network'.* The council found earned benefits in *'converting it* [locations] *from a fixed line, or a fixed ADSL or a*

fixed ISDN line that goes to the site, to a mobile NextG connection', and the benefit was that *'we've actually saved a lot of money ... you change your cost from maybe three to five hundred dollars a month, down to a hundred dollars a month, so yeah, and you get a doubling in speed or tripling in speed'.*

Implementing G2E m-Government services has benefited the council in many ways, such as *'saving overtime costs'* as a result of no longer *'entering in information manually, which now they can enter out in the field'*. The participant affirmed that it *'increases* ***productivity,*** *they* [mobile workforce] *can actually get more work done or provide more services to the public, or* ***respond quicker to the public,*** *because they can get information online out there, like job despatching,* [the] *guys they got laptops always on out there, so the jobs come through, they can see the details straight away when they're out there in the field'*. This shows that the return on investment not only benefits the government council, but all its constituents, such as the employees and citizens.

To sum up, to implement mobile government in any council it is important to understand the potential benefits to be gained from such a system in order to justify the costs and to assist in the decision making process.

7.2.12.Conclusion

This case study reinforces the mobile government success factors found in previous case study (QLDCC1): Drivers, Solutions, Constituents, and Providers. It has highlighted the business case factor, business case, security and benefits as new perspectives to be considered when deciding to implement a mobile

government system. Table 12 lists QLDCC2 perspectives and their success factors.

Table 12: Mobile government success factors - QLDCC2 Case Study

Success Categories	Success Factor(s) From QLDCC2 Case Study
Drivers	• The availability of technology
Solutions	• Easy management • Up-to-date • Selecting of access device • Data transfer speed • One platform • Device independent solution • Low overhead on the back office systems
Constituents (Citizens)	• Broadband availability • Mobile penetration and usage • Easiness and readability of G2C services • G2C services to mimic the real life process
Constituents (Employee)	• Staff trust • Staff acceptance • Training • Change management
Providers	• Security • Data transfer speeds • Infrastructure • Compatibility with the council systems • Future plans

Success Categories	Success Factor(s) From QLDCC2 Case Study
Business Case	• IT liaison with business groups • Understanding business requirements • Awareness of available technologies • Justifying the needs and costs • Reflect on benefits
Security	• Update department's network • Awareness of all the risks, threats and vulnerabilities • Implement as many security levels as required • Best password selection procedures • No information to be kept on devices
Government Help	• Negotiation with providers
Benefits	• Understanding the benefits

7.3.Chapter Conclusion

Table 13 summarises the success factors emerging from the analysis of the QLDCC1 and QLDCC2 case studies. The table shows the discrete and mutual perspectives and their success factors.

Table 13: Mobile government success factors - QLDCC1 & QLDCC2 Case Studies

Success Categories	Success Factors FromQLDCC1 Case Study	Success Factors from QLDCC2 Case Study
Drivers	• Saving Costs • Staff productivity • Coverage • Volume of use • Constituent's demand • Fast service delivery	• The availability of technology
Solutions	• **Business case** • Clear objectives • Determine business requirements • Architecture • Managed as a project (IT project management skills) • **One platform solution** • Software reuse • Testing and evaluation	• Easy management • Up-to-date • Selecting of access device • Data transfer speed • **One platform** • Device independent solution • Low overhead on the back office systems

Success Categories	Success Factors FromQLDCC1 Case Study	Success Factors from QLDCC2 Case Study
Constituents (Citizens)	• Acknowledge receipt of problems • Fast Response • Increase trust • **Citizen's convenience**	• Broadband availability • Mobile penetration and usage • **Easiness and readability of G2C services** • G2C services to mimic the real life process
Constituents (Employee)	• Understanding staff abilities • **Staff acceptance** • Involvement in planning • Staff technological literacy • **Training** provision • **Change management** • Applications' ease of use	• Staff trust • **Staff acceptance** • **Training** • **Change management**
Providers	• Understanding of the provided services • Researching the market • Negotiate the best deal • Utilising government contracts • Provider's experience and infrastructure	• Security • Data transfer speeds • Infrastructure • Compatibility with the council systems • Future plans
Business Case		• IT liaison with business groups • Understanding business requirements • Awareness of available technologies • Justifying the needs and costs • Reflect on benefits

Success Categories	Success Factors FromQLDCC1 Case Study	Success Factors from QLDCC2 Case Study
Security		• Update department's network • Awareness of all the risk, threats and vulnerabilities • Implement as many security levels as required • Best password selection procedures • No information to be kept on devices
Government Help		• Negotiation with providers
Benefits		• Understanding the benefits

The next chapter will discuss three more Australian case studies, but from the state of New South Wales (NSW).

CHAPTER 8

8.Australian Case Studies: State of New South Wales

This chapter discusses the mobile government systems implemented at three Australian councils in the State of New South Wales (NSW). The rationale behind the selection of local government level is based on the fact that there are many more community issues dealt with at local government level than there are at either state or federal level. These community issues create pressure on local governments to improve their services through adopting the newest mobile and wireless technologies. The analysis of the case studies generated a number of success factors that must be considered when planning and implementing a mobile government system.

8.1.First New South Wales Council Case Study (NSWCC1)

8.1.1.Introduction

For ethical reasons the information is de-identified. Thus, the researcher will refer to this government department as **NSW City Council1 (NSWCC1)**

Government level: City Council - Local Government Department
State: New South Wales (NSW)
Country: Australia
Population: '140,000'
Number of Employees: '1000'
Number of Interviewees: One
Interviewees' Position: IT manager

8.1.2.The council's current use of WIRED Internet

The council has utilised wired Internet technologies for several years. The council uses email and owns a dedicated website hosting the following popular online services:

- Pay My Rates
- Library catalogue
- Search local events
- Community Directory
- This week at Council
- City Snapshot

- **NSWCC1**[6] statistics
- Councillor details
- **NSWCC1** suburbs
- Community Plan
- Transport Guide
- The **NSWCC1** Land and Environment Plan (LEP)
- Development Control Plan
- Public exhibitions
- Council agendas & minutes
- Jobs at Council

8.1.3.The council's current use of MOBILE and WIRELESS Internet

The council provides a Wi-Fi Internet connection at their library, but has not yet implemented any mobile government services. At the time of the interview[7], the council was *'testing some services'*, but they *'don't have anything running live at the moment'*.

8.1.4.Government to Employee (G2E) m-Government Projects

This council has not been utilising mobile and wireless technologies, but they recently decided to do so to provide services *'for employees only'*. Thus, the council has been testing a number of mobile government applications/solutions,

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6 The council's name has been de-identified for ethical reasons
7 The interview was conducted in March 2008

and the following are examples of implemented applications and others under testing:

- (under testing) Accessing corporate systems from home: according to the participant, *'we've got that working in a way that we've got a few people testing it out'*,
- (implemented) *'We do have our General Manager and Lord Mayor running on Blackberry only so that's a mobile solution for them. So they get live email and live calendar'.*

8.1.5.Drivers

The first perspective to be discussed is drivers behind adopting an m-Government system in the council. The case study reveals a number of drivers pushing the utilisation of wireless and mobile technologies in the public sector. The participant noted that *'there are several areas'* that pushed the council to implement mobile government, *'one of which is working from home because we* [the council] *have a* ***flexible work arrangement*** *... so that people can work from home quite easily and still access our corporate systems'.* This acknowledges the mobile government benefit of working from anywhere at any time, and defines the benefit as a driver that propels a mobile government implementation.

The participant also discussed *'asset management'* as another area to benefit from the mobile government solution when he stated that council employees '*have to go around inspecting their assets'.*

8.1.6.Solutions

The second perspective to be discussed is **solutions**. The solutions issue has been raised by a number of the Australian participants. This participant indicated that the solution to accessing the council's systems from home was to incorporate *'a NextG card and they link into our Citrix MetaFrame, which comprises of email and corporate applications which they can use from home'*.

In his discussion of developing the service of accessing councils system's from home, the participant noted that they *'had some problems with it earlier on but we've sorted out those problems'*. This highlights the benefit of having a developed mobile government framework that provides a path to help avoiding anticipated problems that other government departments have experienced.

This case study discusses issues related to the **access devices** and highlights the access device as a success factor within the solution category. The participant highlighted *'the issues of which physical equipment do we standardise on?'* In discussing the access devices, the participant pointed out *'the other restricting things that we have are the mobile technology of PDAs, they change every six to 12 months'*, which reveals that the frequent changes in access device technologies -mainly the PDAs- could be a barrier to adopting the mobile government system.

The participant stated that *'every time we invest in something and then in 12 months time'* the technology changes resulting in the following consequences:

- *'We can't expand the fleet'*
- *'We can't buy another one of those* [access devices such as the PDA] *because it's outdated'*
- *'We have to get another mobile technology'*
- The implemented software not working on the *'the new version of that PDA'*

This highlights the importance of selecting a mature and stable access device technology that would support current corporate systems and any future fleet expansion. The issue of upgrading devices must be investigated thoroughly before selecting a particular set of devices.

In addition to the challenge of selecting the right access devices on which to standardise the solution, the participant identified the end users' lack of IT literacy as another challenge to the success of the mobile government system. The participant also confirmed ease of use as another success factor in getting higher acceptance from end users. The participant suggested that *'we have to make the application as easy to use as possible'*.

The nature of the access device (i.e. technology, size, memory and processing power) dictates the functionality level of the application on the device (i.e. PDA, laptops). For example, PDAs cannot host huge applications, but they can access them. The participant commented that *'we find that if the application itself* [corporate applications] *has a specific PDA application where they* [end users] *just tick the boxes, that's easy for them to use'*. This acknowledges that the application's functionality level depends on the access device. It also indicates

that a simple Graphical User Interface (GUI) eases the use of the device and the hosted applications.

In order to improve productivity and service levels, *'you have to be able to use the whole functionality of the software whether it's on a laptop or whatever'*, but *'most of those functionalities, when the software is ready it's not ready for PDAs. They're ready more for laptops and not for PDAs. So when you're trying to run on the PDA it just doesn't work'*. This acknowledges yet again that the functionality level required in the field to get the job done dictates which access device to use (i.e. PDAs, laptops, tablet PCs, mobile phones, or a combination).

In his discussion of solutions, the participant explained that *'we're just learning about all that at the moment'*. This highlights the importance of this research in guiding government departments to reach a successful implementation of mobile government services. The participant recommended the practice of cooperating with other departments already implementing mobile government solutions. He noted that *'there is a group of IT managers that work together that discuss all the issues'*. However, the participant admitted that within local government there are different systems implemented, and only those with the same systems would be of actual assistance. Thus, *'what we have to do is, we have to be more closely aligned with people with the same systems as we have'*. This highlights that standardising systems within the same government level would increase the learning and the cooperation between them. It would also decrease costs, as the departments would utilise the same technologies and run the same training.

The participant observed that *'you've got local government software suppliers and then you've got asset management software suppliers, which are totally different'*. He illustrated further, saying that:

> *Within asset management itself, there are heaps and* ***heaps of software providers*** *out there and they all* ***don't do all assets****. So* ***one asset management system may focus*** *just on buildings, another just on bridges. Then when we try and purchase* ***all the different systems to cater for all the different assets****, it gets fairly convoluted. So it depends on the asset management system depending on whether they've developed the mobile computing capabilities, although* ***we're going to try*** *and* ***bring all of our assets under one system now*** *in the next probably 18 months. It'll be a huge project and to try and bring that together, we need to* ***specify in our tender*** *to say we want to be able to* ***do mobile computing****, it should be mapped.* ***Every asset should be able to be mapped*** *and then try and bring all of the asset types into the* ***one asset management system****, which is* ***a huge challenge*** *because usually for one particular type of asset, it's very specific what information needs to be kept about that particular asset and how the servicing works.*

The above discussion illustrates the reasons behind having many systems within one unit and thus many software providers. This practice results in extra costs in purchasing and supporting the different systems. As a solution, the participant reiterated that *'we're going to try and bring all of our assets under one system now'*. This accords with the 'one platform' solution discussed in the Queensland state case studies. Although the 'one platform' solution has been implemented by the Queensland councils, it was only recently considered, and has yet to be

implemented, by this council. This highlights the importance of having a devised framework to guide governments in the planning and implementation to reach successful mobile government. This is why **this research aims to devise an adaptive mobile government framework to guide the implementation of successful mobile government systems.**

The participant asserted that the 'one platform' solution *'is a huge challenge'*, saying that:

> *What we have to do is try and* ***convince our asset managers*** *that generically they all [the different systems] do the same thing but we've just got to* ***find the correct words for them to join them in the one system.*** *So it's not just local government management systems, property systems. There's asset management systems which are generic throughout all organisations. Any company will have an asset management system and because there's so many of them, they all develop at different rates.*

The participant illustrates that the challenge stems from *'convincing our asset managers'*, and determines that *'we've just got to find the correct words for them to join them in the one system'*. This acknowledges the role of the change management in gaining acceptance. The change management factor was found to be significant in the analysis of the Queensland case studies. This once again confirms the importance of the end product of this research (the mobile government adaptive framework) as a guide, because it is based on the analysis of real case studies.

The coverage factor has been discussed in the Queensland case studies, and the participant here also acknowledged its importance. He noted that *'we have a*

couple of places that are located in really deep valleys and the NextG coverage is really awful', and admitted that weak or no coverage '*will hamper our solution'.*

The participant summarised that mobile government solutions *'need to function'* properly. He used the following example to illustrate this:

> *It's like now when we buy PCs, we don't want the hassle of having the PCs not working. It should just work. So when we go to mobile technology, we just want the mobile technology to work. It has to work regardless and then so they [end users] don't need to worry about that part of it. They just follow the instructions and it goes and they do it.*

To sum up, the case study has revealed the following solutions for success need to be considered:

- Good network coverage
- Lessons from similar mobile government projects
- Proper selection for the access devices
- User friendly applications
- Easy to use applications
- One platform solution
- Role of change management

8.1.7.Security

The participant discussed the importance of understanding and dealing with all possible security issues related to mobile government. In his brief discussion of the security aspect, the participant acknowledged the **lack of care shown by**

mobile providers towards security issues. He added that *'right now, the responses we've been getting from those people in mobiles saying "just put this up as your firewall, it doesn't matter"'*. This acknowledges the finding of lack of care found in the security aspect in the QLDCC2 case study.

The participant stressed that security *'does matter to us because we're **protecting people's information**, and we have a certain **responsibility** to make sure that it's not easy to get to'*. This highlights the need to take the best measures to ensure the security of the data. Unfortunately, the participant acknowledged that even the toughest security measure could be broken: *'I understand that if they really wanted to break down the firewall, they probably can'*, but added that *'it's our duty to **make it as difficult as possible**. That's our duty of care in terms of that'*

To sum up, the participant highlighted the following security success factors:

- Meet the duty of care
- Implement the highest security measure to protect information
- Do not only rely on providers' recommendations

8.1.8.Mobile Government Constituents

As discussed earlier in this case study, mobile government application/solutions are developed to serve Governments (G), Employees (E), Citizens (C), and Businesses (B), creating G2G, G2E, G2C, and G2B interaction channels, for which they use the wireless channel but through a variety of mobile devices. This study is more focused on the success factors of G2E m-Government; it also discusses G2C services and their success factors, but will mainly report on the G2E part of mobile government.

8.1.8.1.Government to Citizen (G2C)

The department has not invested in any G2C services. The participant justified this lack of investment *'because there's no return on investment at all'*. Thus, the only implemented G2C service is operated by the library, and it only uses basic SMS to notify citizens when *'a book is due'*.

The participant, in justifying not developing G2C mobile services, said that: *'we haven't looked at that probably because the* ***demand*** *just isn't there at the moment and* ***whether it's worth spending the money to develop*** *something like that or not'*. He explained that demand means *'in terms of the people wanting to access that'* type of services. This highlights the importance of knowing the demand, which requires surveying citizens to understand their needs. The participant said that, in order to survey citizens, the council is *'trying to run some interactive on our website to get information from people'*, but admitted that *'the response rate is really, really low'*. This raises the following questions about the surveying tool:

- The validity of the tool
- The access to the tool
- The appropriateness of using only one surveying tool to measure demand

Distributing the survey via citizens' mobile phones could be a better method to get more opinions. To that suggestion, the participant answered: *'you can poll them and you probably will get a* ***much higher rate*** *than what you're getting now I'd say, yeah'*. The participant expected a better response because this type of method is *'more push technology. That's the "in your face" with the mobile*

phone', compared to the web surveying where *'you're advertising and tell people it's there for them to go and have a look at it'*. The participant cautioned that mobile polling *'depends on privacy as well'*. He explained that *'it depends on whether you* [the citizen] *want to be subjected to that sort of polling on their mobile phone'.*

The above discussion highlights the importance of the following factors:

- Determine demand
- Use proper surveying tools

8.1.8.2.Government to Employee (G2E)

In his discussion of the G2E services to be implemented within the *'asset management area'*, the participant explained the old way of doing work where *'they have to go around inspecting their assets. Like usually they'll get a clipboard out there and there'll be a whole list of things to tick'*. This old method shows the prolonged period of time spent in doing the work. To save the time, the council decided to go mobile, utilising a *'tablet notebook. So running an application on a tablet notebook but* ***it wasn't a live mobile solution'***.

Having a live connection means being able to implement a prompt update to the corporate systems on the spot, but lacking it means the following:

a) *'synchronise the form'* to the mobile device at the council,
b) *'get the form out there, they* [employees] *fill it out'*,
c) *'they bring the electronic form back into the organisation', and*
d) *'they plug it* [mobile device] *in and it synchronises to their database'.*

Investing in mobile technology through using tablet notebooks saved the data entry time (typing on computers rather than writing on paper) and the data transfer time through synchronising the electronic forms rather than entering the data from the paper forms. Nevertheless, the employees still had to travel back and forth to the council to get the jobs and the related forms synchronised to their machines.

The council understood the benefits and decided *'to find a solution where they* [the employee] *can actually update online'* while out in the field. Therefore, the council explored mobile solutions on PDAs. Being happy with the outcome the council decided to extend the utilisation of mobile and wireless technologies.

In addition to the saving of *'the travelling back and forth'*, the wireless and mobile solution added the benefit of better *'distribution of work'* where *'the job gets sent'* online to the mobile workforce, and *'it means that they don't have to come in, in the morning, to get their work'*.

In his discussion of the G2E solutions, the participant discussed the challenge that *'a lot of staff who at the moment in their transition, they use computers for a very short percent of their time'*. Thus, the participant acknowledged that *'to get them* [employees] *to actually use computers is* ***challenge'***. The participant concludes that **training** them *'definitely is'* the solution.

In his discussion of the NextG and 3G wireless technologies, the participant noted that although 3G was available few years before NextG came out, the department did not utilise it. He said the reason was that at the time *'our staff wasn't ready for mobile solutions yet'*. He also recommended against *'introducing something that staff just isn't ready for, because we'll just be* ***wasting a lot of money'***, which

contradicts the 'saving costs' driver. This highlights **staff readiness** as a success factor, and emphasises that *'the drive needs to come from the area'*. This acknowledges and reinforces the finding in the QLDCC1 case study that demand should come from the business unit.

In order to convince the staff and get them ready for the transition to mobile government, the participant affirmed that it is the responsibility of the *'management area to talk to staff as well to say "we need to start going mobile"'*. This acknowledges the role of **change management** found in the QLDCC1 case study and in the solutions part of this case study. The participant also said that *'It's just a matter of just* ***testing it with them*** *and just saying: "are you ready to use it?"'*. This emphasises the importance of staff approval on using the solutions. To gain their approval the participant recommended **involving the staff** in **testing the solutions**.

Gaining the staff's approval is *'not the simple thing of just introducing mobile technology'*, as there is the challenge that *'a lot of people think that you're just trying* ***keep track*** *of where we're going and what we're doing'*. As a solution, the participant suggested it was important to *'try and get them to see the benefits of it* [mobile government solutions]". Getting the staff *'to* ***see the benefits'*** poses another challenge, in that *'they have to* ***learn how to use all the packages'***. The participant confirmed that *'learning how to use all the packages itself is a big deal to them* [staff] *obviously'*. To solve these challenges, the participant recommended one should *'****keep trying*** *and just* ***offer the training*** *and* ***talk to them*** *and* ***making sure they see the benefit*** *of it once they've* ***learnt how to use the system properly'***.

The mobile government system results in many benefits[8] that could also present the challenge of user resistance. This resistance would emerge from the fear of job loss as a result of the benefits of 'better productivity' and 'increased efficiency' achieved by one employee, to the possible detriment of a colleague. This resistance *'tends to be a bit of a block sometimes'*. The participant acknowledged that *'we have had in the past as well, not just mobile but other technology come through and it really cut down the number of staff required in that particular area and in that sense, we've reduced the number of staff'*.

In summary, the participant stressed that *'definitely if we can* ***show the staff what's in it for them*** [it] *would be* ***a huge success factor'***, and then *'follow that with* ***proper training*** *for them to use it and make it and* ***keep it as simple as possible for them*** *to use, it would be* ***a key success factor'***.

To sum up, the above discussion has highlighted a number of success factors that are important to the provision of G2E mobile government services:

- Staff training in the use of the solution
- Staff training to grasp the benefits and gain approval
- Staff readiness
- Change management role
- Staff involvement in solution testing

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8 See the 'Benefit' section of all case studies

8.1.9.Providers

The perspective to be discussed, Providers, includes mobile service providers and solution providers. Many success factors play a role in this perspective. As discussed earlier, any perspective and its related success factors need to accord with the main drivers behind the development of any mobile government project. Based on the discussion, cost saving so far forms a core component in the set of drivers. Thus, the selection of a provider is a process that should be based on cost saving, along with the many others factors to be discussed here.

In his discussion of the security issues, the participant admitted that *'there's always issues about security'* and said that *'our biggest problem with mobile technology is that everyone* [solution providers] *says that: "yes you can do it, but it's not very secure", so they* [solution providers] *don't care about the security as much as we do when they're selling the products'*. This highlights the importance of having a skilled IT division who can understand the solution to be provided by any provider, and its ability to secure data. The participant claimed that *'a lot of suppliers aren't too worried about that. They just want to sell their product'*, and argued that many would say: *'"oh just set this up with your firewall and you'll be right" but then the database is exposed to the rest of the world'*. It is therefore concluded that **provisioning the required security that matches the department's needs** must be set as a measure of provider selection.

In his discussion of solutions, the participant discussed the role of the solution providers in the success of mobile government systems. The participant opined that many applications are developed by '*third party vendors'* and *'we don't control those applications'*. He pointed out that *'it all depends on whether the*

vendor has updated their software to be able to run more user-friendly or not'. This highlights that vendor selection is crucial to the success of the mobile government system.

The vendor (application provider) is not the only one to blame for not producing user friendly solutions, because usually vendors try to match the customer's [i.e. council's] corporate systems. The participant discussed the fact that *'we have those challenges within the organisation itself actually using software that's not as user friendly as it can be or we'd like it to be'.* This highlights the possible need for the government department to also update their system to be more user-friendly.

In the solutions discussion it was found that applications are device specific. In other words, it is crucial to understand the work requirements and pass them to the vendor in order to select the appropriate device and develop a working application. This also requires an understanding of the possible future expansion of the same or different access devices. Thus, a vendor's readiness to respond to future expansion is a crucial selection factor, and third party vendors have to be notified of all future possibilities.

Government departments could use many different application/solution developers; as the participant said, *'with local government, there's about three/four different providers of software for local government software'.* In order to coordinate and cooperate with other departments to achieve better results and learn of their experience, the participant confirmed that *'we usually align with the same group of councils that have the same suppliers rather than just anyone because one group of suppliers might have that functionality quicker than*

another'. Thus, in selecting potential providers, it is recommended to negotiate with suppliers who have previously implemented systems for other government departments. This would increase the cooperation between government departments using the same provider, and consequently should increase the successfulness of the mobile government solutions to be implemented.

To affirm the importance of coordinating with other, similar departments, the participant pointed out that *'as a group of IT managers within local government we try and push a lot of suppliers to be able to do things. So there's definitely a forum there to do the pushing'*.

In his discussion of a solution, the participant acknowledged the coverage factor, and emphasised that poor coverage *'will hamper our solution'*, especially the solutions that *'have to have direct access to the corporate applications'* in the field. Thus, although coverage is a solution success factor, it also plays a role in provider selection. Consequently, governments should consider partnering with providers with the best available network coverage. The participant's opinion was that the *'black spots'* are a provider's issue, and the department cannot do anything about it; as he said, *'it's a Telstra issue so it depends whether Telstra can get the link'*.

Based on this discussion, it can be concluded that coverage is a success factor that *'needs to be there'*, and is crucial to implementing mobile government. What is required, therefore, is partnering with a provider that best covers the area the department manages. Different local councils could partner with any provider that best covers their area, and the same applies to higher levels of government. For example, state government should partner with providers who best cover the

whole state and federal government with providers best covering the whole country.

Providing best coverage does not necessarily mean covering every inch of the area, but at least those areas where mobile services are used or needed should be adequately covered (i.e. the populated areas). This criterion of minimum coverage should be set by the government department and negotiated with the provider. The participant highlighted that *'we've just got to get them* [the provider] *to actually provide to those areas and* ***there's no other alternative solution'***. It is also necessary to negotiate the possible need for future extension to the network when required; for example, because of increased population in new areas. To ease the negotiation with the selected provider, the participant noted that *'we've got an* ***account manager*** *at Telstra and we're always in discussion with them'*.

The participant indicated that there are *'black spots'* in the area his department manages but *'we just don't know exactly where they are'*. The participant from QLDCC2 acknowledged the importance of knowing the areas with weak or no coverage, and suggested driving around the area with an access device, be it a laptop or PDA, to find out where the black spots are and report them to the provider. This check could be done by either the provider or the department itself, in which case, the department should have a map of the areas in which the services are required both now and in the future.

In terms of utilising mobile government as an emergency response system, the participant clarified that in case of emergencies such as storms the mobile network is not very reliable. For example, the participant illustrated that the NSWCC1 area was hit by a strong storm in June 2007, and *'because of what was*

happening, the Telstra network just went down for a little while', and *'the electricity went off'*. He further explained that *'the only thing that was online was the radio stations. So I think they will look at better communication with the radio stations in terms of emergency first of all rather than trying to set up your own mobile network'*. This highlights the importance of **network reliability**, especially in emergencies such as severe weather, and adds it as a new success factor and criterion towards provider selection.

Although radio stations may survive extreme weather and are accessible by everybody, mobile phones still have the advantage of higher penetration and prompt attendance from their owners. In an emergency, citizens are more likely to attend to their mobile phones and read their SMS than to switch on a radio station for an emergency report. Of course, this would also depend on the location of the citizen and the type and seriousness of the emergency.

To sum up, the above discussion concludes that partnering with carefully selected providers is important, and that partnership is based on the following factors:

- Skilled IT division to assist in selecting providers
- Provider's ability to provide the required security
- Cost saving
- Application vendor's ability to provide user friendly solutions
- Application vendor's ability to respond to future expansion
- providers used by other departments
- Provider's network coverage and its reliability
- Network reliability
- Provider's assigned personnel to manage the department's needs

8.1.10.Benefits

In his discussion of gaining staff approval for the use of mobile government solutions, the participant highlighted the importance of helping staff to understand the benefits of the solutions.

The participant noted that implementing mobile government results in many benefits, such as *'people can actually use their time a lot better and do other things'*. The participant added that *'because they* [the workforce] *are so far behind in other work, hopefully when this system goes in it will actually help them do their* ***work a lot more efficiently*** *and* ***be on time*** *and all of the other things. So that's one aspect of it'*.

To sum up, the following are the anticipated mobile government benefits:

- Time saving
- The amount of paperwork saved
- Better allocation of jobs
- Ability to do work from home rather than to commute
- *'flexible work arrangement, that we can add to retain staff'*
- Job distribution while workforce in the field, rather than *'them having to come in'*
- Increase work efficiency and meeting deadlines

In terms of the Return on Investment (ROI) of mobile government, the participant was of the view that *'it wouldn't come back ... in money (dollars)'*, but *'you would see it in the benefits* [for] *the staff'*. He explained that *'instead of wasting time*

travelling around and allocating paper jobs, they [staff] *can be doing a lot more productive things.'*

8.1.11.Government Role

The participant said that *'the government has a role to play there'*, and stressed the importance of the federal government's contribution to the success of mobile government, adding *'definitely. I think that's really important'*. According to the participant, the government could *'set up whether it be* ***incentives*** *or* ***the policy*** *to say "look this is where we should be heading, all mobile technology companies should follow that sort of framework"'*. This suggests tailoring a **mobile government policy** that suits the needs of the government departments, and highlights it as a success factor.

In his discussion of the government's role, the participant opined that any monopoly in the mobile and wireless technology sector is an obstacle to the success of mobile government. He noted that *'if it's always down to the monopoly that we have, the* ***cost is a big prohibitor*** *for us expanding as a nation in terms of mobile technology because some of us just can't afford the Telstra prices'*. He recommends the **liberalisation of the telecommunication sector** and highlights it as a success factor.

Although the participant recommended liberalisation of the telecommunication sector, he also recommended against the privatisation of any government telecommunication company because *'when they* [the government] *on-sell it* [public telecommunication company] *to mobile providers, they have to* ***put up their prices*** *as well to cover their own cost.'*

To sum up, the federal government in any country has a role to play in the success of any mobile government system. The following are the success factors for the government role perspective:

- Devise a mobile government policy for all related parties to follow
- Liberalisation and not privatisation of the telecommunication sector

8.1.12.Decision to go mobile

The decision to adopt the mobile government system is based on the perspective (i.e. drivers, technologies, solutions, and benefits) discussed in this case study. The participant believed that mobile government should be included in the department's ICT strategic plan, which reflects the department's vision. He noted that *'the Council has its own visions ... and we're* [ICT Steering Committee][9] *supposed to fit inside the vision of the Council'.*

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9 According to the participant, the ICT Steering Committee is a committee *'that gets representatives from all over the council to input into where you should go with IT in the organisation. We do our strategic plans and action plans from there'.*

8.1.13.Conclusion

This case study has discussed a local government council experience in implementing a mobile government system. At the time of the interview, the council was still in the testing phase of some mobile government applications, and has not yet implemented the one mobile government system. Thus, the case study revealed fewer success factors compared to the Queensland case studies discussed in Chapter 7.

The participant highlighted the importance of this research in supporting the mobile government initiative and helping government departments to successfully implement it. The analysis of the NSWCC1 case study has revealed a number of mobile government perspectives and their related success factors, which are listed in Table 14 below.

Table 14: Mobile government success factors - NSWCC1 Case Study

Success Category	Success factors from the NSWCC1 Case study
Drivers	• Work flexibility in accessing corporate systems anywhere, any time.
Solutions	• Good network coverage • Research similar mobile government projects to learn from • Proper selection for the access devices • User friendly applications • Easy to use applications • One platform solution • Role of change management

Success Category	Success factors from the NSWCC1 Case study
Security	• Meet the duty of care • Implementing highest security measure to protect information • Not relying on providers' recommendations
Constituents (Citizens)	• Determine demand • Use proper surveying tools
Constituents (Employee)	• Staff Training to use the solution • Staff training to grasp the benefits and gain approval • Staff readiness • Change management role • Staff involvement in solution testing
Providers	• Skilled IT division to assist in selecting providers • Provider's ability to provide the required security • Cost saving • Application vendor's ability to provide user friendly solutions • Application vendor's ability to respond to future expansion • Consider providers used by other departments • Provider's network coverage and its reliability • Network reliability • Provider's assigned personnel to manage the department's needs

Success Category	Success factors from the NSWCC1 Case study
Benefits	• Time saving • The amount of paperwork saved • Better allocation of jobs • Ability to do work from home rather than to commute • *'Flexible work arrangement, that we can add to retain staff'* • Job distribution while workforce in the field, rather than *'them having to come in'* • Increase work efficiency and meeting deadlines
Government Role	• Devise a mobile government policy for all related parties to follow • Liberalisation and not privatisation of the telecommunication sector

The next section discusses the second NSW case study.

8.2.New South Wales Case Study 2

The previous section has discussed the first New South Wales (NSW) case study and revealed a number of success factors. This is the second NSW case study. Although all case studies are standalone, their analysis revealed many mutual as well as distinct mobile government perspectives and relevant success factors. This case study threw more light on mobile government devices, benefits and solutions.

8.2.1.Introduction

This city council provides a range of services and facilities for residents, visitors and businesses. The council, which has been established for over 200 years, is today one of the largest Local Government Areas in New South Wales, with approximately 180,000 residents speaking more than 60 different languages.

To best serve a large multicultural population, the council has set the vision *'To continue to grow the City ... as a vibrant, strong, attractive City which values its people, its environment and its community, where there are opportunities to grow, achieve, work and live in an environment of compassion and understanding'*.

The council's vision led the council's mission to provide:

- Well managed services and facilities that meet the needs of the community, and that respect the environment and diversity, and
- A strong service delivery culture.

The researcher will refer to this government department as **NSW City Council2 (NSWCC2)**[10]**.** Following is more information about the council:

Government level: City Council - Local Government Department
State: New South Wales (NSW)
Country: Australia
Council's Area: '77 square kilometres'
Population: '180,000'
Number of Employees: Not known
Number of Interviewees: One
Interviewees' Position: IT manager

8.2.2.The current use of WIRED Internet

The council owns a website that provides **information** about:

- **The Council**: such as vision and mission, council meetings, and careers
- **Development**: such as planning guidelines and policies, and development applications
- **Business**: such as business directory and economic profile
- **Environment**: such as plants and animals, industry and the environment and air quality

10 The information is de-identified for ethical reasons.

- **Library**: such as library services, online database, facilities, fees and charges.
- **Services**: waste and recycling, education, public transport and parking
- **Community Info**: community directory, children, youth, disability services
- **Leisure**: sports facilities, parks and reserves, local sport clubs, cultural activities

This council also provides a number of **online services** such as:

- **Development Application (DA) tracking**. The interviewee advised that the public *'in the website they can track, for example, where their development applications are at, but they* ***don't get any notification through SMS or directly through email'.***
- **Community directory**
- **Rates online** to register for online billing and online electronic payment (ePayment)
- **Library catalogue**, community profile, and community atlas. According to the participant, *'they* [the public] *also access library services and they have much more of an interactive relationship there. They can obtain a password and they can reserve books online and they'll collect them later. They can extend their books themselves; extend the length of loan and whatever'.*

8.2.3.The current use of MOBILE and WIRELESS Internet

The participant disclosed that mobile government services are *'mainly used to actually deliver services by the staff'*, thus the majority of the mobile government

services are G2E, which are not of direct interest to the public and so are not listed on the council's website.

The participant discussed the late technology enhancements, and said: *'so certainly in the last 18 months we've seen an enormous increase in the type of solutions we're providing'*. The following are examples of the different mobile government services provided by the council to their employees:

- **Internal use of SMS**: the participant advised that *'at the moment internally with staff we do use SMS'*. She explained that *'for example, we get an SMS for appointments that we have using calendar. So let's say you were an employee of Council and you have a series of appointments, you can choose to be alerted by SMS or not and you will get an SMS in your mobile phone warning you that in 15 minutes or half an hour - that's a personal setting - you've got a meeting'*.

- **Infringement officers**: the participant outlined that *'they use mobile devices and they have mobile small printers too. So basically if you've parked your car in an area where you're not supposed to park, or if you've exceeded the time or whatever, the infringement officer will issue a notice* ***right there*** *and print it and issue it to you'*.

- **Council rangers**: the participant defined them as *'the people that actually patrol and inspect that Council abides by all the systems, abides by the number of regulations like no dumping rubbish, abandoned vehicles'*, and explained that *'they use laptops connected to our systems via VPN*

through a wireless ISP ... and they're basically working like if they were here'.

- **Environment Health Officer**: the participant explained that *'the environmental health officers, who are the people that inspect food shops, they are also starting to use the same type of solution* [as the council rangers] *so that they can conduct regular food inspections".*

- **Graffiti area**: the participant noted that *'graffiti is another area that's using tablet PCs. So the people that do inspections in terms of graffiti, they log their report of the graffiti incident with all the information that needs to be done by just using a form where they tick'.*

- **Road inspection**: the participant discussed a near future potential to add this area to the mobile government systems. She said that road inspectors, *'the people that maintain the roads, that particularly inspect the roads, have been talking for a long time about using mobile devices for inspection of roads'.* She further offered that the decision is based on the fact that *'clearly there are enormous benefits that can be derived by using mobile devices that use GPS technology'* in this area. This highlights the importance of **understanding all the potential mobile government benefits** to aid in the decision making process. The benefits of mobile government are discussed in section 10.2.10.

8.2.4.Devices

The participant, in her discussion of mobile government services, noted that the road inspection area is a potential mobile government area. The reason behind the delay to date was waiting for the proper technology to arrive. The participant said that *'technology has improved now'* and many of the available smart mobile phones *'can actually operate as a GPS unit and can record coordinates'*. The participant noted that now that the technology is available, it is crucial to investigate its features *'depending on what needs to be done'*, for example, *'the size of the screen'*.

The enhancement and improvement of technologies mean that many *'technologies have merged'* into one device. This technology merge helps in decreasing the number of mobile devices to buy and carry. This council has *'a fleet of about 200 mobile phones. We have about 50 plus digital cameras and then we're talking about GPS devices on top of that'*. Although the participant recommended using merged technology devices, she noted that the required functionality and accuracy levels of the devices should be taken into consideration when investigating a merger. For example, *'some of the GPS devices obviously need to be more accurate, in which case they'll have to be specific enough particularly for engineers'* in which case it is recommended to have a standalone device. The participant further explained: *'but just for the average person that just wants to pinpoint, for example, where they'd found a pothole and they just need the coordinates and whatever'* they could use an all-in-one device with lower accuracy levels.

The reason that the council is *'investigating whether* [they] *can merge all these technologies in just one mobile device'* is because it is difficult *'to manage ... too many devices"*, such as *'a mobile phone ... a digital camera and a tablet PC'*. The question of whether to utilise merged technologies is subject to the job requirements and the need for multiple devices.

The participant recommended consulting the staff when choosing the mobile device to be utilised in mobile government solutions. She explained that some would prefer a *'laptop rather than a PDA because it is* [the PDA] *too small for them'*. This highlights the need to consider the user's convenience when choosing mobile devices.

Mobile devices are a crucial part of mobile government systems. Although the discussion of the case studies so far has highlighted the proper selection of devices as a success factor, they *'need to be supported by* [a proper] *internal infrastructure'*, the participant said.

To sum up, successful selection of devices should consider the following factors:

- Understand the job requirement
- Understand the functionality and accuracy level required
- Consider using merged technologies when appropriate

8.2.5.Mobile Government Constituents

The council has implemented a number of m-Government services towards citizens and employees. The following sections reveal more services success factors.

8.2.5.1.Government to Citizen (G2C)

The use of SMS technology within the council as a reminder tool to its employees has encouraged the council to consider extending its use to citizens. The participant demonstrated that *'for example, we could remind people when their rates are due and a number of possibilities'*. She added that *'we at the moment have identified that there's a possibility of using some SMS message in terms of communicating with the community'*. She argued that *'clearly, particularly in the area of SMS, there are a lot of opportunities'*, and explained that many areas that deal with citizens could benefit, *'particularly in areas such as the library ... reminders of when books are due'*.

Providing G2C services *'depends very much on the community and what the community expectations are'*. Thus, the participant recommended a *'wider community consultation to see how ready the community is for that type of service'*. The participant suggested that it also *'depends very much on the age composition of the community'*.

To sum up, to provide G2C services it is crucial to calculate the citizens' readiness for such services.

8.2.5.2.Government to Employee (G2E)

The section recording the department's current use of mobile and wireless Internet shows that a number of G2E m-Government services are operational. In her discussion of the use of mobile technology by infringement officers to issue tickets, the participant explained that *'at the end of the day they come back into*

the organisation and that information is uploaded to the Infringement Processing Bureau, which is a centralised service in New South Wales that all councils use'.

The participant explained that the use of mobile technologies within the council *'has meant a complete change in terms of how they* [staff] *operate'*, which adds complexity to the work, and raises acceptance issues. The use of merged technologies (i.e. one device containing Phone, PDA, Camera, and GPS) adds extra complexity. The participant cautioned that *'I find that the most difficult thing is to get agreement of all the staff'*, and advocated that the solution lies in proper *'human change management'*. Thus, the participant recommended *'going through a consultation process'* with users. She explained that successful consultation must follow the order of *'educating the users first ... to make them aware of the benefits, and* ***then*** *trying to talk to them'* about the changes.

Change management needs to consider the age factor. The participant recommended that *'it is important to note the age of staff in the organisation'*. She explained that *'there's different types of* [technology] *awareness'* amongst different age groups. For example, she explained that *'baby boomer and pre-baby boomer ... those people, you have to take the time to explain the possibilities of the technology and it has to be easy to use'* for them to accept it, while *'Generation X and Generation Y'* users are more aware and ready for immediate transition. Nevertheless, she questioned, *'how do you achieve a balance by still addressing the security requirements and the potential risks of using that?'*

Council departments have staff from all age groups and technological literacy levels, and the participant noted that *'a number of these staff didn't use*

computers', either at work or at home. Thus, *'they really need training on just basic understanding of computers'*. The participant recommended *'a big commitment for training'*.

In her advocacy of the necessity of training, the participant explained that *'technology is there to support the business requirements ... So it's not the IT department or the technology that will deliver the benefits; it is actually the business that delivers the benefits and that is where the* ***behaviour, the skills come on board'***. This highlights the importance of change management and training in changing the behaviour and the skills to deliver the benefits and achieve the return on investment (ROI).

Lack of computer literacy also means lack of security literacy. The participant, through the following scenario, demonstrated the impact of security literacy on the mobile government system, observing that the mobile government users in the field need to:

> *connect to our environment* [the council systems] *via VPN* ... [such as] *the Document and Record Management System or the Property System* [to do their job]. *Once they've finished* [the job] *(i.e. inspecting a particular site)* ... *their expectation is that the system* [session] *continues to be open* ... *but because of security considerations that we need to have* ... [the session expires] *after X amount of time idle* ... *they* [the users] *are struggling a little bit to understand that. They find that a little bit of an annoyance, but the users need to understand that if they lose it* [the mobile device], *or if they have an accident in-between* [sites] *there's a potential security data risk."*

This scenario highlights that security is a higher priority than users' convenience and that change management and training should consider and address security issues. Although the participant explained that *'from my perspective, they are minor issues'*, she recommended researching the best measures to ensure the highest security that *'doesn't impact directly on them* [the users]'.

The 'increased productivity' benefit could also increase resistance to the adoption of the mobile government system because of the fear of losing jobs. However, the participant assured that *'mobile government has not affected jobs in terms of reduction'*, but it definitely has an *'impact on the skills* [requirement] *of the type of people that need to come on board'*. For example, *'when a vacancy occurs, instead of filling it with an extra admin support, you may fill it with something else; another position that's required in Council'*, which benefits the department more.

Another cost saving factor is the decrease in overhead costs per position, gained through saving physical space within the department. The participant illustrated that the introduction of the G2E services along with the nature of the workforce's job which *'requires them to be in the community a majority of the time'*, results in less need for desks and workstations in the department; because of mobile government, there is *'no need for a desk for every* [workforce] *member'*.

The participant also raised the *'occupational health and safety issues such as carrying a tablet on the shoulder'* for long hours. So far, through all case studies, this is the first mention of this issue.

To sum up, most mobile government services are used by government employees to improve the services provided to the other constituents (i.e. citizens,

businesses, and other government departments). Thus, Employees are a major constituent in the mobile government system, and their acceptance of the technology is a key factor to a smooth transition and crucial to its success. The following are crucial success factors to be considered:

- Proper consultation process
- Proper change management
- Proper training
- Ease of use
- Consideration of different users' age groups
- Consider all potential health and occupation safety issues
- Prioritise security over anything else
- Educate users about security issues within the change management process and through training
- Research and implement the highest security measures with the least impact on the users
- Change users' behaviour

8.2.6.Benefits

To measure the benefits achieved, the participant recommended *'collecting data to be able to demonstrate with data all the improvements'*, and noted that *'it's the business manager's responsibility to collect that data'*. She also recommended quantifying the collected data because *'the quantitative results will support justifying investing'* in more mobile government projects and *'justifying the required budgets'*.

The participant explained that the department is carrying out an analysis to acknowledge potential benefits achieved from mobile government and to identify any new, unanticipated ones. The council *'hasn't quite completed the analysis yet'*, but *'we have meetings about what had we actually **gained** from that introduction'*. This section points out the many mobile government benefits highlighted by the participant.

In her discussion of the mobile government system, the participant acknowledged *'the benefit that it has delivered to the organisation'* and identified that the major benefits *'are particularly **process improvement** and **more direct improved service delivery'***. Table 15 demonstrates by example the identified benefits.

Table 15: A service comparison pre- and post m-Government

BEFORE Mobile Government	AFTER Mobile government
A ranger normally used to come into the office, had a PC here or get an admin team to print out the inspections they have to carry out for the day, be it as a result of complaints that the customers have made or as part of a general approach.	*Nowadays they don't need to come here because they have this thing, like a terminal. It's a similar kind of laptop, that VPN and they take that with them, they check the tasks for the day, they conduct their inspections.*

The workforce not having to commute to the department to collect their tasks means a saving in time and petrol. The participant also demonstrated the service improvement benefit through the following example: *'There was a stormwater issue. It got logged at 6 o'clock in the morning. The ranger was inspecting it at 7 and the residents were very impressed how come they managed to respond so quickly. That is a* [major] *... benefit'*. This highlights community satisfaction as an important benefit.

In her discussion of mobile government benefits, the participant identified *'cost reduction'* as a major benefit that drives the adoption of mobile government. The participant explained that the use of mobile government services decreased the amount of tedious and trivial *'admin work'* such as filing, printing forms, and data entry, as accessing information, installing forms and filling them is done in the field and immediately synchronised with the corporate systems. This allows the admin staff to *'effectively deliver other Council service s... maybe in a completely different area'*, and thus results in more productivity from the one staff member. The productivity of the admin staff has increased by *'1.5 because they're no longer doing the admin work and they don't do the filing of all these things'*.

Finally, in her discussion of G2C services through SMS the participant pointed out a new, interesting benefit, when she said that *'it's a very good way of communicating, particularly with deaf people who have the special telephone SMS. It's a great tool to communicate'*. According to (Westly 2009) past effort to aid the deaf has focused on hearing devices. But in year 2009 engineers from the University of Washington and Cornell University 'have taken big step toward developing a mobile phone that allows real-time conversation in sign language'. The project named mobile American Sign Language (mobileASL) relies on the video sharing capability of mobile phones. Figure 29 depicts the mobileASL.



Figure 29: mobileASL project (Westly 2009)

The participant clarified that consulting the community is not the IT division's job, but the division could identify and recommend the area for community consulting. To sum up, it is critical to understand the potential benefits of mobile government in making the decision to implement a mobile government strategy. The participant recommended quantifying the benefits to justify developing more mobile government projects. The following lists the potential mobile government benefits identified through analysis of this case study, or directly identified by the participant:

- Saving time (i.e. less commuting)
- Service improvement
- Immediate notification and response (discussed in the solution section)
- *'shorten the time of response to citizen requests'*
- *'improved service delivery'*
- Citizens' satisfaction
- *'improve efficiencies'*

- *'cost reduction'*
- Decreased overhead costs per position because of physical space saving
- *'improved accountability'*
- *'there's definitely been savings on paper'*
- Communication tool with the disabled citizens

8.2.7.Mobile Government System and Solutions

This section reflects and builds on the discussion of all the mobile government perspectives revealed in this case study, which contribute to building a successful mobile government system.

The participant discussed a number of mobile government solutions implemented by her council. She explained that the decision to implement the solutions is for a better *'change in business direction'* because *'the businesses themselves wanted the process to be more productive, improve the processes'*. To improve the processes and achieve the ROI from the mobile government, the participant highly recommended re-engineering the processes: ***'new processes** need to be put in place'*, otherwise *'you will be doing the same things the old way even though you've got new technology ... and that's the biggest challenge'*.

She demonstrated that developing a solution is a mutual effort between *'IT together with the businesses ... for example, in the case of the rangers and the environmental health officers, it was a joint process where IT demonstrated the technology and gave them some options and they chose what could be moved into that area'*.

The participant demonstrated the need to investigate a number of requirements for extending SMS services to the public. She explained: *'We're at the moment working on the **business case** and the **business requirements'**.* This highlights the importance of the business case and the identification of its requirements as a success factor, which accords with the findings of the State of Queensland case studies listed table 13.

The participant commented that *'the systems that we use have that capability, but clearly we need to refine the actual business requirements and what **impact that will have on internal processes** within the library'*. This highlights the inevitable necessity of understanding the abilities of the current organisation's systems to handle the extension, along with any possible impact on the system, and any resulting change or re-engineering to the process.

The system's ability to go mobile means that it has the facility to communicate with mobile devices. The participant pointed out that *'the applications that are delivered on the PDAs are really components of much bigger systems that are used within the Council'*. For example, the *'environmental health system needs to be able to develop forms and applications'* to be used with the different mobile devices. Thus, the participant recommended outsourcing applications development to vendors with expertise in mobile environment. To ensure a successful mobile government system, it is crucial *'when we select applications these days, we select applications that can deliver a web solution that's possible to be delivered in a mobile device'*. This highlights the potential increased access and use of m-Government systems.

To sum up, the implementation of mobile services (i.e. the use of SMS) internally within the organisation and the benefits it brings could be considered as a pilot project for larger implementation within the community. The following have been highlighted as success factors toward the G2C mobile services:

- Understand the capability of the existing system to handle the extension
- Understand the impact of the extension on the backend systems
- Understand the impact of the extension on the process
- Develop business case and identify its requirements

In her discussion of the proper time to invest in technology to be able to start implementing the mobile government system, the participant said that *'it's not so much waiting for the technology. I think the technology is there now'*, but cautioned taking risks. She noted that government departments should not be '*risk takers'*. Rather, she recommended investing in technology *'that's already proven'*, in other words, the technologies that have been used in *'a number of* [similar] *organisations'*.

In her discussion of mobile devices, the participant highlighted that the utilised mobile solution could be enhanced to improve service delivery. For example, in the case of the devices used by the council rangers, she explained: *'that's going to be further enhanced next year with portable printers so that they can issue notices if they have to and that obviously improves the service'*. In addition, the solution used by the environment health officer *'will be enhanced within the next 18 months for them to actually be able* ***to use a form*** *and be able* ***to check it*** *and* ***then issue either a compliance certificate or a notice of improvement*** *or whatever'*. This highlights that any government could start adopting the mobile

government system at any time to achieve the many benefits, and that **solution upgrade** could happen at any time to improve services. The important element is to make a start.

A one platform mobile government system has been recommended by all the participants, and this case study has reinforced that trend. In her discussion of adopting mobile technologies in the area of graffiti, the participant illustrated that after logging graffiti, *'it automatically sends a notification to the people who actually will clean up or will have to deal with the graffiti. They also have a tablet so they receive the notice and they can go and at the end they can close their job immediately'*. This reinforces the one platform solution found in the analysis of the previous case studies. The **one platform** hosting all solution will facilitate communication between the different mobile government solutions in the different areas of the one department, or the many government departments. This also highlights the benefit of immediate notification and response.

The mobile government uses wireless Internet technologies such as 3G and NextG to connect to government systems. The following Table 16 shows the technologies used in the different case studies discussed so far.

Table 16: Wireless networks used in different mobile governments

Case Study	QLDCC1	QLDCC2	NSWCC1	NSWCC2
Wireless Technology Used	3G & NextG	NextG	NextG	3G

The participant from QLDCC2 did not recommend 3G due to a slower speed than NextG, but despite the fact that NextG is used by three councils (QLDCC1,

QLDCC2, and NSWCC1), the NSWCC2 council did not utilise NextG. The participant explained that the council *'started with 3G [technology] by 3*[11] *and it was found that the connectivity was not that good in our area"*, so the council decided to change the provider and *"moved to Telstra"*. The participant justified not using NextG that "*We're waiting until that becomes a little bit more stable and widely used.*"

According to Telstra (2008) "Telstra's NextG network is the fastest national mobile broadband network in Australia. It has been built from scratch for future needs rather than a bolt-on upgrade of an existing system". NextG network "operates in a superior frequency range and has more base stations than its competitors. Thus, customers have access to higher download speeds". Table 17 below compares 3G and NextG.

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[11] According to (Hutchison 3G Australia Pty Ltd 2008), '3 is part of Hutchison Whampoa's global group of companies – one of Australia's biggest foreign investors, and an employer of over 230,000 people in 56 countries. 3 launched Australia's first 3G mobile network in April 2003. Today, over 2 million customers know first hand just how good it is to be 3. 3 provides live Mobile TV, full length audio and video music tracks, multiplayer games, Mobile Broadband, face to face Video calling and much more in 3's broadband zones'.

Table 17: NextG and 3G comparison

Criteria	3G Network	NextG Network
Provider	In Australia offered by Optus, Vodafone, and 3	Provided by Telstra
Frequency	Operates on 2100 MHz which provides less coverage	Operates simultaneously on 850/2100 MHz and also uses High Speed Downlink Packet Access (HSDPA). The 850 MHz is a lower frequency that provides a greater distance than the 3G, thus it adds the new feature of extended coverage.
Coverage	3G only covers the capitals and a limited number of other major city areas	Telstra's Next G™ network covers an area twice as large as any of our competitors. It covers an area of over 2 million square kilometres which means it covers 99% of Australia's population and provides superior coverage in more buildings, car parks, tunnels and lifts than any other 3G network in Australia. Figure 30 below depicts Telstra's NextG coverage map.
Speed	maximum of up to 7.2 Mbps	maximum of up to 3.6 Mbps

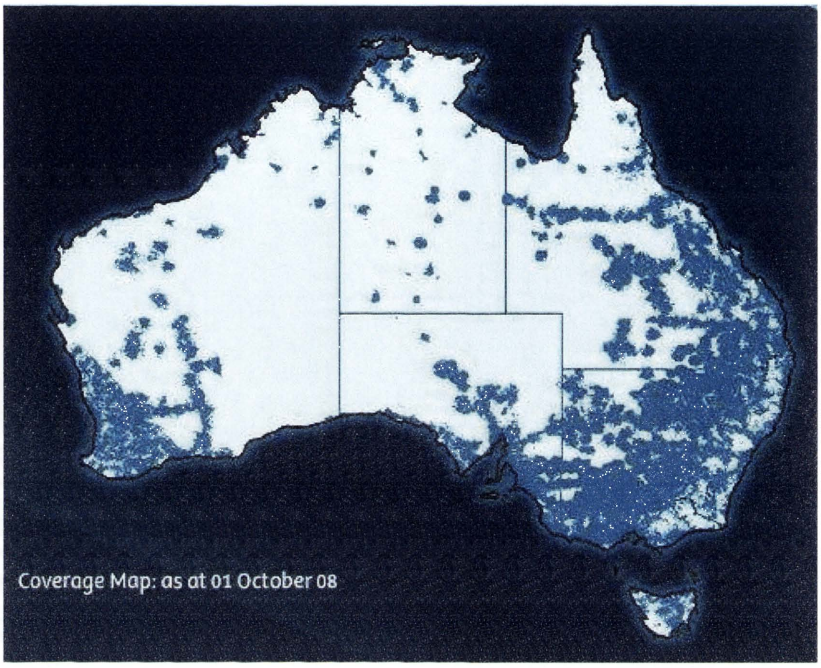

Figure 30: Map of Telstra's NextG network coverage (Telstra 2008)

Although Table 14 and Figure 30 above both show that the NextG network is superior to the 3G network, the council NSWCC2 has chosen 3G because *'It's better for their area'*. This highlights the value of selecting the provider network that provides the best coverage for the area the department services.

To sum up, in order to build a successful mobile government system and solutions, it is crucial to understand the following success factors:

- One platform solutions to be the core of the whole mobile government system
- Re-engineer work processes
- Utilise the devices that match the job requirements and consider future upgrades to improve the services

- Select the provider that best covers the department's area
- Select the wireless technology that is best provided in the department's area

8.2.8.Conclusion

This case study has revealed that *'in preparing* [for a successful mobile government] *there's a lot of pressure particularly on telecommunication expenses, on the network infrastructure and the security infrastructure'*. The analysis of this case study has revealed a number of new mobile government perspectives and their success factors to be added to those discovered in previous case studies to reach an adaptive mobile government framework. Table 18 below presents the success factors.

Table 18: Mobile government success factors - NSWCC2 case study

Category	Success factors
Devices	• Understand the job requirement • Understand the functionality and accuracy level required • Consider using merged technologies when appropriate
Constituents (Citizens)	• Evaluate citizens' readiness
Constituents (Employee)	• Proper consultation process • Proper change management • Proper training • Ease of use • Consideration of different users' age groups • Consider all potential occupational health and

Category	Success factors
Constituents (Employee) (Cont)	safety issues • Prioritise security over anything else • Educate users about security issues within the change management and training, • Research and implement the highest security measures with the least impact on the users • Change users' behaviour
Benefits	• Saving time (i.e. less commuting) • Service improvement • Immediate notification and response (discussed in the solution section) • Shorten the time of response to citizens' requests • *'Improved service delivery'* • Citizens' satisfaction, • *'Improve efficiencies'* • *'Cost reduction'* • Decreased overhead costs per position because of physical space saving • *"Improved accountability"* • *"There's definitely been savings on paper"* • Communication tool with the disabled citizens
Solutions	• One platform solutions to be the core of the whole mobile government system • Re-engineer work processes • Utilise the devices that match the job requirements and consider future upgrades to improve services • Select the provider that best covers the department's area • Select the wireless technology that is best provided in the department's area

8.2.8.1.Where to now?

The next chapter will discuss the last case study in the series of the Australian councils within the state of New South Wales (NSW).

8.3.New South Wales Case Study 3

The previous sections have discussed two New South Wales (NSW) case studies and revealed a number of mobile government perspectives and their success factors. This section discusses the third and last NSW case study in this international mobile government research. In this case study the participant highlighted the need to develop a mobile government definition when he said *'It's not one I've seen a specific definition of'*. This research has discussed and defined mobile government in Chapter 6, 'm-Government Fundamentals'. This case study discusses the mobile government devices, providers, stakeholder, benefits, and the mobile government system and solutions.

8.3.1.Introduction

This city council provides a range of services and facilities for residents, visitors and businesses. Approximately 180,000 people reside in 16 suburbs with a total area of 33.4 square kilometres under the NSWCC3's administration. Many members of the NSWCC3 population were born in a number of different countries and speak a variety of languages at home, such as English, Arabic (including Lebanese), Chinese languages, Greek, Korean, and Vietnamese (NSWCC3 2008).

To best serve its diverse community, the council set goals and core values, belief principles, ethics principles, business principles, quality principles, and is committed to involving all its stakeholders. Following is more information about the council:

Government level: City Council - Local Government Department.
The council will be referred to as NSW City Council3 (NSWCC3)
State: New South Wales (NSW)
Country: Australia
Council's Area: 33.4 square kilometres
Population: '130,000'
Number of Interviewees: One
Interviewees' Position: IT manager

8.3.2.The current use of WIRED Internet

This council, like the other Australian councils in these case studies, owns a website that provides **information** about:

- **The Council**: such as Demographics and interesting statistics, what's on, local town centres
- **Council and meetings**: such as Mayor and councillors, Council meetings, City Plan and budget
- **Community and Residents**: such as community development, centres and safety
- **Business and Industry**: such as food and health inspections, recycling and waste disposal for business
- **Building and Development**: such as general building information, development application process, and codes and policies
- **Library and Heritage**: such as Library catalogue and patrons' details
- **Environment and Health**: such as health facilities and stormwater and drainage
- **Waste and Recycling**: such as waste and recycling tips
- **Roads and Traffic**: such as traffic management, street signs and footpath

In addition, this council also offers a number of **online services** such as:

- **Payments**: paying rates online using credit card and direct customers to the State Debt Recovery Office website to pay fines
- **Development Application (DA) tracking**: Tracking DA and downloading applications forms and checklists
- **Community Services**: community directory and disability services
- **Roads and Traffic**: such as parking and permits
- **Library catalogue**, such as online tutoring, booking a computer, and online databases

8.3.3.The current use of MOBILE and WIRELESS Internet

The participant advised that there already are a number of implemented mobile government solutions in the council, along with others under development. The council has '*got a variety of devices that use wireless technology and has a variety of areas that get a benefit from using them in, or will very soon*'. The participant explained that *'the predominant use is by various types of rangers'*, such as *'rangers that go out looking for stray dogs ... and parking officers'* in addition to *'a number of managers that keep in contact through Blackberry's PDA'*. The participant said that *'the newest* [mobile government solution] *that we are about to implement ... is our immunisation clinic'* solution.

The immunisation clinic is a free Government to Citizen (G2C) service for babies and toddlers and is provided because the *'council is responsible for immunisation of children'*. The immunisation clinic solution consists of *'software that keeps track of who's got what immunisations and our staff go out and organise these*

things'. Table 19 below compares the old immunisation solution and the new mobile one.

Table 19: Old immunisation solution compared to the mobile one

Old immunisation solution	Mobile immunisation solution
'Staff downloaded a copy of the data base onto a laptop, they've taken it filled it in, brought it up and then replaced the existing copy with the updated copy.'	A number of wireless devices are plugged into laptops to get them Internet connectivity and Citrix applications are published to these laptops. As a result, the employees are able to directly manipulate the database out in the field in real time.

The implementation of the mobile immunisation clinic solution has resulted in many **benefits**. The participant listed the following:

- **Fewer errors**: *'eliminate duplication and possible confusion between two sets of databases'*,
- **Easiness**: *'easier for everyone involved because it's real time; they can check information on the Internet'*, and
- **Higher accuracy**: *'since there's no chance that the database can get out of sync so therefore there's no chance that anybody could ever get a wrong record for a particular child of what injections they've already had or pills they've already taken. That hasn't been a problem but if* [we] *can eliminate it even happening then it's a good thing'.*

The participant also discussed the use of mobile and wireless technologies by *'some individual directors to access ... the email product'* to communicate with the council *'when they are off site at conferences or sometimes at their homes where they've got poor Internet connection but good wireless reception'*.

8.3.4 Devices

The participant discussed that the mobile devices used are *'various forms of PDA, like Blackberry; HP iPAQ & i-mate'*, and *'in the type of remote computing, like personally carried devices, there are several different environments that we're* [the council] *looking at* [such as] *tough-book laptops'*.

The participant in his discussion of mobile government solutions explained that the data entry requirement is a factor in selecting the mobile devices to utilise in the solution. For example, for *'anything that involves a lot of data input, PDAs are not very good'*, whereas *'laptops have full keyboard, and a full size screen'* which *'actually makes a big difference for the ease of inputting information ... such as inputting a lot of data into a database like names, addresses and times and dates of birth'*, or incident reports.

In addition to the data entry requirement, the participant stressed the suitability of the device for the work environment. He explained that the work environment dictates the nature of the mobile device. For example, if the work of a business unit requires a large amount of data entry and access to the main systems, then mobile computing capabilities along with hardware specifications such as large keyboard and screen are required, and this suggests selecting laptops. If, due to the work environment, the laptop *'is going to be thrown into the back of trucks,*

and going to carried around in dusty and dirty environments', then robustness is required, but *'you cannot build that kind of robustness into anything without using strong materials, and nobody is making super strong carbon fibre laptops at the moment, so they put melding on to make them stronger and that makes them heavier'*. The job and environment requirements suggested utilising *'tough-books'*.

Although utilising tough-books met the business requirements, the participant said that *'one of the people involved in that came back and complained that they were too heavy'*. This highlights the Occupational Health & Safety (OH&S) issues discussed in the second NSW case study. The participant from NSWCC2 discussed that although mobile devices such as laptops offer great convenience, they pose possible OH&S issues, such as neck or shoulder strain due to their heavy weight and the possible need to carry it for long hours. Although the participant from NSWCC3 acknowledged the OH&S issues, he recommended utilising laptops over PDAs. He argued also from an OH&S perspective that, despite the *'PDA's major benefit of portability'* because of size and light weight, there are *"a lot of arguments against PDAs on the basis of the difficulty typing, the smallness of the screen and the eye problems that are potentially associated with that'*. The participant explained that PDAs are suitable for very limited data entry such as *'reading barcodes with a barcode reader or taking photographs'*. This highlights the importance of considering all possible OH&S issues when selecting mobile devices. The discrepancy between the requirements of the work environment for specific mobile devices and OH&S suggests the need to develop ergonomic principles and guidelines.

To wirelessly connect to the main system supporting a specific solution, a wireless broadband modem (i.e. USB key modem) is needed, which is plugged into the mobile device (i.e. laptop). The participant discussed the importance of sourcing modems that do not *'project over a certain degree over the side of the laptop, because they get caught when they get put in the bag, and they get jerked around'* while commuting. He explained that *'they are plugged into the mother board so they can damage the mother board'*. This emphasises the importance of selecting durable devices that do not cause breakage to a more expensive device such as the laptop. For example, a USB dongle could be used instead of a USB key, or the latest laptops with built-in Wireless HSDPA Network Adapters could be considered.

To sum up, a successful mobile government solution requires a mobile device that suits the nature of work. The case study has revealed the following success factors to aid in making an informed decision about mobile device selection:

- Amount of data entry required
- Work environment requirements
- OH&S considerations
- Ergonomic principles and guidelines

8.3.4.Mobile Government Constituents

The council has implemented a number of G2E services, but no G2C services have yet been implemented. The following subsections reveal the G2E services success factors.

8.3.4.1.Government to Citizen (G2C)

The council does not provide any mobile government G2C services. The participant explained that this is due to there being *'no demand from customers'*. He also explained that for the council or government department to develop such services, *'statistics on the number of connected residences'* is required. Tables 20 and 21 depict the age structure and Internet use within the NSWCC3 area which could be used as an indicator for the possible use of mobile government, but what is required is a census on the use of mobile devices and the wireless Internet within the community.

Table 20 NSWCC3 age structure (id 2006)

Age Structure	Numbers	%
Infants 0 to 4 years	9,449	7.3
Children 5 to 17 years	21,564	16.6
Adults 18 to 64 years	81,409	62.6
Mature adults 65 to 84 years	15,644	12.0
Senior citizens 85 years and over	1,898	1.5
Total persons	129,964	100.0

Table 21 NSWCC3 Internet use (NSWCC3 2008)

Type of Internet connection (household)	% NSWCC3	% Sydney Statistics
Broadband	34.8	45.0
Dial-up	15.8	16.5
Other connection	0.8	0.7
Total Internet Connections	51.4	62.1
No Internet connection	38.4	29.0
Internet connection not stated	10.2	8.9
Total	100.0	100.0

8.3.4.2.Government to Employee (G2E)

In his discussion of mobile government solutions the participant expressed the view that *'you can introduce technology and it can have an immediate benefit to people to use straight away, or it might need them to be trained on how to get that benefit'*. The need for training depends on the device used and the technological literacy of the user.

The participant observed that *'a lot of people come out of school and university with very good skills but no knowledge of what the skills are for in the real world'*. This discrepancy suggests that even technologically literate users might need some training to learn the proper use of technology within the context of their organisation. The participant discussed the example of *'introducing a user to a spreadsheet'*. He said that *'the average person coming out of school now knows how to use a spreadsheet'*, but users *'do not know what a spreadsheet is for* ***in a given organisational context*** *so they've got to be educated on where to use the spreadsheet and what to do to extract from the spreadsheet and ... the best methods'*.

The mobile government system has to comply with data protection legislations, the Privacy Act, conditions of employment, and policies. This compliance requires high security measures to protect the data and information. Compliance with the legislation is a key success factor in convincing stakeholders to use mobile government services. To sum up, the following are G2E success factors:

- Provision of the required training
- Compliance with data protection and privacy legislation

8.3.5.Benefits

According to the participant, *'there's a lot of benefits'* to implementing mobile government services. He noted that *'there's a clear advantage to the wireless connection ... [such as] better **protection**, greater **security**, and greater **ease'***. He observed that with *'wireless connectivity you can maintain virus updates to keep the machines running better'*. Wireless connectivity ensures immediate update to systems such as the mobile government applications and the operating systems. According to the participant this is an important feature of mobile government; for example, in the case of daylight savings, the time on a connected device will automatically be adjusted, which is not the case with an offline machine.

For offline machines such as those used in the old immunisation clinic solution, they *'will be an hour out and that makes a lot of difference if you are looking at records and say, well, this record was created at 10:25 when it was actually created at 11:25 or 9:25'*. The participant also mentioned that in the case of no connectivity *'we* [the council] *have to find a free staff member'* to update the machines.

Although the connected machines are vulnerable to malicious attacks such as viruses and spyware, connectivity adds a data protection security feature. For instance, if an offline machine in the old immunisation solution were to crash, get lost or stolen, then the data relating to those children would be at high risk of loss or improper use. The participant illustrated that by suggesting *'the worst case scenario for stolen information would be* [access to] *children's details by a paedophile'*. The mobile immunisation solution stores data in a centralised database and thus prevents data loss.

This database *'isolates data from individual device destruction'* and allows immediate update, backup, and restoration of data. The participant explained that the database *'server's rate of failure is very much lower than an individual laptops, plus it gets backed-up at night, plus it's got power protection built in, plus it's in a secure room in a building that you basically have to blow-up to destroy'*. In case of device loss or theft, the offenders would not find any data on the machine and they cannot access the database because of the many security levels. Thus, according to the participant, *'it is much safer and you get that safety simply by putting in a wireless connection'*. Table 22 below compares the drawbacks of the old immunisation clinic to the benefits of the mobile one.

Table 22: Connectivity benefits

Risk	Old immunisation clinic	Mobile immunisation clinic
Device Failure	• Machine maintenance • Possible **data loss**	• Machine maintenance • **No data Loss**: data is backed up • Immediate restoration of data
Device Loss	• **Data loss** • Possible **access to data**	• **No risks** in case of high security measures implemented • **No data loss**: data is updated • Immediate restoration of data
Device Stealth	• **Data loss** • Possible **access to data**	• **No risks** in case of high security measures implemented • **No data loss**: data is updated • Immediate restoration of data
Duplication	• Possible *'data diversion'* • Possible *'numerous copies of data'* • Possible Confusion of which is *'current data or the accurate one'*	• **One centralised copy of data** that *'is always up to date'*

The participant highlighted that mobile government services have *'given the possibilities to reach and work at sites* [where] *we never could do it before'*, saying that *'you can set up a temporary office somewhere'*, for example, to do work such as setting up a site office in disaster areas to attend to citizens' needs.

To sum up, the participant discussed the implemented mobile government solutions in his council and highlighted a number of benefits. In his discussion, the participant advocated mobile government systems and concluded that *'I would imagine by the end of this year* [2008] *that we're going to have much greater deployment of mobile devices'*. The following lists the discussed mobile government benefits:

- Auto systems and solutions update
- Auto antivirus update (critical for security and privacy reason)
- No duplication of data (fewer errors)
- Ease of use
- Higher accuracy
- Added data safety and security

8.3.6.Providers

Implementing mobile government solutions is *'cost effective ... when the cost of wireless Internet ... is sufficiently low because of competition'*. This highlights the importance of liberalising the telecommunication sector. The low price advantage motivated the council to connect more sites where they would previously have hesitated to do so because the cost was prohibitive.

The participant admitted that the council *'did not really start thinking about this* [implementing mobile government solutions] *as practical until the* ***costs came down'***. He justified that position, saying that although mobile government solutions are *'very lovely thoughts and they are very useful, but the business process pushing them was fairly low, but once it became cost effective then it was a matter of saying, well, there's a lot easier way to do this now'*. This illustrates that the demand for mobile government solutions comes from the business, and that businesses demand cost effectiveness from providers.

The participant highlighted the speed of the wireless Internet provided. He discussed that the wireless Internet speed utilised in his council *'averages between 1.2Mb-1.5Mb and that's a good speed'* compared to the 512Kb wired Wide Area Network (WAN) used within the council.

Mobile government solutions do not usually *'operate 24hrs a day'*. Thus, the low cost and speed advantage coupled with the sporadic use of mobile government solutions makes the wireless connection ideal for *'getting services to areas that we* [the council] *couldn't deliver to anymore'*.

Coverage is another factor highlighted by the participant when he explained that *'local government areas are bounded'* and thus *'wireless reception'* is not an issue. This highlights the relevance of the department's area to the coverage percentage provided by the different networks. The higher the percentage, the better the provider. The participant noted that Local Government Area (LGA) departments *'can use whoever's got the best price'*, as most networks would provide the needed coverage for that area compared to *'a state government*

authority that is covering a much larger area' which would have to go for *'Telstra which has got the widest coverage'*.

In his discussion of the mobile government system, the participant discussed the commercial nature of the current wireless technologies. This highlights the need to consider the stability and ability of Commercial Mobile Services (CMS) providers to maintain the provision of the wireless technologies that support the mobile government system.

The participant discussed the cost and speed factors. He explained that the mobile government solutions in his council are using the 3G network (Hutchison 3G Australia), similar to NSWCC2. He explained that in addition to the *'cheaper price advantage',* the 3G network provides double the speed of Telstra's NextG network. The participant also mentioned the compatibility factor with other networks, explaining that the wireless modems provided by Hutchison 3G Australia to access their 3G network are compatible with Telstra's NextG network, so they can automatically switch to Telstra's NextG if the 3G network is down or out of range. This supports the idea of sourcing a provider with low cost and faster speed. It also indicates the advisability of using providers that are partnered with others whose network can be used to extend their own network, or in emergencies.

Finally, the participant noted that the reliability, reputation, and the immediate support of the provider are factors that must be considered. For example, *'although it might not make sense'*, he recommended using a major vendor's wholesaler (e.g. Optus) rather than the major vendor themselves (i.e. Telstra). He highlighted that wholesalers would appreciate and attend to small customer

needs more than the major vendor would. He explained that *'when you deal directly with the major vendors, their direct support is not as good as the wholesale support, because Optus deals with Telstra with hundreds of millions of dollars, and they demand a level of service and Telstra responds better to them, but you dealing with Telstra is thousands of dollars, and you can ask for whatever you like, but they'll give you what they feel like'.*

To sum up, the participant stressed that selecting the right provider is crucial to the success of the mobile government solutions, and the case study revealed the following provider success factors:

- Coverage
- Price of service provision
- Stability of providers in the long run
- Provider's partnership agreements with other providers
- Low cost
- Services speed

8.3.7.Mobile Government System and Solutions

The mobile government provides 'anytime, anywhere' I'*access to the main system* [within the department]. *This system has all kinds of governance controls* [such as] *back-up systems, security and disaster recovery'*. Since the main system is an electronic government (e-Government) system, then adding the wireless and mobile technologies to the existing system gives the mobile government all the benefits of the e-Government system. This highlights that the mobile government system is an extension of an existing e-Government system. This finding accords

with the online survey findings discussed in Chapter 6, 'm-Government Fundamentals'.

The participant observed that *'wireless technology is* ***not a business level service,*** *but it is a* ***simple commercial service*** *which means that its guaranteed up-time is not the same as you would have for a business'*. This highlights the stability issue of wireless technologies when considering converting the whole e-Government system to an m-Government one. At the moment, *'the type of usage* [of m-Government solutions] *is sporadic, so it is not going to be operating 24hrs a day. Thus, it does not require 24hrs up-time 99.9%'*.

The participant acknowledged that *'security is an issue'*, and explained that the mobile government solutions implemented in the council are using thet CITRIX system; he noted that *"'it is difficult to hack CITRIX systems, very difficult ... because it is encrypted'*. This highlights researching the highest security measures and encryptions. The participant also stressed the importance of installing *'anti-virus and anti-spy software on the mobile devices'*.

The participant discussed the importance of understanding any possible interception during transmission and reception. For example, *'a wireless receiver that is listening in that cell where the mobile device is'*. But the participant acknowledged that *'once the signal gets into the cell and into the backbone, it's probably untouchable, because those backbones are very well protected by the various phone companies'*. To sum up, the participant emphasised on understanding all possible security issues to achieve a successful m-Government.

8.3.8.Conclusion

The analysis of this case study has revealed a number of mobile government perspectives and their success factors to be added to those discovered so far in previous case studies to reach an adaptive mobile government framework. Table 23 below presents these success factors.

Table 23: Mobile government success factors - NSWCC3 Case Study

Success Category	Success factors from NSWCC3 Case study
Devices	• Amount of data entry required • Work environment requirements • OH&S considerations • Ergonomic principles and guidelines
Mobile Government Stakeholders (Citizens)	• Collect census • Judge demand
Mobile Government Stakeholders (Employees)	• Provision of the required training • Compliance with the data protection and privacy legislations
Benefits	• Auto systems and solutions update • Auto antivirus update (critical for security and privacy reasons) • No duplication of data (fewer errors) • Ease of use • Higher accuracy • Added data safety and security
Providers	• Coverage • Price of service provisioning • Stability of provider's on the long run • Provider's partnership agreements with other providers • Low cost • Service speed
Mobile Government Systems and Solutions	• Understand all possible security issues

8.4.Chapter Conclusion

Table 24 below summarises the success categories and their relevant factors, as found in the three NSW case studies.

Table 24: m_Government success categories/factors from NSW case studies

Success Category	Success factors from the NSWCC1 Case study	Success factors from the NSWCC2 Case study	Success factors from the NSWCC3 Case study
Drivers	• Work flexibility in accessing the corporate systems anywhere, any time		
Solutions	• Good network coverage • Research similar mobile government projects to learn from • Proper selection for the access devices • User friendly applications • Easy to use applications • One platform solution, • Role of change management	• One platform solutions to be the core of the whole mobile government system • Re-engineer work processes • Utilise the devices the match the job requirements and consider future upgrades to improve the services • Select the provider that best cover the department's area • Select the wireless technology that is best provided in the department's area	• Understand all possible security issues

Success Category	Success factors from the NSWCC1 Case study	Success factors from the NSWCC2 Case study	Success factors from the NSWCC3 Case study
Security	• Meet the duty of care • Implementing highest security measures to protect information • Not relying on providers' recommendations		
Constituents (Citizens)	• Determine demand • Use proper surveying tools	• Evaluate citizens' readiness	• Collect census, • Judge demand
Constituents (Employee)	• Staff Training to use the solution • Staff training to grasp the benefits and gain approval • Staff readiness • Change management role • Staff involvement in solution testing	• Proper consultation process • Proper change management • Proper training • Ease of use • Consideration of different users' age groups • Consider all potential occupational health and safety issues • Prioritise security over anything else • Educate users about security issues within the change management and training • Research and implement the highest security measures with the least impact on the users • Change users' behaviour	• Provision of the required training • Compliance with the data protection and privacy legislations

Success Category	Success factors from the NSWCC1 Case study	Success factors from the NSWCC2 Case study	Success factors from the NSWCC3 Case study
Providers	• Skilled IT division to assist in selecting providers • Provider's ability to provide the required security • Cost saving • Application vendor's ability to provide user friendly solutions • Application vendor's ability to respond to future expansion • Consider providers used by other departments • Provider's network coverage and its reliability • Network reliability • Provider's assigned personnel to manage the department's needs		• Coverage • Price of service provision • Stability of providers in the long run • Provider's partnership agreements with other providers • Low cost • Service speed
Benefits	• Time saving • The amount of paperwork saved • Better allocation of jobs • Ability to do work from home rather than to commute • *'Flexible work arrangement, that we can add to retain staff'*	• Saving time (i.e. less commuting) • Service improvement, • Immediate notification and response (discussed in the solution section), • Shorten the time of response to citizens' requests	• Auto systems and solutions update • Auto antivirus update (critical for security and privacy reason) • No duplication of data (fewer errors) • Ease of use • Higher accuracy • Added data safety and security

Success Category	Success factors from the NSWCC1 Case study	Success factors from the NSWCC2 Case study	Success factors from the NSWCC3 Case study
Benefits (Cont)	• Job distribution while workforce in the field, rather than *'them having to come in'* • Increase work efficiency and meeting deadlines	• *'Improved service delivery'* • Citizens' satisfaction, • *'Improve efficiencies'* • *'Cost reduction'* • Decreased overhead costs per position because of physical space saving, • *'Improved accountability'* • *'There's definitely been savings on paper'* • Communication tool for disabled citizens.	
Government Role	• Devise a mobile government policy for all related parties to follow • Liberalisation and not privatisation of the telecommunication sector		
Devices		• Understand the job requirement • Understand the functionality and accuracy level required • Consider using merged technologies when appropriate	• Amount of data entry required • Work environment requirements • OH&S considerations • Ergonomic principles and guidelines

8.4.1.Where to now?

This case study is the last of the Australian case studies. The next chapter will discuss the International case studies from the countries of Jordan and the United Arab Emirates.

CHAPTER 9

9.International Case Studies: Jordan & United Arab Emirates

This chapter reflects on four international case studies in the countries of Jordan (two case studies) and the United Arab Emirates UAE (two case studies). The interviews were conducted in person in both countries and discussed the mobile government systems implemented in the participating departments. The analysis of these case studies generated a number of new and different perspectives of mobile government and related success factors that must be considered when planning for and while implementing a mobile government system in any country. The rationale behind researching International case studies is to ascertain any country-based differences in order to devise a general mobile government framework.

9.1.Case study of Jordan

'I believe that in the coming years most governments will go towards the m-Government' (A Jordanian federal government interviewee)

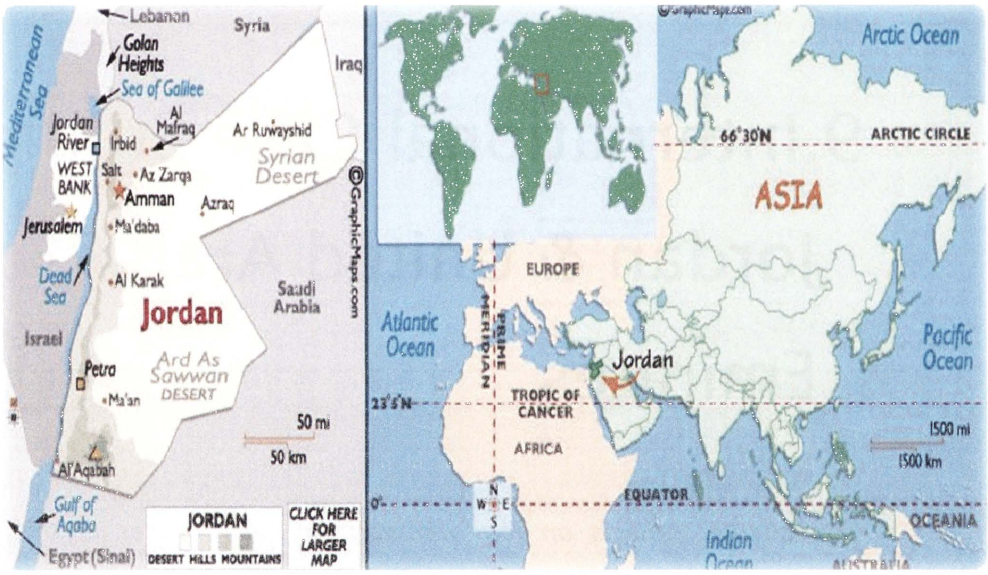

Figure 31: Location and map of Jordan (World Atlas 2008a)

9.1.1.Introduction

This case study discusses the mobile government implemented in one federal department and one state department in Jordan. The state department is a commercial government-owned company that is run by the private sector and administered by the government. For ethical reasons, the information is de-identified. Thus, the researcher will **refer to** the federal government department

as **JorFed** and the state department as **JorState**. To distinguish the interviewees at state level, they will be referred to as JorState01, JorState02, and JorState03.

Government level: Federal and State Government Departments
City: Amman (capital of Jordan)
Country: Jordan
Country Population: 6,198,677 est. at July 2008 (Central Intelligence Agency (CIA) 2008a)
Number of employees: '1200' within JorState and unknown within JorFed,
Number of Interviewees: One from JorFed and Three from JorState,
Interviewees' Position: IT manager from JorFed, Customer Service Manager JorState01, IT Director JorState02, and Head of Customer Information System (CIS) and Quality Unit JorState03.

Table 25 Facts about Jordan (Central Intelligence Agency (CIA) 2008a)

No. Of Telephone Landlines 585,500 (2007)	No. Of Mobile subscribers 4.771 million (2007)
No. Of Internet Service Providers (ISPs) 5	No. Of Mobile Service Providers 4
No of Internet Users 1.127 million (2007)	

Despite the rapid adoption of ICTs in Jordan, 'Internet penetration remains modest and slow-growing" (Central Intelligence Agency (CIA) 2008a).

9.1.2.The current use of WIRED Internet

Jordan's e-Government initiative was launched by HM King Abdullah II in 2000. According to the (Ministry of Information and Communication Technology (ICT) 2008), the following departments of **JorFed** are now providing e-services:

- Government Tender Directorates
- Income Tax
- Jordan Customs

- Ministry of Industry & Trade
- National Information Technology Centre
- Departments of Lands and Surveys
- Housing and Urban Development Corporation

The **JorState** department also owns a website that provides information about the department (i.e. department's profile, vision & mission, planning and investment, the department's achievements), and information for customers (i.e. documents required for a specific application, location of department offices). According to interviewee **JorState01**, the department is considering providing e-payment services soon.

9.1.3.The current use of MOBILE and WIRELESS Internet

The Jordan e-Government program has launched its SMS gateway to *'to increase the communication channels with the citizens and government services users'*. SMS technology has been chosen as an effective method to communicate with citizens. The gateway provides mobile services through both pull messages (messages sent upon customer's request) and push messages (messages sent to customers without their request).

The mobile services are accessed through a designated number (94444) which is fixed through all mobile services providers. Currently, there are twelve government agencies utilising the mobile gateway to communicate with their customers. Table 26 lists most of the departments and their provided mobile services.

Table 26: SMS services in Jordan (Jordan e-Government 2008b)

Government Department	Service(s) provided
Civil Service Bureau	• Competitive Ranking
Driver and Vehicle License Department	• Vehicle license expiry date
Government Tenders Directorate	• Announcement for New Tenders • Inquiry about Specific Tender • Inquiry about Specific Contractor
Greater Amman Municipality	• Vehicle Traffics Complaints
Housing and Urban Development Corporation	• Notifications about housing & land tenders
Income and Sales Tax Department	• Tax balance / Individuals • Tax balance / Corporate
Jordan Meteorological Department	• Weather Forecasting
Jordanian Customs	• Inquiry about vehicle custom, • guarantee orders • Temporary Admission for goods • Transit Guarantees
Jordan Water Company-Miyahuna	• Water Bills
Royal Cultural Centre	• Activities of Royal Cultural Centre

According to (Jordan e-Government 2008b), the SMS gateway 'aims to increase the communication channels with the citizens and government services users'. The participant **JorFed** explained that most government departments were officially informed about the initiative. The departments were asked to provide their *'feedback on the initiative'* along with *'what kind of services they want, what was the expected volume of SMS to be sent, and whether they have customer base or not'*.

Although most departments were contacted, only twelve government departments are utilising the SMS gateway. According to (Jordan e-Government 2008b), this is due to:

> lack of support extended by the leadership of other public organizations; resistance to change; inability of other public to institutions to improve

their services, sustain or define them; insufficient human expertise available in this field plus the inability to recruit or sustain current expertise.

The **JorState** department has been using a mobile government solution for entering meter readings and issuing on-the-spot bills to customers. The solution depends on a complicated up-to-date backend system. The solution records the time and the location of any transaction made (i.e. entry of meter reading). According to interviewee **JorSta01**, *'the solution will be soon enhanced with Geographical Information System (GIS) to direct the ranger to the location of any meter'*. The solution also sends an SMS to its customers reminding them of bill due dates. According to **Jordsta01**, the implementation of the mobile government solution has produced many benefits such as:

- Not missing any meters
- Zero errors
- Indirect monitoring of workforce to evaluate their efficiency and effectiveness
- Ensure delivery of bills
- Customer satisfaction

JorState01 also noted that such services *'give a bright image of the country, which aids in attracting foreign investments'*.

9.1.4.m-Government vs e-Government

The Jordan e-Government (2008b) website explains that the SMS gateway is an e-Government initiative. The **JorFed** interviewee noted that the Jordanian m-Government has been *'approved as a strategy of the e-Government program'*,

thus, it is considered a subset of e-Government. The participant discussed that the inclusion of m-Government under the e-Government umbrella is due to power of the Jordanian e-Government program *'in which e-Government is responsible to provide such services on behalf of all government entities in Jordan'*. This means that m-Government was framed within the e-Government initiative to empower it to achieve the potential benefits.

Despite considering the m-Government as a subset of e-Government, the **JorFed** participant stated that countries with immature or no e-Government program can *'definitely implement m-Government'*. He explained that it is possible *'if they have a ready mobile infrastructure'*, but e-Government services are still required *'because there are many services you cannot introduce through mobile devices'*. This highlights an m-Government restriction due to the limitations of the access devices such as screen size, and the small keyboard.

Although Jordan has four mobile operators none of them provide 3G services. Jordan's m-Government services are restricted to the use of SMS technology to provide basic information services. The **JorFed** participant commented that *'I believe that in the coming years most governments will go towards the m-Government, especially as most countries of the world will transform to 3G'*. He explained that 3G technologies *'will enhance and enrich the services and* [will enable developing] *... more services, compared to what we have nowadays'*. This highlights the need for 3G technology at a minimum to enhance the m-Government services to higher levels (i.e. transactional levels).

The **Jorfed** interviewee acknowledged the role of 3G networks in generating demand for m-Government services. He explained that *'once the 3G is*

introduced ... definitely the mobile usage will be increased dramatically and there will be a need to use the m-services'. This highlights that governments should consider and start planning for m-Government before licensing the 3G communications technologies. This will help governments to set the conditions for its m-Government program in its own interest when tendering for 3G. The compliance of the new mobile service operator in supporting the m-Government program would encourage other existing competitors to do the same to keep their share in the market, for fear of losing their customers.

To sum up, the maturity level of the e-Government services could dictate the degree of independence of the m-Government services. In other words, m-Government could be a standalone program in the absence of an e-Government program, or as a result of the immaturity of same. The ability of the m-Government program to provide higher levels of services depends on the availability of the required infrastructure and technologies such as 3G.

9.1.5.m-Government team

Regardless of whether or not m-Government is a subset within e-Government , an m-Government team or department is required. The **JorFed** participant explained that it is necessary *'to have a dedicated team to support this kind of services'*, and such a team must be led by an enthusiastic leader. The participant emphasised the role of the m-Government team *'for different reasons, for example: for benchmarking, for evaluation, for assessment, for comparing, for research, for market research internally and externally'*. The team also needs *'full assessment of the experience of other countries'*.

The selected m-Government team must be *'multi-skilled'*. The participant recommended that the team should have backgrounds in:

- Mobile and wireless technologies
- Telecommunication sector
- Mobile services
- Government services

For the team to succeed in promoting m-Government services to all government entities and implementing them in these entities, the team *'needs the support and cooperation from all those entities'*, otherwise, *'they will not succeed'*. In order to obtain the cooperation of all departments, the **JorFed** participant emphasised that *'definitely, the team shall have power'* to face all barriers and demand all stakeholders to cooperate.

The m-Government program requires a dedicated budget. The **JorFed** representative acknowledged that *'definitely there should be a separate budget'* for m-Government, but he could not estimate the amount of such budget. He concluded that *'having an m-Government department is like delivering a baby that will grow up in time, so if you want to transform to m-Government, your budget shall be very flexible'*.

The budget should have learning and experience sharing expenditures such as attending conferences and running training programs. The **JorFed** participant explained that *'it is very important to share experience with more advanced countries* [which preceded] *Jordan in implementing'* mobile government services.

He identified *'reducing efforts, time, and money'* as benefits resulting from experience sharing and learning lessons.

The **JorState01** interviewee emphasised the benefits of experience sharing. He mainly recommended *"attending specialised international conferences where country experiences are presented'*. He also said that *'this aids learning from others'*, and that it was valuable to *'find a country with mutual characteristics to specifically learn from their experience and implement it in your country'*.

To sum up, the following success factors should be considered when planning for m-Government:

- Dedicating a separate m-Government budget
- Selecting multi-skilled team and leader
- Training
- Sharing experience with advanced m-Governments
- Empowering the m-Government team to demand cooperation from all government entities and the mobile operators

9.1.6.m-Government Stakeholders

The participant from **JorFed** highlighted mobile literacy as a success factor. He explained that *'I believe that the Jordanian citizens have the best skills of using the mobile handsets in which they will not have any barrier to utilise any government service introduced through mobile handset'*. He also explained that literacy by itself is not enough, but it is the customer's *'happiness and satisfaction'* resulting from *'the positive experience'* of using the m-Government services.

The high mobile technology literacy of Jordanian citizens is due to the high level of competition between the four mobile operators. This number of mobile operators with a *'tendency to introduce a fifth operator to the market'* is a result of the liberalisation of the telecommunications sector in the country. This high competition in the Jordanian mobile market has resulted in the following:

- *89% mobile penetration compared to 18% Internet penetration*
- *64% of all mobile users have more than one subscription*
- *If you exclude the inhabitants aged less than 15 years old, the penetration rate of mobile usage goes up to 133% which I think will increase within few years, especially there is a tendency to introduce a fifth operator to the market.* (JorFed interviewee).

The high literacy in mobile technologies together with the competition among mobile service providers has allowed for the introduction of premium mobile services in the country. The **JorFed** participant said that *'mobile users in Jordan currently use different entertainment services through mobile handsets with premium rate'* and maintained that *'if you can provide government services with less rates I believe they will utilise it'.* This suggests considering the use of premium services as an indicator of the future use of mobile government services. It also highlights the consideration of a fair price for mobile government services. The Jordanian e-Government program has introduced mobile government services with affordable charges and, according to (Jordan e-Government 2008b), the e-Government Program has twice reduced the cost of mobile government services to expand its use. This highlights the significance of the cost factor in extending the adoption of the m-Government services.

The **JorState02** participant discussed the partnership between the government departments, and between the departments and mobile operators. He explained that *'the partnership with the private sector is required and important'*, and recommended *'partnering with all mobile service providers because the government cannot and should not force the citizen to subscribe to a specific provider'* to access mobile government services.

To sum up, to achieve successful m-Government services (and incidentally, demand for G2C), the following must be considered:

- Liberalisation of the telecommunication sector and allowing competition in the market;
- Addition of conditions related to supporting the m-Government program when tendering for licensing a new mobile service provider;
- Provision of m-Government services through all available providers;
- Mobile technology literacy;
- Provision of a positive experience when using the services for the first time;
- Citizens' happiness and satisfaction using the services;
- Consideration of the use of premium mobile services as an indicator;
- Fair charges for the m-services.

9.1.7.Marketing m-Government services

Marketing is essential factor in informing and extending the use of m-Government services. **JorState01** recommended "*conducting as many pilot trials*

as possible for each [developed m-Government services] to ensure its functionality and stability" before marketing the service. The **JorFed** participant recommended conducting a marketing campaign in which most or all media channels should be utilised such *'as newspapers, flyers, brochures, TV, sending bulk SMS to the customer base of all mobile operators informing them about the new services'*. This participant also recommended evaluating the campaign to measure its *'effectiveness and efficiency'* to improve future campaigns. To conduct such an evaluation, it would be necessary only to *'monitor the number of hits or the utilisation of these services through the mobile operators'*. This again highlights the role of mobile operators in the evaluation and promotion of mobile government services. To sum up, the following are the m-Government marketing success factors:

- Ensure functionality of the services offered prior marketing
- Utilise most/all available media
- Evaluate each marketing campaign for future improvements

9.1.8.Characteristics of m-Government services

The **JorFed** participant felt that users should have a positive experience using m-Government services for the first time. He suggested that a positive experience is the product of *'having the information as simple as possible, easy to be accessed services, easy to be used services, easy to be learnt'*. For this reason, the Jordanian m-Government team has developed a Java application to assist customers to access their desired service.

This application provides a menu of m-Government enabled departments, and after selecting the department, it lists the m-services provided by the selected department. The **JorFed** interviewee stated that such an application eases the interaction with the m-Government portal. The application, according to this participant, should be in the main spoken language of the country, in addition to being available in other spoken languages in multi-cultural countries. The participant again emphasised monitoring the *'number of visitors per service, per mobile operator'*. To sum up, m-Government services need to have the following are some characteristics:

- Ease of use
- Simple to navigate
- Easy to learn
- Introduced in the county's spoken language
- Translation to other language if necessary

9.1.9.Security of m-Government services

The **JorFed** participant reiterated that the Jordanian m-Government is only providing basic informational services, and that *'currently there is not any transactional services though the mobile services'*. These basic informational m-Government services *'do not need sophisticated security measures'*. Security is not a major issue as there are no personal data exchanges through the m-Government channel, but the **JorFed** interviewee stated that security is a major issue for m-Government that should be handled professionally. He further explained that since the Jordanian m-Government is a subset of its e-Government program, it is the responsibility of the security team within the e-

Government unit to deal with the issue, until a dedicated m-Government team is assigned to administer the m-Government program. To sum up, the level of m-Government security depends on the functionality level of its services. The higher the functionality (i.e. transactional), the higher is the required security, and the greater the need for a specialised m-Government security team.

9.1.10.m-Government Vision & Mission

Although the Jordanian m-Government program does not have a vision or a mission, the **JorFed** participant recommended setting an m-Government vision and a mission. He said that *'we do not have a clear plan for the coming few years'* precisely because of a lack of an m-Government vision and mission. Thus the participant advocated *'having a clear plan and strategy vision with set objectives and time of goals, action plans to be completed and finished within set time frame'.*

Interviewee **JorState01** recommended having a clear vision and mission as *'they will guide setting the goals and objectives'* which will determine *'and prioritise the requirements in order to achieve a successful m-Government services'.* To sum up, the participants emphasised the benefit of starting the m-Government project with both a vision and a mission statement.

9.1.11.Conclusion

The chapter has discussed the m-Government program in the country of Jordan along with an m-Government solution utilised in a Jordanian government department. The case study has revealed a number of new and different mobile

government perspectives compared with the ones found in the Australian case studies. Discussion about the differences and the reasons behind them takes place in the next chapter. Table 27 summarises the Jordanian perspectives and the derived success factors.

Table 27: Mobile government success factors - Jordan case study

Category	Success factors
Mobile Government team	• Knowledge of Mobile and wireless technologies • Knowledge of the Telecommunication sector • Knowledge of the Mobile services • Knowledge of the Government services
Mobile Government Stakeholders	• Liberalisation of the telecommunication sector and allowing competition in the market • Add condition related to support the m-Government program when tendering for licensing new mobile service provider(s) • Provide the m-Government services through all available providers • Mobile technology literacy • Ensure positive experience using the services from the first time • Citizens' happiness and satisfaction using the services • Consider the use of premium mobile services as an indicator • Fair charges for the m-services
Marketing m-Government services	• Ensure functionality of the services offered prior marketing • Utilise most/all available media • Evaluate each marketing campaign for future improvements

Category	Success factors
Characteristics of m-Government services	• Ease of use • Simple to navigate • Easy to learn • Introduced in the county's spoken language • Translation to other language if necessary
Security of m-Government services	• Higher functionality of m-Government services requires higher security measures • Need for specialised m-Government security team
m-Government Vision & Mission	• Start the m-Government program with clear vision and mission

9.1.11.1.Where to now?

The next section will discuss two case studies from the United Arab Emirates. Both case studies are at state level government and they both reflect on their state's m-Government program.

9.2.United Arab Emirates (UAE) Case study

"*m-Government is still a new field and there is not much implementation around the world due to lack of knowledge and experience*" (a participant from the UAE government)

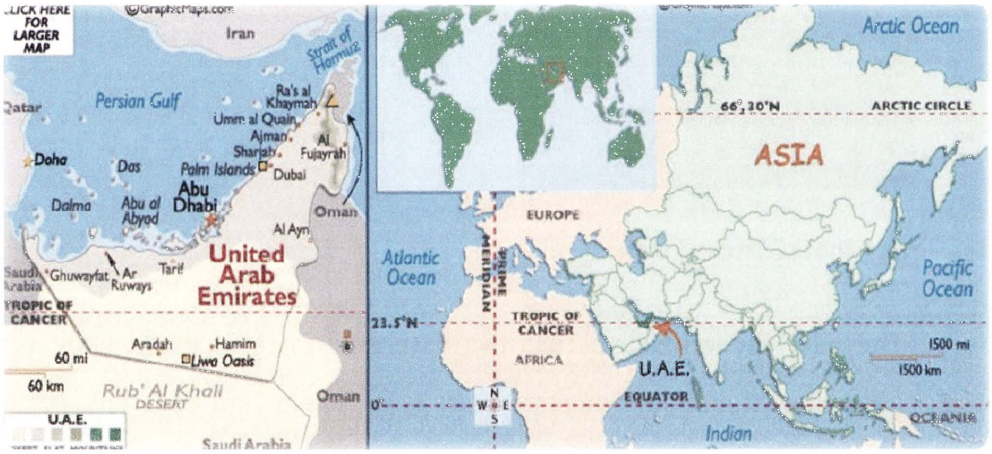

Figure 32 Location and map of UAE (World Atlas 2008b)

9.2.1.Introduction

This section discusses the mobile government programs and services implemented in two UAE states. The interviews were conducted in August 2007 with top officials from the e-Government units running their state's e-Government program. Again, for ethical reasons the information is de-identified. Thus, the researcher will refer to the case studies as **UAEstate01** and **UAEstate02**.

Government level: State Government Departments
Country: United Arab Emirates (UAE)
Country Population: 4,621,399 est. at July 2008 (Central Intelligence Agency (CIA) 2008b)
Number of Interviewees: One from UAEstate01 and One from UAEstate02
Interviewees' Position: The Director General of eGov (UAEstate01), IT Manager (UAEstate02)

Table 28: Facts about United Arab Emirates (UAE) (Central Intelligence Agency (CIA) 2008b)

Population	
4,621,399 July 2008 est.	
No. Of Telephone Landlines	No. Of Mobile subscribers
1.385 million (2007)	7.595 million (2007)
No. Of Internet Service Providers (ISPs)	No. Of Mobile Service Providers
3	2
No of Internet Users	
2.3 million (2007)	

According to the (Arab Advisory Group 2008), *'UAE recorded the highest cellular penetration rate by H1 2008, which stood at 198.6%'* meaning that in effect, every UAE resident has two mobile phones.

9.2.2.The current use of WIRED Internet

The UAE is the most wired nation in the Arab World and one of the top nations in the online world. **UAEstate01**'s e-Government vision is to: *'enable a modernized and efficient (**UAEstate01**) Government to embrace and utilize the latest developments in e-Government technology for meeting the needs of citizens, residents, tourists, businesses, and investors'*. Thus, the **UAEstate01** participant explained that his state's *'e-Government is not a new government, but it is reengineering the government's work through the electronic technologies'*. He

further explained that e-Government *'is a body to monitor and control other departments for the betterment of the public'*.

The **UAEstate01** e-Government portal provides information and services to Citizens (C), Businesses (B), and Government departments (G). The portal also provides useful links to local government departments, ministries and federal government departments, press and media, and to other states' e-Government portals.

UAEstate02's e-Government was announced in early 2000 and launched in late 2001 with the vision of *'easing the lives of people and businesses interacting with the Government and contributing in establishing* [UAEstate02] *as a leading economic hub'*. An e-Government portal to integrate the eServices of all government departments within the state was launched. The ePortal provides eServices to citizens, residents, visitors, and businesses, such as the following (listed in alphabetical order):

- ePayments
- Education
- Employment
- Entertainment
- Health
- Housing
- Media
- Tourism
- Transportation

9.2.3.The current use of MOBILE and WIRELESS Internet

The **UAEstate01** participant explained that the implementation of m-Government is the result of demand from *'the high penetration of mobile phones, the benefit of easy access, and the investor needs for anywhere, anytime access'*.

The **UAEstate02** interviewee said that the state's m-Government is *'an innovative channel of communication between customer and government departments via the mobile and wireless technologies'*. She explained that the m-Government services *'are all informative and none is transactional yet'*. Thus, the services are mainly delivered through SMS technology. This participant also explained that it is the responsibility of the e-Government unit to inform all government departments about the availability of the mobile channel *'and ask the ones who wish to join to send a list of the services to be published on the mobile portal'*. Currently, there are 23 government departments within the state (**UAEstate02**) that send general information to the state's residents (push technology) and three departments that use the pull technology to send specific information upon request. Table 29 lists the three departments and the services they provide.

Table 29: Pull SMS services in UAEstate02

Pull Service			
Service	**Keyword**	**Parameter**	**Example**
Salik Registration/Payment	دفع	AccountNo	0261 دفع رصيد
Prayer Timing	من	Keyword	من
	منهم	Keyword	منهم
Trade License Fees	DEDFIN	Trade License Number	DEDFIN 510500
Trade License Status	DEDTRN	Trade License Number	DEDTRN 510500
DEWA Bill Enquiry	DEWA	AccountNo	DEWA BILL 123456789
Case Information	DPP	Service Number Case Number	Dpp e c01 501 2008 88
Traffic Fines	FINE	Car Plate Number - Car Type - Car Code	Car Plate Number - Car Type - Car Code
Help Information	HELP	Keyword	HELP FINE
	INFO		INFO
Salik Registration/Payment	MPAY	AccountNo	mpay activate 9178061166
Prayer Timing	P		P
Prayer Timing	PRAY		PRAY
Prayer Timing	PRAYE		PRAYE
	REG		REG

9.2.4.m-Government Vs e-Government

The participant from **UAEstate01** noted that the state's perception of m-Government *'is different than those in many other countries* [even from states in his country] *who perceive m-Government as a new and different trend'*. He explained that *'he does not perceive m-Government as a new trend of e-Government, but a subset of e-Government'*. He highlighted that in e-Government there are *'concepts and means & methodologies'* and said that *'there are many different means of connecting the stakeholders to the e-Government such as through telephone, PDA, laptops, PC'*. Thus, he concluded that *'m-Government is a method of connecting stakeholder to the e-Government, and thus it is a subset'*. Otherwise, he cautioned, *'we will end up with many types of*

governments such as d-Government for Desktop Government, or t-Government for Telephone Government'.

The **UAEstate02** participant acknowledged the need for e-Government prior to m-Government when she explained that *'to implement m-Government you need to e-enable your services first, and then customise the services for mobile access'.* But she also explained that *'you can provide m-Government services without having ready e-Government, but they would be basic services provided by the government entities'.* This acknowledges the finding that basic informative m-Government services could be provided without the need for a mature e-Government. This should help developing countries in the stage of developing e-Government or planning for it.

The **UAEstate02** interviewee also discussed the fact that the e-Government infrastructure provides many more options for the convenience of the user. She justified the need for e-Government *'because transactional m-Government services would use the e-Government infrastructure such as the payment gateway'.* All that would be required is to customise the gateway to interact with mobile access. Despite the customisation, not all e-Government services could go mobile. While the e-Government payment gateway provides all payment options, mobile payment methods are limited, for example *'m-Government users could pay with their credit card, but cannot request a direct debt through their mobile phone'.*

In his discussion of his state's e-Government program, the participant **UAEstate01** explained that e-Government is a **body** that monitors and controls other departments' efforts towards utilising the electronic technologies in their

daily work. In the Jordanian case study, the **Jorfed** participant stated that high level m-Government needs a dedicated multi-skilled team, and it was found that *'regardless of whether m-Government is a subset within the e-Government or not, an m-Government team/unit is required'*. Based on the discussion of the online survey findings on the functionality levels of the m-Government services, the m-Government unit could be a **standalone body, or part of the e-Government body**. This would depend on the functionality level of the m-Government services intended to be implemented in a specific country.

Basic m-Government services that use SMS technologies for interactions with the stakeholders do not need a standalone body to control their implementation. Fully interactive m-Government services using various mobile and wireless technologies (i.e. wireless Internet, GPS, GIS, laptops), on the other hand, need a high level of management to control enforcement and implementation to ensure successful 'anytime, anywhere' seamless interaction between stakeholders (Businesses, Citizens, and Government). The **JorFed** interviewee explained that the m-Government unit needs power to get *'the support and cooperation* [required] *from all* [government] *entities'*. Thus, embedding the m-Government unit within the e-Government body ensures that it inherits the powers granted to the e-Government unit. This results in having an empowered m-Government unit within the e-Government body. The m-Government unit's role is to monitor and push the government departments' efforts towards utilising mobile and wireless technologies in their daily work to achieve the many benefits.

9.2.5.Developing m-Government

The **UAEstate01** participant discussed the importance of sharing experience and learning from previous national and international implementations of m-Government. He advised that **UAEstate01**'s e-Government body has *'studied the implementation of e-Government and m-Government in the countries of: Canada, Singapore, Malaysia, and India, and Georgia in America'*. In general, he recommended *'studying the top countries ranked by the United Nations'*, but noted that it is better to learn from similar countries, that is, countries of similar culture.

To develop a successful m-Government program, the **UAEstate01** participant recommended any government going mobile to follow the following steps:

1. *'To work in parallel manner.'* He explained that *'while starting the first step in developing m-Government service, the m-Government body should start educating the stakeholders (mainly users) about it'*.

2. *'Develop an m-Government strategy, preferably hiring an expert in the m-Government field for this purpose. The expert will examine the infrastructure readiness and pass recommendations on what needs to be done'*.

3. *'Start surely.'* He explained that the m-Government body should ensure the availability of all required resources (i.e. human) for the successful of its strategy. He also recommended *'starting with the services on demand that results in quick Return on Investment* (ROI)'. He further

explained that the return should be feasible and quick for all stakeholders, such as the government itself and the public.

The **UAEstate02** participant recommended conducting *'surveys to check users' acceptance and also to benchmark'* after releasing the first m-Government services and *'before going any further'*. She highlighted that this practice benefits the department when evaluating the services, which allows them to improve the strategy to increase the performance and thus the acceptance of the services.

4. *'Outsource onshore but not offshore'*. The **UAEstate01** participant explained that it was necessary *'to use the available local expertise, and to ensure bringing international experience onshore'*. This also ensures easy access to developers for any needed future development.

The **UAEstate02** interviewee also recommended outsourcing. She explained that *'partnership with the private sector (i.e. project developers), because of their expertise, and that you cannot build an army of developers as hundreds of developers are needed to work on the ongoing projects'*. She also recommended building the portal in-house, so that the team is available for 24/7 maintenance and update.

9.2.6.m-Government Stakeholders

The participant from **UAEstate02** explained that his state has not had any problems with mobile service providers as there is *'one giant mobile service provider that has provided the required services to another state before'*. The participant noted the extensive role that mobile operators play in achieving a successful m-Government system.

Both the participants from **UAEstate01** and **UAEstate02** recommended surveying the users of the services and obtaining their feedback. The **UAEstate01** participant also suggested listening to *'stories, gossip, backbiting, and act accordingly'*. The **UAEstate02** interviewee opined that *'it is the transactional services that will attract the customers'*, so even if the initial surveys show low adoption, the m-Government team should aim at developing transactional m-Government services.

9.2.7. An m-Government platform

The **UAEstate01** representative discussed the fact that *'UAEstate01 has a centralised channel for receiving, and exploiting, and installing, and activating and launching any ICT related project'* such as the e-Government project. He noted that *'all government departments are integrated into one-platform'*. Thus the platform was ready, and required only to be wirelessly connected through the mobile service providers. This highlights and emphasises the importance of the one-platform factor found in some of the Australian case studies (e.g. QLDCC1). The participant recommended building a one-platform that integrates all government departments.

The one-platform connects all government departments and ensures the highest security under the supervision of the m-Government unit. The **UAEstate01** participant also noted the communication cost saving as a benefit of the one-platform approach. This benefit *'is a result of centralised administration, centralised infrastructure, centralised monitoring, and centralised maintenance'*.

9.2.8.m-Government portal

The participant from **UAEstate02** explained that her state has an m-Government portal already customised for mobile phone access.

9.2.9.Characteristics of m-Government services

The **UAEstate02** participant explained that government services could be fully delivered through the m-Government channel, or semi-delivered, although some government services could not be delivered at all through the m-Government channel due to its nature. The **UAEstate02** representative also acknowledged that *'services have different nature'*, such as the requirement for attachments, or completing a long form which requires lengthy data entry, and *'some cannot be provided through the mobile portal'*. Thus, she recommended carefully selecting the m-Government services to be developed. This participant further explained that most government departments in **UAEstate02** were excited about the m-Government initiative and were requesting many services to be provided through the m-Government portal, but she stressed that *'these services must be filtered to check which one can fit in the mobile portal'*.

The **UAEstate02** participant reported that transactional services such as *'paying fees, renewing health card'* are simple to use and straightforward. She concluded that it was necessary to consider *'all the mobile device limitations such as the screen size and hardship of typing'* when filtering the suggested services for development, as *'m-Government services must be as user friendly as possible'*.

9.2.10.Conclusion

This section has discussed the m-Government program implemented in two states in the country of the United Arab Emirates (UAE). The case studies have revealed a number of mobile government perspectives, some of which accord with the Jordanian mobile government perspectives, and has also revealed a number of new and different mobile government perspectives that could be added to those found in both the Jordanian and Australian case studies. Discussion of the differences and the reasons behind them is covered in the next chapter. Table 30 summarises the found perspectives and their success factors.

Table 30: Mobile government success factors – UAE case study

Category	Success factors (UAE)
Planning	• Forming m-Government team/unit • One central platform to connect all government departments • Develop an m-Government strategy
Mobile Government team	• Sharing experience and learning from previous national and international implementations • Educating and training users
Mobile Government Stakeholders	• Outsourcing to expert providers • Operators' cooperation and partnership
Marketing m-Government services	• Demand user feedback for analysis and improvements • Surveys to check users' acceptance and also to benchmark • Start with the services on demand that result in quick Return on Investment (ROI)

9.2.10.1.Where to now?

The next Chapter will conclude the results of this m-Government research. The chapter will reflect on the findings of all the case studies and will present a devised m-Government framework.

PART III

m-Government Adaptive Framework

CHAPTER 10

10.m-Government Adaptive Framework

This chapter presents the results of the data analysis in the form of an emerging theoretical adaptive framework represented in a visual model. An extensive literature review is used in the chapter to reinforce and further refine the framework.

The chapter concludes the thesis by addressing the main contributions of this research, relating them to the research questions and objectives stated in the Introduction chapter. It then discusses the implications and significance of the main findings. It also examines limitations of this study, and proposes future research directions. Finally, it outlines the strengths of this research.

10.1.Introduction

The intensive literature review conducted at the beginning of this research identified the eighteen mobile government success factors listed alphabetically in Table 31. The analysis of the nine real-life case studies in this research, however, has identified many more success factors to be considered. Table 32 lists the ten mobile government perspectives that have emerged and their success factors.

Table 31: m-Government Success factor identified in the literature review chapter

•Acceptance
•Access
•Coherent M-Gov framework
•Cost
•E-Government
•High mobile penetration
•Infrastructure
•Infrastructure management
•IT literacy
•Legal issues deregulation of telecommunication sector
•M-Gov awareness
•M-Government Portal and exclusive Gateway GW
•Partnership with private sector
•Privacy and security
•Quality & user friendly applications
•Standards and data exchange protocols
•Strategy
•User needs & preferences applications

Table 32: m-Government Success perspectives and factors identified through this research by Australian Interviewees

Success Categories	Success Factors from QLDCC1 Case Study	Success Factors from QLDCC2 Case Study	Success factors from NSWCC1 Case study	Success factors from NSWCC2 Case study	Success factors from NSWCC3 Case study
Drivers	• Saving Costs • Staff productivity • Coverage • Volume of use • Constituent demand • Fast service delivery	• The availability of technology	• Work flexibility in accessing the corporate systems anywhere, anytime.		
Solutions	• **Business case** • Clear objectives • Determine business requirements • Architecture • Managed as a project (IT project management	• Easy management • Up-to-date • Selecting of access device • Data transfer speed • **One platform** • Device independent solution	• Good network coverage, • Research similar mobile government projects to learn from, • Proper selection for the access devices,	• One platform solutions to be the core of the whole mobile government system • Re-engineer work processes • Utilise the devices that match the job requirements and	• Understand all possible security issues • **One platform solution**

Success Categories	Success Factors from QLDCC1 Case Study	Success Factors from QLDCC2 Case Study	Success factors from NSWCC1 Case study	Success factors from NSWCC2 Case study	Success factors from NSWCC3 Case study
	skills) • **One platform solution** • Software reuse • Testing and evaluation	• Low overhead on the back office systems	• User friendly applications, • Easy to use applications, • **One platform solution**, • Role of change management	consider future upgrades to improve the services • Select the provider that best cover the department's area, • Select the wireless technology that is best provided in the department's area	
Constituents (Citizens)	• Acknowledge receipt of problems • Fast Response • Increase trust • Citizen's convenience	• Wireless Broadband availability • Mobile penetration and usage • Easiness and readability of G2C services • G2C services to mimic the real life process	• Determine demand • Use proper surveying tools	• Evaluate citizens' readiness	• Collect census • Judge demand

Success Categories	Success Factors from QLDCC1 Case Study	Success Factors from QLDCC2 Case Study	Success factors from NSWCC1 Case study	Success factors from NSWCC2 Case study	Success factors from NSWCC3 Case study
Constituents (Employees)	• Understanding staff abilities • **Staff acceptance** • Involvement in planning and design • Staff technology literacy • **Training** provision • **Change management** • Applications' ease of use	• Staff trust • **Staff acceptance** • **Training** • **Change management**	• Staff **Training** to use the solution • Staff training to grasp the benefits and gain approval • Staff readiness • **Change management role** • Staff involvement in solution testing	• Proper consultation process • Proper **change management** • Proper **training** • Ease of use • Consideration of different users age groups • Consider all potential health and occupation safety issues • Prioritise security over anything else • Educate users about security issues within the **change management and training** • Researching and implement the	• Provision of the required **training** • Compliance with data protection and privacy legislations

Success Categories	Success Factors from QLDCC1 Case Study	Success Factors from QLDCC2 Case Study	Success factors from NSWCC1 Case study	Success factors from NSWCC2 Case study	Success factors from NSWCC3 Case study
				highest security measures with the least impact on the users • Change users' behaviour	
Providers	• Understanding of the provided services • Researching the market • Negotiate the best deal • Utilising government contracts • Provider's experience and **infrastructure**	• Security • Data transfer speeds • **Infrastructure** • Compatibility with council systems • Future plans	• Skilled IT division to assist in selecting providers • Provider's ability to provide the required security • Cost saving • Application vendor's ability to provide user friendly solutions • Application vendor's ability to respond to future expansion • Consider		• Coverage • Price of service provisioning • Stability of provider in the long run • Provider's partnership/ agreements with other providers • Low cost • Services speed

Success Categories	Success Factors from QLDCC1 Case Study	Success Factors from QLDCC2 Case Study	Success factors from NSWCC1 Case study	Success factors from NSWCC2 Case study	Success factors from NSWCC3 Case study
			providers used by other departments • Provider's network coverage and its reliability • Network reliability • Provider's assigned personnel to manage the department's needs		
Business Case		• IT liaison with business groups • Understanding business requirements • Awareness of available technologies • Justifying the			

Success Categories	Success Factors from QLDCC1 Case Study	Success Factors from QLDCC2 Case Study	Success factors from NSWCC1 Case study	Success factors from NSWCC2 Case study	Success factors from NSWCC3 Case study
		needs and costs • Reflect on benefits			
Security Security (Cont)		• Update department's network • Awareness of all the risk, threats and vulnerabilities • Implement as many security levels as required • Best password selection procedures • No information to be kept on devices	• Meet the duty of care • Implementing highest security measure to protect information • Not relying on providers' recommendations		
Government Help		• Negotiation with providers	• Devise a mobile government policy for all related parties to		

Success Categories	Success Factors from QLDCC1 Case Study	Success Factors from QLDCC2 Case Study	Success factors from NSWCC1 Case study	Success factors from NSWCC2 Case study	Success factors from NSWCC3 Case study
			follow • Liberalisation but not privatisation of the telecommunication sector		
Benefits		• Understanding the benefits	• Time saving • The amount of paperwork saved • Better allocation of jobs • Ability to do work from home rather than to commute • *'Flexible work arrangement, that we can add to retain staff'* • Job distribution while workforce in the field, rather	• Saving time (i.e. less commuting) • Service improvement • Immediate notification and response (discussed in the solution section) • Shorten the time of response to citizen requests • *'Improved service delivery'* • Citizens'	• Auto systems and solutions update • Auto antivirus update (critical for security and privacy reasons) • No duplication of data (fewer errors) • Ease of use • Higher accuracy • Added data safety and security

Success Categories	Success Factors from QLDCC1 Case Study	Success Factors from QLDCC2 Case Study	Success factors from NSWCC1 Case study	Success factors from NSWCC2 Case study	Success factors from NSWCC3 Case study
Benefits (Cont)			than *'them having to come in'* • Increase work efficiency and meeting deadlines	satisfaction • *'Improve efficiencies'* • *'Cost reduction'* • Decreased overhead costs per position because of physical space saving, • *'Improved accountability'* • *'There's definitely been savings on paper'* • Communication tool with disabled citizens	
Devices				• Understand the job requirement • Understand the functionality and accuracy level required	• Amount of data entry required • Work environment requirements • OH&S considerations

Success Categories	Success Factors from QLDCC1 Case Study	Success Factors from QLDCC2 Case Study	Success factors from NSWCC1 Case study	Success factors from NSWCC2 Case study	Success factors from NSWCC3 Case study
				• Consider using merged technologies when appropriate	• Ergonomic principles and guidelines

In order to fully understand the opportunities that are presented by mobile government and to ensure the success of the necessary investments, it is important to develop a thorough understanding about the conditions of success. Thus, the theoretical framework to be discussed in this chapter represents the identified factors that influence the adoption and development of mobile government systems. The framework forms a set of detailed guidelines and practical recommendations on how to maximize the chances of successful implementations of mobile government systems.

The success factors in the framework are organized around ten perspectives. The ten groups - Drivers, Solutions, Constituents (Citizens), Constituents (Employees), Providers, Business Case, Security, Government Role, and Benefits are the ones that have been proven in the collected data. Figure 33 below depicts the theoretical framework of m-Government as it emerged from the data analysis in the form of a visual model. The framework is adaptive as its components are "rich and detailed", and they are not specific to one country, technology, organisational factors, economical factor, and social and human factors. The richness and level of details give any government the capacity of adaption. The framework has been commended for "bringing the issues facing implementation of m-Government into sharp relief".



Adaptive m-Government Framework (AmGovF)



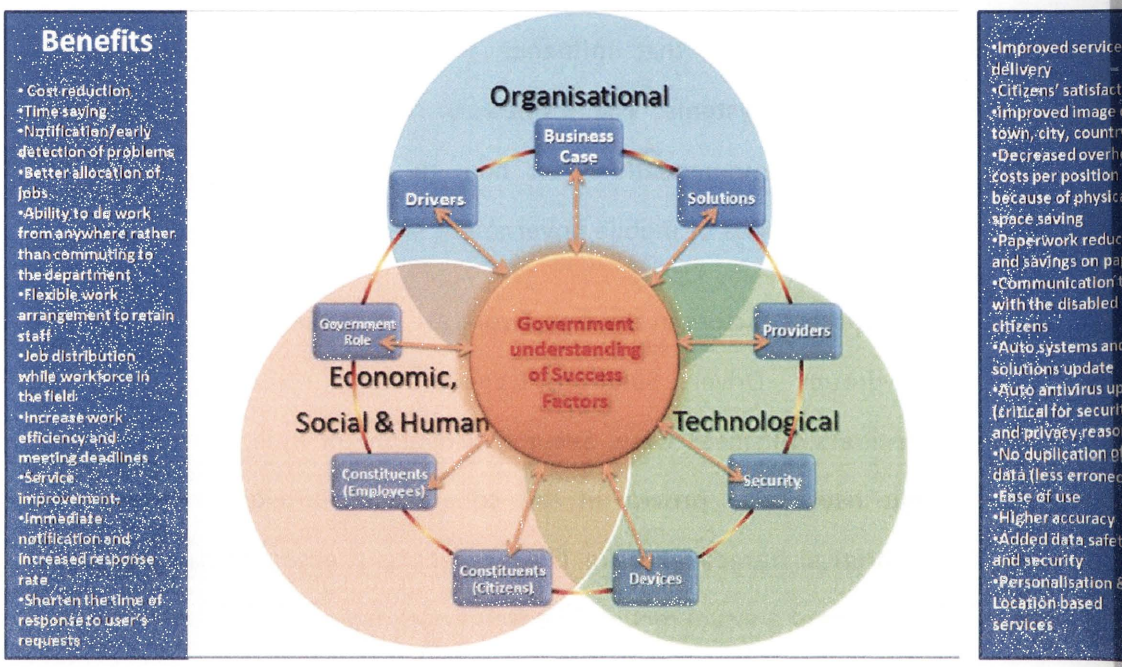

Figure 33: The adaptive m-Government framework

The model represents the m-Government framework required to achieve successful m-Government systems. The following sections will explore each category and its properties in detail.

10.2.The Devised Mobile Government Framework Discussion

The literature review listed 'Coherent M-Government framework' as a success factor, but did not discuss what such a framework consists of or explain its nature. The rigorous data collection and analysis procedures implemented in this research have analysed the online survey of experts, together with the case studies, and presented the m-Government success factors. This has led to the forming of an adaptive m-Government framework. In this chapter, the identified m-Government success categories and their relevant factors are represented in a visual model that depicts the devised mobile government success framework. It should be noted that the findings reflect the viewpoint of IT managers rather than business managers.

The framework is described in a narrative structure around the proposed perspectives/categories and their properties/success factors. The discussion extensively uses up-to-date literature that strongly purports to be addressing mobile government issues, mobile systems development, m-commerce and other relevant literature. The purpose of using the literature is to reinforce the findings of this research to evidence the emerging m-Government framework, to confirm the rigour and quality of the research, and to refine and enhance the framework. The following sections will summarise the contribution of this research (the devised adaptive mobile government framework) and will discuss each of its perspectives and its properties in detail. It should be noted that in the following discussion, only a representative subset of the articles is used. The researcher

suggests that all the perspectives have a role to play or influence the practice of mobile government adoption, diffusion, and development.

10.2.1. The Drivers Perspective

The analysis of the case studies revealed a set of key factors which essentially drive the adoption of mobile government. Table 33 below lists these factors.

Table 33: m-Government 'Drivers' perspective and its success factors

Success Perspective	Success factors	Corresponding literature review
Drivers	• Advancements in mobile and wireless technologies	• (Ghyasi & Kushchu 2004; Goldstuck 2003; Kuscu, Kushchu & Yu 2007a; Lallana 2008b)
	• Saving costs	• (iReach 2008; Roggenkamp 2007)
	• Staff/organisation productivity and efficiency	• No match found
	• Coverage	• (Kuscu, Kushchu & Yu 2007b)
	• Volume of use	• (Kuscu, Kushchu & Yu 2007b)
	• Constituent demand	• (Carroll 2005; Kushchu, Arat & Borucki 2007)
	• Fast service delivery	• (Kuscu, Kushchu & Yu 2007b; Roggenkamp 2007)
	• The availability of technology	• (Carroll 2005; Kuscu, Kushchu & Yu 2007b)
	• Work flexibility in accessing the corporate systems anywhere, anytime	• (iReach 2008; Mallett, Millar & Beane 2006)

Although different government departments have quite different responsibilities, tasks, structure, and customers, they share very similar drivers to the

development and adoption of m-Government. The investigation conducted in this research shows many of these drivers were and remain the same.

Kuscu, Kushchu and Yu (2007b) outline three main m-Government drivers: the high mobile penetration, 'evolution of mobile Internet technologies, standards, and protocols toward faster and more sophisticated application, and adoption of mobile Internet applications and services by individuals and businesses'. These drivers acknowledge the drivers that emerged from this research. The report entitled *m-Government in Ireland 2008* conducted by iReach acknowledges the cost savings and better access to public services for citizens drivers, and adds the 'process efficiencies' driver (iReach 2008).

Mallett, Millar and Beane (2006) acknowledged the flexibility driver, and outlined that 'work is no longer a place to go to but an activity to be undertaken'. Thus, employees are demanding work flexibility in order to undertake their work whenever and wherever it is convenient for them.

People nowadays are accustomed to a positive and convenient experience when dealing with the private sector, which utilises state-of-art technologies to serve its customers. This has led to a demand to adopt new technologies in the public sector to meet constituents' increased expectations for convenience, improved services (pressure), efficiency and effectiveness (pressure), and anywhere, anytime reach (pressure), and supporting economic development, especially for rural areas of developing countries (pressure) (Kushchu, Arat & Borucki 2007). The discussed drivers essentially drive government departments to request utilisation of mobile and wireless technologies through proposing a business case.

10.2.2. The Business Case Perspective

Analysis of the case studies has revealed the importance of developing a proper business case for the development of a mobile government solution and services. It has also identified the success factors and properties of the business case as listed in Table 34 below.

Table 34: m-Government 'Business Case' perspective and its success factors

Success Perspective	Business Case proposed success factors	Corresponding literature review
Business Case	• IT liaison with business groups	• (Gefen & Ridings 2003)
	• Understanding business requirements	• (Boland 1978; Gefen & Senn 1998; Mallett, Millar & Beane 2006)
	• Awareness of available technologies	• No match found
	• Justifying the needs and costs	• No match found
	• Reflect on benefits	• No match found

The business case, according to the case studies findings, must be developed with mutual efforts from both the department or business group and the IT group. Gefen and Ridings (2003) acknowledge the importance of the liaison, and highlighted that: 'the nature of the relationship that users have with Information Technology (IT) personnel is an important aspect determining user attitudes and use of new IT' and affirmed that 'IT group responsiveness can increase user acceptance of new IT'. In addition, the liaison improves communication between the relevant groups and results in a better understanding of business requirements and the system (Boland 1978; Gefen & Senn 1998). The business case needs to justify an m-Government project based on a cost/benefit analysis. Table 35 below lists the following costs related to providing mobile services.

Table 35: Costs of Mobile Services (Kar 2008, pp. 12-13)

Tangible Costs	• *Capital hardware, devices, servers, software* • *Operational cost: especially air time* • *Software licences* • *Support and management* • *Integration e.g. with legacy systems*
Intangible Costs	• *'Always on' stress* • *Destruction of communities of practice* • *Complying with legislation e.g. working hours* • *Nuisance in public places by ringing phones, loud talking people* • *Privacy* • *Last-minute attitude to deadlines*

Benefit/cost justification would typically answer the following question: *How will the system improve the organisation?* Potential benefits of implementing m-Government systems are discussed within the 'Benefits' perspective. In order to develop any m-Government system, a system request is required to start planning for solution development.

10.2.3. The Solutions Perspective

The third perspective to be discussed, 'Solutions', includes twenty four success factors. Table 36 lists the success factors for any mobile government solutions. Some of the Solutions' success factors overlap with those in other categories. Such overlapping means that one of the overlapping categories is a prerequisite to the other. For example, the *Business case*, *Clear objectives*, *Determine business requirements* are factors within the 'Business Case' category, which is a

prerequisite to the mobile government solution. Also, *Good network coverage*, *Select the provider that best covers the department's area* are mutual success factors with the 'Providers' category. These overlapping success factors will be discussed in the category within which it fits best.

Table 36: m-Government Solutions perspective and its success factors

Success Perspective	Solutions proposed success factors	Corresponding literature review
Solutions	• Clear objectives	• No match found
	• Determine business requirements	• No match found
	• Architecture	• (Metafas, Karathanasis & Blionas 1996)
	• Managed as a project (IT project management skills)	• (Mallett, Millar & Beane 2006)
	• Software reuse	• No match found
	• Testing and evaluation	• (Kaikkonen et al. 2005; Kjeldsko al. 2004; Lionbridge 2006; Roggenkamp 2007)
	• Easy service management	• (Mallett, Millar & Beane 2006)
	• Up-to-date	• No match found
	• Data transfer speed	• (Dewan & Chen 2005)
	• Device-independent solution	• (Chen et al. 2006; Jankowska 20 Olmstead et al. 2007; Zhao & Okamoto 2008)
	• Low overhead on the back office systems	• No match found
	• Dedicated mobile government team	• No match found
	• Research similar mobile government projects to learn from	• No match found
	• Proper selection of the access devices	• No match found
	• User friendly applications	• (Olmstead et al. 2007)
	• Easy to use/self-adapting applications	• (Geihs et al. 2006)
	• Role of change management	• (Capra, Francalanci & Marinoni 2 Chynoweth 2009; de Jager 2009)

Success Perspective	Solutions proposed success factors	Corresponding literature review
Solutions (Cont)	• One platform solutions to be the core of the whole mobile government system	• (Decker & Bulander 2009)
	• Re-engineer work processes	• (Net Impact 2004; Olmstead et al. 2007; Scholl et al. 2008)
	• Utilise the devices that match the job requirements and consider future upgrades to improve the services	• Discussed within the devices perspective.
	• Select the provider that best covers the department's area	• Discussed within the provider perspective.
	• Select the wireless technology that is best provided in the department's area	• (Hosbond & Nielsen 2005)
	• Understand all possible security issues	• (Chen 2006; Chen 2008; Mallett, Millar & Beane 2006)
	• Introduced in the country's spoken language	• (Mukherjee & Biswas 2005)
	• Translation to other languages if necessary	• No match found

10.2.3.1.Mobile government core platform

The in-depth knowledge gained from the analysis of the case studies showed that mobile government solutions can change business processes within government departments. It also suggests that the mobile government platform is the most important factor in achieving functional and quality mobile government solutions. A mobile government platform is the underlying hardware or software on which the mobile government solutions or applications would run. The interviewees have acknowledged the high importance of defining a platform. According to the Webopedia Computer Dictionary (2009), 'Once the platform has been defined, software developers can produce appropriate software and managers can

purchase appropriate hardware and applications'. The platform is programmable and thus it is customised to the department's needs.

Different departments have different needs, each 'with their own responsibilities, tasks, structure, and customers' (Olmstead et al. 2007). Thus, they develop their own applications based on their needs. Olmstead et al. (2007, p. 31) demonstrate that to deliver a mobile government service 'one department connects to a particular mobile operator and "somebody" implements a proprietary bridge to one specific operator interface. This bridge can normally not be reused for other applications or other mobile operators'. This means implementing separate bridges between each application and each mobile operator. This method increases the adoption cost and forms a barrier, especially in times of national or global financial crisis.

Mobile government services have been developed, implemented and operated by individual government departments; therefore these departments have heterogeneous platforms. This highlights the interoperability issue. According to (ANUIT 2005), interoperability is the:

> capability to provide successful communication between end-users across a mixed environment of different domains, networks, facilities, equipment, etc. from different manufacturers and (or) providers. In this context the communication is meant between end-users or between an end-user and a service provider.

Thus, 'to support interactions among mobile devices in heterogeneous networks', Chen et al. (2006) propose 'a lightweight mobile service platform ... which minimizes the requirement of system resources and is suitable for execution on mobile devices'. Olmstead et al. (2007) also acknowledge the problem and

recommend 'the deployment of an open service platform, that can be shared by networked authorities'; the open service platform would harmonize the quality of public services and overcome related *divided* phenomena.

The use of mobile technologies and semantic web technologies to provide mobile government services requires financial, technical, and human resources which could be a burden for small organisations with limited budgets 'due to the complexity of the value chain', thus, 'the authorities are hesitant about investing time and money in stand-alone proprietary solution that require major investments' (Olmstead et al. 2007). The Jordanian case study is therefore a good example to follow, where the Ministry of Information and Communication Technology (MOICT) has developed a central platform that hosts all services from all participating departments. Olmstead et al. (2007) confirmed this method and, as a result, started the USE-ME.GOV project. Their project's main aim is to 'provide an open and interoperable platform that can be shared by different local authorities and diverse organisational units'. Finally, such a platform reduces the cost of providing the services and should address *openness, interoperability, usability, and security* (Decker & Bulander 2009; Olmstead et al. 2007; Tadwalkar, Xiaoli & Lim 2007).

10.2.3.2.Device-independent solution

Mobile devices available in the market have device-specific features and therefore they vary in their capabilities and limitations (Hübsch et al. 2005; Jankowska 2005). According to (Jankowska 2005): 'this raises the problem of creating separate presentations for each device type or, at least for each class of devices'. However, 'this approach yields high quality results but induces high development

and maintenance costs due to the large number of different versions of a single application' (Hubsch et al. 2005). Thus, mobile government solutions should be designed to allow the delivery of content (information and services) to all users (Businesses, Citizens, Employees, and other Government departments) regardless of device capabilities or wireless networking technologies (Olmstead et al. 2007, p. 45).

'Mobility' implies that something is movable, or has the ability of moving or being moved, and adds the pressure of a need for continued access from anywhere and anytime, which requires connection through any available network domestically or internationally (Kushchu, Arat & Borucki 2007; Olmstead et al. 2007). This has provided mobile users with a plethora of alternatives to access the internet (Chen et al. 2006).

> Examples of these devices and protocols include Palm PDA with web clipping, cellular phones with wireless application protocol (WAP), short message service (SMS), e-mail devices (Black-Berry, AT&T PocketNet phone) that support POP3 or IMAP, Pocket PCs that support AOL instant messenger (AIM). (Chen et al. 2006).

Any mobile government solutions should be developed with all devices and networks in mind. Zhao and Okamoto (2008) confirm the issue but explain that 'of course, contents are provided based on the capabilities of the mobile device' and state that 'although some content may be specifically designed for mobile devices, content providers cannot assure that this content can be accessed by all mobile devices, because of the wide variety of technical characteristics, and existing standards'. Zhao and Okamoto (2008) outline the solution in constructing an architecture that detects the capabilities of the access device and thus provides adaptive content based on these capabilities. (Jankowska 2005)

also recommended using a device-independent technique which would help to render suitable content automatically. Such architecture or technique could be part of the mobile government platform.

10.2.3.3.Mobile government team

The international case studies were conducted at the equivalent of state and federal levels and explored different success factors than the local government case studies. Having a dedicated mobile government team is one factor that was discovered. To achieve successful m-Government solutions, the team should have the necessary capabilities and skills to manage complex m-Government projects and should become a recognised guide as well. Such a team must have knowledgeable and skilled leadership, such as a dedicated m-Government program manager. An m-Government program's project manager should have the ability to build and manage teams, and excite people (Capra, Francalanci & Marinoni 2007). The team factor is further discussed in the section on the findings from the international case studies.

10.2.3.4.Solution architecture

Technological advances and the increased complexities of Mobile ICTs require capabilities to be met when designing the architecture for any mobile government solution. Metfafas, Karathanasis and Blionas (1996) identified controllable abstraction, reusability, analysis of capabilities, and a high level of validation as essential components. An effective designing tool is the Unified Modelling Language for Real-time (UML-R). Drosos, Metafas and Papadopoulos (2004)

acknowledge its benefits in reducing designing time, especially when there is more than one development team collaborating in co-designing a mobile system.

10.2.3.5.Re-engineer work processes

The case studies showed a need for cultural changes within the department, and emphasised the importance of re-engineering work and administrative processes within any department willing to adopt mobile government. Olmstead et al. (2007) acknowledges this factor and explains that it requires 're-organization of internal structure' which usually faces resistance for reasons such as organisational constraints. Re-engineering of the authorities' processes enhances inter/intra organisational interoperability (Capra, Francalanci & Marinoni 2007; Olmstead et al. 2007) and therefore any barrier or constraint should be overcome. Net Impact (2004)[12] proved that a 'majority of organisations re-engineer process to leverage technology', and that structural changes occurs in response to utilising technologies, proving that reengineering is a best practice to increase productivity. Net Impact (2004) pointed out the timing factor, and

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[12] A study of organizational productivity where Net Impact 2004 interviewed more than 1,400 technology, and organisational decision-makers in eight countries - France, Germany, Italy, the Netherlands, Poland, Spain, Sweden and the United Kingdom.

recommended the fulfilment of re-engineering processes before implementing technology to achieve better outcomes.

10.2.3.6.Testing and evaluation

Any developed mobile government solution has to go through many testing phases by the developers and users. Steps must be taken to verify the system's quality and to ensure that it functions as it should from the technology standpoint and the user perspective. Thus, developers must be aware of all work contexts in order to prepare suitable testing scenarios in the lab or in the field. Although Kjeldskov et al. (2004) show that a usability test in a laboratory may be just as effective, Kaikkonen et al. (2005) conclude that time-consuming 'field testing is worthwhile when combining usability tests with a field pilot or contextual study where user behaviour is investigated in a natural context'. User acceptance testing (UAT) is discussed within the 'Constituents' category.

Application testing must consider all major testing steps such as 'checking the design and proof-of-concept solutions against user requirements early in the development cycle, exposing the entire system or application to unexpected events, and subjecting the software to volume, load and stress conditions' (Lionbridge 2006). However, a strategic approach is required for testing mobile government applications due to advances in wireless technologies, the unique characteristics of the mobile paradigm such as the increased complexity of emerging handheld devices and the underlying system architecture (i.e. complex operating systems running the device) (Hosbond & Nielsen 2005). In addition, consideration must be given to 'the greater sensitivity to security and load related

problems in wireless infrastructure', and 'the increased complexities of scale' (Lionbridge 2006).

10.2.3.7.Selecting the wireless technology

Although the continuous advances of wireless and mobile technologies is a main mobile government driver, it necessitates in-depth analysis and consideration of what technology to use as a foundation for future mobile systems. The analysis of case studies listed *Select the wireless technology that is best provided in the department's area* as a success factor.

10.2.3.8.Change Management

The case studies showed that successful change management needs to be preceded by a thorough understanding of the impact that the new mobile government system will have on working practices, in order to define the change.

Change needs enough money, time and management capability to get things right, but more importantly, change requires the readiness of the people who will be most impacted by that change. Any change incorporates a fear of the unknown (Kushchu, Arat & Borucki 2007). Thus, for people to be ready and committed to change, they need to understand the reasons behind the change in order to accept it. Being able to comprehensively communicate the change is crucial to its success (Capra, Francalanci & Marinoni 2007; de Jager 2009; Paton & McCalman 2008), and information should be available to answer the many questions that are likely to be raised during the long change process. Kushchu, Arat and Borucki (2007) emphasise that 'interpersonal communication should be at the centre of this process in order to persuade the parties involved to willingly be part of the

change rather than forcing them to agree to the set goals'. Rogers (1995) notes that the way information about innovation is communicated is crucial, as it influences the adoption process. Thus, transitioning to m-Government requires that the departments involved communicate the change using well-defined guidelines or rules. Paton and McCalman (2008) recommend selecting capable media to ensure penetration, and to customise the message using appropriate content and tone. Since communication is two-way process, they also emphasised the need for feedback.

For a successful change, Paton and McCalman (2008) point out that change management has to have complete knowledge of the circumstances surrounding the change, and an understanding of the interactions and potential impact of the change. They recommend using valid and defined models for the effective management of change, and to perform a practical step-by-step means of handling change.

Change needs to be conducted by trusted people. Since trust is a product of positive relationship, then change needs to be led by managers who interact with the frontline: 'people trust their local line managers, but not these senior managers' (Chynoweth 2009). Thus, it is concluded that change 'needs to be led by lower-level managers who have a direct relationship with staff and who have been trained to handle change' (Chynoweth 2009). Capra, Francalanci and Marinoni (2007) acknowledge that change management capabilities and communication abilities are strong enablers for m-Government success, and suggest importing external experts and consultants if required. Capra, Francalanci and Marinoni (2007) also conclude that cultural changes 'can be fostered by means of incentives and stimulating personnel policies'.

10.2.4. The Security Perspective

Security must be assured in all solutions. The case studies have proven the importance of security, and highlighted security considerations and recommendations that should be taken into account when developing m-Government systems. According to the (International Standards Organisation (ISO) 1989) security is 'a minimization of vulnerabilities of assets and resources'.

Table 37: m-Government 'Security' perspective and its success factors

Success Perspective	Security proposed success factors	Corresponding literature review
Security	• Update department's network	• No match found
	• Awareness of all the risks, threats and vulnerabilities	• (Kumar, Hanumanthappa & Reddy 2008; Straub & Heinemann 2004; Trček 2006)
	• Implement as many security levels as required	• (Chatzinotas et al. 2006; Kumar, Hanumanthappa & Reddy 2008)
	• Best password selection procedures	• (Chatzinotas et al. 2006; Kumar, Hanumanthappa & Reddy 2008)
	• No information to be kept on devices	• (Kumar, Hanumanthappa & Reddy 2008)
	• Meet the duty of care	• (Kumar, Hanumanthappa & Reddy 2008)
	• Implementing highest security measure to protect information	• (Chatzinotas et al. 2006)
	• Not relying on providers' recommendations	• No match found
	• Virtual Private Networks (VPN)	• (Kumar, Hanumanthappa & Reddy 2008)

Literature has acknowledged that m-Government involves hidden risks due to the insecurity of the air medium and the vulnerabilities of wireless systems, and security has therefore been highlighted as a major success perspective (Carroll 2005; Kumar, Hanumanthappa & Reddy 2008; Mallett, Millar & Beane 2006; Tadwalkar, Xiaoli & Lim 2007). Mobile government constituents may give away some personal data in pursuit of a service. Such data could be of a personal nature, such as identity and contact details, financial nature; credit card and banking details; government data; record, registration, certification number (Kumar, Hanumanthappa & Reddy 2008). This raises concerns about the security of such data because of the possible revelation of sensitive data to non-authorised people (i.e. eavesdroppers or hackers) (Chatzinotas et al. 2006) because of security deficiencies in the available wireless protocols (Kumar, Hanumanthappa & Reddy 2008). Tadwalkar, Xiaoli and Lim (2007) and Carroll (2005) also highlighted that lack of security causes user mistrust and therefore a refusal to accept the mobile service. Thus, risk analysis is crucial. According to Trček (2006), risk analysis is 'identifying security risks, their magnitude and required safeguards', where safeguards 'comprise practices, procedures or mechanisms that reduce risks'.

m-Government security can be considered from four aspects: security principles, security of access devices, network security, and security policy. Kumar, Hanumanthappa and Reddy (2008) explain that wireless network security is a scientific field dealing with risks related to wireless computer networks. Secured m-Government systems need to meet the main security principles discussed in Kumar, Hanumanthappa and Reddy (2008), who categorise these security principles as follows:

- *Confidentiality: ensures that information is not disclosed to unauthorised users,*
- *Integrity: ensures that information cannot be corrupted or altered in any way,*
- *Accountability/non-repudiation: guarantees for the identity of the sending and receiving party in an information transmission,*
- *Availability: ensures that the services implemented in a system are available and function properly,*
- *Access control: ensures that only authenticated/authorised entities are able to access services and data. More specifically, the access control security goal can be further categorised into the following sub-goals:*
    - *Authentication: confirms the claimed user identity,*
    - *Authorisation: controls the access rights granted to authenticated users.*

(Kumar, Hanumanthappa & Reddy 2008, p. 404)

Security threats also come from mobile devices. The fact that mobile devices are small in size and portable makes them vulnerable to theft or loss, and the enhancement to mobile devices such as larger storage capabilities allows them to carry sensitive data. Thus, devices have to incorporate access control mechanisms. To ensure device security, Kumar, Hanumanthappa and Reddy (2008) recommend implementing password protection, Biometrics, and Auto logout mechanisms to meet the authentication security principle, and file masking, access control lists, and role-based control mechanisms to meet authorisation security principles. Although it contradicts the m-Government 'anytime, anywhere' vision, Mallett, Millar and Beane (2006) recommend adding

constraints that ensure security, so that, for example, 'physical location and network connectivity might be a determinant of which applications a user can access at any particular time'. Such constraints would reduce fears of malicious access through lost or stolen devices.

Most wireless protocols suffer deficiencies that make Wireless networks prone to passive and active attacks. 'This is mainly because any transceiver in the radio coverage of the mobile device can capture transmitted traffic or inject its own data in the communication link" (Kumar, Hanumanthappa & Reddy 2008, p. 406). Bluetooth protocol (IEEE 802.15) suffers deficiencies that make it vulnerable to attacks that damage devices using Bluetooth technology. According to Kumar, Hanumanthappa and Reddy (2008), some of these attacks are so well known and widespread that they are classified by security experts; for example, *BlueSnarf*, *BlueJacking*, *BlueBump*, and *BlueBug.*

Wireless Fidelity (Wi-Fi) protocol (IEEE 802.11) also suffers vulnerabilities, such that many Wi-Fi providers deploy additional layers of encryption (Kumar, Hanumanthappa & Reddy 2008). General Packet Radio Service (GPRS) protocol provides authentication, but limited authorisation and no non-repudiation (Kumar, Hanumanthappa & Reddy 2008). The Global System for Mobile communications (GSM) is the most popular standard for mobile phones in the world, but according to Kumar, Hanumanthappa and Reddy (2008), most encryption algorithms or mechanisms (e.g. COMP128, A5/1 and A5/2) that are implemented on GSM networks to ensure security could be broken and found to be fundamentally flawed. Kumar, Hanumanthappa and Reddy (2008) conclude that:

> All the commonly used encryption mechanisms have proved vulnerable, so mobiles cannot be trusted easily when communicating confidential information. SMS is untrustworthy, and end-users should always confirm the content of an SMS if deemed important. (Kumar, Hanumanthappa & Reddy 2008, p. 409)

The case studies showed utilisation of networks such as GSM, 3G, and NextG, with the majority of the cases utilising the 3G networks. Kumar, Hanumanthappa and Reddy (2008) states that 'past implementations of wireless protocols have presented a number of security vulnerabilities, but latest protocols such as 3G and WiMAX seem to have the requisite maturity for secure deployment and utilisation'. The case studies also recommend utilising the Virtual Private Networks (VPNs), and Kumar, Hanumanthappa and Reddy (2008) conclude that a preferable solution in the case of m-Government is the session layer security.

Even the most secure system in the world has a serious flaw, namely the human factor (Trček 2006). People need to be aware of the risks, to prevent human errors or negligence that could cause security breaches (Kumar, Hanumanthappa & Reddy 2008). Hence, government departments need to spread security awareness and develop security policies to be followed by all m-Government users. Kumar, Hanumanthappa and Reddy (2008) list the following policies which should be adopted by operators and users of m-Government:

- *The use should ensure that the handheld device supports SSL/TLS session layer security and possibly VPN software,*
- *The registered users of the system should change their authentication credentials frequently,*
- *Storing sensitive information in the handheld device or in storage cards not allowed unless it is encrypted,*

- *The user should empower the access control of the handheld device when possible,*
- *Untrusted wireless networks access points should be avoided, and*
- *Antivirus/firewall software and latest security patches should be installed in handheld devices.*

(Kumar, Hanumanthappa & Reddy 2008, pp. 410-411)

Finally, the case study and literature recommend that to secure m-Government systems, an understanding of all possible threats to any part of the system is required in order to find suitable defence measures (i.e. algorithms, mechanisms and policies).

10.2.5. The Devices Perspective

Any secured m-Government solution needs to use the right access devices. Mobile government solutions could utilise any mobile and wireless devices such as mobile phones, Personal Digital Assistants (PDAs), Smart phones, Laptops, and GPS enabled devices. Technological enhancements such as longer battery life, larger capacity up to 24 GB, and faster processing capabilities have 'promoted handheld devices to worthy substitute of the personal computers when users go "mobile"' (Chatzinotas et al. 2006), but have also attracted the attention of

hackers[13]. The analysis of the mobile government services implemented in the different case studies highlighted 'Devices' as an important mobile government perspective. Table 38 below lists the devices' success factors/properties.

Table 38: m-Government 'Devices' perspective and its success factors

Success Perspective	Devices proposed success factors	Corresponding literature review
Devices	• Understand the job requirement	• (Olmstead et al. 2007)
	• Understand the functionality and accuracy level required	• No match found
	• Consider using merged technologies when appropriate	• No match found
	• Amount of data entry required	• No match found
	• Work environment requirements	• (Mallett, Millar & Beane 2006)
	• OH&S considerations	• No match found
	• Ergonomic principles and guidelines	• No match found

The amount of data input/output required for any service though a mobile government application may dictate the input/output modalities. Thus, an application may require one modal User Interface (UI) or multimodal UI. Examples of input channels are: voice, keyboard, stylus, and handwriting, and output channels are: text, graphics, and sound (Olmstead et al. 2007). Although users

[13] Security of mobile devices is discussed within the security perspective

may prefer one input modality over another, an input/output modality fits specific service characteristics. Choosing input/output modalities for a mobile government solution should be based primarily on service characteristics, then on user-preferred modalities. Olmstead et al. (2007) recommend utilising multimodal UI, so that users can switch between input modalities if a situation requires it.

Due to special characteristics of mobile devices such as size and battery life, Olmstead et al. (2007) and Decker and Bulander (2009) recommend considering context-awareness mechanisms. Olmstead et al. (2007) discuss the fact that context-aware mechanisms 'make input tasks easier by providing the service with required information (e.g. user's location, environmental information, time), hence alleviating user's effort'. Succeeding in selecting input/output modalities enhances the usability of the mobile government (Olmstead et al. 2007). Geihs et al. (2006) also highlighted that the performance and quality of mobile applications crucially depend on the dynamically changing properties of the execution context, such as changing bandwidth and noisy environments which affect the sound output. To provide the best possible service to the user, they recommended developing self-adapting applications that automatically adapt to context changes and/or user preferences. *Self-adapting applications* is added to the solution's success factors. Responsiveness is a measure of the quality of any m-Government service. To achieve better responsiveness, it is important to understand the functionality and accuracy level as a basis for selecting the access devices to be used.

10.2.6. The Providers Perspective

Providers are crucial partners in the successful adoption of mobile government systems. The analysis of the case studies has revealed the importance of 'Providers' and categorised it as a main perspective. Table 39 below lists the providers' success factors.

Table 39: m-Government 'Providers' perspective and its success factors

Success Perspective	Providers' proposed success factors	Corresponding literature review
Providers	• Understanding of the organisation's services/tasks	• (Goodhue & Thompson 1995)
	• Researching the market	• No match found
	• Negotiate/offer the best deal	• No match found
	• Utilising government contracts	• No match found
	• Provider's experience	• (Peinel & Rose 2007)
	• Security	• (Carroll 2005; Dewan & Chen 2005; Mukherjee & Biswas 2005; Straub & Heinemann 2004)
	• Data transfer speeds	• (Chen 2006; Chen 2008; Dewan & Chen 2005)
	• Provider's infrastructure	• (Peinel & Rose 2007; Scholl et al. 2008)
	• Compatibility with council systems	• (Chen & Adams 2005; Chen 2006)
	• Future plans (i.e. expansion)	• No match found
	• Skilled IT division to assist in selecting providers	• No match found
	• Provider's ability to provide the required security	• No match found
	• Cost saving	• No match found
	• Application vendor's ability to provide user friendly solutions	• (Peinel & Rose 2007)

Success Perspective	Providers' proposed success factors	Corresponding literature review
Providers (Cont)	• Application vendor's ability to respond to future expansion	• No match found
	• Consider providers used by other departments	• No match found
	• Provider's network coverage and its reliability	• No match found
	• Network reliability	• No match found
	• Provider's assigned personnel to manage the department's needs	• No match found
	• Coverage	• (Mallett, Millar & Beane 2006)
	• Price of service provisioning	• (Ingelbrecht et al. 2008; Jordan e-Government 2009a, 2009b; Mallat 2007)
	• Stability of provider's on the long run	• No match found
	• Provider's partnership agreements with other providers	• (Kumar, Hanumanthappa & Reddy 2008; Peinel & Rose 2007)
	• Low cost	• No match found
	• Service speed	• (Chen 2006; Chen 2008; Dewan & Chen 2005)

10.2.6.1.Selecting the right provider

As discussed in the 'Solution' perspective, the heterogeneous platforms and networks form a challenge that could be solved using an open-platform, but the real challenge is 'the ability to provide seamless and adaptive quality of service in such a heterogeneous environment'.

10.2.6.2.Considering providers used by other departments

The case studies show that providers already partnering with other departments have more experience than those who have not taken that step. It can be seen

that partnering with experienced providers has advantages such as lower cost and faster provisioning of services, due to established infrastructure.

10.2.6.3.Pricing

Although pricing is a reflection of user value (Kar 2008), Mallat (2007) identified 'premium pricing' as one of the major barriers to mobile services adoption. The Ministry of Information and Communication Technology (MOICT) in Jordan has recognised this adoption barrier and therefore reduced the cost of the m-Government pull[14] services twice in less than a year. The Jordanian MOICT also bears the cost of the Push[15] SMSs (Jordan e-Government 2009a). Consequently, the 'SMS Gateway is The Number One E-Service Used amongst The Jordanian Society' (Jordan e-Government 2009b). A Gartner report outlined that 'mobile messaging services yielded $68.1 billion in regional revenues during 2007' and forecasted 'text message volumes to reach 5.6 trillion in 2012' (Ingelbrecht et al. 2008). This demonstrates in favour of using SMS due to its lower pricing. (Kar 2008, p. 49) concludes that the 'pricing model [structure] should be part of the design process'.

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[14] mobile services/information requested by citizens through SMS

[15] SMS sent by public organisations users.

10.2.6.4.Network Coverage

Coverage is one of the main mobile government adoption drivers and reliable coverage is thus very important. The government level, whether local, state, or Federal, determines its own need for better and wider coverage. For example, when providing G2E services within a local council, only one provider is needed to provide the services in that limited area, whereas in federal government, country wide coverage is needed that allows users to roam securely and seamlessly between networks utilising the best network, accessing the required applications and information from anywhere (Mallett, Millar & Beane 2006).

A higher government level means it is responsible for more constituents who could be scattered over larger areas and wider coverage provided by one or maybe more operators is required. For example, in the case of G2C, citizens could live anywhere in the country, but a government department cannot disenfranchise sectors of the population because of their provider; therefore all providers should be partners in providing the services to the citizens.

10.2.6.5.Operators' partnership with others

It was discussed within the network coverage factor that m-Government users need to roam securely and seamlessly between networks to utilise the best available network to access the required applications and information 'anytime, anywhere'. Different networks have 'different capabilities and restrictions in the kind of traffic they allow' (Kumar, Hanumanthappa & Reddy 2008), however, therefore, agreements between operators are required to ensure seamless access and the highest security.

10.2.6.6.Understanding organisation's services and tasks

The Task-Technology Fit (TTF) theory highlights the importance of 'the fit between technologies and users' tasks in achieving individual performance' (Goodhue & Thompson 1995). Capabilities of technologies must match or fit the tasks the users need to perform and therefore technology providers need to understand m-Government services and the requirements of their underlying tasks. According to Goodhue and Thompson (1995), tasks are actions carried out that turn inputs into outputs; in the context of this study, for example, a task would refer to making an enquiry or uploading information to the main system. Goodhue and Thompson (1995) developed a measure of task-technology fit that consists of eight factors: quality, locatability, authorisation, compatibility, ease of use/training, production timeliness, systems reliability, and relationship with users. Goodhue and Thompson (1995) assert that ensuring the eight constructs of TTF have a positive impact on individual performance and utilisation. Figure 34 depicts TTF theory.

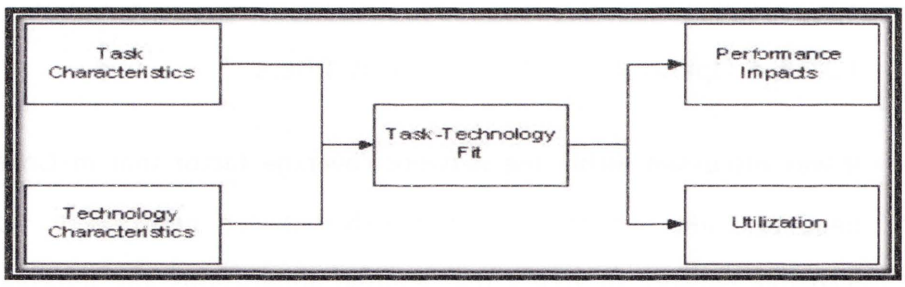

Figure 34: Task-Technology Fit (TTF) theory (Goodhue & Thompson 1995)

10.2.7. The Government Role Perspective

The analysis of the case studies proved the important role of higher governments in aiding the adoption of the mobile government. The case studies presented three success factors for the government role, as listed in Table 40.

Table 40: m-Government 'Government Role' perspective and its success factors

Success Perspective	Government Role proposed success factors	Corresponding literature review
Government Role	• Negotiation with providers	• (Peinel & Rose 2007)
	• Devise a mobile government policy for all related parties to follow	• No match found
	• Liberalisation but not privatisation of the telecommunication sector	• No match found
	• Develop m-Government strategy	• No match found
	• Devise suitable business and revenue models	• (Kar 2008)
	• Develop an m-Government vision and mission	• No match found
	• Dedicate an m-Government team or unit	• No match found

Peinel and Rose (2007) highlight the importance of the government's role in negotiating contracts with the private sector. The literature also confirms the importance of organisational willingness as a major success factor. Olmstead et al. (2007) explains that a government department 'is acting in [a] kind of monopoly' where customers have to use their services as no other organisation is providing them. Although demand (external pressure) is the common driver for utilising ICT to improve work processes, productivity and efficiency, along with

gaining many other benefits, the internal opposition could be stronger than the external pressure. Thus, higher government should play a positive role in encouraging organisational willingness to adopt mobile government systems by devising a mobile government policy which incorporates a strategy for all concerned parties to follow.

Net Impact (2004)[16] proved that the 'majority of organisations reengineer process to leverage technology', and that structural changes occur in response to utilising technologies. This usually results in internal opposition for various reasons, such as organisational change, economic factors or fear of losing the job due to incompetence in the new technologies or being replaced by the new technologies. Job loss factor was explored through the nine case studies and it was shown that mobile government systems may not result in job losses, but may re-position some staff to other departments within the organisation to do different duties because fewer people are required to perform the job. Kushchu, Arat and Borucki (2007) acknowledge that m-Government systems 'can potentially lead to the re-definition of job description and duties'. The interviewee Jorstate02 highlighted

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[16] A study of organisational productivity where Net Impact 2004 interviewed more than 1,400 technology, and organisational decision-makers in eight countries - France, Germany, Italy, the Netherlands, Poland, Spain, Sweden and the United Kingdom.

that m-Government initiatives changed the skills government departments are looking for in new job applicants.

Interviewee JorFed discussed the importance of having an m-Government strategy, either within the e-Government strategy or separate from it. He highlighted the importance of having an m-Government vision set by the central government to guide and drive all agencies' efforts towards the successful implementation of m-Government. This practice can be found in Sweden, where central government declares its vision to 'facilitate and stimulate development within agencies' (Capra, Francalanci & Marinoni 2007).

10.2.7.1.Business and Revenue Models

Producing mobile services requires a network of firms, therefore a business model is required and its components 'will define potential inducements for firms to create or join a network' (Kar 2008, p. 89). According to Timmers (1998), the business model is 'the organisation or "architecture") of product, service and information flows and the sources of revenues and benefits for suppliers and customers'. Kar (2008, p. 89) affirms that 'the business model components likely to play the greatest role in network formation are the revenue model and the benefits for suppliers and customer'.

The mobile government revenue model issue was briefly mentioned by the JorFed interviewee, but was not thoroughly discussed. Because of the semi-structured nature of the interview, which limited asking direct questions that could guide the interview or bias the interviewee's opinions, and because of the limited interview time, the researcher could not lead the interviewees to discuss mobile

government revenue models. Thus, this section will discuss the revenue model according to its suggested importance in the literature.

Peinel and Rose (2007) confirm the 'added values materialised by the combination of m-Government, business models and in particular revenue model for financing the services'. While requested m-Government services (pull services) are paid for by the applicant, revenue models are needed to finance push m-Government services (Peinel & Rose 2007).

Peinel and Rose (2007) confirm the need for a solid business model to establish m-Government services as a sustainable business. They report on the experience gained in three major European research projects (APNEE, APNEE-TU, and USE-ME.GOV) that provide mobile services through partnership with the private sector (i.e. private portal operators and telecommunication operators). The literature shows that partnership with the private sector is an important step towards implementing m-Government (Al-khamayseh, Lawrence & Zmijewska 2006; Sandy & McMillan 2005). In Malta, for example, the m-Government project is carried out with the co-operation of the country's main mobile companies.

> By definition, a Public-Private Partnership (PPP) is a contractual agreement between a government entity (public sector) and a for-profit corporation (private sector). Together, these entities agree to provide services to the public by combining their assets and skills and share the risks and rewards. (Snabe 2005)

Partnership with the private sector such as mobile service providers will help to share the risk and rewards (Snabe 2005) such as Return On Investment (ROI). It will allow all parties to broaden their reach - such as government partnership with the right private mobile provider's network to reach constituents anywhere

in or out of the country - and will accomplish better results (United Nations Foundation 2003). Goldstuck (2003) points out that partnership with the private sector contributes to lessening the burden of the initial cost related to infrastructure provision. Since PPP is the most recommended revenue model, the following factors highlighted by Peinel and Rose (2007, pp. 96-97) must be considered to avoid conflicts:

- *Law concerning exchange of data and ownership/copyright of data;*
- *PPP contracts;*
- *Documentation ownership;*
- Balance the investment on the private and the public site for a win-win-situation of both parties;
- Restrictions against the potential misuse of individual data of the citizen by the private sector due to specific business/revenue needs.

Along with the PPP revenue model, Peinel and Rose (2007, pp. 98-101) recommend considering one or a combination of the following revenue models for financing mobile government initiatives:

- *Advertising and sponsoring;* acknowledged by Kar (2008)
- *National and international funding;*
- *Payment by the citizens;* according to Kar (2008) payment by citizens has two models: a subscription model where users are charged a periodic fee, and a utility model where the user pays based on actual use or what is known as 'pay as you go'.
- *Sharing of the service or the platform with other authorities.*

10.2.8. The Constituents (Employees) Perspective

m-Government has a major impact on employees and thus adaption may take longer than anticipated, hindering the success of the project or causing delays in outcomes. Table 41 below lists the 'Employees' success factors.

Table 41: m-Government 'Employees' perspective and its success factors

Success Perspective	Employees' proposed success factors	Corresponding literature review
Constituents (Employees)	• Understanding staff abilities	• No match found
	• Staff acceptance	• (Roggenkamp 2007)
	• Involvement in planning, design and testing process	• (Ahtinen, Nurminen & Häkkila 2007; Barki & Hartwick 1994; Barki & Hartwick 2001; Capra, Francalanci & Marinoni 2007; Fidel et al. 2007; Gefen & Ridings 2003; Scholl et al. 2008)
	• Staff technology literacy	• (Kushchu, Arat & Borucki 2007)
	• Training provision	• (Kushchu, Arat & Borucki 2007; Scholl et al. 2008)
	• Change management	• (Capra, Francalanci & Marinoni 2007)
	• Solution's ease of use	• (Davis 1989; Moore & Benbasat 1991; Rogers 1995; Rogers 2003; Taylor & Todd 1995; Tornatzky & Klein 1982)
	• Staff trust	• (Scholl et al. 2008)
	• Staff acceptance	• (Davis 1989; Davis, Bagozzi & Warshaw 1989; Kushchu, Arat & Borucki 2007)
	• Staff training to use the solution, grasp the benefits and gain approval	• (Chang & Kannan 2003; The Working Group on E-Government in the Developing World 2002)
	• Staff readiness	• No match found
	• Proper consultation process	• (Scholl et al. 2008)

Success Perspective	Employees' proposed success factors	Corresponding literature review
Constituents (Employees) (Cont)	• Consideration of different user sectors (e.g. age groups)	• (Kushchu, Arat & Borucki 2007; Venkatesh et al. 2003)
	• Consider all potential health and occupation safety issues	• No match found
	• Prioritise security over everything else	• (Mallett, Millar & Beane 2006)
	• Educate users about security issues within the change management and training	• No match found
	• Research and implement the highest security measures with the least impact on the users	• No match found
	• Change users' behaviour	• No match found
	• Compliance with the data protection and privacy legislations	• (Carroll 2005; Chen 2006; Chen 2008; Dewan & Chen 2005; Mukherjee & Biswas 2005; Straub & Heinemann 2004)

Kar (2008) affirms that mobile workforce solutions represent a crucial domain for developing mobile services, and explains that mobile workers are 'considered to be people whose professional tasks can only be completed in a "mobile environment", which refers to the user's mobility and the need for technology that supports this mobility' (Kar 2008, p. 8). Following is a discussion of crucial success factors for the mobile workforce.

10.2.8.1.Acceptance

Kushchu, Arat and Borucki (2007) acknowledge the importance of employee acceptance and caution against 'forcing employees to accept something that they do not believe in ... as this will bring resistance and hindrance ... and may lead to

total rejection'. Thus, they highlight the role of change management as an important factor.

Due to the significance of user acceptance, it is important to distinguish betveen the system testing conducted by the developer or vendor from the acceptance testing conducted by the user, known as beta testing. To ensure acceptance, system tests must consider all contexts where the mobile government solution is to be used in order to find and fix any issues that could occur within any context. Information systems theories have proven and explained the importance of user acceptance. The Technology Acceptance Model (TAM) has pointed out usefulness and ease of use (Davis 1989; Davis, Bagozzi & Warshaw 1989) as impotant acceptance factors.

The case studies revealed *Consideration of different user sectors* (e.g. age groups) as a success factor. The Unified Theory of Acceptance and Use of Technology (UTAUT) aims to explain user intentions to use an Information System (IS) and subsequent usage behaviour. The theory incorporates performance expectancy, effort expectancy, social influence, and facilitating conditions as constructs that determine usage intention and behaviour, and according to Venkatesh et al. (2003), age, gender, and experience are posited to mediate the impact of the four key constructs on usage intention and behaviour, as depcted in Figure 35 below.

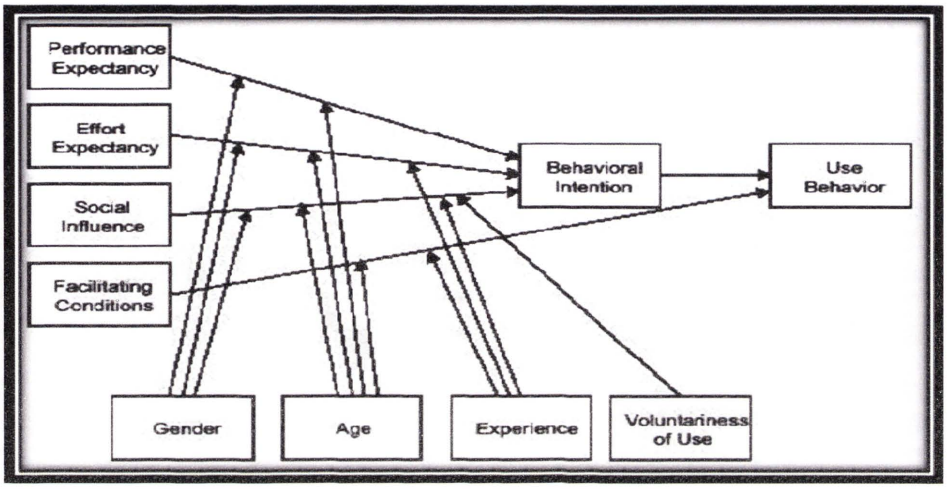

Figure 35: Unified Theory of Acceptance and Use of Technology(Venkatesh et al. 2003)

10.2.8.2.Involvement in planning and design process

Kumar, Hanumanthappa and Reddy (2008) state that 'm-government services require radically different approaches for service design, development, operation and interaction model'. There is almost consensus in the literature on the importance of user involvement in the planning and designing process for ICT projects (Barki & Hartwick 1994; Barki & Hartwick 2001; Capra, Francalanci & Marinoni 2007; Gefen & Ridings 2003; Scholl et al. 2008). Involvement has many dimensions in which it can be both top-down and bottom-up internally (within the department) and externally (with central government and other users) (Capra, Francalanci & Marinoni 2007).

'Field operations differ from other organizational areas in that they have higher degrees of complexity and expose lower degrees of structure in the organization of work' (Scholl et al. 2008). Thus, the mobile workforce operating in the field has specific needs that need to be met in the design. Scholl et al. (2008) recommend

that the mobile information system for field operations should be designed and built from a fieldwork-centric perspective. Fidel et al. (2007) add that 'to be useful, the technology design would need to be based on work procedures, and for the system to be able to incorporate those requires that the procedures are clear and consistent'. The user involvement is also discussed in the 'IT liaison with business groups' factor within the business case perspective.

10.2.8.3.Training

Both The Working Group on E-Government in the Developing World (2002) and Chang and Kannan (2003) agree that the first step in creating acceptance is to train and educate staff, starting with superiors who influence staff down through the bureaucracy. Chang and Kannan (2002) suggest that training technology-receptive employees will result in staff who will play a key role in supporting their peers. Capra, Francalanci and Marinoni (2007) acknowledge the importance of learning and both formal and informal training. They state that 'learning is a key factor for cultural changes', and observe that sound training and learning allow people to 'better understand the new contexts and objectives, and gain business process ownership, self-motivation, empowerment, customer orientation attitudes as well as the propensity to share information and knowledge' (Capra, Francalanci & Marinoni 2007, p. 114).

10.2.8.4.Data Protection and User Privacy

Strong penetration of ICT into many if not all segments of our lives, and our dependence (professionally and personally) on information systems, have increased threats to our security and privacy and resulted in new vulnerabilities

(Trček 2006). The same applies to m-Government systems that use the Global System for Mobile communications (GSM) network. GSM is the most popular standard for mobile phones in the world, particularly in Europe and Asia. According to Kumar, Hanumanthappa and Reddy (2008), 'one of the lesser-known features of GSM is the ability to fix a subscriber's location ... to within meters in some cases'. This raises a major concern about users' privacy. According to the (Cambridge Advanced Learner's Dictionary 2005), privacy is 'someone's right to keep their personal matters and relationships secret'. Thus, to ensure privacy, a two stage process should be followed: 'the first step is the awareness of users that they have to pay attention to privacy' (Trček 2006).

The interviewees did mention privacy concerns occasionally. Straub and Heinemann (2004) acknowledge these concerns and highlight the importance of ensuring users' privacy to increase acceptance of the system. The second stage in the process of assuring privacy is 'that there have to exist means that enable them [users] to protect and control data about themselves' (Trček 2006). For example, a location-based or location-aware G2E solution could track or monitor workers for efficiency purposes, but this may have legal repercussions (Kushchu, Arat & Borucki 2007). All parties involved in any mobile government transaction need to take reasonable effort to demonstrate that the user's information is private and this must be governed through legislation (Trček 2006). According to (Kar 2008), privacy and security can be considered as opposite values; thus, to ensure privacy, security is required as a key condition (Macumber & Cheung 2007; Trček 2006).

10.2.8.5.Ease of use

Kar (2008, p. 45) observes that 'the system should be easy to learn so that the user can rapidly start getting some work done with the system'. In his Diffusion of Innovation (DoI) theory, Rogers (1995; 2003) discusses five characteristics of innovations. These characteristics incorporate the complexity of the innovation. According to Rogers (1995; 2003), complexity is 'the degree to which an innovation is perceived as difficult to use', thus less complexity is required in all m-Government solutions to increase its adoption. (Davis 1989) in his Technology Acceptance Model (TAM) acknowledges that ease of use - 'the degree to which a person believes that using a particular system would be free of effort' - directly impacts perceived usefulness, and both impact the intention of use as depicted in Figure 36 below. The Theory of Decomposed Planned Behaviour (DTPB) which uses theoretical constructs from TAM and DoI acknowledges ease of use and usefulness (Taylor & Todd 1995).

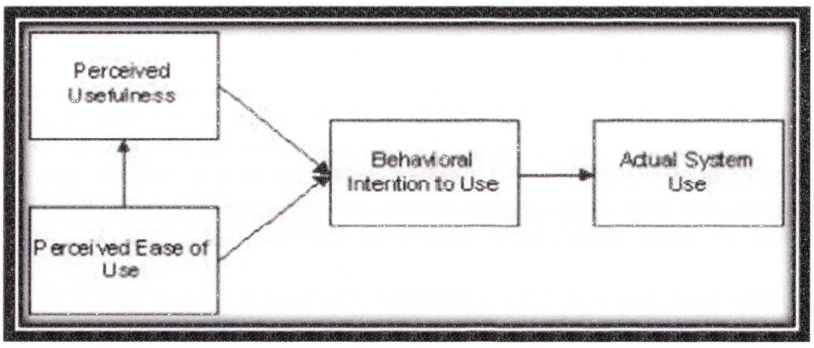

Figure 36: Technology Acceptance Model (TAM)(Davis 1989; Venkatesh et al. 2003)

Tornatzky and Klein (1982) analysed 75 articles on IS innovation and concluded that ease of use appears as a constant determinant of adoption.

10.2.9. The Constituents (Citizens) Perspective

Adopting and diffusing m-Government systems in the public sector and their use by employees have an impact on citizens. Governments have to be able to introduce new public services and processes that are available to their citizens as well as public sector employees. Hewlett-Packard (2003) categorises citizens as the following types of users:

- *citizens resident within administrative area,*
- *citizens resident outside administrative area,*
- *foreign citizens resident within administrative area,*
- *foreign citizen resident outside administrative area, and*
- *citizen's agents and proxies.*

Table 42: m-Government 'Citizens' perspective and its success factors

Success Perspective	Citizens' proposed success factors	Corresponding literature review
Constituents (Citizens)	• Acknowledge receipt of problems	• No match found
	• Fast Response	• (Kushchu, Arat & Borucki 2007)
	• Increase trust	• (Roggenkamp 2007; Scholl et al. 2008)
	• Citizens' convenience	• (Carroll 2005; Chen 2006; Chen 2008)
	• Broadband availability	• No match found
	• Mobile penetration and usage	• (Carroll 2005)
	• Easiness and readability of G2C services	• No match found
	• G2C services to mimic the real life process	• No match found

Success Perspective	Citizens' proposed success factors	Corresponding literature review
Constituents (Citizens) (Cont)	• Determine demand	• (Carroll 2005; Roggenkamp 2007)
	• Use proper surveying tools	• No match found
	• Evaluate citizens' readiness	• No match found
	• Collect census	• No match found
	• Judge demand	• (Roggenkamp 2007)

Although this study has concentrated on G2E m-Government, it also researched and analysed the G2C. It has been noticed that they share the majority of the success factors found in this study. For example G2C m-Government is still considered a complementary channel, and that the G2C applications/services should be incorporated within the one platform approach recommended earlier.

Although G2E and G2C m-Government share many success factors, some differences that were found and discussed in this study. For example, the need to surveying citizens to know their needs compared to involving the employees in the development process. Also while the government department could impose the use of m-Government applications on its employees, it is not possible to do so with the citizens. Thus, it is important to attain representative figures of mobile usage to predict citizens' acceptance and accessibility. According to NSWCC3 the implementation of G2C m-Government applications is poor due to 'no demand from customers'.

Roggenkamp (2007) acknowledges the importance of user acceptance and affirms that it is the 'main driver for the success of a service'. Thus, any mobile government service has to pass a User-Acceptance Testing (UAT). Roggenkamp (2007) described user acceptance as 'a product of user behaviour in relation to the available technology and a given environment'. Carroll (2005) also

acknowledges the importance of citizens' acceptance of m-Government offerings, and cautions that 'what people believe they need or do frequently diverges from what they are observed to do'. It is therefore important to understand the citizens' needs in the sense of demand, not in the sense of 'wishing for something' (Roggenkamp 2007). To assess needs more closely (Ahtinen, Nurminen & Häkkilä 2007), it is recommended to deconstruct the individual context (Roggenkamp 2004, 2007).

Carroll (2005) concludes that 'the lesson for m-Government is clear: unless the services and applications of m-Government meet citizens' needs, they will not achieve long-term, persistent use'. Roggenkamp (2007) acknowledges Carroll's finding when he states that 'user needs, more so the evaluation of a service to meet these needs is crucial for its success'. Thus, it is recommended that starting by 'developing a small set of high-value services is likely to be more successful in terms of citizens' acceptance' (Carroll 2005). Ahtinen, Nurminen and Häkkilä (2007) also recommend prioritising 'the implementation of the different features allowing the most urgently needed features to be available earlier'. This leads a user to the initial decision to use the service and explore the opportunities offered (Roggenkamp 2007), but eventually it is the positive experience and meeting the needs that make for long-term success and persistent use (Mallett, Millar & Beane 2006).

Based on the discussion above, emphasis should be placed on a thorough and systematic consultation with current and potential users. The consultation process should use proper surveying tools to collect census, determine demand and needs, and explore readiness.

10.2.10. The Benefits Perspective

The adoption of mobile technologies by the public sector not only benefits parties who use these services, but also has positive impact on the internal workings of the public sector (Kushchu, Arat & Borucki 2007). No doubt the major benefit of m-Government is obtaining services anywhere, anytime (ubiquity), but the analysis of the nine case studies has produced twenty five more benefits that need to be understood by government to encourage the adoption and diffusion of m-Government. Table 43 lists all the benefits that emerged.

Traditionally an IS project is an investment that simply uses the equation: Value Proposal = Benefit of System - Cost of System. Organisations typically apply financial cost/benefit analysis to appraise potential investments, therefore understanding the benefits is very important as the potential advantages of m-Government impel governments to strongly support it.

Table 43: m-Government 'Benefits' perspective and its success factors

Success Perspective	Benefits proposed success factors	Corresponding literature review
Benefits	• Time saving (i.e. less commuting)	• (Kar 2008; Kumar, Hanumanthappa & Reddy 2008; Kushchu, Arat & Borucki 2007; Olmstead et al. 2007)
	• Notification/early detection of problems	• (Olmstead et al. 2007)
	• Better allocation of jobs	• No match found

Success Perspective	Benefits proposed success factors	Corresponding literature review
	• Ability to do work from anywhere rather than commuting to the department	• (Kushchu, Arat & Borucki 2007; Olmstead et al. 2007)
	• Flexible work arrangement to retain staff	• (Capra, Francalanci & Marinoni 2007; Kar 2008; Kushchu, Arat & Borucki 2007; Mallett, Millar & Beane 2006)
	• Job distribution while workforce in the field	• No match found
	• Increase work efficiency and meeting deadlines	• (Kar 2008)
	• Service improvement	• (Kushchu, Arat & Borucki 2007; Roggenkamp 2007, p. 61)
Benefits (Cont)	• Immediate notification and increased response rate (discussed in the solution section)	• (Kushchu, Arat & Borucki 2007; Olmstead et al. 2007)
	• Shorten the time of response to user's requests	• (Kushchu, Arat & Borucki 2007; Roggenkamp 2007, p. 61)
	• Improved service delivery	• No match found
	• Citizens' satisfaction	• (Kar 2008; Olmstead et al. 2007)
	• Improved image of town, city, country	• (Kar 2008; Olmstead et al. 2007)
	• Cost reduction	• (Kumar, Hanumanthappa & Reddy 2008; Kushchu, Arat & Borucki 2007; Olmstead et al. 2007; Roggenkamp 2007, p. 61)
	• Decreased overhead costs per position because of physical space saving,	• (Kushchu, Arat & Borucki 2007)
	• Improved accountability	• No match found
	• Paperwork reduction and savings on	• (Kushchu, Arat & Borucki

Success Perspective	Benefits proposed success factors	Corresponding literature review
Benefits (Cont)	paper	2007)
	• Communication tool with the disabled citizens.	• No match found
	• Auto systems and solutions update,	• (Kumar, Hanumanthappa & Reddy 2008)
	• Auto antivirus update (critical for security and privacy reason),	• (Kumar, Hanumanthappa & Reddy 2008)
	• No duplication of data (less erroneous),	• (Kar 2008; Kushchu, Arat & Borucki 2007; Roggenkamp 2007, p. 61)
	• Ease of use,	• No match found
	• Higher accuracy,	• (Kushchu, Arat & Borucki 2007)
	• Added data safety and security.	• (Kumar, Hanumanthappa & Reddy 2008)
	• Personalisation & Location based services	• (Kumar, Hanumanthappa & Reddy 2008)

Parker et al. (1992) categorised benefits as substitutive, that is, where technology substitutes for people to improve efficiency; complimentary, where technology allows people to work in new ways to improve effectiveness; and innovative, where technology creates new ways of doing business to improve competitive advantage. (Olmstead et al. 2007) acknowledge the many m-Government benefits, and add some that did not emerge from the data, such as 'increased transparency'. Kushchu, Arat & Borucki (2007) have reported many m-Government projects that acknowledged most of the benefits listed in Table 43, such as the following projects:

North London Strategic Alliance (NLSA) Street Wardens Pilot Project is an m-Government application that streamlines the operations of street wardens. This

project has acknowledged the time savings benefit: *increasing in the response time of wardens to incidents, elimination of duplicate work, increase in the accuracy of reporting and reduction in citizen claims and legal costs due to visual evidence and cost savings* (Kushchu, Arat & Borucki 2007, p. 142).

Barnsley Metropolitan Borough Council, Impact Team Officers Mobile Data Project is an m-Government application that facilitates transferring reports from the field to the council. This project has acknowledged the benefits: *operational efficiency in the form of elimination of duplicate work, minimization of travelling time, attending more complaints, cost savings since less office space and workstations are needed, and better services offering* (Kushchu, Arat & Borucki 2007, p. 142).

Mobile Working at Barking and Dagenham Project enables six void inspection surveyors, who deal with 2,000 void inspections every year, to use mobile devices to transfer their findings (inspections results and questionnaires) electronically back to the office. This project has acknowledged the benefits: *surveying time has been improved and increased by 2 hours per day compared to before, void turnaround has been cut down by at least 2 days, some savings achieved in HR, less office space is required, the quality of the surveyors report and the gathered data has improved, surveyors are able to access more information outside of the office which contributes to the quality and accuracy of their reports* (Kushchu, Arat & Borucki 2007, p. 143).

Norwich City Council Street Scene Project: Parking Services enables parking attendants to report illegal parking and environment-related issues to the central parking system, using their handheld devices. This project has acknowledged the benefits: *increased productivity, one man hour saving, increased revenue, less*

paper work, less office space since the attendants do not have to go back to the office (Kushchu, Arat & Borucki 2007, p. 144).

Environment Protection Department of Hong Kong: Mobile Field Inspection System project enables inspectors to use PDAs to exchange information on chemical waste collectors and review the results of past inspections. This project has acknowledged the benefits: *increased in productivity by around 10%, 1.5 man hour saving per inspection team on a daily basis; and elimination of duplicate work* (Kushchu, Arat & Borucki 2007, p. 145).

10.3.International case studies findings

The four international case studies have acknowledged some of the success perspectives that emerged from the Australian ones. It also added a few success factors that enhanced the framework. Table 44 lists the success factors that emerged from the Jordan and UAE case studies.

Table 44: m-Government Success perspectives and factors identified through this research by International Interviewees

Category	Success factors (Jordan)	Success factors (UAE)
Planning	• Dedicating a separate m-Government budget • Selecting multi-skilled team and leader • Training • Sharing experience with advanced m-Governments • Empowering the m-Government team to demand cooperation from all government entities and the mobile operators • Start the m-Government program clear vision and mission.	• Forming m-Government team/unit • One central platform to connect all government departments • Develop an m-Government strategy

Category	Success factors (Jordan)	Success factors (UAE)
Mobile Government team	• Knowledge of Mobile and wireless technologies • Knowledge of the Telecommunication sector • Knowledge of Mobile services • Knowledge of Government services	• Sharing experience and learning from previous national and international implementations • Educating and training users
Mobile Government Stakeholders	• Liberalisation of the telecommunication sector and allowing competition in the market, • Add condition related to supporting the m-Government program when tendering for licensing new mobile service providers • Provide m-Government services through all available providers • Mobile technology literacy • Ensure positive experience in using the services for the first time • Citizens' happiness and satisfaction using the services • Consider the use of premium mobile services as an indicator • Fair charges for the m-services	• Outsourcing to expert providers • Operators' cooperation and partnership
Marketing m-Government services	• Ensure functionality of the services offered prior to marketing • Utilise most or all available media • Evaluate each marketing campaign for future improvements	• Demand user feedback for analysis and improvements • Surveys to check users' acceptance and also to benchmark • Start with the services on demand that result in quick Return on Investment (ROI)

Category	Success factors (Jordan)	Success factors (UAE)
Characteristics of m-Government services	• Ease of use • Simple to navigate • Easy to learn • Introduced in the county's spoken language • Translation to other languages if necessary	
Security of m-Government services	• Higher functionality of m-Government services requires higher security measures • Need for specialised m-Government security team	

While the five Australian case studies analysed m-Government projects at local government level, the four international case studies analysed projects at higher government levels: state government in UAE and federal in Jordan. The researcher interviewed IT managers in all case studies, but it was noticed that their roles are different in local, state, and federal departments. To clarify, it was observed that the IT manager's role at a local government department level is more technical than the role of IT managers in higher levels of government departments, where it is more of a management role. Thus, while the Australian interviewees revealed more technical details about the success of the mobile government systems, the international interviewees added important knowledge from their management perspective as they discussed factors such as policy, legislations, budgets, and team management. It can therefore be seen that Table 44 lists different perspectives than those emerging from the Australian case studies (Table 32).

The new perspectives that emerged from the four International case studies were incorporated within the ten-perspective framework discussed in section 10.1. The rationale for this is that the success factors emerging from the international case studies are relevant to the ten discussed perspectives, and that they fit within, enhance and refine the framework. For example, the *Characteristics of m-Government services* perspective has the following success factors: ease of use, simple to navigate, easy to learn, introduced in the country's own language, and translation into other language if necessary. Most of these success factors were revealed in the Australian case studies and therefore discussed earlier in their relevant perspectives within the framework. 'Ease of use' was thoroughly discussed as part of the 'Solutions' perspective, and within the acceptance success factor.

Another example is the 'Mobile Government Stakeholders' perspective which contains eight success factors. The factors 'Liberalisation of the telecommunication sector and allowing competition in the market' and 'Provide the m-Government services through all available providers' had already been discussed within the Government role perspective as they emerged from the Australian case studies. The success factors 'Ensure positive experience using the services from the first time' and 'Citizens' happiness and satisfaction using the services', are also discussed within the 'Constituent (Citizens)' perspective. The success factor 'Fair charges for the m-services' is discussed within the 'Providers' perspective and within the pricing success factor. The factor 'Mobile technology literacy' is discussed within the 'Constituent (Citizens)' and 'Constituent (Employee)' perspectives.

The security of m-Government systems was also highlighted as a crucial success factor. The international case studies revealed that the higher functionality of m-Government services requires higher security measures. The security has already been revealed by the Australian case studies and was thoroughly discussed within the 'Security' perspective. The success factors which emerged from the international case studies and were not discussed earlier will be discussed now, despite the fact that they were listed in the relevant perspective tables in section 10.1.

10.3.1. The new emergent success factors

The international case studies revealed the following success factors:

- Clear m-Government vision and mission
- Dedicated m-Government budget
- Dedicated mobile Government team
- Empowering the m-Government team to demand cooperation from all government entities and the mobile operators
- Introducing the service/solution in the country's own language
- Marketing m-Government

10.3.1.1.Vision and Mission and strategy

The international case studies revealed the importance of starting the m-Government program with clear vision and mission, as they will set the desired goals and guide the process to achieve them. m-Government vision and mission should be set by the government and therefore it is added to the 'Government role' perspective.

10.3.1.2.Budget

Although the international case studies revealed that an m-Government program is included in their e-Government program, they highlighted the need for a separate m-Government budget to cover the required costs such as marketing. A list of tangible costs can be found in Table 35. The m-Government budget partially depends on the selected business and revenue models discussed earlier. To reduce the budget needed, the case studies recommended that government add conditions related to supporting the m-Government program when tendering for licensing new mobile operators and service providers. The m-Government budget is added to the 'Government Role' perspective.

10.3.1.3.m-Government Unit or Team

The interviewees discussed the need for a either a standalone m-Government unit or team. They highlighted the importance of a dedicated unit/team to carry out, supervise and manage the process of adopting, developing and diffusing of m-Government systems. Such a team must have: knowledge of state of the art mobile and wireless technologies, knowledge of the telecommunication sector, knowledge of Mobile services, and knowledge of Government services. To stay up-to-date with the rapid enhancements in mobile and wireless technologies, it has been recommended to share experience and learn from other successful m-Government projects, mainly in countries with a similar culture. The m-Government unit/team could be a standalone body, or part of the e-Government body.

When adopting m-Government, it is expected that there will be no response - or a late response - from government departments unwilling to participate in the m-Government program. Thus, it has been recommended that the m-Government unit/team be empowered to demand cooperation from any department. The 'dedicated m-Government team' success factor is incorporated within the Government Role perspective.

10.3.1.4.Marketing m-Government

The international case studies recommended starting by offering the services on demand that result in a quick ROI. They also revealed that in the prior marketing of m-Government services, the functionality of the newly-offered services must be ensured. Offering functional services on demand spreads by word of mouth, which aids and eases the marketing of the services. A successful m-Government marketing campaign should utilise most or all available media. It is also highly recommended that each marketing campaign be evaluated for future improvements. Evaluation is possible through demanding user feedback. The analysis of the feedback indicates the acceptance level.

Marketing m-Government services is carried out by the government and should have been considered in the budget. Therefore, this factor was added as a success factor within the 'Government role' perspective.

10.3.1.5.Service language

Introducing the service/solution in the country's own language is a critical success factor that is added to the 'Solutions' perspective (see Table 36). Such a factor has an impact on the acceptance and usability of the service/solution. The

language used to introduce the service is very important for its acceptance, and the international interviewees recommended introducing it in the spoken language of the country. For example, the Maltese m-Government website <http://www.mobile.gov.mt/> is presented in the Maltese language with an equivalent English website <http://www.mobile.gov.mt/?mb:lang=en>. Mukherjee and Biswas (2005) acknowledge the importance of this and recommended using the local language in providing m-Government services.

10.4.Chapter Conclusion

This chapter proposes an adaptive m-Government success framework, validated by evidence found in the data and the up-to-date literature review. Data was collected by conducting online surveys and multiple local and international case studies, employing key informant interviews. The literature review consulted various theories on the adoption and diffusion of technological innovations such as Diffusion of Innovations, Technology Acceptance Model, Decomposed Theory of Planned Behaviour, Unified Theory of Acceptance and Use of Technology, and Task-Technology Fit.

The literature review also explored success factors proposed for mobile governments from specific m-Government literature and other related fields. Studies that extended the adoption models to suit mobile government, such as the Task–Technology Fit for Mobile Information Systems, were also consulted, as well as mobile technology publications that discussed innovation versus infrastructure factors, competitive and contingency factors, moderating factors, or technology factors, and user-oriented factors. Finally, a number of additional

mobile government success factors were compiled from these studies and added to the framework, such as the business and revenue model factor.

In order to foster a successful adoption and diffusion of m-Government, all m-Government systems components such as access devices, solutions (i.e. applications, user interface, content), government departments, providers (i.e. operators, content providers, applications developer/vendors, service providers) have to work together to provide an m-Government service that adds value to the users (Employees, Citizens, Businesses, and other Government departments). Based on this research, the following key success perspectives emerged: Drivers, Solutions, Constituents (Citizens), Constituents (Employees), Providers, Business Case, Security, Government Role, and Benefits. All these perspectives and their related success factors must be studied and understood, and could be applied in any country willing to boost successful m-Government systems.

10.5.Thesis conclusion

The gap between the potential of mobile government and the lack of success in its implementation so far highlights the importance of research in this field. It was revealed at the beginning of this study that while there may be many reasons for the lack of adoption and diffusion of mobile government, previous research has highlighted only a few specific factors. This suggests that research is needed to discover as many as possible success factors for mobile government, which prompted the following research question:

What are the factors contributing to successful transition to and implementation of mobile government systems? How? Why?

To answer the research question, this study aimed to qualitatively identify successful aspects of m-Government and the relevant factors required for successful adoption and diffusion of m-Government systems. The basic assumption is that m-Government is still in its infancy, and there is not yet full awareness of the adoption and diffusion factors that contribute to its success. This, therefore, became the focus of this research. Research of any kind into m-Government research is quite a recent development, and there is a major lack of literature. For this reason, the search for data by desk analysis, as well as by online surveys, and in-field interviews, was very difficult. The results achieved are presented in the m-Government framework model (Figure 33).

Specific objectives that were proposed to help achieve this aim included:

a) identifying all the factors that may influence adoption and diffusion of mobile government,

b) integrating such factors and relations between them in a framework,

c) providing specific recommendations and guidelines in all the various perspectives.

Successful m-Government requires a clear roadmap that guides the shift. Such a roadmap should clearly incorporate all possible success factors and identify what needs to be changed and how to make it happen. The devised m-Government framework is thus a major contribution to the success of an m-Government roadmap, and consequently the success of any m-Government project. The main contribution of this study is the theoretical adaptive framework that explains the specific factors that influence adoption and diffusion of mobile government, provides interesting findings on each of the identified factors, and at the same time integrates such investigations as one coherent whole that forms a framework of success factors for mobile government.

This study provides an original and significant contribution to knowledge in the field of mobile government. Some factors have never before been proposed. Others have been proposed in fragmented explanations that focused on a limited number of influences. Yet other factors have been proposed, but this research offers more accurate or understandable names and interpretations for them. In addition, this study integrated all the factors in a holistic framework, pointing out contexts and conditions that form categories and properties belonging to specific perspectives. The multitude of specific guidelines and recommendations that have been discovered in the participants' data is another important contribution. All of the above, including factor names, relations between them, and detailed

guidelines come from empirical data and the real world. The framework offers specific guidelines and can be used by governments at all levels to understand the success factors in each perspective, and to learn of particular recommendations in each of the perspectives.

The study also defined m-Government and answered the question: Could a fully-interactive m-Government be best suited for developing countries while many of them are suffering insufficient telecommunication infrastructure - the basic infrastructure for e-Government? It shows that different functionality levels of m-Government system dictate whether e-Government is required or not.

10.5.1. Research Limitations

Despite the strength of the case studies in relying on descriptive information provided by different interviewees, revealing countless success factors due to the uniqueness of each case, there is nevertheless room for important details to be left out. These could lead to variance in the success factors between case studies, and thus wider generalisation should be treated with caution. The main limitation of this research is that while it aims to be as generic and universally applicable as possible, some social issues such as culture could usefully be studied separately for specific countries. This could be a direction for further studies that would focus on specific locations and cultural influences or legal regulations affecting mobile government in various countries. This research could guide other researchers to study one or more success perspectives in their own countries, to add to the m-Government literature.

As with all survey-based and interview-based research, there are limitations to the interpretation of the results. Although the survey and interview questions were pilot tested prior to implementation, differing interpretation of questions may influence some responses.

Another research limitation to generalising the research contribution is the need for all m-Government key players, such as users of m-Government systems (i.e. employees and citizens) and providers (i.e. mobile operators, application vendors, and mobile device manufacturers) to learn from each other and understand the success factors from their perspectives.

The research could include quantitative evidence to reinforce the research results and contribution, and the researcher intends to quantify the results in future publications. Further specific recommendations within the various perspectives could be discovered in future studies, and hopefully this framework will provide guidance for other researchers, both in terms of specific categories that it is important to study, and of the processes that may be employed.

10.5.2. Strengths of this Research Significance

The research question in this study was based on the identified research gaps, as revealed in Chapter 1. Mobile government is still in its infancy, and it was shown that previous research focused on only a few success factors, both when this study was started and at the end of this project. A holistic framework addressing the success factors/limitations was missing, hence the significance of this study. This research also contributes with its comprehensive study to enrich the available literature.

10.5.3. Sound and relevant theoretical background

The theoretical background of this study was considered not in an abstract way, but rather to offer direct implications for this research, as revealed in Chapter 3. The guiding epistemology (constructionism) holds that meaning is not discovered, but rather is constructed by human beings as they engage with the world. Mobile government systems in this research, therefore, were not studied in isolation, but through conscious engagement with the real world through real case studies. Constructionism additionally posits that no subject's experience can be described in isolation from its object, and therefore, the meanings studied in this research project were generated from the subjects' use of mobile government solutions.

The interpretivist approach adopted in this study meant that the researcher was not looking for objective numerical data about mobile government systems, but rather for meanings that people assign to the phenomena studied, the influence of context on mobile government systems, and the full complexity of the situation. The specific theoretical perspective that guided this study, symbolic interactionism, dictated the focus on social interactions, which allowed the researcher to become aware of others' perceptions, attitudes, and values, and to interpret such meanings.

10.5.4. Rigour and quality of the research

This quality and rigour of this research were assured by a careful application of specific quality procedures. The testing and verification were conducted as an integral part of the development of the framework, and the accuracy of the

results was guaranteed through the constant comparison method. This thesis devoted the whole of Chapter 3 to the quality-ensuring procedures employed in this research. Numerous techniques were used to uphold the quality of the research: for example, the actual words of the participants have been used to name perspectives and success factors, instead of traditional terms used in well known models, which has helped to generate a true and accurate framework. Chapters 4 and 5 clearly explained the details of the data collection and analysis processes in this study so that the quality of this research could be established. To better communicate the data collection and analysis processes, detailed explanations were provided, illustrated with figures and screenshots. Also, numerous quotes from the participants were used, not only to provide rich illustrations of the topic, but also to validate the conclusions and to demonstrate to the reader how the researcher generated the framework.

10.5.5. Impact value of this study

The impact of this study springs out of its uniqueness. Throughout the research process the researcher globally published several peer-reviewed papers about government mobile services, which directly contributed to this thesis. These publications attracted many researchers who requested the researcher's cooperation in the same field to either participate with a chapter in an edited book, or co-write conference or journal papers. The impact of this study was also felt when other researchers started referring to the researcher's published work. The mobile government research (El-Kiki 2008) is one example. The impact of this study was also represented in the strong interest of several government departments at different levels in the results of the study, especially when the

researcher was requested to provide copies of this thesis when completed. In addition, the results of this study are presented in such a way that it can be understood by non-academics and, hence can be directly applied in practice.

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APPENDICES

Appendix A: Human Research Ethics Committee Approval

Appendix B: Web-survey

Appendix C: Interviews transcripts

Due to the size of the thesis and also the web-surveys and interview transcripts, the appendices were converted into PDF format and are available in the attached DVD.