ASSESSING THE M-GOVERNMENT READINESS WITHIN THE PROVINCIAL GOVERNMENT WESTERN CAPE

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by

Jacques du Preez

Supervisor: **Ms Naomi Burger**

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DECLARATION

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Jacques du Preez

15257606 (Student Number)

ABSTRACT

m-Government or mobile-Government is seen as part of e-Government and an additional channel for the delivery of public services and information to the citizen. This study critically examines and evaluates the extent to which the Provincial Government Western Cape has adopted m-Government and implemented related services.

A survey conducted by Kirsten (2006) on the adoption and readiness of mobile technology by businesses in South Africa was used as the foundation of this study to determine the level of readiness in the Provincial Government Western Cape. Managers and technical staff within the Province's information and communication technology component, the Centre for e-Innovation, were interviewed and asked to complete the survey.

The study found that, although there is a relatively high degree of adoption with regard to various aspects of mobile and wireless technology, there are many obstacles and barriers that need to be overcome in order to achieve a higher level of m-Government maturity or readiness.

The study makes various suggestions on how to overcome these barriers. The most important suggestion is to develop a holistic approach to the adoption of m-Government. Plans for adoption should be incremental to ensure that small victories that can be built on are achieved; the involvement of key stakeholders is also essential.

OPSOMMING

m-Regering oftewel mobiele-Regering word gesien as deel van e-Regering en is ’n addisionele kanaal vir die lewering van publieke dienste en inligting aan die landsburgers. Hierdie studie ondersoek en evalueer krities die mate waartoe die Wes-Kaapse Provinsiale Regering m-Regering aangeneem en relevante dienste geïmplementeer het.

’n Studie deur Kirsten (2006) oor die aanname en gereedheid van besighede in Suid-Afrika deur middel van ’n opname, is gebruik as fondasie om die vlak van gereedheid in die Wes-Kaapse Provinsiale Regering te bepaal. Onderhoude is gevoer met bestuurders en tegniese personeel van die Provinsie se inligting- en kommunikasie-tegnologie afdeling, die Sentrum vir e-Innovasie. Die opname wat deur Kirsten ontwikkel is, is ook gebruik om verdere inligting in te win.

Die studie het getoon dat alhoewel die vlak van aanname redelik hoog is met betrekking tot sekere aspekte van mobiele en draadlose tegnologie, daar steeds verskeie struikelblokke en hindernisse is wat oorkom moet word om ’n hoër vlak van m-Regering-gereedheid te bereik.

Die studie maak verskeie voorstelle om hierdie hindernisse te oorkom. Die belangrikste voorstel is om ’n holistiese benadering tot die aanname van m-Regering te hê. Planne vir aanname moet inkrementeel wees sodat klein suksesse, waarop gebou kan word, behaal word. Die betrokkenheid van sleutel-aandeelhouers is ook van kardinale belang.

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LIST OF ACRONYMS AND ABBREVIATIONS

1G	first generation
2G	second generation
3G	third generation
4G	fourth generation
BRIC	Brazil, Russia, India, China
CCTV	closed-circuit television
CD	compact disc
CEI	Centre for e-Innovation (branch in Department of the Premier)
CIO	Chief Information Officer
CITCOM	Central Information Technology Committee
CPSI	Centre for Public Service Innovation
CSIR	Council for Scientific and Industrial Research
DESA	Department of Economics and Social Affairs (United Nations)
DITCOM	departmental information technology committee
DoA	Department of Agriculture
DoC	Department of Communication
DoL	Department of Labour
DPSA	Department of Public Service and Administration
DST	Department of Science and Technology
DSTV	digital satellite television
DVB-H	digital video broadcast – handheld
DVD	digital versatile disc or digital video disc
EDGE	enhanced data rates for GSM (global system for mobile communication) evolution
FOSS	free open-source software
G2B	government-to-business
G2C	government-to-citizen
G2E	government-to-employee
G2G	government-to-government (all levels)
GB	gigabyte
GCIS	Government Communication and Information Services
GHz	gigahertz
GIGO	garbage/good in garbage/good out
GITOC	Government Information Technology Officer's Council
GPRS	general packet radio service

GPS	global positioning system
GSM	global system for mobile communication
HIS	Health Information System
HSDPA	high-speed downlink packet access
http	hypertext transfer protocol
IBM	International Business Machines
ICASA	Independent Communications Authority of South Africa
ICT	information and communication technology
IEEE	Institute of Electrical and Electronics Engineers, Inc.
IM	information management
IMST	information management, systems, technology
ISD	Information Society and Development (Presidential Task Force)
ISP	internet service provider
ISSA	Institute of Satellite and Software Applications
IT	information technology
IVRS	interactive voice response system
kg	kilogram
LAN	local area network
MAN	metropolitan area network
Mbps	megabits per second
MIOS	Minimum Information Interoperability Standards
MISS	Minimum Information Security Standard
MMS	multimedia message service
MS	Microsoft
MWT	mobile and/or wireless technology
NGO	non-government organisation
OCIO	Office of the Chief Information Officer
OGCIO	Office of the Government Chief Information Officer
P&D	Planning and Development
P&S	Policy and Strategy
PAN	personal area network
PC	personal computer
PCCN	Provincial Common Core Network
PDA	personal digital assistant
PGWC	Provincial Government Western Cape
PPP	public-private partnerships

RAS	remote access services
RSA	Republic of South Africa
RFID	radio frequency identification
SIM	subscriber identity module (card)
SITA	State Information Technology Agency
SMS	short message service
StatsSA	Department of Statistics
TB	tuberculosis
UMPC	ultra-mobile personal computer
UN	United Nations
US / USA	United States of America
USB	universal serial bus
VoIP	voice over internet protocol
VPN	virtual privacy network
WAN	wide area network
WAP	wireless application protocol
Wi-MAX	worldwide interoperability for microwave access
WLAN	wireless local area network
WMAN	wireless metropolitan area network
WPAN	wireless personal area network

GLOSSARY

e-Government	All electronic government technologies and services.
e-Readiness	Extent to which e-Services can be deployed.
e-Service	Any “electronic” service delivered to a client or an organisation by means of information and communication technologies.
FOSS	Free open-source software is in the public domain (available to all free of charge). Organisations may often change this software’s source code to suit their own requirements or to customise the features.
http	The protocol used to transfer information on the World Wide Web. An HTTP address (one kind of Uniform Resource Locator (URL)) takes the form: http://www.microsoft.com (Microsoft, 2003).

hotspot	an area, usually part of a local network, where mobile devices can connect to the network and internet.
iPod	iPod is a popular brand of portable media players designed and marketed by Apple Inc. and launched on 23 October 2001 (Wikipedia, 2008l).
m-Government	All mobile government technologies and services.
m-Readiness	Extent to which m-Services can be deployed.
m-Services	Any “mobile” service delivered to a client or an organisation by means of Mobile and/or Wireless Technologies.
near field communication (NFC)	A short-range high-frequency wireless communication technology which enables the exchange of data between devices over about a decimetre distance. NFC and Bluetooth are both short-range communication technologies which have recently been integrated into mobile phones. The significant advantage of NFC over Bluetooth is the shorter set-up time.
online	Describes a system which is connected (generally electrically) to a larger network, but data and information can generally not be updated immediately (Wikipedia, 2008m).
pull services	To “pull” implies that information or data are being received from the government’s perspective.
push services	“Push” refers to sending information to one of the four delivery segments.
real-time	System that responds to events or signals within a predictable time after their occurrence; specifically the response time must be within the maximum allowed, data and information can be updated immediately (Wikipedia, 2008n).
SIM	Subscriber identity module card – A removable smartcard for mobile phones. SIM cards securely store the service-subscriber key used to identify a subscriber. The SIM card allows users to change phones by simply removing the SIM card from one mobile phone and inserting it into another mobile phone (Wikipedia, 2008o).

WAP	Wireless Application Protocol, an open international standard developed by the Wireless Application Protocol Forum Limited, a company incorporated in terms of the laws of the United Kingdom, for applications that use wireless communication and includes internet access from a mobile phone.
Wi-Fi	A wireless technology brand owned by the Wi-Fi Alliance intended to improve the interoperability of wireless local area network products based on the IEEE 802.11 standards. Wi-Fi is often associated with hotspots. Common applications for Wi-Fi include internet and VoIP (voice over internet protocol) phone access, gaming and network connectivity for consumer electronics such as televisions, DVD players and digital cameras. It is often incorrectly termed Wireless Fidelity. (Wikipedia, 2008c)
Wi-MAX	*Worldwide Interoperability for Microwave Access* is a telecommunications technology that provides wireless data in a variety of ways. To date research has found more than 250 Wi-MAX networks worldwide. They are not yet used extensively, but by 2010 they will be, and by 2013 there will be more than 80 million subscribers worldwide (Belouin, Blattes, Léglise & Ménérat, 2008:20; Wikipedia, 2008d).

LIST OF APPENDICES

CHAPTER 1: INTRODUCTION AND PROBLEM STATEMENT

1.1 Introduction

Machiavelli (BrainyMedia, 2008) said, “There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things”. This comment most certainly also applies to the adoption of mobile and/or wireless technology (MWT) in the delivery of services. Throughout the world innovative examples of MWT abound. Service providers are racing to gain a competitive edge in a volatile environment. Governments cannot be left behind and it is in this context that mobile services are starting to emerge in South Africa and also the South African public service. These services are called m-Services or “mobile” services. In the context of the public service they fall within the ambit of m-Government.

m-Government or “mobile” government is a relatively new concept that is gaining significant attention internationally. Although m-Government could be considered to be a new specialised area, it should be seen as complementary to e-Government (electronic government) activities (Kushchu & Kuscu, 2003:2; Sharma & Gupta, 2004:465; Lallana, 2004b). Just as Heeks (2006:142) indicates that e-Government services and provision of public sector information are supplementary to the traditional face-to-face and phone-based methods, so m-Government is supplementary to e-Government. m-Government is therefore not the next step in e-Government, but rather a new channel for the delivery of public services and information to the citizen. New value is added and it allows for improved use of what already exists (Kacza, 2005:31).

There are various interpretations of the meaning of m-Government, though essentially it is about getting public services and information by means of MWT to citizens who have access to the technology. MWTs include the use of portable digital assistants (PDAs) and portable computers, as well as radio, cellular and satellite technology. Public services that m-Government could possibly contribute to will be discussed at length in the study. The concepts above are explained in more detail in Chapter Two.

1.2 Background

Public service delivery is an important and topical issue. Citizens rely on governments to deliver services effectively and efficiently. South Africa has been a true democracy for more than a decade and many citizens are restless because election promises have not been kept. Throughout South Africa there are signs of communities showing dissent and despondency as far as the country's authorities are concerned. The massive challenge regarding service delivery, in especially rural areas, needs to be addressed to ensure equality of services. This dissent and the recent spate of xenophobic attacks are arguably an indirect result of poor public service delivery.

e-Government can be seen as a significant contributor to public service delivery. This contribution is not always directly visible to the public, as much of e-Government takes place "behind the scenes". These "behind the scene" activities include storage of data and records pertaining to every aspect of every citizen from birth to death. Government talks about life events from the cradle to the grave (Farelo & Morris, 2007:76). The national e-Government strategy addresses each of these phases in a citizen's life by developing e-Services that relate to each life phase (Burger, 2007).

It is unlikely that dissatisfied communities could be appeased through e-Government, although by making smart use of it, many of the required and desired services could be delivered in a more timely fashion. These contributions will not always be evident and directly visible to the citizen. Many of these e-Services are provided in the background to enable smooth delivery of the direct services. There are examples worldwide of m-Services that reach citizens directly. Chapter Two will elaborate on these.

According to Stones (as cited in Kirsten, 2006:1), there are more than 2.2 billion cellular-phone (cell-phone) users worldwide. Cellular Online (as cited in Kirsten, 2006:1) indicates that South Africa has around 30 million cell-phone users, but these figures are debatable, according to Goldstuck (2005:82), because of a high churn rate. The churn rate is calculated by dividing the average monthly cell-phone disconnections during a period by the average total customer base during the

period. The churn rate could be as high as 42.3%, according to Vodacom (2008a). Goldstuck (2005:82) suggests that the subscribers indicated should therefore be reduced by as much as 20%.

The way people communicate has changed significantly in recent years. Fixed-line telephone users have been outstripped by cellular subscribers since 2001 (Goldstuck, 2005:85). This trend is also seen internationally, where communication by cell-phones surpassed fixed-line telephones in 2000 (Goldstuck, 2005:86). The use of the mobile has brought a new dimension to communication. The use of the short message service (SMS) allows cell-phone users to communicate by means of short text messages of up to 160 characters. Paterson (as cited in Kirsten, 2006:36) states that there are more than 300 million SMS messages sent monthly in South Africa, while Goldstuck (2005:96) claims that there were 500 billion SMS messages worldwide in 2004. This indicates that SMS is the most favoured means of communication worldwide. Governments need to take cognisance of this and think of innovative ideas to capitalise on this phenomenon. As will be seen in Chapter Two, there are many examples of how this has already been done.

Taking e-Government to a level of mobility will enhance the ability of public officials to deliver services more effectively and efficiently. There is proof that the use of mobile technology has had a positive impact on service delivery in rural and difficult-to-reach areas in other parts of the world (Crompton, 2006). The assumption is that the same or similar benefits could be accrued in the South African environment. The major role players in South African e-Government are becoming more vocal on the topic of mobile government. This in itself justifies this study, but to clarify this in more detail, the purpose of this study is explained below.

1.3 Purpose of the study

The proliferation of cellular technology and the vast penetration of cell-phones in South Africa and other countries allow for a myriad of possibilities regarding mobile service delivery. More than 70% of the South African population have access to cell-phones (Department of Statistics (StatsSA), 2008:3). There are

many examples of how MWT is used worldwide and in South Africa for a range of services. This has led to the rise of new terms in the e-Services environment; among others, m-Democracy, m-Directory, m-Banking, m-Health, m-Learning and m-Security. These terms and examples of each will be examined in the study.

In South Africa there are several examples of m-Government, which, together with other possibilities, will be explored to ascertain how these examples could be utilised or expanded within the Provincial Government Western Cape (PGWC and also referred to as the Province in this study). The study will aim to focus on m-Government services that could contribute to the achievement of provincial and national goals within the Province, while ensuring their alignment with the national strategy for e-Government.

Besides the fact that this is a topical issue worldwide, there are many reasons for undertaking a study such as this one. Arguably, the most significant reason is the fact that cell-phones have become the dominant form of communication in South Africa and elsewhere. Wherever you look, people are communicating on cell-phones by voice and, very importantly, also by text. The cell-phone is no longer seen simply as a “nice-to-have” item, but has become an essential part of every sphere of society (Kirsten, 2006:73). Few people write letters today because a short text message sent by phone is received instantly and a reply is often received within a couple of seconds or minutes. Throughout society, from the affluent in the city to the poor in rural areas, cell-phones have brought people closer to each other. This has allowed for opportunities to deliver many of the current e-Services via this mobile avenue as well.

Surveys done by the South African research company World Wide Worx in 2005 indicate that more than 90% of people were satisfied with the impact of cell-phones on their personal and working lives (Kirsten, 2006:73). The survey also indicated that more than 24% of South African cell-phone users communicate by SMS more than once daily and just over 10% have never used SMS.

A further reason is the use of mobile technology to enhance democratic participation of citizens, which has been employed in various countries including the United Kingdom, Brazil and India. Voting by means of SMS was used

experimentally as a first step in the United Kingdom in 2002. “Voting is just one of many democratic processes — such as consulting, petitioning and campaigning — that will offer opportunities and challenges to mobile technology advocates” (Di Maio, 2002:3). The possibility of utilising the same applications locally is a matter for consideration.

It is unlikely that this will happen at a national level at this stage, but deciding whether to remove an old town landmark may be an example of where an SMS election could provide a meaningful measure of the local attitude toward the proposal. As part of a democratic society, citizens should have the ability to voice their opinions. The SMS is an excellent vehicle for this option.

Mobile employees have become an essential part of organisations worldwide. The PGWC employees are no different. Managers and field staff alike have access to cell-phones, data cards and portable computers to perform their duties. The impact of this phenomenon on service delivery will also be examined.

Within the PGWC, and especially the Branch: Centre for e-Innovation (CEI), this study could be utilised as a working document to contribute to the proposals on e-Government service solutions, especially regarding MWT. The *iKapa* growth and development strategy for the PGWC highlights improving information and communication technology (ICT) infrastructure and mobility as one of the goals to grow and share the economy (PGWC, 2007b:36).

Currently there is little literature on this specialised subject. Although there are many articles relating to e-Government, the number of articles and literature focusing on m-Government is negligible; nevertheless this is changing rapidly. This study will contribute to this body of knowledge.

The PGWC and most government institutions employing ICT have a measure of their e-Government readiness or e-Readiness. There are many existing tools to measure e-Readiness. However, as m-Readiness is a very new concept, the tools to measure it are few and far between. Most e-Readiness tools include aspects of mobile technology, yet there is no *de facto* standard from any recognised institution to measure m-Readiness yet.

The study by Kirsten (2006), *Mobile business adoption and readiness in South African organisations*, looks specifically at the local context and uses a variety of sources to compile an m-Readiness model. Chapter Five explains how the m-Readiness assessment of the PGWC was conducted in line with the study done by Kirsten.

The reasons above have outlined the purpose of the study. m-Government in the PGWC will be explored, described and explained. The potential value of the research will now be examined.

1.4 Potential value of the study

This study focuses on assessing the m-Government readiness within the PGWC. The state of m-Readiness will provide the Province with an indication of whether there are any shortcomings, challenges and/or opportunities to deliver services through mobile technology. In addition, the study will afford other provinces and government institutions the opportunity to replicate it. The findings of the research can be used to establish a baseline for the current m-Readiness so that progress can be measured at future intervals.

The PGWC (2008a) is in the process of coordinating the Provincial Common Core Network (PCCN). Mobile technology including wireless communication has been identified as an important part of provincial connectivity. This research and its results will be made available to this team, which could assist them in making informed decisions regarding mobile connectivity within the Western Cape. The conclusion and recommendations could be used as a basis for further research by the role players in the PGWC to ascertain their viability.

The purpose and the value of the study have been accounted for, so it is time to provide clarity on how this study was conducted. The explanation of the research design and methodology follows where the research problem and the objectives of the study will be described.

1.5 Research problem and objectives

1.5.1 Research problem

As mentioned above, the primary question that this study aims to answer is: “To what extent is the Provincial Government Western Cape ready to implement m-Government?”. The assumption is that, although there are many examples of the use of MWT, many shortcomings regarding m-Government readiness still prevail. In addition to answering the major research question, a few additional questions will also be addressed. These include: “What m-Services are currently being delivered?” and “What future m-Services could benefit the citizens of the Western Cape?”.

1.5.2 Research objectives

The research objectives can be divided into the general aim and specific objectives.

1.5.2.1 General aim

The general aim of the research is to critically examine and evaluate the extent to which the PGWC is ready to implement m-Government. m-Readiness is the *dependent variable* that depends on m-Government, which is the *independent variable*. The readiness level of the organisation will provide an indication of the organisation’s current use and ability to utilise mobile technology.

There are many interpretations of “readiness”, therefore a definition for this and other terms will be provided in Chapter Two. The meaning of the word “extent” in the research problem statement can also be debated. Chapter Three defines the m-Readiness model and how the measurement was done. During the study these aspects were discussed with various role players involved in government ICT in the PGWC.

What is clear at this point is that internationally readiness is determined differently, albeit that most aspects overlap. The study done by Kirsten (2006) and theory by Goldstuck (2003) and Goldstuck (2005) will be used as the basis for measuring of readiness in this study.

1.5.2.2 Specific objectives

The specific objectives of this study are primarily to:

- Offer a broader understanding of m-Government within an e-Government context;
- Find out how m-Government has been utilised, focusing on the PGWC, and specifically its relation to public service delivery; and
- Conduct an m-Readiness assessment of the PGWC.

In addition the following secondary aspects will also be addressed:

- Present possible future applications of m-Government;
- Provide both a critical and objective analysis of m-Government's benefits, drawbacks, limitations and challenges; and
- Determine measures that can be put in place to improve the readiness of the PGWC for m-Government.

These objectives mentioned above need to be applied within specific parameters. Furthermore there are certain limitations to this study that need to be discussed. The next section will look at the scope and limitations of the research.

1.6 Scope and limitations

1.6.1 Scope of research

The study looks at the m-Readiness of the Provincial Government Western Cape. The work done by Kirsten (2006) to determine the readiness and uptake of MWT of corporate South Africa is used as a baseline for the research. The m-Readiness tool is discussed in Chapter Three and the unit of analysis, the PGWC, will be described in detail in Chapter Five.

This study does not intend to develop an m-Readiness measuring tool. The lack of a tool is one of the limitations of the study and will now be discussed.

1.6.2 Limitations of study

There is no recognised m-Readiness measuring tool, hence the research relied heavily on the work done by authors such as Goldstuck (2003), Goldstuck (2005), and Kirsten (2006). Chapter Three provides a breakdown of how this study used existing literature to compile a measuring tool for this study. Time constraints meant that the full development of a replicable m-Readiness measurement tool was not possible and would require further research.

There is not much literature on m-Government, although the number of articles is increasing rapidly. This meant that in some instances the writings on e-Government had to be used. Some of these, such as the strategic documents for the PGWC on e-Government, are as much as eight years old.

Although a focus group was planned to gather more data, the operational requirements of the role players made it impossible to get them together before the deadline. The interviews with the relevant role players in the PGWC provided enough information to obviate the need for a focus group.

The research design and the methodology will provide more details on how the scope for the research project and its limitations were addressed.

1.7 Research design and methodology

This empirical study uses a case study to research the m-Readiness of the PGWC. The case study model was decided upon, as Mouton (2006:149) suggests that ethnographic research which intends to provide an in-depth description of small numbers of cases should use the case study design map. Case studies are typically applied to, among others, business studies of organisations. The study of PGWC's m-Readiness is an example of this.

Various authors and sources are used to provide evidence for this study. This provides objective evidence. Although there is some possibility for error and bias, this has been minimised by ensuring that the data collection (see Chapter Five) has been conducted objectively and systematically. Any shortcomings in this regard are also discussed in Chapter Five.

Appropriateness of the evidence has been ensured through tried and tested data-capturing tools. The survey questionnaire and interview questions are based on research by Kirsten (2006), Goldstuck (2003) and Heeks (2002). All the questions relate directly to the research problem. For details on the data collection and analysis, refer to Chapter Five. The evidence collected with regard to m-Readiness of the PGWC supports the findings in Chapter Six. The lack of an official tool to measure m-Readiness is a limitation that only further study and research could address. The m-Readiness tool used for this study, in lieu of an official one, does serve to provide a meaningful measure, though. The compilation of this tool is discussed in Chapter Three.

This research will contribute to the body of knowledge in this regard and this could possibly lead to the construction of a formal hypothesis for further deductive research (Welman, Kruger & Mitchell, 2007:34).

To avoid "reinventing the wheel", this research makes use of previous related studies. The work done by Kirsten (2006) does not consider the public sector, as it falls outside the scope of his work. However, government cannot be left behind with regard to mobile service delivery.

1.8 Outline of chapters

The layout of this study is based on Mouton's (2006:122-125) generic model for theses. This study provides background on m-Government, a macro to micro picture of the current situation regarding m-Government readiness in the PGWC, and the findings, which are discussed and summarised in Chapter Six.

Chapter 1: Introduction and problem statement

This chapter provides the introduction and background to the study. This is followed by the problem statement and the objectives of the study. The account of the scope of the study and the associated limitations provides details on what will be researched and the challenges that were faced. The research design and methodology are also briefly discussed and should be read in conjunction with Chapter Five, which looks at data gathering and analysis.

Chapter 2: Theoretical framework

The second chapter is the theoretical framework for the study, which was compiled through a comprehensive literature review that explains the global and local aspects of m-Government and as it relates to e-Government. The key concepts relating to this study are explained and the legislative framework is examined. The aspects surrounding m-Government, such as reasons to use it, examples and benefits, are discussed. The international and local contexts are also discussed before summarising the framework. The amount of information relevant to the subject led to the chapter being split into three parts. The readiness model and the associated technology both warranted their own chapters, and are consequently dealt with on their own.

Chapter 3: m-Readiness model

Chapter three speaks to the m-Readiness measurement tool. The research by Kirsten (2006) to determine mobile readiness in corporate South Africa was used as a basis for measuring the m-Readiness in the PGWC. Although the main focus of the study is based on research done by Kirsten (2006), the work by Goldstuck (2003), Goldstuck (2005) and other experts in this field was also considered.

Chapter 4: Associated technology

Associated technology is divided into three basic categories and, after an abridged history of MWT, the categories are examined. The first category looks at wireless networks, while the second category looks at the mobile and wireless devices. The final category will refer to the associated technology software and applications.

Chapter 5: Data gathering and analysis

The fifth chapter outlines the data gathering and analysis. The unit of analysis, the PGWC, is described and the key variables are discussed. The methods to collect primary and secondary data are explained in relation to the m-Readiness model.

Chapter 6: Research findings

Chapter Six addresses the crux of the study, the research findings and the result of measuring the PGWC m-Readiness. The research findings are based on data collected from within the Province on the various aspects of m-Government. The

chapter looks at m-Government resources, activities, inputs, outputs, outcomes and the impact of m-Government on the citizen.

Chapter 7: Summary and conclusion

The final chapter concludes the study and makes recommendations regarding the future possibilities of utilising MWT within the Province. Possible future related research areas are also indicated.

1.9 Summary

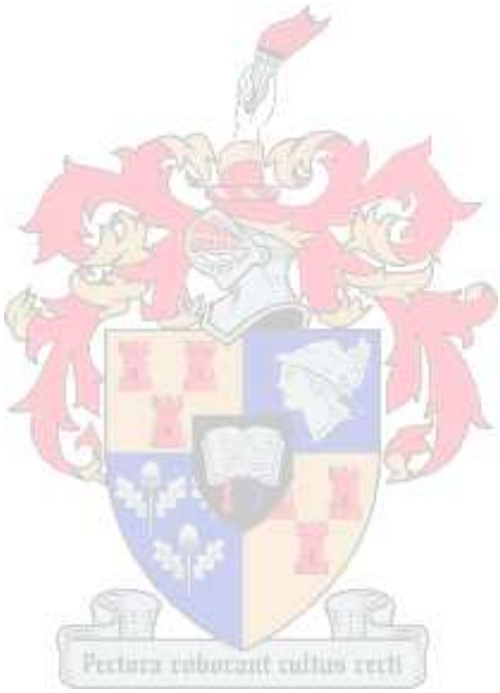
The boom in cell-phone use over recent years means that the citizenry of South Africa are embracing communication technology. Recent surveys suggest that more than 70% of South Africans have access to a cell-phone (StatsSA, 2008). This figure could be higher for the Western Cape, based on previous surveys.

The public service has been implementing e-Government strategies for almost a decade. Many of these services are mature, but the advances in technology mean that a new focus area needs attention. This new focus area is in the field of MWT. There is an opportunity to capitalise on the widespread cell-phone penetration by looking at existing and new e-Services that could be delivered via this mobile channel.

More and more government employees are becoming field workers. These mobile employees need to keep in touch with their head office and have access to important data so that decisions can be made in a more timely fashion. Further to this, there are many opportunities and examples that will be looked at in the research regarding the use of mobile technology in an array of public services, including health, security and education.

m-Government has the potential to contribute significantly towards public service delivery, but it is very much in its inception phase. This study will look at how ready the PGWC is to make use of m-Government to deliver its services using mobile technology.

This first chapter has outlined the reasons for undertaking the study as well as the methodology that was used. The background to the study has been provided and the next chapter will clarify the theoretical framework and key concepts associated with m-Government will be clarified, and definitions for these concepts will be provided.



CHAPTER 2: THEORETICAL FRAMEWORK

2.1 Introduction

The theoretical framework for this study was built up through a literature review, which concluded in July 2008. The literature consulted included recent literature on m-Government, e-Government and MWT. In some cases, such as the provincial e-Government strategy, it was necessary to use sources that were as old as seven or eight years, as these were the most recent writings available on the subject.

As m-Government is in its infant stages, there are few books on the topic. Most people see m-Government as a part of e-Government. This meant that the relation between e-Government and m-Government was also studied. As a result of the huge penetration of cell-phones worldwide, more and more people are seeing cell-phones as an important tool in service delivery, not only in the private sector but also in the public sector. Hence there are increasing numbers of articles and reports that provide meaningful input and background to m-Government, albeit mostly internationally. The key concepts in this regard will be explained below.

This chapter will also look at the legislative context within which the unit of analysis, the PGWC, functions. Furthermore, aspects of m-Government such as examples, benefits and related challenges are also discussed. The chapter concludes by defining the context for this study. Before looking at the associated policy documents and other related aspects, the key concepts regarding m-Government will be examined.

2.2 Key concepts

When researching something new, there will always be a need to define new and existing concepts to ensure that there is common understanding. m-Government is no exception. There are numerous terms and acronyms related to MWT. An explanation of the most essential terms that are relevant to

m-Government follows. Logically, e-Government is the first concept that needs to be explained.

2.2.1 e-Government

It has already been said that m-Government is an integral part of e-Government, but e-Government needs further clarification. There are possibly as many definitions of e-Government as there are articles about it. The “e” represents electronic, so “e-Government” basically means electronic government. Below is a collection of some of these definitions.

The World Bank (as cited in Singh and Sahu, 2007:477) defines e-Government as “the use of ICT to improve the efficiency, effectiveness, transparency, and accountability of government”. Singh and Sahu (2007:477) state that e-Government can, in addition to the above, potentially control fraud and corruption as well. Lallana (2004b) argues that e-Government is about the improvement of public services by means of ICTs.

Ni and Ho (2005) state that e-Government is about the delivery and enhancement of government information services to government employees, other government institutions or units, private business companies and/or the citizens, especially through the internet. These four avenues are collectively known as the delivery model for e-Government, and consist of government-to-government (G2G), government-to-employee (G2E), government-to-business (G2B) and government-to-citizen (G2C). The delivery model will be discussed in more detail below.

Heeks (2006) explains e-Government as any task, process or service that is conducted or delivered “electronically” or by means of information and communication technology. These include various mobile options to deliver e-Government services, not only front-desk services or direct contact with the public, but also the indirect or support services that contribute to service delivery, such as the maintenance of the communication network infrastructure.

The Department of Public Service and Administration (DPSA) defines e-Government as: “electronic government, also known as e-Government, digital government, and online government refers to government’s use of information

communication technology to exchange information and services with citizens, businesses, and other arms of government. e-Government may be applied by the legislature, judiciary, or administration, in order to improve internal efficiency, the delivery of public services, or processes of democratic governance" (Department of Public Service and Administration (DPSA), 2007a).

e-Government does not only include "online government" or "internet-based government," but also applies to many non-internet "electronic government" technologies. Many of the examples below fall within the scope of m-Government, but the DPSA (2007a) defines them as "non-internet technologies":

- telephone and fax;
- short message service (SMS) and multimedia message service (MMS);
- wireless networks and services;
- Bluetooth, smartcards and other near-field communication applications;
- closed-circuit television (CCTV);
- tracking systems;
- radio frequency identification (RFID) and biometric identification;
- road traffic management and regulatory enforcement;
- identity cards;
- polling station technology (non-online e-Voting);
- television and radio-based delivery of government services; and
- e-mail, online community facilities and electronic mailing lists.

All the definitions of e-Government have certain aspects in common. They all refer to electronic government technologies, specifically ICT, and services that are utilised to improve the services to the citizens, either directly or indirectly. For the sake of this research, e-Government will be seen as entailing "The use of ICT to contribute toward direct or indirect public service delivery internally and/or externally."

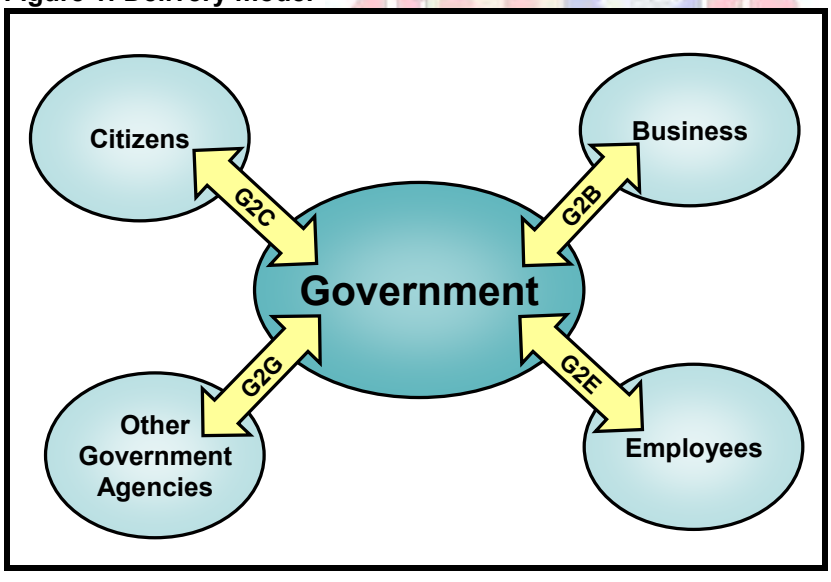
"Direct" contributions are made where the public interfaces directly with any of the e-Government services, while "indirect" services refer to the "back-office"[1] functions such as keeping the network infrastructure up and running.

"Internally" refers to other government role players including employees, and "externally" refers to organisations, businesses and/or citizens outside the government. The various segments internally and externally to which services are delivered are collectively called the delivery model.

2.2.1.1 Delivery model

Goldstuck (2003:26) talks about the areas where government delivers services as delivery directions or market segments. Heeks and Lallana (2004) call these delivery channels, while the DPSA (2007a) and Wikipedia (2008f) talk about a delivery model. Generally there are four areas or segments, although the DPSA (2007a) refers to only three, as they possibly regard employees as part of internal government. Figure 1 is a graphic interpretation of the delivery model.

Figure 1: Delivery model



The bottom-left segment in Figure 1 is government-to-government, which refers to the interaction between government organisations, departments and authorities on all levels (Wikipedia, 2008h).

[1] A back office is a part of most corporations where tasks dedicated to running the company itself take place. Examples of back-office tasks include IT departments that keep the phones and computers running (operations architecture) (Wikipedia, 2008p).

One of the most common internal functions is information sharing, and interaction could be both internal and/or external. This “internal” communication more than likely relates to interdepartmental or other government institutions at local, provincial or national level. External communication possibly refers to communicating with governments in other countries.

The bottom-right segment in Figure 1 refers to the government-to-employee interaction. Employees are in constant communication with government. Employees often need to address personal information needs. As 21st-century knowledge economy workers, many are becoming “mobile workers”. They are no longer only in an office. To enable them to deliver the required services more effectively, many have been provided with technology that enables them to perform their duties from wherever they may be and at any time.

Government-to-citizen refers to the online interaction between government and individual citizens. This is the direct interaction between government and the individual with regard to any e-Government service, usually by means of a central government portal (Wikipedia, 2008i). Services associated with this segment include personal taxes and applications for life-event documents and certificates relating to identity, passport, birth, marriage and death, among other things. Personal interests in education, welfare and health-related matters are also included.

Lastly, there is the government-to-business segment. This refers to the online interaction between the various levels of government and the commercial business sector (Wikipedia, 2008j). Non-government organisations (NGOs) are also included in this segment. The services and functions that are found here include business issues relating to legislation and policies, registration, taxation, import and export duties and procedures, labour and employment, training and many others.

Wikipedia (2008f) suggests that each of these sectors has basically four kinds of activities. The first is the “pushing” of information such as regulations, news and notifications over the internet. The second is two-way communication between government and citizen, business, employee or other government organisations. This allows users to engage in discourse with the relevant authority on a range

of matters including problems with, or comments on, services. Thirdly, activities could include transactions where users have the ability to lodge tax returns, apply for grants and pay for services or fines. Finally, activities could include the ability to campaign, vote or conduct polls, in other words electronic democracy.

2.2.1.2 Evolution of e-Government

The United Nations' Department of Economics and Social Affairs (United Nations (UN), 2008:16) indicates that there are five stages in the evolution of e-Government:

> Stage I (**Emerging**) refers to the government's online presence, mainly on an official website with links to the main departments. The UN indicates that as part of their readiness evaluation they specifically look at links to the department of education, health, social welfare, labour and finance. The majority of the information is static and there is hardly any interaction with citizens.
>
> In Stage II (**Enhanced**) public policies including laws and regulations as well as other information that is relevant to the citizen are obtainable. Archived information is readily available and citizens can download documents, statistics and reports. Links to current news or newsletters are often available. This stage offers a one-stop shop single window to government e-Services.
>
> Stage III (**Interactive**) sees the start of an interactive portal to enhance the convenience of citizens. The online delivery of services that include interactive and downloadable electronic forms for license renewals and tax payments, among others, are evident. Additional features also include the delivery of audio and/or video and the use of electronic signatures.
>
> During Stage IV (**Transactional**) two-way interactions between the citizen and the state make provision for online transactions such as the payment of taxes, licence and other fees by credit or debit cards. Applications for services that are linked to life events ranging from a

person's birth to death can be processed online. These services are typically available 24 hours a day, seven days a week.

Stage V (**Connected**) realises the connection to the citizen through an integrated back-office infrastructure. This means that there is horizontal connection between government agencies, vertical connections between levels of government from central to local authorities, interoperability between infrastructures, connection to the citizens and among stakeholders such as Government, the private sector, NGOs, academic institutions and civil society. The government decision-making processes also support and encourage e-Participation by the citizen via various channels.

These five stages in e-Government can also be applied to m-Government and will be referred to again when the m-Readiness model is explained in Chapter Three. Now that e-Government, the associated delivery models and their evolution have been explained, m-Government can be unpacked.

2.2.2 m-Government

m-Government or mobile government refers to the use of mobile technology, such as mobile phones, portable computers and PDAs to deliver any government service either internally or externally. Lallana (2004b) adds that these ICTs should be connected to a wireless local area network (WLAN). This however, places a constraint on the definition and for the purposes of this study mobile technology could be connected to a range of networks, not only WLANs. Lallana (2004b) reminds us that m-Government is not something new. Wireless technologies have been part of law enforcement and national defence since 1935 (Goldstuck, 2005:7), when the use of radio made it possible for armed forces and pilots to communicated with one another.

In order to delve further into m-Government, the difference between *mobile* and *wireless* needs to be established. Although many people use mobile and wireless interchangeably, there is a difference. The Oxford English Dictionary (2008) defines them as follows:

Mobile

"Capable of or characterised by movement; movable, not fixed or stationary"

To be mobile means able to move. The worker can be working while away from the office.

Wireless

"Without a wire or wires"

Wikipedia (2008g) defines wireless as "technologies where information signals are transferred without using wires, as opposed to cordless, which are electrical and electronic devices without cable or cord for mains power supply". Wireless therefore mainly refers to communication by means of devices that are not connected. The earliest example of this occurred when Marconi transmitted radio signals wirelessly in 1894 (Goldstuck, 2003:18).

In other words, if government needs to make their services mobile, they will have to make use of wireless technology. For m-Government to succeed, mobile and wireless technologies need to be used. Gartner Research (also known simply as Gartner) differentiates between mobile wireless and semi-mobile wireless in their annual glossary of mobile and wireless terminology (Simpson, King, Reali, Zimmerman & Jones, 2008). They indicate that "mobile wireless" means that the client stays connected to the network at vehicular speeds. They define "semi-mobile wireless" as being connected to a network where devices move no faster than pedestrian speed.

Maumbe and Owie (2006:2) describe m-Government as the delivery of government services and information using mobile technology, including wireless networks and mobile devices. They argue that laptops should be seen as portable devices that are plugged in at various points of access and therefore not truly mobile. However, laptop or portable computer technology has developed to such an extent that most have the ability to access wireless networks using Wi-Fi and/or Bluetooth.

m-Government should not be seen as a substitute for Web-based government. Mobile phones cannot provide all the functionality of the internet, but they do

provide an additional channel to access government services (Singh & Sahu, 2007:484).

A definition by Davison (2005) for m-Democracy services refers to the use of mobile technology as part of the political process: “m-Democracy introduces the concept of mobile government or m-Government into the democracy space. Assuming wireless connectivity, m-Democracy allows citizens to access government information from ‘everywhere’ at anytime. In general, content that helps someone locate a meeting or check recent government announcements during idle time, such as when on public transport, are most appropriate”.

Davison’s definition leads to the conclusion that sometimes the term m-Democracy is used synonymously with m-Government. This is, however, not in line with other literature consulted. Thus, m-Democracy in the context of this study will refer to the citizens’ ability to take part in the political or democratic processes using mobile technology.

Wikipedia (2008b) defines m-Government as “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, PDAs and wireless internet infrastructure”. Wikipedia’s explanation encompasses most of the current thinking around mobile government as it is and intends to be used within the PGWC. The reasons to use m-Government will now be discussed.

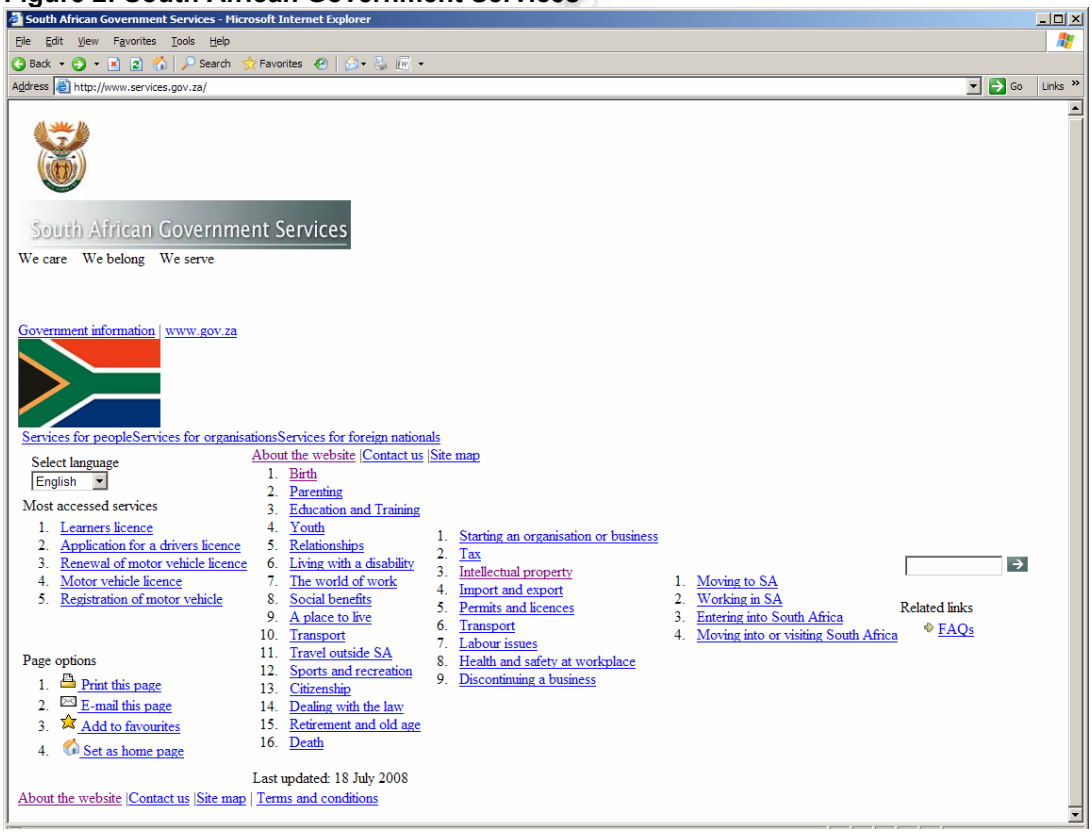
Based on the definitions above, it is clear that as far as m-Government is concerned, mobile and wireless technologies cannot be dealt with separately. Therefore this study will define m-Government as “the use of MWT to contribute directly or indirectly toward public service delivery internally and/or externally”. The terms direct, indirect, internally and externally have been defined in the definition of e-Government. One further aspect of the definition will be the explanation of public service delivery by defining e-Services and m-Services.

2.2.3 e-Services and m-Services

e-Services or electronic services refer to the services delivered as part of public service delivery by use of ICT. m-Services, on the other hand, are services that can be delivered by means of MWT. All MWT can be regarded as part of the collective term ICT, and therefore m-Services is also seen as part of e-Services.

Government has succeeded in creating a single portal to access the e-Services required from the “cradle to the grave”. Information and forms can be accessed from *www.services.gov.za* on a range of topics from birth to death. The portal is available in all eleven official languages of South Africa and the simplicity of its design makes it a very useful site for anyone, local or foreign, wanting to access the government services.

Figure 2: South African Government Services



Source: Republic of South Africa, 2008

The application of these m-Services can be categorised in various ways. This study will look at the way in which Lallana (2004a) defines mobile applications.

2.2.3.1 Mobile applications

Lallana (2004a) discusses four ways in which m-Government can be harnessed in the public sector. This ranges from improving the communication between the government and the citizen to improving the internal operations of government. The four mobile applications as described by Lallana are briefly discussed below, but should not be seen as the only m-Services. Other examples of mobile applications such as m-Security, m-Conservation and m-Education are discussed in *Examples of m-Government* on page 42.

m-Communication improves the communication over the four delivery segments and is arguably the most important aspect of m-Government. None of the other activities could take place without communication. The push and pull of information is facilitated by it. Information affords citizens the ability to make educated decisions and promotes accountability and transparency. Reaching citizens can easily be done by governments through mobile devices. In countries such as Singapore, Malta and the United Kingdom (UK) governments alert citizens on issues ranging from notifications of road tax renewal, medical examination results, passport renewal, season parking reminders, court sitting/hearing deferrals, examination results, social security payments, security threats, and parliamentary notices and alerts. E-mail notifications are free in the UK, whereas there is a subscription fee for text messages, but despite this, subscriptions to text message services outnumber e-mail subscribers almost two to one. There is no doubt that mobile information services are becoming more popular.

m-Transactions and m-Payments refer to a different way of interaction between government and the service delivery segments. Applications where payments or transactions take place are considered to be part of organisations that have reached a high level of maturity, indicating Stage IV in the evolution process (see *Evolution of e-Government* on page 19). One example of m-Payments can be found in Finland, where commuters in Helsinki can pay for public transport by sending an SMS message. Users are billed through the mobile service provider and receive an SMS ticket. Once tax returns are received by post, Norwegian taxpayers SMS personal details and a special code to government if the return is correct. An estimated 1.5 million Norwegians

benefit from this service by not having to return their forms by mail. Further examples are explored in *m-Administration* on page 49.

m-Democracy is also known as m-Voting and refers to the use of SMS by citizens to take part in the democratic processes of a country. This m-Service has not been used widely yet as there are often fears around security and privacy. As the security of associated applications improves, the use of m-Democracy will also increase. In 2002 elections were held at a local level in Liverpool and Sheffield in the United Kingdom. Voters were provided with personal identity numbers (PINs) if they voted by SMS. m-Voting will in all probability never replace traditional methods of voting, but it will definitely become another means of casting your vote.

m-Administration relates to the improvement of internal public sector operations. MWTs afford officials the ability to access real-time data they need from the internet, intranet or mobile device under their control and to “stay connected”. This extends the government employee’s office to the field where they work face to face with citizens.

Although Lallana (2004a) uses only these four terms to collectively describe m-Services, there are many others that have been created as a result of mobile service delivery. Among these, service providers refer to m-Learning, m-Health, m-Security, m-Banking and m-Conservation. These will be briefly described under *Examples of m-Government* on page 42. The last concept to be explained is the concept of readiness, both in terms of “e-“ and “m-“.

2.2.4 e-Readiness and m-Readiness

As with most of the terms used in the field of ICT, there are many definitions for e-Readiness. According to Peña-López (2008), e-Readiness is “the ability to use Information and Communication Technologies to develop one's economy, to foster one's welfare”. The Bridges.org organisation (Bridges.org, 2008) defines e-Readiness as "The ability for a region to benefit from information and communications technology". For the sake of simplicity it is defined as “the extent to which e-Services can be deployed”.

There are many ways to measure e-Readiness and one of the more recognised methods is used by the UN (2008:14), which uses three indices to determine the level of readiness: the Web Measure Index, Infrastructure Index and Human Capital Index.

Web Measure Index is determined by surveying the number of services at each of the five stages of e-Government evolution (see *Evolution of e-Government* on page 19). The greater the number of services at each stage, the higher the index value.

Infrastructure Index is a composite weighted average index of six primary indices based on basic infrastructural indicators. The six indicators are the number of people out of a 1,000 with access to personal computers (PCs), who are internet users, have a telephone line, are mobile phone users, Broadband users and have a television in their homes.

Human Capital Index consists of the adult literacy rate and the combined gross enrolment ratio at primary, secondary and tertiary education. Adult literacy carries two thirds of the weight and the gross enrolment ratio one third.

Based on these indices, the UN ranked 192 countries' e-Readiness status. The result of this survey for 2008 can be seen in Table 1. The top five countries in the world, the top three in Africa, and four developing countries collectively known as BRIC, namely Brazil, Russia, India and China, are included.

Table 1: e-Readiness table as per UN e-Government survey 2008

Country	Web Measure Index	Infrastructure Index	Human Capital Index	e-Gov Readiness Index	Ranked
Sweden	0.983	0.784	0.978	**0.916**	**1**
Denmark	1.000	0.744	0.993	**0.913**	**2**
Norway	0.947	0.738	0.991	**0.892**	**3**
United States	0.953	0.666	0.971	**0.864**	**4**
Netherlands	0.789	0.814	0.988	**0.863**	**5**
Brazil	0.602	0.218	0.883	**0.568**	**45**
Russian Federation	0.334	0.248	0.959	**0.512**	**60**
South Africa	0.552	0.175	0.806	**0.512**	**61**
China	0.508	0.160	0.837	**0.502**	**65**
Egypt	0.605	0.089	0.732	**0.477**	**79**
India	0.478	0.044	0.620	**0.381**	**113**
Lesotho	0.345	0.030	0.768	**0.381**	**114**

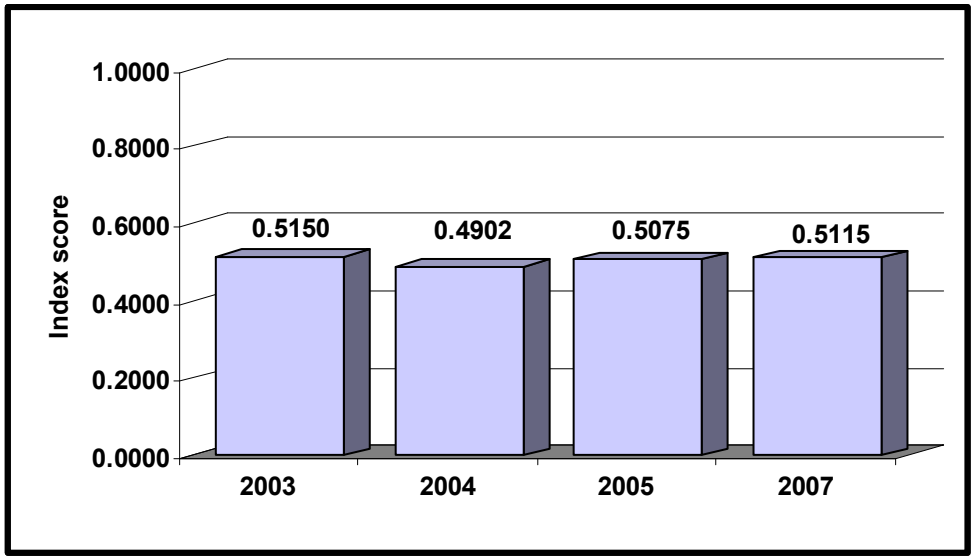
Source: United Nations, 2008

The e-Government readiness survey conducted on 192 countries by the UN (2008:20) in 2008 indicated that there were no countries from Africa in the top 35 nations. The UN attributes this mainly to the high cost of deploying robust infrastructure, but also to the fact that many developing countries have been unsuccessful in fully implementing their e-Government policies. The continent has more important social issues related to health, education, and employment that need to be addressed with tight budgets. Although South Africa was ranked at 61, with a drop of three positions from 58 in 2005, the e-Readiness index score did increase by 0.004 from 0.508 in 2005 to 0.512 in 2008 and South Africa is still ranked first in Africa and placed in the top third of all countries measured. Interestingly, South Africa is ahead of China and India, which are two countries that are often seen as relatively advanced in ICT. The main reason for this can be attributed to India's poor scores in the Human Capital Index, China's Web Measure Index, and both countries' Infrastructure Index.

Within Africa, Egypt at 0.477 leads the North African region and continues to move up the ranks. Egypt moved up 61 positions from 140th in 2005 to 79th in 2008. The Web Measure Index for Egypt was very high at 0.605, which is 28th overall. In Egypt citizens can download forms and even pay by credit card on the national website. Their website also makes provision for access from mobile devices, is wireless application protocol (WAP)-enabled, and has links to video and audio (UN, 2008:25).

The Southern African region, with the exception of South Africa, did not fare so well in the survey. Most countries dropped in rankings in 2008. With an index score of 0.512 South Africa still leads the region, with Lesotho at 0.381 in second place. The UN describes South Africa as a "standout e-Government leader in sub-Saharan Africa" (UN, 2008:26). Figure 3 below illustrates how South Africa has fared since 2003. In reality there has not been any progress, according to the UN. There has been a drop of 0.0035 over the last four years.

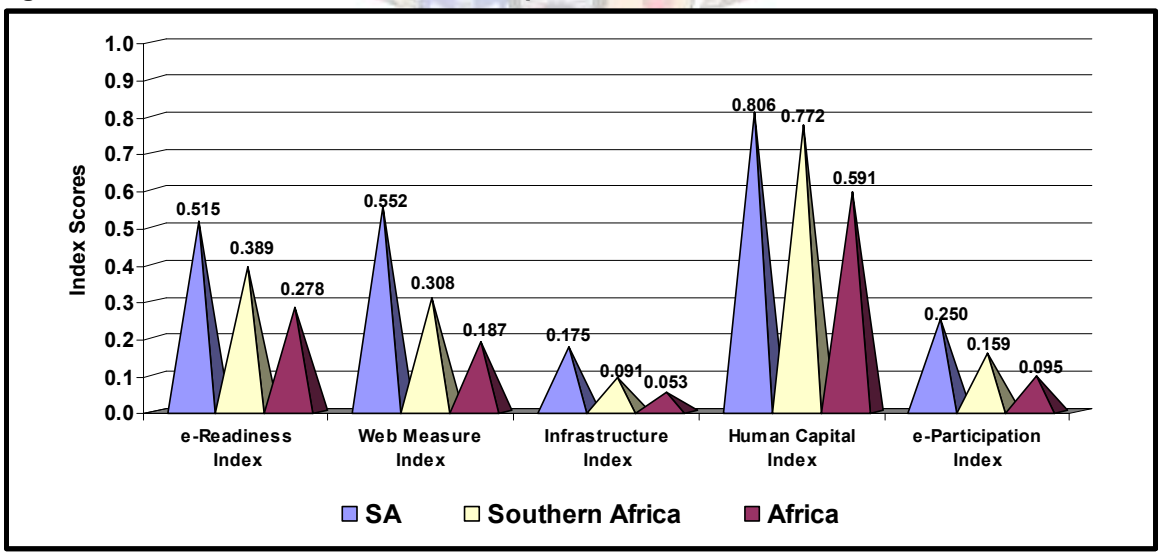
Figure 3: South Africa's e-Readiness scores from 2003-2007



Source: United Nations, 2008

If South Africa is compared to the rest of Africa and Southern Africa, the picture seems much brighter, though. Nevertheless, the poor scores for infrastructure and e-Participation are causes of concern and indicate areas where improvement is essential. The e-Participation index indicates how well citizens participate in the e-Government process by measuring the implementation of e-Information, e-Consultation and e-Decision-making services (UN, 2008:60).

Figure 4: South Africa's e-Readiness compared to Africa and Southern Africa



Source: United Nations, 2008

Following the definition of e-Readiness, it follows that m-Readiness refers to "the extent to which m-Services can be deployed". The study failed to find a definitive tool to measure m-Readiness. Chapter Three is devoted to explaining

how the m-Readiness tool was compiled for this study by making use of previous studies undertaken by Kirsten (2006) and World Wide Worx (Goldstuck, 2003; Goldstuck, 2005). Suffice to say, the indices used by the UN will not be used as the m-Readiness measures.

Now that the key concepts have been defined, the legislative framework and context within which m-Government needs to function can be considered. As has been shown previously, it is difficult to divorce m-Government from e-Government and therefore on the whole legislation focusing on e-Government is highlighted.

2.3 Legislative framework

m-Government is part of e-Government and therefore the legislative framework includes all the relevant policies relating to e-Government. There are no policies directly relating to m-Government as yet. The DPSA is mainly responsible for compiling the policies relating to e-Government (DPSA, 2007a). Various government departments have addressed the ICT issue, though, and Haricharan (2003) mentions that, in addition to the DPSA, the Department of Communication (DoC) and the Department of Science and Technology also contribute to policy documents. The DPSA (2001) laid the foundation for e-Government with its information technology (IT) policy framework in which it referred to e-Government as the “Digital Future”. These policies need to lead to support for e-Government at the highest levels.

President Thabo Mbeki was very supportive of e-Government. Besides the Presidential Task Force on Information Society and Development (ISD), which consisted of a number of the world's most significant IT leaders, he also established the National Commission on ISD in 2001. He openly supported e-Government and the use of ICT in South Africa. He stressed the importance of this sector and the government's commitment to making use of its potential for development. During the opening of Parliament in 2003 he confirmed that the setting up of government-wide call centres would be sped up and that an e-Government Gateway with a directory of e-Government services that address

the needs of citizens would be made available (Haricharan, 2003). This has been achieved with great success and he continued this trend in 2008 when he indicated that ICT was a “critical priority” (Mbeki, 2008) and that various other ICT matters needed urgent attention. The mandate to deliver e-Government has been delegated down to the other levels of government as well.

The PGWC published a White Paper in 2001 to “prepare the Western Cape for the knowledge economy of the 21st century”. The Cape Online Strategy was drafted to give effect to this policy (Haricharan, 2003). Since then e-Government has been steadily deployed as per the strategy. The PGWC’s (2007b:36) Growth and Development Strategy highlights improving ICT infrastructure and mobility as one of the goals to grow and share the economy.

As can be seen from the above, there is ample evidence that the South African government is committed to establishing e-Government as an essential part of its service delivery armoury. The short overview of e-Government-related policies below provides an understanding of how important e-Government is seen as being.

2.3.1 e-Government policies

The DPSA has the mandate and task of promoting the use of information technology (IT) and management (IM) to improve service delivery in the public service. The Office of the Government Chief Information Officer (OGCIO), in consultation with the Government Information Technology Officer’s Council (GITOC) and other stakeholders, has put in place a framework of policies, standards and regulations to ensure the harmonised transformation of government to ultimately offer citizen-centric services. In addition, the state Information Technology Agency (SITA) was established in 1998 tasked as the ICT agency for Government.

The eventual goal is to have a single view of government for citizens to access the relevant services at their convenience. The following policies, standards and documents are in place to effect the implementation of e-Government (DPSA, 2007a):

- *The State Information Technology Agency Act, Act 58 of 1998 and The State Information Technology Agency Amendment Act, Act 38 of 2002*
  The source of e-Service providers to the government is regulated by this act. Section 7 of the SITA Act specifies that all ICT services must be acquired from or through SITA. SITA has the responsibility to provide a secure wide area network (WAN) to allow government departments to interact with each other, citizens and business, as well as data-processing or associated services for transversal information services. They set standards regarding ICT that are approved by the Minister of Public Service and Administration. The SITA Act is arguably the most important piece of legislation on e-Government (Republic of South Africa (RSA), 1998; RSA, 2002b).

- *Electronic Communications and Transactions Act, Act 25 of 2002*
  This makes provision for the facilitation and regulation of electronic communications and transactions, the development of a national e-Strategy for South Africa, promoting universal access to electronic communications, encouraging the use of e-Government services, and related matters. In addition, it makes provision for the acceptance of data messages, issuing of permits, licences or approvals in the form of data messages, and for making or receiving payments in electronic form (RSA, 2002a).

- *Electronic Communications Act, Act 36 of 2005*
  This Act repeals the Telecommunications Act, Act 103 of 1996 and makes provision for the regulation of telecommunication activities (excluding broadcasting) and for the control of the radio frequency spectrum. The Act also proposes the establishment of an independent South African Telecommunications Regulatory Authority and a Universal Service Agency of South Africa (RSA, 2005).

- *Minimum Information Interoperability Standards (MIOS) version 4.1 and handbook on MIOS*
  This guideline on the minimum requirements, based on the United Kingdom Minimum Information Interoperability Standards, has been adopted and is in line with international trends and best practice. The document describes the policies and technical standards for the e-Government strategy of South

Africa. “The standards will allow information to flow seamlessly across the public sector and will provide citizens and businesses with better access to government services. In addition, by adopting internet and worldwide web standards, the framework aligns government with the rest of industry and serves as a basis for reducing the costs and risks associated with carrying out major IT projects” (DPSA, 2007b:2). With regard to m-Government it specifies that the standards used for mobile phones regarding WAP, general packet radio service (GPRS), SMS and MMS (DPSA, 2007b:24; DPSA, 2007c:22).

- *Minimum Information Security Standard (MISS)*
  This policy indicates how security of information in general must be dealt with, including security around communicating information by computer or other related means (DPSA, 2004:63).

- *Presidential review commission report, Chapter 6: Information management, systems and technology*
  Chapter Six of the report describes the challenges experienced with information management, systems, and technology (IMST) in the public service as well as possible options for transformation that could play a part in overcoming them (DPSA, 2007d:1). One of the concerns that this report raises is whether it is advisable to invest in further advanced technologies when considering the low level of education and the vast extent of unemployment. This raises the counter-argument of whether South Africa can afford not to invest in them, considering how dependent current service delivery is on many of these advanced technologies. The report suggests that employing IMST would be both feasible and desirable, if it can be used to assist all segments of society (DPSA, 2007d:3). An international comparison is done, where the e-Government strategy of Australia is compared to Malaysia’s and current challenges are highlighted (DPSA, 2007d:7).

  The current lack in standardised approaches towards IMST nationally, notwithstanding SITA’s efforts, is a major challenge that will need to be addressed by the DPSA. Very little mention is made of m-Government, but

the challenges associated with IMST and e-Government are also part of m-Government challenges.

- *Public Service Regulations (PSR), 2001; as amended up to 2006, Chapter 1, Part III: E*

  Part III: E of the regulations stipulates the responsibilities of the heads of department to establish information plans, information technology plans and operational plans for the implementation of ICT (RSA, 2006).

- *Public Service Regulations (PSR), 2001; as amended up to 2006, Chapter 5, Part I to Part III*

  This refers to the electronic government regulations, which include "the underlying e-Government value (including the Batho Pele principles and the use of IT as a tool to leverage service delivery effectively and efficiently), information security, and interoperability" (RSA, 2006).

- *Information Technology (IT) Planning Guidelines (2002)*

  This document provides background and details for public managers on how to compile their strategic IT plans. Although this guide does not refer explicitly to ICT, it has generally been accepted that they do also refer implicitly to ICT. The PGWC is in the process of updating its departmental ICT plans. "IT planning is a process by which the business objectives and business strategies are mapped and technologies and applications are identified and prioritised in line with these strategies and objectives" (Government Information Technology Office Council, 2002:3).

- *Policy on Free and Open Source Software use for the South African Government*

  The policy document refers mainly to the use of free open-source software (FOSS) to enhance e-Government. Programmes and the required phases they need to go through from "Initiation" and "Enhancement" through "Maturity" are highlighted. The first two phases are estimated to be completed within a three-year timeframe. The impact on m-Government is in the recognition of the technical back-office requirements to deliver services through standard technologies and software.

In general, computer software is expensive, so the use of free software is a huge advantage in poor developing countries. The Shuttleworth Foundation has placed Freedom Toasters in various accessible locations to allow the public to gain access to this software. The FOSS policy describes how FOSS contributes to development in South Africa and the implications, advantages and disadvantages of using FOSS (DPSA, 2006).

- *The Cape Online e-Government White Paper, 2001*
  Although this policy is seven years old, it is currently still the prevailing policy. An updated policy (see below) is in the process of being formulated. The Cape Online programme looks at ICT within the PGWC holistically. Not only does it specify how the Province will deliver e-Services, but it also specifies how other role players such as national departments and parastatals will interact and contribute towards e-Government within the Western Cape. Cape Online includes key initiatives such as the Cape Gateway project, which is the key project to provide information on government services through an internet portal (PGWC, 2001).

- *The draft e-Government strategy for the Western Cape, 2008*
  This policy document is still in draft form and currently in the process of being approved. Contact with the author of the document established that this policy does encapsulate the use of mobile technology (Klaas, 2008; Mbhele, 2008; PGWC, 2007d).

The cellular phone has become an essential communication device in developing countries. In rural and difficult to reach areas, cellular infrastructure allows communication to take place where there are still no fixed-line telephones, allowing almost all households to stay in touch. The cell-phone will arguably be one of the main channels that governments will use to communicate with their citizens in the near future.

Many governments still continue to focus on the internet as the major medium for providing e-Government services, though (Singh & Sahu, 2007:478). The provision of e-Services requires vast investment and so governments need to ensure that e-Government projects are successful. Linking e-Government

policies to service delivery policies is essential, if success on any level is to be achieved.

2.3.2 Service delivery

The few dedicated e-Government policies and strategies need to link to the policies that refer to effective and efficient service delivery. These policies imply directly and indirectly that the use of e-Government will achieve better service delivery (RSA, 2006). These policies include:

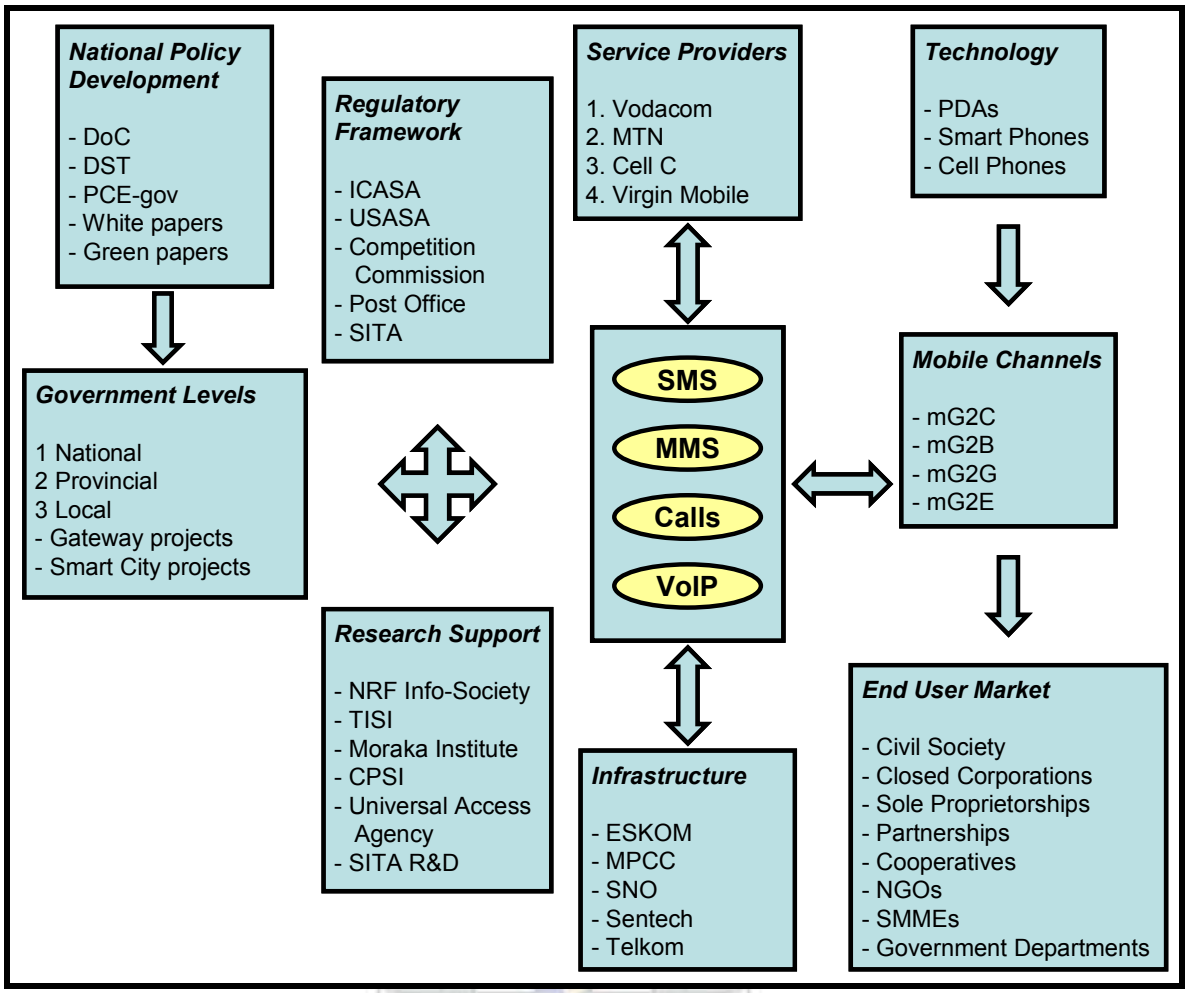
- *The Constitution of South Africa, Act 108 of 1996*
  Article 195 talks of effective and efficient delivery of services (RSA, 1996);
- *The Public Finance Management Act, Act 1 of 1999 (amended Act 29 of 1999)*
  Also relating to economic, effective, and efficient service delivery (RSA, 1999a; RSA, 1999b); and
- *The White Paper on Transformation of Public Service Delivery (Batho Pele), Notice 1459 of 1997 (RSA, Department of Public Service & Administration (DPSA), 1997)*
  Focusing on the eight essential areas including, consultation, service standards, access to services, courtesy, access to information, openness and transparency, the right to redress and value for money. Of these, "access to services" and "access to information" are arguably most relevant to m-Government.
  Harricharan (2003) indicates that "e-Government is an application of the principles of (the) White Paper on Transforming Public Service Delivery". He adds that "providing more and better information" and "increasing openness and transparency" have huge implications for e-Government strategies.

The policies relating to e-Government and service delivery are related directly to m-Government, but m-Government can easily be seen within its own context as described by Maumbe and Owie (2006).

2.3.3 m-Government context

Figure 5 illustrates the policy development framework for m-Government as portrayed by Maumbe and Owie (2006).

Figure 5: South Africa's m-Government architecture



Source: Adapted from Maumbe & Owie, 2006:4

Key

CPSI	Centre for Public Service Innovation	MPCC	Multi Purpose Community Centres
DoC	Department of Communication	NRF	National Research Foundation
DST	Department of Science and Technology	PCE-gov	Presidential Commission on e-Government
ESKOM	National Electricity Supply Authority		
ICASA	Independent Communications Authority of SA	SITA	State Information Technology Agency
mG2B	mobile Government to Business	SMMEs	Small Micro and Medium Enterprises
mG2C	mobile Government to Citizens	SNO	Second Network Operator
mG2E	mobile Government to Employee	TISI	The Information Society Institute
mG2G	mobile Government to Government	USASA	Universal Service Agency of South Africa
		VoIP	Voice over internet Protocol

Their policy framework indicates that policies are developed at national level, but an omission on their part is that they do not include the DPSA, the lead

department in e-Government. Besides the national developers of policy, they also include the regulators in the framework. The model provides a good overview of the majority of stakeholders and the associated technology. The various levels in government and the support for research are also included. The rest of the model consists of service providers, controllers of the infrastructure, the major types of technology, and the end users of the services (SMS, MMS, voice calls and voice over internet protocol (VoIP)), as well as the channels through which they are accessed. It is assumed that Maumbe and Owie included data under MMS. Arrows between the various components that make up the model indicate the relationship.

The legislative framework provides the conditions within which m-Government and e-Government need to function. This framework is not only about directly addressing e-Government and m-Government issues, but also service delivery. Additional aspects of m-Government such as the reasons for using it, examples of it, benefits and limitations will be discussed to clarify the context further.

2.4 Aspects of m-Government

2.4.1 Reasons for using m-Government

Proponents of m-Government argue that it can help make public information and government services available "anytime, anywhere" and that the ubiquity of these devices mandates their employment in government functions.

The growth of cellular and mobile technologies worldwide is arguably unrivalled. There are countless examples of how this technology can be beneficially utilised, also in the public service context.

To quote m-Government theorist and proponent, Ibrahim Kuchshu, "As e-Business evolves towards m-Business, e-Government seems to follow the trend with a few but significant mobile government applications" (Wikipedia, 2008b).

Davison (2005) argues that, since mobile communication has become an accepted part of mainstream society, there could be less resistance to receiving

government information or responding to calls for government feedback. He suggests that “it provides a dynamic means for citizens, particularly younger citizens to interact with local authorities and other government (departments) providing location-based services”. He continues by saying that mobile access is a cost effective way to deliver government information and services where there are lower levels of internet or PC access. Davison uses Japan as an example where homes often have little space for a home computer, and citizens younger than 30 use their mobile phone as their first access to the internet.

The situation in South Africa and other less developed countries is vastly different, but still holds true. If mobile centres, of which there are already a couple of examples, or multi-purpose centres can be deployed in rural areas, even the remotest of citizen would be able to access mobile government services.

Singh and Sahu (2007:482) emphasise that developing countries need to ensure that the e-Services they deliver are based on the level of e-Readiness, not only of government, but also of the citizens as well. They indicate that using the internet to deliver certain information services might not be worthwhile. Alternative creative and innovative methods such as the use of call centres should also be considered.

Mobile phones include features and functions that have become part of everyday life. These features include the ability to use it as a calendar or calculator, play games, take photos, make voice recordings, use it as a global positioning system (GPS) to find your way and, of course, to access the internet. Various message services allow mobile phone users to have daily messages delivered to their phones ranging from Bible verses and weather to news and the latest sports results.

The high demand by consumers has potentially contributed to bridging of the digital divide. Mobile phones are no longer restricted to higher socio-economic levels. Even enhanced mobile phones have become very affordable, contributing to a much fairer distribution to all socio-economic levels. The relatively low cost of cell-phones is one of the reasons why cell-phone penetration has been so significant (Singh & Sahu, 2007:483).

The use of PCs and mobile phones to access the internet is compared by Singh and Sahu (2007:485) in Table 2. Although computers are still preferred by most users, there are certain kinds of information, such as weather forecasts and sport scores, that users would prefer to download by cell-phone. Large documents such as books or multimedia are still mostly downloaded by PCs.

Table 2 provides a clear indication of the benefits of mobile devices over personal computers.

Table 2: Comparing features of personal computers and mobile phones

Features	PC (with internet)	Mobile phone
General		
Cost	High	Low
Memory	High	Low
Processing speed	High	Low
Screen size	Large	Small
Portability	Low	High
Pocket ability	No	Yes
Weight	High (kilograms - heavy)	Low (grams - light)
Value added services	Low	High
Language of communication	English	Any Language
Need for training and expertise	High	Very Low
Quality of telephony	Poor (via VoIP)	Good
Infrastructure requirements		
Constant electric power required	Yes	No
Internet service provider required	Yes	No
Telephone/Broadband connection required	Yes	No
Data transmission		
Method	E-mail	SMS
Document transmission	Possible	Not possible
Size of data	Very Large	Small
Time spent in typing of message	Low	Medium
Time to access information from dispatch	On opening e-mail account	Immediate
Cost of sending one information (in India)	US$ 0.05 per call	US$ 0.01 per message
Accessing information		
Internet connectivity	Possible on all PCs with modem	Possible only in few models
Size of Web page which can be downloaded	High	Low
Utility/menu accessible	High	Low
Financial transactions	Yes	Yes
Authorising transaction	Yes	Yes

Source: Singh & Sahu, 2007:485

Besides the fact that processing is slower and there is limited screen size, the cell-phone comes out on top for both general and infrastructure requirements. Under data transmission the major drawback of cell-phones is the limited size

for document transmission and the speed at which messages can be typed. Internet connectivity through cell-phones is an area where technological advances can be expected. Documents, albeit small, can already be transmitted via the cell-phone. Advances made with portable computers, regarding processing speeds, memory and wireless networking capabilities, now allow the downloading of large files while being on the move.

The cell-phone is more personal, as it has “reachability”, is convenient and provides freedom and flexibility of use and lifestyle. Cell-phones have not only become an integrated part of everyday life, but style and fashion trends will play a greater role in all mobile devices as users want them to reinforce their lifestyle choices (Chapman, Milanesi & Willis, 2008:5). Some of the driving forces over the next couple of years are lowered costs, increased service options, citizen convenience, ICT security and interoperability.

These reasons for deploying m-Government are not exhaustive, but they provide a backdrop to its importance and why it cannot be ignored. In order for m-Government to really take off, it should contribute to service delivery; Goldstuck (2003) highlights areas in this regard.

2.4.2 Improving service delivery through m-Government

Goldstuck (2003:48) indicates that there are six areas that need to be focused on, if organisations want to enhance service delivery and improve internal efficiencies.

Connectivity

The 21st-century knowledge economy is driven by information that is kept on websites, intranets, databases and document warehouses. Public officials are also part of this economy and many are spending less time at their desks and more time in the field. There are more mobile workers today than ever before. For these officials it is paramount to have access to the right information at the right time. This means that they need to be connected to their networks. “Connectivity is the basic building block of all other forms of mobile and wireless communication”. These knowledge economy workers have become so reliant

on the information they need that everything else falls flat if there is no connectivity.

Personal communications

The ability to stay in touch with the mobile workers has been improved through mobile devices and the ability to use SMS, e-mail and instant messaging.

Information management

The old saying “Garbage-In, Garbage Out” or GIGO still holds true today. Organisations need to change this to “Good-In, Good-Out”. Even if connectivity is great, but the information is not accurate, accessible, up to date or user friendly, the chances are that no one will want to use the information.

Logistics

MWTs are used from production to retail phases in the corporate world for, among other things, to monitor production remotely, scan barcodes with handheld scanners and sell products using wireless cash terminals. The use of MWTs in logistics benefits the public directly without their being aware of it. Governments can also make use of MWTs to assist with the logistics of everyday business. Mobile applications to manage assets, warehouses and procurement combined with a dynamic strategy to manage information could improve the way government and its resources are managed (Goldstuck, 2003:62).

Positioning and identifying

The use of positioning software and tools in location-based services has improved the way in which emergency services respond to calls. A GPS chip will enable the response teams to pinpoint the exact location of the caller, thereby allowing them to map a route to the emergency. Existing technology allows customers or emergency callers to be identified. Other applications could be the identification of sites or GPS coordinates where road repairs are needed or even where criminal activities are taking place (Goldstuck, 2003:64).

Transactional

Making transactions over the cell-phone is relatively new to South Africa. There are a plethora of adverts where an SMS can be sent to a number to subscribe to

some mobile service such as the delivery of new ring tones or cell-phone wallpapers. On the odd occasion an SMS number is used to donate funds to a cause, such as the fund for recent xenophobia victims, and banks have introduced certain cell-phone functionality that allows customers to conduct basic transactions such as transferring funds. Goldstuck (2003:66) indicates that improved interfaces and applications could be extended to other services, for example, the paying of municipal fees, topping-up electricity accounts, or even a motor vehicle license renewal. He suggests that the most successful application thus far is the topping-up of prepaid cell-phone air time. These and any other possible mobile services need to be carefully examined to ensure that the end justifies the means. The bottom line is service delivery. If citizens are gaining benefits in time and convenience, it should be seriously considered.

Within each of these areas there are possible services that could enable and improve the delivery model (G2G, G2E, G2B, and G2C). Examples of current m-Government and the use of mobile devices in service delivery provide an understanding of the possibilities.

2.4.3 Examples of m-Government

Citizens need to interact with governments for various reasons. They need to gain approval or permission for a host of activities such as building, driving, starting a business and travelling abroad. They need to pay taxes, duties and license fees as required by law. Local authorities receive payment for services such as refuse removal, water and electricity. Governments also pay citizens certain grants, social pensions and subsidies. Information on an assortment of issues ranging from applying for services to the status of their applications is required by citizens (Singh & Sahu, 2007:486). Presently most of these interactions happen face to face. The challenge is to present these services over a range of channels, for example, face to face, telephonically or remotely over the internet.

There are many examples worldwide of the use of mobile technology by private and public organisations. As technology advances the only limitations will be our own imaginations and the costs incurred. The list below is by no means

exhaustive and should rather be seen as a brief glimpse into the possibilities of mobile technology. The examples below will be placed within the categories as described by Lallana (2004a), but it should be kept in mind that new areas will be defined as m-Services evolve. Some of these new areas will be alluded to in this section, including some that are already recognised. Two of these are m-Learning and m-Security. They will be added to the four that Lallana (2004a) refers to, namely m-Communication, m-Transactions, m-Democracy and m-Administration.

2.4.3.1 m-Communication

Communication takes place over and between the various sectors of the delivery model of e-Government (see *Delivery model* on page 17). Public officials stay in touch with their managers, staff and other government organisations by means of mobile phones and other devices. Communication with citizens and businesses takes place by SMS, e-mail and other means. The importance of communication is not at issue here, as it is accepted as being essential to the effective and efficient functioning of governments.

One of the alternative methods to interact with government is through call centres. Calling a centralised government call centre provides the citizen with a voice-driven menu, available in the official languages and with a standard choice of options (Singh & Sahu 2007:486). Either the interactive voice response system (IVRS) or an operator responds to these options. The operator can look up information on the web and provide it to the caller orally, by SMS or voice mail. If the answer is not accessible, the operator can forward the query to an expert in the appropriate department. The answer can then be sent to the citizen in the most efficient manner. Some people could argue that m-Communication and m-Administration are the same, or that communication is part of administration.

Public information kiosks

Public information kiosks (PIKs) provide citizens with information in a convenient manner. Ni and Ho (2205) call them “an interface medium between users and a service or information provider”. When these kiosks are placed in public places, they provide another means for citizens to interact with government. Singh and

Sahu (2007:484-5) quote various examples worldwide where governments have deployed PIKs to enable citizens to access public services and the internet. Besides the provision of the public services, PIKs also help close the digital divide by making the internet more accessible to citizens who did not have previous access to it.

There are basically three kinds of information kiosks, according to NI and Ho (2005:62). The first kind is mainly used for information dissemination and advertising. These kiosks provide information to users about products or services. Examples of these can be found at the entrance to many shopping centres, where shoppers can use touch-screen menus to find shops or amenities. These kiosks are also found in tourist centres, trade fairs and even at certain fuel stations across South Africa. Communication is one-way and information is conveyed in the form of video, animation, text and sound.

Interactive information kiosks allow users to interact by touch screen or even a keyboard in some cases. Clients key in their information such as names, codes or dates and are supplied with the relevant information, or often a hard copy such as a ticket or coupon, if the kiosk has a printer. These units can be found in areas with many pedestrians such as airports, some shopping malls and convention centres.

The third kind of kiosk allows full transactions. These kiosks have greater capacity, allowing for complex transactions and the exchange of information. Touch screens or simple keyboards allow users to key in their requests. Security at these kiosks is often very high and the use of security codes or personal identity numbers (PINs) and a card are often required. The most common examples of these kinds of kiosks are automatic teller machines (ATMs).

South Africa's Department of Communications has deployed mobile public internet terminals (PITs). See *Annexure F: Public Information Terminals* on page 190 for more details. The Cape Access project is in the process of acquiring mobile units that will be capable of taking e-Services to rural areas where there is no power of fixed telephone lines (Tshabalala, 2008). The units will have up to eight computers connected to the internet via satellite. This will

allow citizens in rural areas to access government's e-Services from within their communities.

Online labour services

The Department of Labour (DoL) advertises its online services on its web portal (Department of Labour, 2008). The services they offer include registration with and updating of Unemployment Insurance Fund details, feedback on the status of compensation claims, ability for companies to report their employment equity status online and the ability to verify one's marital status.

m-Information services

Telemedicine or mobile medicine can be used to make a difference to service delivery. In the Eastern Cape a number of pathology labs have the ability to send blood-test results to rural clinics as soon as they have been processed by means of global system for mobile communication (GSM) phones that are connected to their computers (Goldstuck, 2005:55). Patients can be treated much earlier, which means that this service aids the early treatment of, for example, tuberculosis and reduces the disease's impact in the Eastern Cape.

Another example of how tuberculosis (TB) is being combated can be found closer to home at Groote Schuur hospital. TB patients are notified about appointments and medicine through daily SMS text messages. This service was so successful that it has been expanded to nearly 10,000 patients with chronic illnesses ranging from HIV/AIDS to arthritis. Similarly, therapeutic counsellors have been issued standard cell-phones loaded with special menu-driven software to capture information on their AIDS patients when the patients are visited. This information can then be sent to a central database, where authorised doctors or nurses can access it and provide expert and effective treatment (Goldstuck, 2003:55).

Many public schools also interact with learners' parents by means of SMS to notify them of any relevant school notice such as forthcoming events. The South African Revenue Service (SARS) notifies clients of transactions via their mobile phones (SARS, 2008).

Mass alerts can be sent by government to warn citizens of any impending disaster. When a teenager in Hong Kong created a panic by distributing false information on a website that the city was infected with the Severe Acute Respiratory Syndrome virus, authorities acted quickly by sending a text message to every cell-phone in Hong Kong. Out of the 6-8 million residents, close to 6 million received the text message which read “Director of Health announced at 3 p.m. today there is no plan to declare Hong Kong as an infected area”. This was the first time a message of this kind was sent by any government. When London was being threatened by terrorist attacks, a local company provided a service that alerted subscribers of any terror alerts (Goldstuck, 2003:56).

In the Philippines and in China citizens can send SMS messages to public officials on a range of issues (Lallana, 2004a) ranging from requests for information to complaints about government services or officials.

Internet as tool

Singh and Sahu (2007:477) say that the internet is the most important tool to deliver e-Government, but that the digital divide means that it is still out of reach for the majority of citizens. The community survey in South Africa by the Department of Statistics (StatsSA, 2008:3) indicates that only 7.3% of South Africans have access to the internet. Internationally the figures as indicated by the United Nations (2008:116) e-Government survey were a paltry 6.7%. Although South Africa compares favourably to international internet users, it is still a very small minority who make use of the internet. Nevertheless, countries still focus most of their attention on delivering e-Government solutions via the internet.

Information can be accessed by people via mobile devices over the internet through government portals. The same service could enable citizens to contact or schedule meetings with public officials.

One of the best examples is the Canadian mobile portal that provides services to citizens that are specifically geared to mobile technology. A range of services including border wait times, economic indicators, exchange rates, weather services including a hurricane centre, public service employee directories and a

news service makes this a most useful site. The wireless sites can be accessed at *wap.gc.ca* or *www.gc.ca* (Canada, 2007).

The United Kingdom (2007) also has a mobile internet services site that is accessible from *www.direct.gov.uk/mobile* called Directgov Mobile. This site is a version of their main portal and is specifically designed for cell-phones with internet capabilities. The services they offer include public announcements, quick guides on money, homes and property, learning, travel and legal help, Information services such as application forms, latest travel and transport information such as bus schedules, and national health services. In 2007 the Directgov Mobile site won the Good Communications Award for mobile technology (UK, 2007).

The Canadian government has an information service that is accessible through mobile phones to search for public official contact details, check on time delays at the border, up-to-date economic indicators and exchange rates, as well as news (Singh & Sahu 2007:483).

Californian citizens can register for a mobile service to receive, among other things, current information about energy warnings, traffic jams and press releases anytime and anywhere. Goldstuck (2003:56) states that this free service should be seen as a pilot and not a model on how to implement mobile information services.

During the 1998 national elections in South Africa, the Independent Electoral Commission created a nationwide satellite-based WAN, as well as the necessary infrastructure, to manage the democratic process (Heeks, 2002:100).

2.4.3.2 m-Transactions and m-Payments

Besides the information services offered by banks via mobile technology, internet banking is also available via the cell-phone. m-Banking is a term that is used by many of the major banks already.

Using biometrics

India is a trendsetter in using biometric technology to bring public services to rural “underserved” communities. The Department of Rural Development in the

state of Andhra Pradesh uses public-private partnerships (PPP) to make social security payments via cell-phones loaded with banking applications. The mobile phones communicate with biometric smartcards through RFID to validate applicant details. They intend extending this service to other areas such as housing payments and small farm loans (Economist Intelligence Unit, 2008:11).

SARS e-Filing

The South African Revenue Services (SARS) launched e-Filing in 2006 as a secure electronic tax return and payment submission service. This service is free and payments can be made via credit-push or debit-pull options, or through internet banking, where SARS tax types have been added as beneficiaries (SARS, 2008). These services can also be accessed through mobile technology and the internet.

2.4.3.3 m-Democracy

Mobile democracy is about the use of cell-phones and other mobile devices to take part in a democratic society. The views of citizens are heard through SMSs, e-mails and even voice. Democracy is usually associated with making a selection or voting for a favourite option, person or party. There are numerous examples of mobile technology used to cast votes. In South Africa and abroad the various game and reality shows such as *Idols* encourage citizens to cast their vote for their favourite contestant.

In 2004 Spain's general election was arguably influenced via mobile technology. Following a terrorist attack, protestors were quickly mobilised by mobile phones using SMS on the eve of the election. Political analysts say that this led to the ultimate defeat of the Popular Party. This is an indication of how effectively mobile technology can be used to influence the democratic process (Suárez, 2005).

In the United Kingdom (UK) the Sheffield City Council used its website for the election of a councillor for the year in 2003 (Singh & Sahu 2007:483). The website had step-by-step instructions on how to vote electronically. Citizens could vote by using the internet, phone, SMS text message, public access kiosks or using a traditional polling station.

Davison (2005) states that mobile communication could be used in surveys and polls. He suggests that government could encourage citizens through flyers or posters posted in public areas to offer input. With mobile devices becoming more capable of playing back video and audio, web casts or pod casts posted on the internet could be downloaded to any mobile device such as a cell-phone, Apple's iPod or PDA. The citizen will be able to access government audio or video "*on the go*".

Studies on electronic forms of voting in the UK have indicated a wide interest in m-Voting. Many citizens were unwilling to use text messaging to vote for various reasons. The major reason, according to the study, is that text messaging was seen as too "frivolous" to be used for voting and that it was more a "fun" communication tool. Older voters indicated that they did not know how to use text messaging and, although younger voters considered it as an easy option to vote, most would be unwilling to use it. The findings suggest that m-Voting should be seen as an additional voting channel to supplement other options such as voting by post or via the internet and by fixed phone (Lallana, 2004a).

2.4.3.4 m-Administration

m-Administration is about the efficient and effective functioning of the public service. Any mobile technology that contributes to delivering services more quickly, cheaply and conveniently to the citizen are part of m-Administration. There are many examples already in use and a few examples are mentioned below.

In Germany some toll roads use a combination of mobile technology and GPS to automatically charge motorists toll fees (Chevallerau, 2005:198)

Public officials might need to schedule meetings, scan for any changes or updates or review their e-mails (Davison, 2005). The PGWC is already using these services and is in discussions with the relevant role players to create a virtual campus in the Cape Town city bowl. This will allow government officials at local, provincial and national levels to access certain information from anywhere within the footprint of the campus. Many officials already have the ability to work "wireless" from remote locations using cellular and Wi-Fi technology.

Another example from the European Union includes the Austrian citizen card service which can also be used with mobile phones, enabling Austrian citizens to digitally sign documents and securely transact with government using their mobile phones (Chevallerau, 2005:22).

Although Heeks (2002:99) is specifically referring to e-Government, the same applies to m-Government when he says that it contributes to cutting the cost of services.

Coordinating

In the Florida Keys Mosquito Control District on the east coast of North America, the West Nile virus and other diseases are spread by mosquitoes in an area of more than 4,000 km^2. Using a wireless fleet management system, government officials are able to monitor the location, speed and direction of their 61 vehicles in real time, thereby facilitating the coordination of the deployment of the insecticides. A coordinator sees a digital map at headquarters that displays all the vehicles and their details, and he or she is able to direct vehicles as required or generate reports based on their movement and spraying. This makes it possible to calculate the cost effectiveness of the activities (Lallana, 2004a).

2.4.3.5 m-Conservation

Nature conservationists in South Africa need to constantly monitor the animal populations in their reserves. Mobile units containing GPS allow even illiterate game trackers to identify animals by their spoor and to indicate the number of animals seen. The number of animals and their location are stored on the mobile device. These data are then taken to the ranger stations and fed into a computer. The data are then accessible to scientists to analyse and interpret (Goodman, 1997).

2.4.3.6 m-Learning and m-Education

Development in rural areas in India is being supported through the Computers on Wheels project (Crompton, 2006), where citizens in difficult-to-reach areas have access to Indian public services such as banking and education. Real-time education and downloaded learning material is used to empower rural citizens on a variety of topics.

In the Western Cape the Department of Agriculture has used satellite technology mounted on a mobile bus to bring education to the rural developing farmers. The bus contained eight computers linked to the internet by satellite. The bus also boasts video-conferencing facilities and a projector for remote real-time lectures. A much wider application of the unit in many other diverse activities is achieved in this way (PGWC, 2007a).

2.4.3.7 m-Security

In 2004 the Dutch Government implemented a mobile alert system which allows it to provide instructions in case of natural disasters, accidents and other emergencies to citizens via their mobile devices (Chevallerau, 2005:388).

In Australia the Department of Urban Services in Canberra used mobile technology to give law-enforcement officers real-time access to databases with information about national drivers and vehicles (Bittinger, 2001:2).

Vodacom has a “Look4Me” service that allows mobile phones to be tracked by their signal. This allows people to keep track of their loved ones via SMS, WAP or the internet (Vodacom, 2008b).

Mobile technology can be used to combat crime. Goldstuck (2003:56) reports that the Department of Justice has identified three possible uses for mobile phones. The first involves the reporting of crime to dedicated numbers. Networks are able to identify the caller and his/her location, which could expedite the dispatching of authorities more efficiently. Secondly, SMS text messages could be sent to the public as a quick way of reporting judicial matters. The third idea would please anybody who has been called as witness to any court. SMS messages could ensure that witnesses are informed more accurately and timeously of court dates and times, thereby saving the witness the agony of waiting for a case that is often postponed.

In 2007 the first idea came true when the CrimeLine initiative was started by PriMedia in the Western Cape and Gauteng. This initiative allows citizens to anonymously report any tip-offs about crime or criminals by SMS message to 32211, at a cost of R1 per SMS. Tip-offs include details of the alleged offence. This initiative has been most successful and celebrated its first anniversary in

June 2008. According to their website, *www.crimeline.co.za*, 471 suspected criminals were arrested countrywide in the first year and more than R20 million worth of stolen property, drugs and counterfeit goods was recovered. Clearly citizens are more than willing to pay for a service that they feel is beneficial to them or their communities.

These services mentioned above are impacting on the life and work of citizens and public officials alike. Nevertheless, there are certain limitations and challenges that should be considered. These should be weighed against the benefits as well as the costs to determine whether the "juice is worth the squeeze" (BrainyMedia, 2008).

2.4.4 Benefits of m-Government

Heeks and Lallana (2004) say, "The main benefit that m-Government brings is its boundary-breaking potential: truly allowing working on an anywhere, anytime basis and helping to create a truly integrated digital nervous system for government". Wikipedia (2008b), on the other hand, highlights accessibility, convenience and flexibility as the main benefits. Public transport, safety and security of commuters, and often centralised services make it difficult for the average citizen to gain access to some government services. m-Government can bring many services directly to the public.

This will lead to "improved quality of information and information supply, reduction of process time, reduction of administrative burdens, cost reduction, improved service levels, increased efficiency, and increased customer satisfaction". These returns are interrelated and complementary (Cap Gemini, 2004:3, 9). Although the Cap Gemini report refers to e-Government, the benefits most certainly also apply to m-Government. Citizens will gain the most value from improved service and higher turn-around times. In essence the state is more transparent, transactions are processed more quickly and citizens have multiple ways of approaching government. Better service delivery leads to improved customer satisfaction. This in turn leads to more users and an improved image of public authorities (Cap Gemini, 2004:17). This in itself should serve as motivation for any manager to investigate the possibility of these

services further. The Cap Gemini report states that returns for businesses are virtually the same as for citizens, but because their interaction is more frequent, returns can be more significant.

Davison (2005) suggests that one of the biggest advantages of m-Government is the readily accessible information, services and communication. The state has the ability to report problems (for example, civil emergencies), and query any related matters in a timely way from anywhere. State employees are able to access their e-mail and real-time information related to the decision-making processes. Access to real-time government announcements and meeting updates can be delivered to their mobile devices, no matter where they are. There is the possibility of better collaboration between state departments to share information that is suitable for small-screen formats.

Heeks and Lallana (2004) indicate additional benefits. They say that public servants will be more productive. m-Government will allow officials to capture data in digital systems while “in the field.” This improves data currency and reduces time spent on data activities. Access to real-time data improves the decision-making capabilities of the officials and mobile technology allows access to all the data available via the internet or their own intranet. This ensures greater effectiveness of the public officials. Better service delivery of government information and services is the result. m-Government delivers information and services to the citizen no matter where he or she is. This has benefits for both the citizens and government; citizens have instant access to whatever they need and government has the ability to reach the citizen with important information timeously, for example, warnings about extreme weather conditions or other emergencies. An additional channel of communication provides greater choice for interactions between government and its stakeholders, including the citizen, which leads to greater participation. This means that the reduced time and effort needed to communicate with government will encourage more communication.

ICT-enabled governance that is connected includes internal and external benefits. Internally duplication is avoided, transaction costs are reduced, bureaucratic procedures are simplified, and there is greater efficiency.

Coordination and communication improve and lead to enhanced transparency, information sharing between agencies and security of information management. Externally the benefits include faster and innovative service delivery, greater efficacy, increased flexibility of service use, and greater citizen participation and empowerment (UN, 2008:7). The UN is talking about e-Government here, but the benefits can easily be applied to the application and use of MWTs as well. Examples of these have already been highlighted briefly. The benefits are clearly worthwhile, but there is another side to the matter which will be discussed in the next section.

These benefits are great, but there are two sides to every coin. To ignore the down-side of mobile government would be foolish. The next section will look at some of the limitations as well as associated challenges.

2.4.5 Limitations and challenges of m-Government

Harricharan (2003) warned that developing countries need to accommodate specific conditions, needs and obstacles. One of these obstacles, the digital divide, is not only about a lack of resources and technology; it is also exacerbated by a lack in expertise and information. Lack of infrastructure, corruption, weak educational systems and the prevalence of oral traditions also hamper the success of e-Government projects in developing countries.

e-Government and web presence are often considered hand in hand. Regarding the use of the internet as the major or only delivery vehicle for e-Government, and by implication m-Government, could be a costly mistake. Singh and Sahu (2007:479) argue that delivering services via the internet holds certain pitfalls that need to be considered. Using the internet may not necessarily improve the quality of service. If conventional methods, such as newspapers and television, are not used to publish the latest information, citizens without access to the internet could be affected detrimentally (Singh & Sahu, 2007:478). The right information is often difficult to locate and users do not want to spend time searching for information. Not many people have access to PCs yet. The 2007 community survey (StatsSA, 2008) indicates that only 15.7% of South Africans have a home PC and only 7.3% have access to the internet from home.

In developing countries elsewhere in the world similar figures are quoted. Although they might afford poor communities with no technology at home the opportunity of accessing internet, public information kiosks and multi-purpose community centres are expensive to maintain.

Language and literacy

Language is also a huge challenge. Holms (as cited in Singh and Sahu, 2007:480) states that English is used in almost 90% of websites, even though more than three-quarters of the world do not understand it. Singh and Sahu argue that technology could easily reach out to the common people if local languages are used. In a country such as India with 18 official languages and more than 100 dialects, this would be a costly exercise. South Africa's *www.services.gov.za* website is available in all eleven of the local official languages. The Western Cape's Cape Gateway portal boasts availability in the three official languages of the Western Cape, but the updating of the information in all three languages has been adversely affected by the lack in available language practitioners and resources (Grammar, 2008; PGWC, 2008e:6). As Singh and Sahu (2007:482) state, "it is almost an impossible task to have portals in all the languages given the limited resources of government".

The challenges of using information kiosks (Ni & Ho, 2005) highlight some of the problems associated with e-Government when dealing with people who are illiterate in rural areas. Africa has similar challenges with e-Government, as Heeks (2002) points out. The levels of illiteracy, unemployment and poverty will play a major role in the accessibility of mobile services and their use by the majority of South Africans. Innovative ideas will be needed to ensure that equitable services are delivered.

Technology limitations

Heeks and Lallana (2004) state that mobile phones are not as suitable as computers when transmitting complex and large amounts of information. Mobile phones still lack many of the features and services offered by PC-based internet applications. Display and information capacities limit their application. He compares m-Government to automated teller machines (ATMs) and says that both are quick to use and convenient, but that behind the scenes complex and

costly infrastructure is required to make final delivery work (Heeks & Lallana, 2004; Davison, 2005).

Security

Security around wireless technology is vitally important if sensitive information is transmitted. Mobile phone numbers and mobile devices are relatively easily hacked and wireless networks are vulnerable because they use public airwaves to send signals.

Legislation

Of all the barriers, legislation offers the greatest challenge, but Goldstuck (2003:34) reminds us that it can be overcome. Wi-Fi, for example, can only be deployed with the required telecommunications licensing and strict conditions need to be adhered to. The Telecommunications Act makes provision for exemptions, but the Independent Communications Authority of South Africa (ICASA) only provides these in exceptional cases.

The SITA Act (RSA, 1998; RSA, 2002b) is also seen as one of the major obstacles to effective ICT service delivery in the public service. Arguments are often heard that they play a middle-man role and this leads to additional expenses. Many argue that it would be cheaper for public offices to deal directly with suppliers of services. Another disadvantage is that the Act does not always cater for the speed at which technology changes. This leads to delays in using and implementing new technologies, as SITA regulates and approves any new technologies prior to its being used. The advantages of SITA are that “scale of benefits”, centralised standards and prevention of duplicating services are achieved. Whether the advantages outweigh the disadvantages is possibly a separate research topic.

Hotspots and Wi-Fi

Wikipedia (2008e) explains hotspots as being venues that offer Wi-Fi access to the internet. These venues often include airports, hotels, coffee shops and other public areas. Most new laptops and other mobile devices sold today have Wi-Fi compatibility. Thornton (as cited in Goldstuck, 2003:37) indicates that the requirements for hotspots and the associated red-tape could also be considered to be a barrier to providing mobile solutions. Value-added network services

(VANS) networks, often also called WLANs, are used by internet service providers (ISPs) to provide mobile or wireless access to the internet. Licensing is required to operate VANS networks and to make use of a particular frequency only for data. Additional requirements include the approval of all equipment attached to the VANS network and that all telecommunications must be channelled through Telkom or Neotel.

Heeks and Lallana (2004) list the following challenges:

- Cost: m-Government tends to be yet one further channel for e-Government, in which case it will create additional costs;
- m-Digital divide: not everyone has a cellular phone, in particular, older and poorer groups in society; therefore only the "haves" will benefit;
- Mobile mindsets: many people still see mobile devices as tools more for fun and entertainment than for serious activities, while business sees as having a more serious function; hence aligning these two mismatched worlds may be difficult;
- Trust/security: m-Government must have good security and must be trusted, as many users still need to cross the credibility gap; and
- Data overload: mobile devices increase stress levels by ensuring users are always connected.

Managing the citizens' expectations regarding service delivery is very difficult in a country where the gap between rich and poor is so wide. There are far greater priorities in a country that has not recovered from years of oppression. South Africa cannot afford to fall behind the rest of the world. ICT and mobile technologies have the potential of being good job creators, but education and skills shortages could hamper growth.

Capacity and capability

Project managers list capacity and capability as two barriers to implementation, but through education managers and users can be made aware of what can be achieved through the use of MWTs (Goldstuck, 2003:28). Internal barriers that are listed include the "lack of knowledge of scope and capability, complex procurement processes, lack of cost justification techniques, and lack in post-

implementation monitoring models". External barriers include "potential theft of the devices and non-payment by communities for services".

Failures

Heeks (2002:103) points out that the outcome of e-Government projects can be grouped into three categories. 'Successful Projects' achieve their goals. Secondly, 'Partial Failures' only deliver some of the anticipated outcomes for some of the time. Finally, 'Total Failures' are abandoned early on or never get out the blocks. Heeks states that in Africa there is a high rate of projects that fall into the third category.

Reasons for failure

Embarking on mobile strategies has many dangers. Goldstuck (2003:29) highlights some of the issues that could lead to disasters. He starts off by mentioning security. A lack in security can lead to the compromising of data. Although security is a very real issue, it should not be seen as insurmountable.

One of the most common reasons why mobile and wireless solutions are avoided is the perceived threat to security. As with any regulated field, if users adhere to the rules, guidelines and principles, there is less chance of data loss or damage. When access is not firmly protected, anyone with a mobile device within the "network's footprint" could potentially gain access. The "network footprint" is the area within which the network signal can be detected and logged into. Suitable security policies and user authentication can prevent hackers from gaining access to the network.

The complexity of the service also has the potential to frighten possible users away. If the system and service is easy to use, more people will tend to use it. This holds true in any country, but especially in a country where there is still much to be done in terms of human capital development.

Goldstuck (2003:29) indicates that standards are also important. Guidelines regarding the architecture, mobile devices and applications to drive the services need to be clearly defined. The result of ignoring this issue could result in costly replacement or the need to redevelop. The standards should not be so rigid that only one manufacturer or supplier is used or that obsolescence of the

technology occurs too soon. The vision of the mobile solution should take all these issues into consideration.

There are various reasons why many organisations do not reach maturity and Goldstuck (2003:24) provides some insight into this.

Table 3: Reasons for not reaching maturity

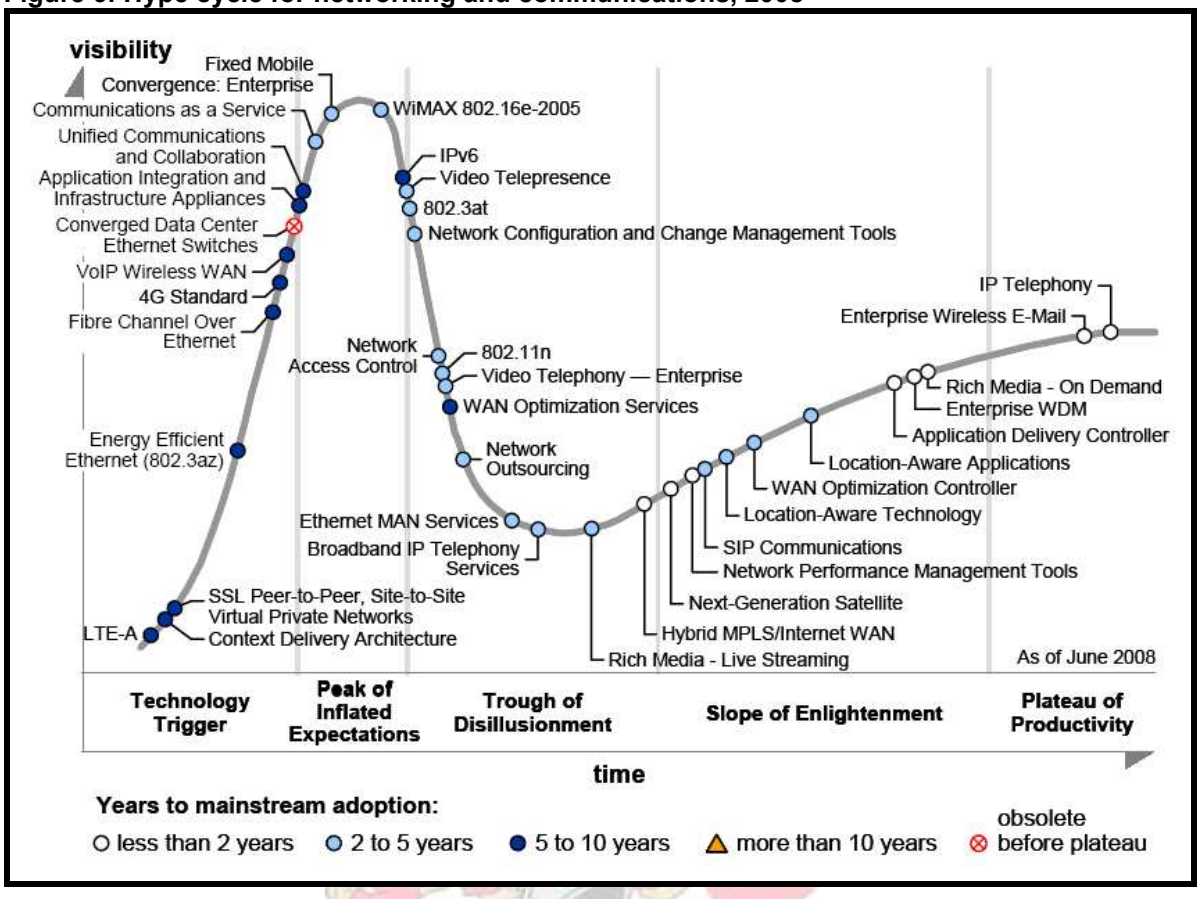
Goldstuck reasons for not being mature yet
Potential users and managers are not aware of the possibilities and options.
Many potential users, on a departmental management level, are only willing to invest in what is needed to get the basics of government service in place. In this context, they see wireless as hype, not as contributing to the basics.
They have not effectively identified potential applications in their environment.
The technology itself is not fully mature, even though implementation is occurring worldwide.
The potential for improving the bottom-line for business is not always obvious, which means that the private sector is not investing heavily in this area, which in turn means that maturity of the technology is held back in terms of on-the-ground experience of users.

Source: Goldstuck, 2003:24

Although it seems as though little is being done to progress with regard to an "unplugged government", ICT-related decisions should be business-needs driven, but these decisions should not exclude MWTs simply because the strategy failed to mention it (Goldstuck, 2003:24). Goldstuck believes that there is tremendous potential to move forward with regard to mobile and wireless connectivity. Although MWTs are volatile, Goldstuck says waiting for the technology to mature is a "recipe for business paralysis".

Gartner produces hype cycles on a regular basis for a range of ICTs (See Figure 6: Hype cycle for networking and communications, 2008). Their research provides an indication of technology adoption according to market acceptance and business success, and provides organisations with an idea of whether or not to consider the technology for their own business solutions. Goldstuck (2003:25) explains Gartner's hype cycle as follows: "When new technologies are introduced, they tend to rise up a curve of enthusiasm which reaches its highest level at the peak of inflated expectations before plummeting to the trough of disillusionment." Because of the enthusiasm about their potential, MWTs register strongly on the hype cycle in Figure 6 and provide an indication of what should be considered in the near future and what should be avoided.

Figure 6: Hype cycle for networking and communications, 2008



Source: Gartner Research, 2008:6

Wait or replicate

Research by World Wide Worx in 2003 (Goldstuck, 2003:42) on whether to replicate available mobile solutions or to wait mentions four ways to categorise the applications. The first category was to replicate applications where value had been shown through working examples or pilots, implementation could be quick and total costs were known. The second category was to demonstrate where value still needed to be proven through further research and pilots. Thirdly, there is excitement and hype about the application, usually new commercial technology or prototypes, but they still need to be proven on large-scale roll-out, and strong business cases need to be made. World Wide Worx suggests that government and the general public normally are not in a position to implement these applications and should investigate the matter further. The last category is to wait. The application has not been proven yet and is often still in development. These solutions would require much more proof before they can be considered.

There are many other crucial questions on issues such as security, anonymity and usability, but pilot programmes established a genuine interest in mobile communications as early as 2002. Di Maio (2002:3) indicates that technical or procedural solutions will not provide all the answers and that additional controls through legislation will be required.

Now that most of the aspects of m-Government have been highlighted, it is time to look at what is happening with regard to mobile government locally and abroad.

2.5 The global and national context

The use of m-Government correlates with the penetration of mobile technology. In countries with a high mobile technology penetration there are often more mobile services available. More than 30 countries in Europe have a mobile penetration of more than 100% (Wallace, 2006). This means that everyone has at least one cell-phone, while some have more than one. Among developing countries, South Africa is a leader when it comes to mobile penetration and even compares favourably with countries such as France and Canada.

Table 4 below is based on annual figures released by the four cell-phone providers in South Africa (Vodacom, 2008a; MTN, 2007; Cell C, 2006; Mochiko, 2008). Although Vodacom and Cell C indicate mobile penetration of 84% and 86% respectively on their websites (Vodacom, 2008a; MTN, 2007), high churn rates, regarded as overestimation, reduce the number of actual live subscribers significantly. World Wide Worx indicates a conservative overestimation by 20% (Goldstuck, 2005:82). The third column in the table, *Less 20% overestimated*, is the number of subscribers if an overestimation of 20% is deducted.

In 2007 the population was 48.5 million (StatsSA, 2008). Penetration is calculated by dividing the population by the total subscribers. The mobile phone penetration in Table 4 then provides a more accurate cell-phone penetration of 73% for South Africa in total and correlates with the community survey by the Department of Statistics in 2007 (StatsSA, 2008).

Table 4: Mobile penetration nationally

	Subscribers (millions)	Less 20% overestimated (millions)	Penetration
Vodacom	24,80	19,84	41%
MTN	14,80	11,84	25%
Cell C	3,45	2,76	6%
Virgin	0,45	0,36	1%
TOTAL	**43,50**	**34,80**	**73%**

Source: Adapted from Goldstuck, 2005

In 2001 the population was recorded as being 44.8 million; mobile phones were used by 32.3%. This translates to a more than 125% increase in the use of cell-phones from 2001 to 2007, or roughly 21% increase per year on average, compared to a population increase of just over 8% or 1.4% per annum on average.

This fast increase in the uptake of cell-phones suggests incredible potential for wireless and mobile technology in South Africa. Goldstuck (2003:16) reported that there were plans to distribute free subscriber identity module (SIM) cards to disadvantaged South Africans and that cellular networks would expand to the most remote regions of the country.

Nevertheless, worldwide there is proof that notwithstanding the advantages and advances in MWTs, few governments already make use of it. Table 5 below from the UN (2008:50) e-Readiness report indicates that hardly any countries provide m-services by cellular phones and PDAs. Almost a third (58 out of 192) use e-mail as a means of communicating with citizens.

Table 5: Mobile service use

	Number countries	Percent
Messages sent to mobile phones	14	7%
WAP/PDA access available	19	10%
E-mail sign-up option for updates	58	30%
Secure link indicated	33	17%
Electronic signature indicated	19	10%
Government guarantees online account will be kept confidential	29	15%

Source: United Nations, 2008:50

Governments should communicate with citizens using methods that citizens prefer. Information must be made available over a range of platforms to accommodate their personal tastes. Deploying a range of infrastructure platforms is costly and therefore developed countries are making use of wireless applications.

Although there are international watchdogs such as the United Nations and the Economist's Intelligence Unit, the focus of this study focuses on the local situation, where there are various role players that influence how ICT and MWT are deployed in South Africa.

2.5.1 National governmental role players

One of the challenges with regard to e-Government and hence m-Government is that there are so many national governmental role players, each with a mandate and some form of autonomy. This leads to redundancy, duplication and wasted efforts as there is too little coordination between these bodies. Below is a short list of the main role players to take cognisance of.

Department of Public Service and Administration (DPSA)

"The DPSA has been mandated with the task of promoting the use of Information Technology and Information Management to improve service delivery in the public service" (DPSA, 2007a).

Centre for Public Service Innovation (CPSI)

"The Centre for Public Service Innovation (CPSI) was established in 2003 by the Minister for Public Service and Administration. The mandate given to the CPSI was the development of innovative, sustainable and responsive models for improved service delivery" (Centre for Public Service Innovation (CPSI), 2008).

The State Information Technology Agency (SITA)

"SITA was established in 1999 to consolidate and coordinate the state's information technology resources in order to achieve cost savings through scale, increase delivery capabilities and enhance interoperability. SITA is committed to leveraging IT as a strategic resource for government, managing

the IT procurement and delivery process to ensure that the Government gets value for money, and using IT to support the delivery of e-Government services to all citizens. In short, SITA is the IT business for the largest employer and consumer of IT products and services in South Africa – the Government. Furthermore, the Act separates SITA's services into mandatory services (i.e. SITA must provide), and non-mandatory services (i.e. SITA may provide)" (SITA, 2008).

Department of Communication (DoC)

"The core functions of the Department of Communications are: To develop ICT policies and legislation that stimulate and enhance the sustainable economic development of the South African 1st and 2nd economy and positively impact on the social well being of all our people, To evaluate the economic, social and political implementation impact, outcomes and processes of the said policies, To exercise oversight on state owned enterprises (SOE), To fulfil South Africa's continental and international responsibilities in the ICT field" (Department of Communication, 2008).

Institute of Satellite and Software Applications (ISSA)

"As an initiative of the Department of Communications, ISSA was established in 1998 with the aim of meeting the high level demands of the ICT sector in South Africa. ISSA was mandated with the creation of high-level human resources in the ICT sector. The vision has subsequently evolved to the development of high-level ICT applications to meet the needs of the country and the continent" (ISSA, 2008a).

Department of Science and Technology (DST)

"The DST strives toward introducing measures that put science and technology to work to make an impact on growth and development in a sustainable manner in areas that matter to all the people of South Africa. This includes focused interventions, networking and acting as a catalyst for change in terms of both productive components of our economy, making it competitive in a globally competitive liberalised environment, and also in respect of the huge development backlog existing among the poorest components of our society. The goal of realising this vision is underpinned by development and resourcing

strategies for the formation of science, engineering and technology, human capital, democratisation of state and society, promotion of an information society and ensuring environmental sustainability in development programmes" (Department of Science and Technology, 2008).

Council for Scientific and Industrial Research (CSIR)

"The CSIR is one of the leading scientific and technology research, development and implementation organisations in Africa. Constituted by an Act of Parliament in 1945 as a science council, the CSIR undertakes directed and multidisciplinary research, technological innovation as well as industrial and scientific development to improve the quality of life of the country's people. Science and technology services and solutions are provided in support of various stakeholders, and opportunities are identified where new technologies can be further developed and exploited in the private and public sectors for commercial and social benefit. The CSIR's shareholder is the South African Parliament, held in proxy by the Minister of Science and Technology" (Council for Scientific and Industrial Research (CSIR), 2008).

The Presidency

The Economic Cluster has been tasked to deliver Project 3 of the Apex priorities as announced by the President during his state of the nation address in February 2008 (Presidency, 2008). The project aims to "Speed up ICT interventions to provide cheap platforms". The description of its mandate reads: "Increase usage of broadband and other ICT by addressing infrastructure development, cost, and access related issues including Infraco, Sentech (wireless broadband) and undersea cables".

Government Communication and Information Services (GCIS)

"GCIS is located in The Presidency and is responsible for setting up the new Government Communication System and transforming the communication functions in government. GCIS is primarily responsible for communication between government and the people. A high premium is placed on development communication that emphasises direct dialogue, especially with people in disadvantaged areas. GCIS is involved in drafting communication strategies and

programmes for the whole of government at national level, and integrating the communication operations of all government departments" (GCIS, 2008).

Independent Communication Authority of South Africa (ICASA)

"ICASA is the regulator for the South African communications sector, responsible for the regulation of broadcasting, postal and telecommunications services. ICASA's jurisdiction covers all nine provinces of South Africa. It is charged with licensing telecommunications, postal and broadcasting service providers, monitoring compliance of licensees against their license conditions, developing policy, managing the frequency spectrum and protecting consumers within the communications environment" (ICASA, 2008a).

The role players above have many overlapping functions relating to ICT and MWTs, but for various reasons there is little coordination of these efforts. The reason for this and possible solutions could be the subject of further studies. Patel and White (2007) cite this lack of coordination as one of the major challenges facing m-Government.

2.5.2 International examples

In their article Singh and Sahu (2007:483) provide examples of international case studies where mobile solutions have been employed. The customs department in Mumbai, India, affords clients the opportunity to check on their imports or exports through an SMS-based enquiry system. This system uses the GSM standard and requires a four-digit authentication code. Similarly, traffic police in Delhi can be sent complaints against taxis to a dedicated SMS number. The Dublin City Council, Ireland, uses a mobile parking service called m-Park, which allows citizens to pay for parking through SMS. The operation takes less than 30 seconds.

Malta claims various mobile information services such as the acknowledgment of citizen communication, updates on the status of complaints, court date changes to witnesses or accused, notification of licence renewals, examination results and notification of social payments. The public also has the ability to order "cradle to grave" certificates from a central registry, pay for the copies by

cell-phone and have them delivered to their homes. Other services they offer by mobile phone include bus schedules, notification of job application outcomes and updates, and reporting incidents to the police force.

In Texas the State Board of Barber examiners used mobile phones to manage their inspections more efficiently. The technology enabled them to have up-to-date online information on companies they needed inspect, insert inspection results in real time, thereby solving potential violations immediately.

The “Hole in the wall” project in New Delhi was an experiment where a computer with internet access was placed in the wall of a computer software and training company facing a poor community with little education (O’Connor, 2002; Goldstuck, 2003:52). No training was provided to the community, but within days the children had figured out how to make use of the technology. This is proof that functional computer skills can be learned with minimal intervention, and has become known as “Minimally Invasive Education”.

Figure 7: Dr Mitra and children at the "Hole in the wall" experiment

Source: O’Connor, 2002

The “Hole in the wall” project is an example of a “digital doorway”. Goldstuck (2003) indicated that GPRS would be most appropriate technology for connectivity of digital doorways to the internet in rural areas, where there was little physical telecommunication infrastructure. It is likely that alternative methods of wireless connectivity would possibly be more appropriate today. If regulatory restrictions are adhered to or overcome, a range of wireless options could be used to link these digital doorways to educational or government institutions.

2.5.3 National groundbreaking initiatives

South African companies have developed world-leading applications in the mobile field and will do so in the future as well. Home-grown services and innovative solutions will respond to real-world needs (Goldstuck, 2003:43). These improvements could range from policing to the monitoring of remote projects anywhere in South Africa (Goldstuck, 2003:39).

There are various national initiatives that are noticed and recognised at an international level. The UN (2008:26) describes the Department of Labour's website as a very good example of a government portal that is designed for the needs of its users. Simplicity in design and the use of key phrases allow for easy navigation of the website. The website incorporates all aspects of labour issues that users might require. These include helpful guides, summaries of legislation on various labour-related matters, labour research findings and statistics, as well as online posting of vacancies. Online filing and registration of services such as compensation claims and employer registration allow for interaction with the department at any time from anywhere. The DoL website is a great example for other government websites in South Africa.

In the Government Unplugged report Goldstuck (2003:43) reports on various South African initiatives in mobile solutions. Although South Africa is considered a developing country, there have been world-leading applications developed here in the field of technology and communication. Home-grown services such as the ability to link to organisation-wide databases through any mobile device are not something new, but the solutions are developed for real-world challenges by people who understand the South African context. Two innovative and globally patented "enabling engines" for remote connectivity are remote interactive voice response (RIVR) and two-way instant short message (TWIST). RIVR can provide users access to information via voice and TWIST can link any cellular phone with any database or computer.

Goldstuck continues by explaining that the concept of pre-paid cell-phone use was pioneered in South Africa to accommodate the many people who could not afford a cell-phone contract and wanted to use the cell-phone in a different manner. Today pre-paid cell-phone accounts are the biggest driver in cell-phone

subscriptions in the world. In the same vein, security of government networks is important and solutions in this regard have also been seen. SecureWorx and SITA developed a solution that enables sign-on through Wi-Fi that is as secure as the existing local area network (LAN) security. South African application developers have also made innovative use of SMS technology that allows cost-effective bulk messaging and integration with e-mail systems. SMS technology is also being used to notify patients of results, appointments and reminders to take medicine (Goldstuck, 2003:20; Goldstuck, 2005:99).

Further examples of national groundbreaking initiatives include the SITA wireless network, rural connectivity, digital doorways, linking employees, fighting crime and social redress through the use of MWT. The following sections will discuss each of these initiatives.

SITA wireless network

A case study that Goldstuck (2003:48) highlights is the SITA wireless network pilot. Stakeholders in this project understand that connectivity is the "basic building block" to access databases and information to enable service delivery and is of paramount importance. This connectivity applies not only to the systems where the information is hosted, but also to the level of connectivity available to the citizens who wish to access it. The Institute of Electrical and Electronics Engineers, Incorporated (IEEE) have, among other things, developed standards for connectivity. The most mature standard for wireless LANs at the time was IEEE 802.11b. The technology used had various requirements, but the most essential was that it needed to be mature and had to provide users with access to e-mail, internet and other proprietary systems and data.

The pilot was conducted in the technology lab and the lessons learned provide government institutions with a good idea of the decisions that they will face, as well as the challenges and issues they might need to address. As expected, security was the greatest risk and most difficult challenge. This leads to additional costs when the solution was outsourced, but it resulted in a "unique solution, both with regard to capabilities and ease of access." A further lesson was that solutions must offer interoperability of new components, inherited

systems, architecture and applications. Most off-the-shelf solutions were fine as long as only standard features were used. Problems arose when additional or enhanced features were implemented. They found that these mostly worked on proprietary systems only and the interoperability of enhanced features, especially security-related issues, was not sufficient. With radio-based networks there are additional issues to consider with regard to planning and placement.

Data reception and transmission are affected by the physical environment and if this is not taken into account, connectivity could be unreliable. Factors that needed special consideration included the number of users sharing the service, physical constraints of the building such as the material used to build it, the location and security of the transceivers and other devices, user maturity and stability of legacy architecture. If the existing LAN is not stable and secure, adding a wireless option will compound the problems. As part of considering a wireless solution, a network audit of the legacy connectivity should be conducted. Finally, wireless solutions should not be seen as a "silver bullet" that will finally solve the problem. They should not be implemented purely for the sake of technology, but rather restricted to high-mobility requirements or areas where traditional cabling is impractical (Goldstuck, 2003:48-50).

Rural connectivity

In the Eastern Cape an independent and alternative communications infrastructure was used to provide connectivity to a "deep" rural community to "support local economic development." The wireless technology, developed by the CSIR, was based on GSM as it meant that coverage in rural areas was good. The 11 Mbps (megabits per second) broadband rural intranet could handle VoIP, data and video communications. Within the 10 km diameter footprint a school, clinic, multi-purpose centre and police station were connected. Although this improved communications within the footprint, there was no external connectivity as there was no link outside the cell (Goldstuck, 2003:50).

Digital doorways

The "Hole in the wall" project (O'Connor, 2002) in India proved that especially children have the ability to learn basic computer skills without being taught

officially. In the Eastern Cape's Cwili Township minimal invasive education was introduced through the first digital doorway by placing a computer outside a busy community centre. The computer was loaded with a range of software from maths tutors to open-source word processing and internet access. The community was immediately interested and people made use of the computer from as early as 04:14 through to 01:20 the following morning. Dr Mitra (as cited in O'Connor, 2002) found in his "Hole in the wall" experiment that, in areas where there is limited literacy, community members help each other to access the services and information they require. Together with the Meraka Institute, the Department of Science and Technology has since launched more than 150 digital doorways throughout the country (Department of Science and Technology, 2007). The Meraka Institute is managed by the CSIR.

It became obvious early on that a lack of infrastructure would require alternative solutions in many rural areas. Many of the rural sites make use of satellite technology, GPRS and Wi-Mesh. Ntshongweni, a township near Durban, became the first site to use Wi-Mesh in September 2007. Various schools were linked to the municipality, allowing learners and teachers to communicate with each other over the network. The digital doorways provide free broadband connectivity to communities and are accessible to them 24 hours a day.

In the same vain the Post Office has started to roll out public internet terminals (PITs) (Goldstuck, 2003:16). Photos of these PITs and screen dumps of the services they offer can be seen in *Annexure F: Public Information Terminals* on page 190.

Linking employees

As far back as 2003 SITA was involved with MTN to provide a solution to connect their executives through finding mobile solutions. The solutions included DataFast through high-speed circuit-switch data (HSCSD) and DataLive using GPRS. To enhance the productivity and service delivery of government employees, the solutions had to provide access to e-mail and web services as a minimum. The MTN solution was robust and integrated well with the Government Common Core Network (GCCN) or government WAN (Goldstuck, 2003:50-51). This partnership has been extended to other

departments and provinces and MTN has negotiated a solution for the PGWC and the Centre for e-Innovation as well (Gamiet, 2008).

Mobile crime fighters

When one watches the popular television series about crime scene investigation units in Miami, New York and Las Vegas, the technology they use looks like science fiction. However, all the technology shown is actually available today, albeit at a cost. In past episodes devices have been used to scan fingerprints and then the investigators are linked directly to their fingerprint database to get information as quickly as possible. The sooner the police can respond to a crime, the greater chance they have of apprehending the perpetrators.

The South African Police Services make use of laptops with GSM data cards that allow them access to national databases. This means that during a raid any vehicles as well as the numbers of their parts and engines can be checked to see whether they are reported as stolen (Goldstuck, 2003:59). This same system has been successfully used at road blocks to identify and recover stolen vehicles. In much the same way the Johannesburg Metro Police sends SMS messages to an integrated information system to check on the status of vehicles or their parts that are suspected of being stolen. They will also be able to confirm the status of a driver by sending these details to the system (Goldstuck, 2003:58).

Social redress

During her budget speech Minister Fraser-Moleketi (2008) announced an SMS number where public servants could make R5 donations towards the re-integration, relocation and provision of humanitarian support for displaced migrants. This is an example of how cellular technology could be used for transactions. This could easily be extended to other areas such as paying for motor vehicle registrations, if users were to include relevant details in the SMS, for example, the vehicle registration or the person's identification number. The Minister continued by announcing that the next generation e-Government was in the process of being implemented. This phase will include six new services ranging from applications for identify documents, child birth certificates, foster

grants, social pensions, maintenance payments and death certificates. She indicated that all these services are “pro-poor”, meaning that the target market for these services is essentially the citizen who has been neglected.

Mobile health

The Dokoza project (DPSA, 2008) uses cell-phones for data and transaction exchange for various medical services. The project was piloted at Johannesburg General Hospital and Helen Joseph Hospital. Services that were focused on included patient registration and history, access to blood test results and the ability of health practitioners to check prescriptions against internal protocols.

AccessHealth is a second project that was implemented at Brits District Hospital and its feeder clinics in North West province (DPSA, 2008). Mobile phones and PDAs were used to register first-time patients and schedule appointments with available doctors at the district hospital. The patient administration and billing (PAAB) system was accessed through a program loaded on PDAs or smartphones. Patient records on the PAAB database could be searched and reminders about appointments were sent to patients via SMS.

There are many examples of how mobile technology has already been deployed successfully in South Africa, but this study looks at results achieved within the Western Cape.

2.6 The provincial context

Within the Western Cape there are many examples of m-Services and not all of them emanate from the PGWC. Various examples have already been mentioned. Knysna, for example, has established the Knysna wireless network, thereby creating a wireless campus or town by deploying MWTs to enable connectivity from anywhere within the town. They indicate that this will contribute to the promotion of local economic development (PGWC, 2008h:46). In the same way the Hessequa Municipality indicate in their integrated development plan for 2007-2011 (PGWC, 2008i) that they will establish a wireless network within their area to allow connectivity in areas where fixed telephone lines have not been installed yet.

Metropolitan police services make use of MWTs to scan number plates for outstanding warrants of arrest. The officers upload the database of outstanding vehicle offences directly to the mobile unit at the start of each day. They have the power to issue a summons and make arrests on the spot. There are unfortunately only three of these mobile units in South Africa at present.

These services and others are examples of what local government is offering with regard to m-Services. This study looks at specific solutions that the PGWC has employed with regard to service delivery. The remainder of this chapter will be devoted to examples of provincial m-Services.

2.6.1 Services in use in the PGWC

The Province has various examples of m-Services that range from the provision of information to citizens to the improvement of administrative processes.

Fleet management

The Government Garage uses a global positioning tracking system to monitor and manage its fleet of 4,000 vehicles (De Freitas, 2008). Their web-based system, called FleetMan (PGWC, 2008c), allows employees to book pooled vehicles easily. Payment for these vehicles is done through the asset management system, and ensures quick and accurate billing. This improves financial accountability and cash flows. This system used in conjunction with e-Fuel, the fuel management system, has saved much money and eliminated fraud almost completely. Micro chips placed in the vehicles allow these management systems to control the multi-million rand assets of the Western Cape. This mobile technology is used in other organisations in South Africa as well, for example, Netstar (Digifleet, 2008).

Electronic Document Management Systems (EDMS)

Paper-based application for social grants and pensions takes a long time and often files are lost or misplaced. The CEI is assisting the South African Social Security Agency to convert their documents to electronic format. This means that in future community social workers could possibly capture data directly to

the EDMS system using wireless technology, thereby ensuring that recipients do not have to travel long distances (PGWC, 2008d).

Cape Gateway

Government information is currently provided to citizens mainly through the Cape Gateway project. A web portal, e-mail channel, call centre and a walk-in centre provide four means through which citizens can gain information. Queries in all three official languages of the Western Cape – Afrikaans, English and Xhosa – are handled by professionally trained staff. The demand for this service has grown considerably since its inception in March 2004. Statistics show that the number of unique visitors (each visitor is counted once only) to the site has grown from 17,000 in June 2004 to an average of more than 100,000 visitors per month in 2008 (PGWC, 2008e:3). Although the majority of these visitors are public servants, more than 40% or 40,000 monthly are from outside government.

The top ten queries regarding e-Services on Cape Gateway are Cape Town traffic fines, checking marital status, getting a firearm licence, applying for a passport, government tenders online, adopting a child, frequent questions on traffic fines, liquor licence applications, household recycling, and bursaries in transport, engineering and the built environment (PGWC, 2008e:6).

The call centre handled more than 95,000 calls in 2007, an average of more than 260 calls per day (PGWC, 2008e:7). The e-mail channel handles more than 570 incoming and 500 outgoing e-mails per month. Cape Gateway has alleviated the number of queries that go to the respective departments; for instance, the traffic department experienced a drop of 60% in their call volume. This project contributes directly to the openness and transparency of government by making information available to the public on request. Many of these services could possibly have been accessed via mobile devices.

The possibility of expanding in the area of mobile information services through the Cape Gateway project is very likely. One of the areas that they are investigating at the moment is the adaptation of the Cape Gateway portal to the

.Mobi (pronounced “dot-mobi”) format (Grammar, 2008). Internet design facilities such as .Mobi, where websites are specifically designed for the cell-phone, are becoming more popular. Various cities in the world have already adopted the proposed standard (see *www.helsinki.mobi*). Jones (2005) suggests that .Mobi should be used by sites that will concentrate on delivering content to cell-phones only.

Cape Access

To complement Cape Gateway, the CEI is providing computer access and skills to rural communities. The Cape Access project has established e-Community forums in Beaufort West, Bitterfontein, Elim, George, Oudtshoorn, Paternoster, Struisbaai, Van Rhynsdorp, Vredenburg and Vredendal. Multi-purpose community centres (MPCC), libraries and schools are utilised to provide internet access to citizens. MWTs are currently being used in Vredenburg, Van Rhynsdorp and Bitterfontein to ensure that connectivity is achieved (PGWC, 2008g; Tsabalala, 2008). The Cape Access project is also in the process of acquiring a trailer with eight computers onboard and remote connectivity via satellite communication (Tsabalala, 2008). This mobile unit will extend public services to rural areas that do not even have infrastructure yet. A multi-disciplinary team consisting of knowledgeable employees from departments such as Social Development, Health, Housing and Local Government will accompany the mobile unit to deal with citizen-specific queries.

Other access points

There are currently 114 public access points in the Western Cape, of which 82% are within Cape Town. Through a public-private partnership, Microsoft has established 12 digital villages in the Province. Microsoft South Africa signed a memorandum of understanding with the Universal Services Agency of South Africa (USASA), a local NGO. The partnership aims to provide every South African citizen with access to technology (Microsoft, 2005).

The Red Door advice centres provide a further means for citizens to connect to the internet. Most centres provide at least 30 minutes free access per user per day at sites located in Atlantis, Beaufort West, Hermanus, Khayelitsha, Knysna, Mitchell's Plain, Oudtshoorn, Paarl and Vredenberg (PGWC, 2008f; PGWC,

2008g). These access points give value to public service information by providing citizens with access to it.

There is no doubt that MWT can improve service delivery in many ways. If the current challenges and limitations are taken into consideration, the progress that has already been made is commendable.

2.7 Summary

Using mobile and wireless technologies in an innovative way to contribute to service delivery is vital. There is much innovation and expertise all around. Much of the technology exists, if not locally, in countries all over the world. South Africa and the PGWC should tap into these vast resources to ensure that mistakes made are not repeated locally and that gaps in existing technology should be identified and solutions sought for them.

A study done by the CPSI in 2003 (2003:48) made suggestions regarding the connectivity of citizens, including the use of mobile technology. They suggest a multi-phased and multi-solution approach that ranges from traditional “wired” connectivity to walk-in centres and IVRS. The study also indicates that mobile solutions are relatively new and that only critical services should be considered at this stage. The study does not mention any provincial services, but that does not mean that there are none that could benefit from “going mobile”. The quickest and cheapest mobile solutions that would also be of benefit to the Province relate to the sharing and dissemination of information through mobile technology.

Chapter Two has looked at most aspects relating to m-Government, including explanations of the concepts, examples, the legislative framework, benefits and the conceptualisation of m-Government globally, nationally and provincially. As the problem statement for this research study looks at the m-Readiness of the PGWC, the m-Readiness tool that was used for this study will be unpacked in the next chapter and that will be followed in Chapter Four by an overview of the associated technology.

CHAPTER 3: THE M-READINESS MODEL

3.1 Introduction

This study is based primarily on the work by Kirsten (2006) and Goldstuck (2003; Goldstuck, 2005) with regard to determining whether organisations are ready to deploy mobile technology to enhance their service delivery. Kirsten's (2006) model on the mobile readiness of South African businesses listed on the Johannesburg Stock Exchange (JSE) was used as a basis to measure the level of m-Readiness within the PGWC. A detailed study into the necessity for a MWT-specific readiness model and then the composition of the model would require a study on its own. This model warrants some in-depth discussion to clarify certain aspects and to point out various short-comings. This chapter starts out by discussing the difference between e-Readiness and m-Readiness measuring tools, then discusses how readiness is measured, and concludes with notes on how the captured data have been interpreted.

3.2 e- and m-Readiness measuring tools

There are many e-Readiness models that are used throughout the world to measure the extent to which organisations are ready to deliver services with regard to ICT. A brief look at the background to readiness models will be followed by an explanation of how the model for this study was compiled.

3.2.1 Background

The UN readiness tool has already been discussed in Chapter Two, but in short they use an index measured as a fraction out of one that is comprised of three separate but related indices. These indices measure maturity of a country's web presence, telecommunications infrastructure and human capital.

The Economist Intelligence Unit's (EIU) model is also well-known. The EIU (2007:1) states that e-Readiness refers to "the state of play of a country's ICT infrastructure and the ability of its consumers, businesses, and governments to use ICT to their benefit".

The EIU (2008:21) measures e-Readiness based on six weighted categories using an index out of 10. The six categories are made up of almost 100 quantitative and qualitative criteria measuring the various components of a country's social, political, economic and technological development.

The six categories and their weightings are:

- Connectivity and technology infrastructure (20% weighting);
- Business environment (15% weighting);
- Social and cultural environment (15% weighting);
- Legal environment (10% weighting);
- Government policy and vision (15% weighting); and
- Consumer and business adoption (25% weighting).

To score high in each of the categories, organisations need to measure up to certain criteria. Connectivity and technology infrastructure looks at the penetration rates of Broadband, mobile phones, internet, PCs, Wi-Fi hotspots, internet security and electronic identification. The business environment is concerned with the overall political and macroeconomic environment, market opportunities, policies toward private enterprise and foreign investment, foreign trade and exchange as well as tax systems, financing and the labour market. The social and cultural environment relates to the education and literacy levels, the degree of entrepreneurship, technical skills of the workforce and the degree of innovation. The legal environment has to do with the effectiveness of the legal framework, policies governing the internet, the level of censorship, and the ease of registering a new business. Government policy and vision refers to the percentage that governments spend on ICT as a proportion of gross domestic product, the digital development and e-Government strategies, and online procurement. Finally, consumer and business adoption looks at how much consumers spend on ICT per head, the level of e-business development, the degree of online commerce, and the availability of online public services for citizens and businesses.

GeoSINC International (2002:12) compiled a comprehensive guide on measuring e-Readiness. They identified five key groups based on criteria from a range of other measuring tools.

These key groups are:

- Access and connectivity;
- Training and education;
- Government leadership;
- Business and private sector; and
- Social development.

Each of these groups had categories as measured by the other measuring tools. The correlation between their comprehensive tool and the EIU tool can already be seen. The e-Readiness guide used by GeoSINC International (2002:12) suggests six further readiness models that could be consulted:

- Centre for International Development at Harvard and International Business Machines (IBM): The Guide to "Readiness for the Networked World".
  Description: A tool and report to assess countries along four stages of development for each of 19 categories, focusing on technology infrastructure, pervasiveness of technology, and the regulatory and business environment.
- Computer Systems Policy Project Readiness Guide.
  Description: Questionnaire and report to assess and rate communities along four progressive stages of development for each of five categories, focusing on existing infrastructure and the pervasiveness of technology in society.
- McConnell International's e-Readiness Reports.
  Description: A report that rates countries in five categories including infrastructure and access, government policies, human capacity, information security, and business climate, on a scale of one to three ('blue,' 'amber,' 'red'), and extensive analysis and recommendations are given.
- The World Information Technology and Services Alliance.
  Description: The questions cover a range of issues, including: barriers to technology industry, role of consumer trust, problems with e-Commerce technology, internal business practices that support e-Commerce, workforce problems, taxes, public policy issues, and resistance from consumers.
- Mosaic Group's tool to track the global diffusion of the internet.
  Description: A questionnaire-based assessment and report, much less detailed than Mosaic's case studies but covering the same issues, including

pervasiveness, geographic dispersion, usage within the economy, technology infrastructure, the internet service market, and sophistication of use.

- University of Maryland, Centre for International Development and Conflict Management's Negotiating the Digital Divide Framework.

Gartner has also developed a tool to measure e-Readiness in Australia (Harris & Roberts, 2006) and this same tool can be used to measure the level of compliance in other areas of the world. One consideration is the level of development within a country. It is important that the measuring tool suits the requirements and unique constraints of developing nations. Taking this into consideration, Gartner developed a balanced scorecard for a study that measured e-Readiness in Bulgaria (Gueorguiev, Dimitrova, Komitska, Traykov & Spassov, 2005).

The UN (2008:125) draws a link between ICT and the millennium development goals through e-Readiness. They indicate that the questions that e-Readiness models ask need to be more responsive to the strategic goals set. This is good advice for national and local strategies as well. Instead of asking about the level of connectivity, questions should be linked to specific goals. As example the UN suggests questions such as "How much bandwidth is needed for remote diagnosis to reduce child mortality?"

As can be seen there are a myriad of readiness tools in the market that could be used to determine the level of e-Readiness, but this study did not find any recognised tools that focused on m-Readiness. For this reason the work done by Goldstuck (2003), Goldstuck (2005) and Kirsten (2006) was used for this study.

3.2.2 m-Readiness tool

Goldstuck (2005) used ten questions to determine the level of m-Readiness. They focus on whether both the technology and the organisation or department are ready. If half the questions are answered positively, chances are the organisation may be in a position to initiate wireless and mobile solutions.

Table 6: m-Readiness questions

	Questions
1.	Is the technology ready for my environment, and is my environment ready for the technology?
2.	Does my IT strategy allow for easy inclusion of mobile and wireless technologies?
3.	Does my IT strategy specifically make provision for mobile and wireless?
4.	Is there widespread use and presence of mobile devices (cell-phones, laptops, PDAs, etc.) in my department or organisation?
5.	Is the technology that will enable this business requirement mature?
6.	Does my backend system operate on standards that allow for extension into mobile and wireless technology?
7.	Can my backend databases be accessed from any computing or data device, and information be presented in a simplified format on a small screen such as those on cell-phones?
8.	Does the technology I have in mind enable a business requirement of my department or organisation?
9.	Will the time it takes to implement the technology be an obstacle in the successful implementation and use of the technology?
10.	Will the cost be justified by the business case for the technology?

Source: Goldstuck, 2003:23

These questions in themselves are not enough to decide on whether to embark on new MWT implementation. As mentioned earlier, the maturity of the technology is very important. Gartner hype cycles (see *Figure 6* on page 60) can assist in determining whether the identified technology is at the right level of maturity for implementation.

The June 2008 networking and communication hype cycle (Gartner Research, 2008:6) indicates that most mobile and wireless technologies will only be mature enough in two to five years.

Institutional readiness refers to the attitude of decision-makers towards the technology. Goldstuck (2003:28) identified this is one of the greatest barriers to implementation. Another obstacle could be the policy and regulatory environment. This determines whether implementation will be possible or not. Among the issues that will have an impact on MWTs are: wireless networking (Wi-Fi limitations as per the Telecommunications Act), open-source software, electronic bill payment and presentation (Electronic Communications and Transactions Act), and general regulations affecting implementation (such as tender procedures that could hamper PPP) (Goldstuck, 2003:34)

Finally, the ease of application will determine whether the users will make use of it. It is important that business needs drive the process and not the technology. If people find a system difficult to use, they will not use it (Goldstuck, 2003:38).

Kirsten's model

Kirsten (2006) used a questionnaire to ascertain the readiness of businesses in South Africa. The questionnaire is attached as *Appendix E: Survey questionnaire* and can be seen on page 183. The survey starts out by asking basic demographic questions and then asks about the established adoption of current technologies in the organisation. The most common current mobile technologies are listed and respondents are required to check boxes indicating technologies already in use in their organisations. Question five looks at mobile technologies that have been combined with established business applications, such as corporate SMS, instant messaging and remote monitoring.

Question six surveys which mobile technology is provided to which kind of staff, ranging from top management to administration staff. Question seven requests an indication of the business fields that have been influenced by mobile devices or applications.

Firm infrastructure, procurement, operations, logistics, marketing and sales, and after-sales service and support are the fields to consider. Question eight looks at the kind of training that employees received regarding mobile technology. Choices include formal, in-house, online, ad hoc training (also from colleagues), self-help and internet research.

Question nine asks respondents to provide an indication of the importance of the common technologies as listed in question four. Responses range from unsure, very unimportant, somewhat unimportant, somewhat important and very important. Question ten asks respondents to provide a measure of organisation-wide sophistication of users. Choices include unsure, very basic, somewhat basic, somewhat advanced and very advanced. The last question provides a list of emerging technologies and asks respondents to indicate how important the new technology is with regard to likely impact on their business. Respondents can select either unsure, not important at all, somewhat important, important or very important.

This readiness survey does not provide a measure as the UN or EIU does, but it does give an indication of the maturity of the organisation with regard to mobile technology adoption.

3.3 Measuring e- and m-Readiness

South Africa scored 5.95 (out of 10) according to the EIU (2008) and was placed 39th out of 70 countries (35th in 2007). Using the same countries that EIU used in their survey, but with the criteria set by the UN, SA is placed at 48th place, but still in the lead for Africa.

According to *The Economist*'s 2008 e-Readiness survey, South Africa is 39th out of the top 70 countries in the world with a rating of 5.95. In 2006 South Africa's rating was 5.74 and in 2007 it was 6.10. This means the readiness rating has dropped by 0.15. Although South Africa is 39th on the list, it is first in Africa and has a higher rating than the largest developing nations (BRIC - Brazil, Russia, India, China).

Table 7: Extract from *The Economist* e-Readiness report 2008

Country	Position	e-Readiness	2007 score
United States	1	8.95	8.85
South Africa	39	5.95	6.10
Brazil	42	5.65	5.45
India	54	4.96	4.66
China	56	4.85	4.43
Russia	59	4.42	4.27
Nigeria	62	4.25	3.92
Algeria	67	3.61	3.63

Source: Economist Intelligence Unit, 2008:5

The PGWC's last e-Readiness assessment was done in 2001. The report indicated that the PGWC has almost reached the fourth stage of maturity (out of five) according to the methodology they used to determine their e-Readiness. The focus of their measurement was whether the PGWC departments had a presence with useful information to the citizen on the internet (PGWC, 2001:9). This is not in line with global standards of measuring e-Readiness and thus a clear and comparative measure is not available.

3.4 Interpreting the results

IBM used the matrix in Figure 8 in its report on MWTs for government to provide a rough guide on whether to employ technology or not. The guide compares the readiness of technology with its sophistication and both can be categorised as "High" or "Low" (Goldstuck, 2003:27). The four categories clearly indicate that a high level of readiness and low sophistication are the first options that should be considered. IBM refers to these as the "low-hanging fruit". As Goldstuck suggests, this categorisation is not as detailed as often required, but it does serve as a good starting point.

Figure 8: Preparing for mobile and wireless technologies in Government

		Degree of sophistication of technology	
		High	**Low**
Technology Readiness of Target Segment	**High**	**Stars** *High-impact projects* Mission critical applications of high strategic advantages should be taken: high level of commitment needed for success	**Low hanging fruit** *Go for immediate wireless development* High probability of successful adoption
	Low	**Future Potential** *Wait and see* Applications more complex; Go forward with pilots; Educate/train employees; wait for mature technology	**Near Harvests** *Educate / Train target segment* High probability of successful adoption

Source: Goldstuck, 2003:27

In both the South African public and private sectors the biggest consideration is the state of the current backend systems. Backend systems need to be compatible with new technologies to ensure that solutions are more cost effective. Installing new technologies on ineffective backend systems could make matters worse. Goldstuck suggests that the solution is first to sort out the backend and align its processes with front-end technologies, and then compile a meaningful business case for new front-end technologies.

Developing a checklist

Research conducted by World Wide Worx (Goldstuck, 2003:44) showed that industry leaders indicated a range of barriers and challenges to successful

implementation of m-Government. Goldstuck suggests that a checklist should be formulated using these barriers. This checklist should be consulted at the outset of the implementation to provide an indication of which barriers could be encountered. Taking preventative and corrective measures at the outset will ensure that buy-in from stakeholders is not detrimentally affected. If this is not done, the project could be doomed and rectifying the damage could be difficult. The checklist below is an adaptation of the barriers and challenges that were identified by the World Wide Worx survey.

Table 8: Checklist for m-Government projects

Factors to consider prior to implementation	**Y/N**
The level of user education is adequate for the technology to be deployed.	
If user education is lacking, training will be provided.	
Business and client expectations and requirements have been matched.	
Hardware	
The service/application is compatible with varying end-user devices and handsets	
Devices and handset are available at a reasonable cost.	
Costing	
The service is affordable (airtime cost).	
An investment appraisal and return on investment has been conducted.	
Costing has been done for the provision of blanket mobile coverage.	
Costing has been done for bandwidth (high and low).	
Communication	
Limitations on bandwidth have been considered.	
Management	
The questions from senior stakeholders (power blocks) have been addressed.	
The suppliers are experienced enough to deliver the product.	
Redress/fault logging system is/will be in place to address user concerns.	
The legal aspect of running data and voice within the same carrier are in place.	
Security	
Security of data on mobile device has been/will be addressed.	
The procurement processes are streamlined (**not** lengthy and cumbersome).	
Old, custom-designed and data-hungry legacy applications have been avoided.	
If old systems that will be interfaced exist, they will be rewritten.	
Wireless infrastructure exists to extend m-Services to roaming officials.	
Appropriate people within different government agencies are available.	
Standardisation of systems is a priority in the organisations.	
There is an understanding of the needs of each department or sector.	

Source: Adapted from Goldstuck, 2003:44

Answering yes to all these statements will not guarantee success, but at least it will assist managers to identify any significant risks or areas that would need to be addressed.

3.5 Summary

Determining the level of readiness of an organisation for any endeavour provides a measure of its ability to adopt a new way of doing business. The use of mobile and/or wireless technology is no different. Any number of e-Readiness models could have been adapted to focus on m-Readiness; however, this study wanted to ascertain the m-Readiness level of the PGWC by using the study that Kirsten (2006) did on mobile readiness of businesses in South Africa. Kirsten's study provides an indication of the level of mobile technology adoption as well as the readiness. This study used the same yardstick that Kirsten used to measure readiness in the PGWC, thereby ensuring that a fair comparison was done.

There is a huge gap between the way in which Kirsten's model measures the level of readiness and the e-Readiness models used by the UN and EIU. The indices used by the UN and EIU are far more comprehensive and include all peripheral aspects relating to e-Government. Kirsten's model focuses largely on the adoption of the technology.

The model is nevertheless replicable and provided a clear understanding of where the PGWC stands with regard to adoption of mobile technology and the current m-Readiness status in comparison to Kirsten's study results.

As mentioned at the end of Chapter Two, this chapter deals with the readiness model, while the next chapter will conclude the literature review by looking at the technology associated with m-Government.

CHAPTER 4: ASSOCIATED TECHNOLOGY

4.1 Introduction

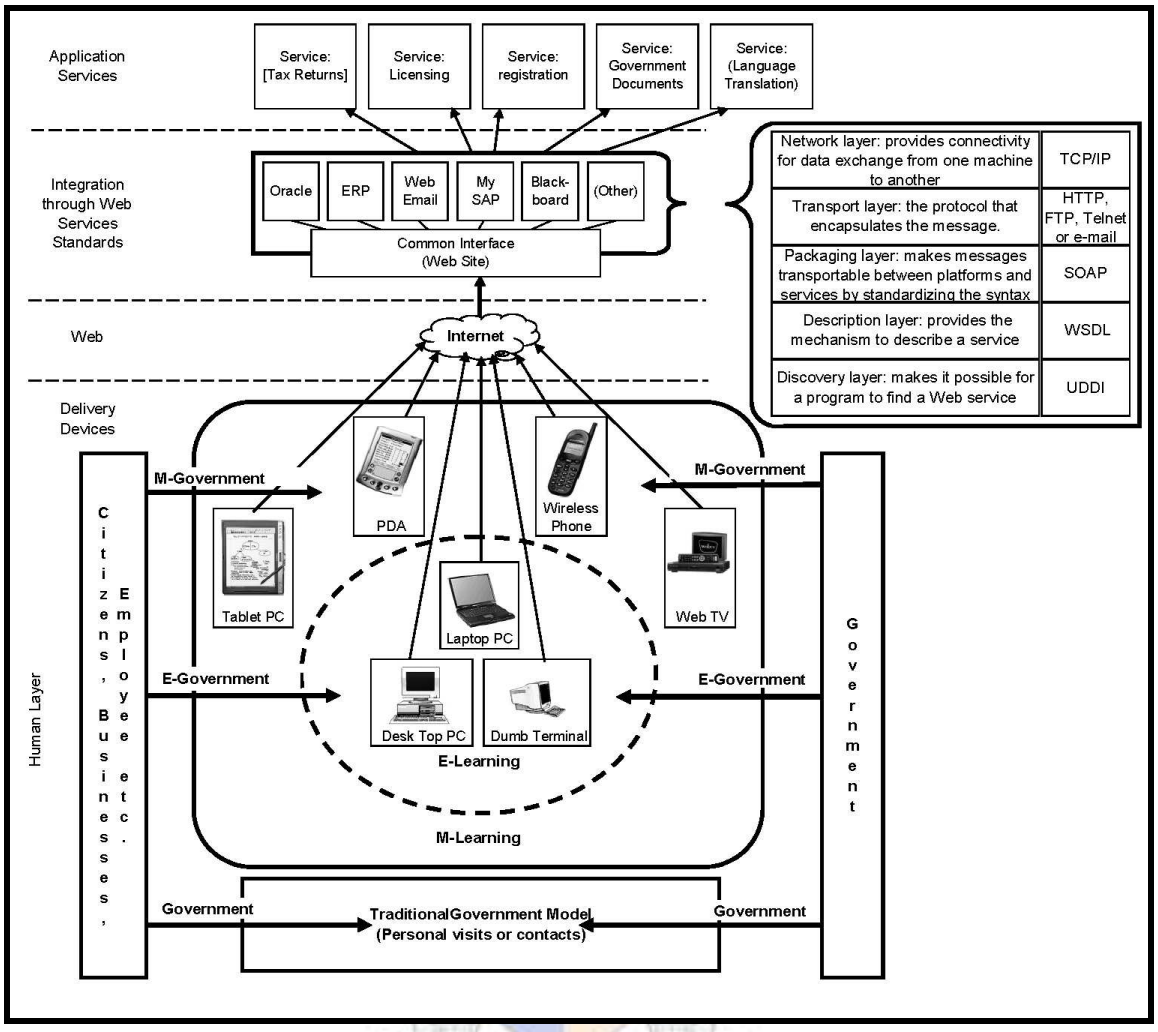
The technologies associated with m-Government are often grouped into a number of categories. Kirsten (2006) divides them into cellular and wireless technologies, transmission protocols and wireless devices. Goldstuck (2005) looks at devices such as laptops and cell-phones, the use of SMS, mobile technology in the business world and also third-generation technology (3G). This chapter does not intend to provide a detailed overview of all mobile and wireless technologies, but will refer to the basics of the technologies most commonly associated with m-Government. Technology changes so rapidly that by the time of publication some of the examples cited might already be outdated. Gartner annually researches the latest trends and terms to produce a glossary of mobile and wireless communication terminology (Simpson, King, Reali, Zimmerman & Jones, 2008) and can be consulted together with the other references noted in this study for more exhaustive details.

The mobile and wireless technologies discussed in this study will be divided into three categories. The first category will look at the network connectivity or the platforms through which mobile connectivity is enabled. Sharma and Gupta's (2004) architecture for m-Government (see Figure 9) talks about the web-layer or connecting to government services through the internet. The difference between cellular and wireless connectivity will be explained in this section. Mobile and wireless devices are briefly discussed as part of the second category and refer to the mobile and wireless tools or devices used to communicate. Cellular phones are once again the predominant discussion point, but there are many other devices that need to be considered as well. Lastly, the application services and software required for communication to take place are discussed. Most of the services have already been mentioned in Chapter Two, but this section provides greater clarity. The chapter is concluded by looking at the issue of standards with regard to MWTs.

Figure 9 below is a representation of the way that Sharma and Gupta (2004:468) see m-Government. Citizens and government employees connect to the internet by means of mobile and wireless devices. Connecting to the internet is integrated

and facilitated through various web services and protocols so that users can access the application services.

Figure 9: Web services architecture for m-Government



Source: Sharma & Gupta, 2004:468

First, a very brief history of mobile technology is outlined below.

4.2 History of mobile technology

From as early as 1890 inventors were discussing the ability to communicate over distances without being connected by wires in some way. The freedom that this would provide the user would change the way the world does business. As with many technological innovations, initial successes were often seen in the field of warfare. Governments often assign huge budgets to defence, which in turn allows for innovative thinking, a luxury that business usually does not have. As can be

seen below, one of the first successes with wireless communication was between two airplanes. This technology was further developed during World War II, when the walkie-talkie was used for the first time to allow two mobile people to communicate wirelessly. The table below is a short extract highlighting the major incidents in the history of mobile technology.

Table 9: Brief history of mobile technology

Year	Incident
1890	Nicholas Tesla provides a theoretical basis for wireless communications.
1894	Guglielmo Marconi demonstrates wireless transmission of signals over two miles, and became regarded as the father of radio.
1916	Two way communication takes place between two airplanes for the first time. This set the scene for the birth of personal wireless communications.
1935	Edwin Howard Armstrong invents frequency modulation, or FM, allowing for high-quality, two-way mobile radio communications. This was used extensively for the first time on the battlefield in World War II.
1940	Motorola developed the first walkie-talkie during the war.
1947	On 15 August an experimental telephone service from moving trains to any other telephone is tested, and an experimental mobile telephone service opened along the Boston-Washington highway a month later. But a mere 12 simultaneous callers could be “on the air” in a city like New York. AT&T scatters low-power transmitters throughout a metropolitan area, using them to “hand off” calls from transmitter to transmitter as customers moved around in their vehicles. This “cellular” technique represents the official birth of the personal wireless technology industry, although it takes another 20 years to develop the technology to manage “handing off” and to get regulatory approval.
1973	Motorola unveils the DynaTAC mobile phone, the first relatively small, personal radio telephone.
1992	The first GSM (global system for mobile communication) network operator goes live in Finland.
1993	First digital mobile network in the United States of America (USA) established. By the end of the year, there are 13 GSM networks on air in seven countries. Since then, more than 400 GSM networks have been established across the globe, all subject to an agreement which defines the GSM standard and makes international roaming, and therefore true international personal connectivity, possible.
1994	South Africa embraces GSM, when Vodacom and MTN are awarded the first cellular licenses in Africa. An expected total subscriber market of 100 000 is reached within 12 months, and today around 13 million South Africans, more than a quarter of the population, use cellular phones.

Source: Goldstuck, 2003:18-19

The walkie-talkie led to the development of radio phones and later cell-phones. World Wide Worx (Goldstuck, 2003) reported in 2003 that a quarter of the South African population use cell-phones. Today that figure has more than doubled, depending on which statistics you read and whether you consider subscriber churn

or not. Since 1994 the growth of cell-phone subscribers has been astonishing. Cell-phones and cellular networks are here to stay. For an infrastructure-poor continent such as Africa, cellular networks offer a good option for governments to get in touch with their citizens. The next section will discuss these wireless networks.

4.3 Network connectivity

Cellular and wireless connectivity are different in the sense that cellular networks are largely voice-centric, while wireless networks are data-centric. In the context of m-Government this is very important. Mobile phone penetration is very high worldwide, but cellular networks give priority to voice services, which means that the speed of accessing data is almost never guaranteed. The explanations below are based on readings in Gartner Research (2008), Wikipedia (2008a to 2008p), Kirsten (2006), Goldstuck (2005), and the websites of the network service providers in South Africa (Cell C, MTN, Neotel, Telkom and Vodacom). Specifics and technical details are omitted, as the intention is to provide background information only.

4.3.1 Cellular technologies

If you have a new cell-phone today, the chances are that you will have high-speed downlink packet access (HSDPA) or at least 3G capability. HSDPA is also known as 3.5G. The “G” refers to the generation of technology. Cellular technology was first seen in South Africa in 1993 and is based on the global system for mobile communication (GSM) (Kirsten, 2006:16). The first generation (1G) was analogue-based and allowed only voice transmission. Although there are other transmission standards used in the world, South Africa has standardised on GSM. The second generation (2G) had a greater bandwidth and allowed for some transmission of data, but it was still very slow compared to fixed-line speeds.

Developing 3G took longer than anticipated and the enhanced 2G was unofficially called 2.5G, which had improved data-transfer speeds and capacity, and made

use of four new standards. The high-speed circuit-switched data (HSCD) technology was able to transmit data up to four times faster, but because it used up to four radio channels simultaneously, it created capacity problems and few operators made use of the technology. General packet radio service (GPRS) and enhanced GPRS (GPRS+) broke data and voice into small packets before sending them over the network, improving connection significantly. GPRS can be used for WAP, SMS, MMS and internet services such as e-mail and web access. Enhanced data rates for GSM evolution (EDGE) were unofficially labelled 2.75G and offered sustainable speeds up to twenty-five times faster than 2G.

The third generation (3G) took advantage of all the new technology in the form of infrastructure and handsets, and operated at a much higher and more reliable speed. This is also a drawback of 3G, as service providers needed to invest huge amounts in completely new infrastructure and users had to upgrade to 3G-enabled phones. Live video and television broadcasts, and CD-quality music, however, could finally be transmitted over the cell-phone reliably. HSDPA is a communications protocol associated with 3G to support faster downloading of data and, as mentioned, is often termed 3.5G. The fourth generation (4G) is not yet mature and Gartner Research (2008) indicates that it could take five to ten years before it is accepted as mainstream. 4G will dramatically improve access speeds of all mobile users, as well as the way in which voice and data are handled on the networks.

Cellular technologies have a huge influence on the way people work and live today. The advances are happening at an extremely rapid pace and governments would be hard-pressed to try to keep up. For this reason most experts suggest that governments adopt proven technologies. The same argument applies to wireless technologies, which is the topic of the next section.

4.3.2 Wireless technologies

Wireless communication is about connecting two or more devices in a network that could either be personal, localised or cover a wider area. Experts typically refer to wireless personal area networks (WPANs), wireless local area networks (WLANs),

wireless metropolitan area networks (WMANs) and wireless wide area networks (WWANs).

WPANs make use of Bluetooth and Infrared for connecting devices such as laptops, cell-phones, printers and scanners. New technology associated with personal area networks (PANs) is ultra-wide band (UWB) which offers higher access speeds and less radio interference.

WLANs and WMANs are also known as short-range wireless networks and they use Wi-Fi to connect computers.

Long-range networks or wireless WANs connect over greater distances and here Wi-MAX (worldwide interoperability for microwave access) and Mobile-Fi are the two technologies used most often.

4.3.3 Service providers

The infrastructure for the WANs and MANs are implemented and maintained by service providers. The service providers can be separated into network service providers and cellular service providers.

Network service providers

These are also known as telecommunication providers or carriers. Until recently Telkom assumed this role in South Africa and was responsible for establishing the telecommunication infrastructure. Neotel has recently entered the market and, with the new competition, there are many expectations of cheaper, more versatile and better service delivery. Both Telkom and Neotel are also making use of mobile and wireless technologies to deliver their services (Telkom, 2008; Neotel, 2008).

Cellular service providers

A great foundation has been laid by the cellular service providers in South Africa. Vodacom and MTN have been in business since the early 1990s, while Cell C and Virgin Mobile are recent additions to the market. The number of cell-phone users in South Africa has surpassed these companies' greatest expectations.

The networks are accessed through mobile and wireless devices, which is the topic of the next section.

4.4 Mobile and wireless devices

Mobile and wireless devices range from mobile phones and computers to devices used for entertainment like the Apple iPod. They have become an integral part of everyday life. This section will look at mobile phones, mobile computers and other mobile devices. This section does not intend to be an exhaustive exploration of the topic, but is rather an introduction to some of the more common devices in use today.

4.4.1 Mobile phones

The most common mobile device in use worldwide is arguably the mobile phone. The uptake of mobile phones has been remarkable and still amazes many people. The cost of the technology has reduced to such an extent that almost everyone can afford to have a mobile phone.

The various packages that cell-phone subscribers offer often include a free phone. Depending on the contract and monthly subscription, a very “smart” phone can be acquired. Some of the latest models offer seamless integration between e-mail, SMS, internet and diaries. Cell-phones can be grouped into three categories, namely basic, enhanced and smart (Kirsten, 2006:43).

Basic phones

Basic phones are mainly voice-centric with the ability to send and receive short text messages via the SMS function. Basic phones have evolved over time and today even the entry-level phone has functions such as an alarm, calculator, calendar, games, stopwatch and basic scheduler. Four of the main cell-phone distributors in South Africa and the world are Motorola, Nokia, Samsung and Sony Ericson (Wikipedia, 2008k). They account for almost 80% of cell-phone sales worldwide. Nokia, the world's largest manufacturer of mobile phones, has close to

a 40% share in the global market. Samsung and Motorola each have a 14% share, while Sony Ericsson holds a 9% share of mobile phone sales.

Figure 10: Basic phones

(Motorola C350, Nokia 1100, Samsung C100, Sony Ericson J110i)
Source: Vodacom, 2008c

Enhanced phones

Enhanced phones have additional functions such as e-mail, the ability to connect to other devices via Bluetooth or infrared, as well as the internet. These phones can also use MMS, play music and videos, take photos and record voice.

Figure 11: Enhanced Phones

(Motorola V600, Nokia 6234, Samsung D820, Sony Ericson S700)
Source: Vodacom, 2008c

Convergence of technology has lead to devices being combined and an example is the ability of an enhanced phone to function as a GPS. Additional applications can be downloaded from the internet and installed on the phone. These applications range from games to loading the entire Bible.

Smartphones

Smartphones are phones that have an operating system (OS) loaded that allows it to function as a mini-computer. These operating systems allow the device to run various software applications including basic word processing, spreadsheets and presentations.

Smartphones with a built-in universal serial bus (USB) and other ports allow the connection of a regular keyboard or mouse. Other features include touch-screen technology, handwriting recognition and voice-activated commands.

Figure 12: Smartphones

(Motorola E398, Nokia 7610, Samsung i780, Sony Ericson P990i)
Source: Vodacom, 2008c

4.4.2 Mobile computers

Mobile computing has also developed in leaps and bounds since the 1990s. Since IBM's Model 5100 in the 1970s, which weighed more than 27 kg, to the lightweight ultra-mobile PC (UMPC) weighing less than 1 kg, the usability and processing has increased in leaps and bounds (Goldstuck, 2005:34). Initially the cost of a mobile computer was much higher than a regular one, but this too has changed and today

standard mobile computers cost only a little more than their desktop counterparts. Notebooks outsell desktop computers in the USA and have around 25% market share of the computer sales in South Africa (Goldstuck, 2005:36).

There is a wide variety of mobile computers of which laptops and notebooks, or tablet PCs, are the most common. The palmtop was born in the early 1990s with the Palm Pilot (Goldstuck, 2005:45). These led to the portable digital assistant (PDA).

PDAs have been the ultimate gizmo for techno-savvy individuals. Typically they have an appointment calendar, a to-do list, an address book for contacts, and a text editor. In the past PDAs and smartphones were distinguishable from one another, but this has changed. The first convergence between PDAs and mobile phones also started in the 1990s with IBM's Simon in 1993 and Nokia's Communicator in 1996 (Goldstuck, 2005:46). Thanks to the convergence of technologies, PDAs and smartphones have merged, and devices marketed as PDAs today could just as easily be marketed as smartphones.

Figure 13: Portable Digital Assistants / Smartphones

HTC TyTn, Motorola R-Z8, Nokia E95-8M, Samsung i600V, Sony Ericson W910i
Source: Vodacom, 2008c

The UMPCs are smaller than laptops or notebooks and usually used for a specific purpose. They have enough processing power to support a wide variety of applications including communication and networking applications and the ability to browse the internet.

The latest UMPC by Nova Mobility Systems (2008) has a 1.1 gigahertz (GHz) processor, up to 2 gigabyte (GB) memory and 120 GB hard drive, battery life of up

to 10 hours, and weighs less than 1 kg. GPS comes standard, as well as with Wi-Fi, Bluetooth, GSM cellular and 3G connectivity.

Figure 14: Nova ultra-mobile PC

Source: Nova Mobility Systems, 2008

Future developments

Below are some of the laptops that will be available in the near future. Designers say they will have built in Wi-Fi capabilities, Bluetooth, touch-screen technology, handwriting and voice recognition, CD/DVD combo drive and global positioning systems (Tu Vie, 2008).

Figure 15: Laptops of the future

Source: Tu Vie, 2008

4.4.3 Other mobile devices

There are many other mobile and wireless devices ranging from handheld music players, digital cameras, security cameras, DVD, web pad (only screen – no keyboard) and converged devices (Goldstuck, 2005:15). These devices are used in a wide range of applications.

In addition, mobile devices are becoming smaller and more powerful. The portable projector below is 3M's MPro110 projector (Carlton, 2008). It can display an image at a resolution of 640 x 480 up to a size of more than one metre.

Figure 16: Portable projector

Source: Carlton, 2008

Five years ago Intel developed the Centrino processor chip with a built-in Wi-Fi card that supports WLAN security standards (Goldstuck, 2003:39). Today the Intel Centrino 2 chip has been developed to cope with the additional processing power required to cope with the requirements of applications today (Intel, 2008), especially mobile gaming. The Centrino 2 chip has been combined with a UMPC and used as an addition to the computer used in the Volkswagen Passat (Intel, 2008) to aid with navigation, video and audio. This device could be used in police or emergency vehicles to assist personnel with their duties in many ways, from providing suspect or patient records to details of a task, maps, photos and plans. This technology is very new and many further applications will be realised in time.

The Apple iPhone (Vodacom, 2008d) is a three-in-one device that combines a phone, an iPod, and an internet device with email and internet access. There are already experiments with the use of such devices for education in future.

Figure 17: Apple iPhone 3G

Source: Vodacom, 2008d

Digital video broadcast via handheld (DVB-H) is a mobile broadcast technology that allows for the broadcast of live television to a mobile phone. South Africa is one of a few countries in the world conducting a trial. DSTV initiated a trial in 2005 that covers suburbs in Gauteng and Cape Town. The Samsung P910, which is both 3G and DVB-H enabled, is being used for the tests. Industry analysts predict that by 2010 up to 150 million people worldwide will be regular users of mobile broadcast services. The trial currently offers eleven channels including sport, news, cartoons, music and lifestyle to identify subscribers in test areas.

Figure 18: Samsung P910

Source: DSTV-Mobile, 2008

4.5 Applications and software

Mobile devices all have software loaded in one way or another. Software can be separated into two groups: operating systems and application software.

4.5.1 Operating systems

Operating systems (OS) are the instructions that drive mobile devices behind the scenes (Goldstuck, 2005:48). There are various operating systems in use today including Palm OS, Windows Mobile and Symbian. There is even a local flavour in the Linux adapted OS for mobile devices called Ubuntu Mobile (Intel, 2008). As devices evolve, operating systems need to keep up to cater for faster processing speeds, greater memory capacity, compatibility with peripheral devices and communication protocols. The most commonly used OS on mobile devices today is Symbian (Goldstuck, 2005:52). The number of applications written for the Symbian OS outnumbers that of the other operating systems, but Windows Mobile is not far behind.

4.5.2 Application software

Application software is software that performs a particular function. On mobile devices this could be programs to listen to music, view and manage photo albums, or do basic word processing. Most of these applications do not come standard with a phone and need to be downloaded from the internet at a small charge (Goldstuck, 2005:53). When choosing a smartphone, the chances are that any application that the user requires has been developed by one or other company.

A few examples of applications that are available for download include:

- Quickoffice, which is compatible with Microsoft Office;
- HanDBase – a database program similar to Microsoft Access;
- Pocket DVD to watch movies;
- Pocket Tunes or UltraMP3 to listen to music;
- Smartphone Notes to synchronise the phone diary with the PC's; and
- Various Dictionary.

(Goldstuck, 2005:54)

A very useful application that has emerged in South Africa is MXiT. MXiT uses instant messaging (IM) technology that allows a user to communicate with other MXiT users. The MXiT application allows for messages of up to 1000 characters to be sent for less than two cents (MXiT, 2008). MXiT can also be downloaded to run on a normal PC, which makes it possible to communicate very cheaply with one or more people simultaneously. This application has many possible uses for governments. An example could be a type of call centre for IM, where citizens can enquire about any government service and receive immediate responses.

4.6 Standards for mobile technology

Goldstuck (2003:32) indicates that there are hardly any universal standards that are acceptable on an international government level, but that this should not stand in the way of deploying the technology. He does provide a list of the central issues regarding standards of current MWTs. South Africa has adopted the GSM standard for mobile phones. GSM is suitable for both current and future mobile technologies as well as “always on” technologies such as GPRS.

There are two leading standards for radio in South Africa, Tetrapol and Tetra, which were adopted by the European Telecommunications Standardisation Institute (ETSI) and are known as professional mobile radio (PMR) systems. Tetrapol has been used in large-scale networks since 1988 and is the preferred technology in use by the South African Police Services and South African Defence Force. The Cape Metro also makes use of Tetrapol. Tetrapol and Tetra are digital, cellular trunked radio systems. Tetrawatch (2008) reports that the major differences between PMR and public mobile radio systems like GSM are “faster call set-up, group calls, priority calls, encryption, and ability to make direct calls without connection via a base station”.

Mobile computer standards mainly refer to the hardware microchips. Intel and AMD are the largest manufacturers of processing chips for personal computers. Operating systems are still dominated by Microsoft (MS), but the free open-source software (FOSS), Linux, is becoming more popular. Goldstuck (2003:32) indicates that these are not global standards, though.

The wireless networks in South Africa are driven by the international standards body, the Institute of Electrical and Electronics Engineers (IEEE). The IEEE is an international non-profit organisation that promotes the advancement of technology related to the theory and practice of electrical, electronic, communications and computer engineering (Wikipedia, 2008a), and has developed more than 900 active industry standards. The most widely used of these standards include Wi-Fi, or wireless LAN, Bluetooth and Wi-MAX.

Table 10: IEEE standards for wireless networks

IEEE Standard	Description
IEEE 802.7	Standards for broadband LAN cabling
IEEE 802.9	Standards for integrated services, like voice and data
IEEE 802.11	Wireless networking – "Wi-Fi"
IEEE 802.11a	Wi-Fi 5 GHz 54 Mbps
IEEE 802.11b	Wi-Fi 2.4 GHz 11 Mbps
IEEE 802.11g	Wi-Fi 2.4 and 5 GHz 54 Mbps
IEEE 802.15.1	Bluetooth
IEEE 802.15.4	Wireless sensor/control networks – "ZigBee"
IEEE 802.16	Wireless networking – "Wi-MAX"
IEEE 802.16e	Mobile Wi-MAX

Source: Wikipedia, 2008a

Wi-Fi allows computers to connect to a local network without cables, typically within a 30-metre radius indoors or 95-metre radius outdoors. These networks are referred to as wireless local area networks or WLANs. Bluetooth is used mainly in a PAN and usually within a metre or two. It facilitates the connection between Bluetooth-enabled devices such as computers, cell-phones, printers and scanners. Wi-MAX networks communicate over a larger area than Wi-Fi and can be either point-to-point or mobile cellular links (Wikipedia, 2008d). Delivering data by satellite has no standard, as companies that use this develop systems to match their goals. Although there is no standard yet, Goldstuck (2003:33) suggests that it should not be a barrier to deployment, especially in rural areas, where it is the most appropriate solution. Cellular technology in South Africa subscribes to the GSM standards, while wireless networking conforms mainly to Wi-Fi and Bluetooth. The only area of concern is standards for PDAs, which have as yet not been agreed on.

4.7 Summary

Mobile and wireless technology changes very rapidly. As mentioned previously, this report does not intend to provide an exhaustive list. The chapter provided a rudimentary explanation of network connectivity and how communication with mobile devices takes place. Examples and explanations of mobile and wireless devices and the applications and software that drive these mobile devices were also discussed.

It is clear from the examples provided that there are many possibilities and uses for mobile technology in the public service as well. There are already many examples of these, as mentioned in Chapter Two. As technology advances, it is likely to become cheaper and more affordable to larger numbers of people. Mobile devices have become part of everyday life and many people have adopted this "new way of life".

This study looks at how this technology has been adopted particularly within the PGWC. Chapter Two has already provided a number of examples of how MWT is being used in South Africa, but the way in which it is being used in the Province was studied using a specific tool and method based on a study done by Kirsten in 2006. The next chapter will look at how the data for this study were gathered.

CHAPTER 5: DATA-GATHERING AND ANALYSIS

5.1 Introduction

Brynard and Hanekom (as cited in Heginbotham, 2006) say that “research encompasses the interpretation of data in order to reach a conclusion”. For the conclusion to be valid, it is important to collect data that are reliable, objective and appropriate. This chapter discusses the sampling design and methods, data conceptualisation, as well as data collection and analysis. However, firstly the key variables of this study and the unit of analysis are considered.

5.2 Key variables

As has been mentioned in Chapter One, m-Readiness is the dependent variable that depends on m-Government, which is the independent variable. The readiness level of the organisation will provide an indication of the organisation’s current use and ability to utilise mobile technology. The unit to be analysed is the PGWC, which will be explained in the next section.

5.3 The unit of analysis

The Provincial Government Western Cape is considered to be a “trendsetter” regarding e-Government in South Africa (Haricharan, 2003). The Cape Online programme has been at the forefront of e-Government developments in South Africa for the last couple of years. As one of the leaders in e-Government, the PGWC is also embarking on various mobile and wireless projects (De Freitas, 2008; Diener, 2008; Gamiet, 2008; Grammar, 2008; Frick, 2008; Van Breda, 2008).

The PGWC consists of twelve departments. These are the departments of Agriculture, Community Safety, Culture and Sport, Economic Development and Tourism, Education, Environmental Affairs and Development Planning, Local Government and Housing, Health, Provincial Treasury, Social Development, Transport and Public Works, and the Premier’s department.

The ICT needs of all these departments are overseen by the Centre for e-Innovation (CEI), a branch within the Department of the Premier (PGWC, 2004:2). The CEI's vision is for "the Provincial Government of the Western Cape to become a leading e-Government to better serve our people in the new, knowledge-based economy" (PGWC, 2004:3). The CEI is one of the only remaining provincial ICT units. In most provinces this function is overseen by the State Information Technology Agency (SITA).

The CEI's main functions (PGWC, 2004:6) are **leadership and governance** in providing strategic direction to provincial top management (PTM) and the Cabinet regarding e-Government, **development and support** of e-Government and ICT development and planning services, and to **supply and support** ICT operational management services to departments. All matters relating to ICT must be approved by each department's departmental information technology committee (DITCOM). Services managers represent the CEI on each of these committees. DITCOMs refer decisions up to the central information technology committee (CITCOM), where CEI managers and subject experts are the key decision makers.

The CEI is divided into work streams to address all provincial ICT matters. The CEI consists of two chief directorates and seven directorates. Operational ICT issues are addressed by the seven directorates.

Cape Gateway is concerned with the development and updating of the PGWC internet portal, www.capegateway.gov.za, management of the outsourced PGWC call centre and the walk-in contact centre at 142 Long street, Cape Town, as well as the Cape Access project.

Education, Culture and Sport (ECAS) oversees, among many other things, the schools connectivity project, Khanya, and all ICT service delivery to the employees of the two departments concerned. Khanya is highlighted as this is an area where wireless connectivity is currently utilised.

Economic Governance and Administration looks after the ICT service delivery to most departments including Agriculture, Economic Development and Tourism, Local Government and Housing, and Transport and Public Works.

Health and Social Development caters for the ICT needs of the two departments including the huge and very important Health Information System (HIS).

Information and Communication Technology Infrastructure (ICTI) has a transversal responsibility to all departments with regard to connectivity and procurement of related ICT hardware, software and services.

Planning and Development (P&D) focuses on business analysis, business intelligence, and enterprise architecture. They also assist in the compilation of ICT plans for each department.

Policy and Strategy (P&S) looks at the strategic direction for ICT in the Province and manages the related policies.

In addition, the head of the CEI or Office of the Chief Information Officer (OCIO), hosts the Project Office which oversees all the ICT projects in CEI. The researcher is part of the Project Office team within the CEI. This meant that he was able to verify and validate data more easily through personal contact and access to internal records.

To measure the state of m-Readiness for the PGWC, it is therefore necessary to look almost exclusively at the CEI for meaningful and up-to-date information. As the official representative for ICT in the PGWC, they have knowledge of all ICT-related projects in the Province and they also maintain relations with other provincial stakeholders such as SITA, the City of Cape Town as well as other local authorities in the Province, and national departments.

The CEI has a staff complement of more than 250 people, but it was not feasible or necessary to contact all staff members. The sample used to compile part of the primary data consisted of managers and experts from all the components within the CEI. How this sample was selected is the topic of the next section.

5.4 Sampling design and sampling methods

Interviews and surveys were conducted in the CEI, which is the official driver of ICT services and solutions for the PGWC. Each of the seven directorates within the CEI were consulted to get an idea of the overall state of m-Government within the PGWC. The sampling design, as described by Burger (2008:7), was a non-experimental longitudinal design. As each business area within the CEI was approached to provide data relevant to that cluster, it means that probability cluster sampling was used. The stratified sample was drawn from heterogeneous groups, which in this case refers to the seven directorates of the CEI.

Before the method of data collection is looked at, the data will be conceptualised to provide a theoretical understanding of the kind of data used.

5.5 Conceptualisation of data

The data collected for this study were used to evaluate the current m-Readiness of the PGWC. A combination of numeric and textual data was used. The data in this study are largely empirical and represent a balance between new and existing data that consist of a combination of textual and numeric data, and required a medium level of control. Having a clear understanding of the data that needed to be collected allowed the researcher to decide on what methods would be employed to collect the data.

5.6 Data-collection methods

Empirical data were collected through semi-structured interviews, a survey, published case studies, statistics and reports. The literature review covers a range of international and local articles from various sources, including texts, documents and websites. The data can be divided into secondary and primary data.

5.6.1 Secondary data

Statistics

International, national and provincial statistics were gathered from available data sets on various research databases, including EBSCO Host, Gartner Research, Science Direct, as well as the websites of service providers of mobile technologies. These providers include the South African companies Cell C, MTN, Vodacom and Virgin Mobile. The statistics relate to various aspects of mobile technology, including the number of people with access to the technology and cell-phone penetration.

Statistics regarding international and national figures were obtained from reports by the United Nations (2008) and the Department of Statistics (StatsSA, 2008) respectively. Annual reports from relevant organisations also provided vital data for analysis. Figures pertaining to the remote access services (RAS) and mobile device accounts for the Province were gained from personal contact with the relevant parties.

Literature review

The literature review focuses partly on the work done by Kirsten (2006), Goldstuck (2003), and Goldstuck (2005) as their work was relevant to mobile technology in South Africa. Kirsten's (2006) readiness survey, together with some of Goldstuck's (2003:23) questions to ascertain m-Readiness, were used to compile a readiness tool for this study. Chapter Three explains how the model for this paper was compiled based primarily on the work by these two authors. The work by Goldstuck on mobile and wireless technologies is highly regarded in South Africa and internationally. As the head of the World Wide Worx research organisation, he has been involved in research for major financial institutions, government departments and international businesses (Goldstuck, 2005:219). Kirsten's (2006) thesis looked at the readiness of large companies in South Africa to adopt mobile technology. His thesis did not consider the role or readiness level of government in this regard, but he did establish a foundation for this study to be conducted.

In addition, reports, journals, articles, published case studies and periodicals from other sources were also consulted as the current knowledge base in book-form on m-Government is limited.

There are many books on e-Government, most of which make mention of mobile or wireless technology. A collection of these texts was also reviewed.

The literature review provides an understanding of the scope of m-Government and explores international best practice in this regard. The understanding of m-Government and its context guided the collection of primary data to establish the level of m-Readiness of the PGWC.

5.6.2 Primary data

Survey

The development of a generic m-Readiness tool posed a particular challenge. At the outset it was apparent that the time constraint would not allow for detailed study in this regard. The literature review uncovered a study that was done locally to determine the state of readiness with regard to mobile business adoption (Kirsten, 2006). Kirsten's study provides the model against which the readiness of the PGWC was tested. The survey was used to capture mobile technology-related data in the PGWC. Surveys were e-mailed or personally delivered to the selected sample. A copy of this survey is attached as *Annexure E: Survey questionnaire* on page 183. As was noted in Chapter Three, this model has some limitations, but the compilation of a more comprehensive m-Readiness tool could be the subject of another study.

Statistics on remote access services were sourced from personal contact and the data were provided by the network technologist in charge of the project. The data were collated, totalled and averaged to produce figures that could be interpreted meaningfully. Cell-phone and data-card statistics for the Province were sourced and interpreted in the same way.

Interviews

The 7-step process interview as explained by Burger (2008:16) was used to conduct semi-structured interviews with experts within the PGWC. Interviews were started by "termalising" or clarifying the reason for the interview and explaining the concepts. The second step was explaining to the interviewee the process through which the results would be attained. Conducting and recording the actual interview

on a digital recorder was step three, while step four involved transcribing the interview after it was concluded. The data analysis and verification made up steps five and six respectively. As the researcher is an employee of the CEI, validating and verifying the data was a relatively simple process. The final step in the 7-step process is the reporting, which can be seen in Chapter Six as part of the research results.

The semi-structured questionnaire was based on the comprehensive literature review and it was piloted within the Project Office of CEI to ensure that all questions were concise and clearly understandable, and that there was no ambiguity. Negative items and loaded terms were avoided to ensure that responses could be as objective as possible. Question seven required of respondents to plot their rating for CEI's level of m-Readiness on a Likert scale. Questions were ordered in a specific sequence to ensure a logical flow to the interview. The questionnaire is attached as *Annexure B: Interview questions* on page 178. Respondents were all from the CEI and are listed in *Annexure A: Primary data sources* on page 176. Removing personal bias is almost impossible and respondents were carefully selected to avoid this. The respondents are all at senior or middle management level and are directly involved in operational issues within the CEI. This ensured, firstly, that they were competent and willing to answer the questions, and secondly, that they were objective candidates, an assessment which was based on personal contact with them in the past. The surveys and transcripts of the interviews, once collected, needed to be verified and analysed.

5.7 Data analysis and verification

The data gathered through the calculation of the remote access services, the interviews and the toolkits were analysed and compared. A combination of qualitative and quantitative methods of evaluation, as suggested by Mouton (2006:159), was utilised. To ensure the data were reliable, objective and appropriate, senior managers and senior staff within the PGWC were approached. Cross-referencing the results of the interviews and survey proved that there was a common understanding and perception of MWTs.

Statistics

Statistics received for the remote access services were not meaningful until they were summarised, aggregated and interpreted. Calculating the average number of hours that each user spends connected to work from outside the office, and costing this on an averaged saving per user, made it possible to analyse the data in a more meaningful way. The saving per user was determined by averaging the hourly rate for users between the upper and lower salary scales of the majority of users with remote access.

Surveys

The survey data were captured in an Excel spreadsheet and graphs were created based on the same interpretation that Kirsten (2006) applied to his data.

Interviews

Interviews were transcribed and tabulated in Excel to look for trends and commonalities. These were then highlighted in the feedback in Chapter Six and compared to the outcomes that Kirsten achieved. Verifying the data was made possible through access to strategic documents and project records and documentation. Many of the responses revealed correlations, which gave the impression that there was a common understanding and interpretation of the organisational goals and objectives among the interviewees.

5.8 Summary

Although the study done by Kirsten (2006) provided the basis for this study, the focus in this instance was the public sector and in particular the PGWC. Determining the m-Readiness and adoption of MWT by the PGWC using Kirsten's tool was done by collecting both primary and secondary data. Using an existing tool meant that not much of it could be changed in order to ensure that results would be comparable. Chapter Six provides the results of this study and compares them to the results that Kirsten (2006) achieved in his study.

CHAPTER 6: RESEARCH FINDINGS

6.1 Introduction

Bill Gates is quoted as saying, “The first rule of any technology used in a business is that automation applied to an efficient operation will magnify the efficiency. The second is that automation applied to an inefficient operation will magnify the inefficiency” (BrainyMedia, 2008). It is important that m-Government is used to enhance services that are currently working. Mobile technologies have the potential to improve service delivery, but they could also be an obstacle.

The research study has produced findings that provide cause for rejoicing, but also suggest a hint of caution. Although there are many successes, there is much that can be done to improve the level of m-Government readiness. This chapter looks critically at the findings by looking at recommendations on the table at present, current m-Government resources and activities, and the results of the survey and interviews.

6.2 Recommendations already on the table

Analyse the situation

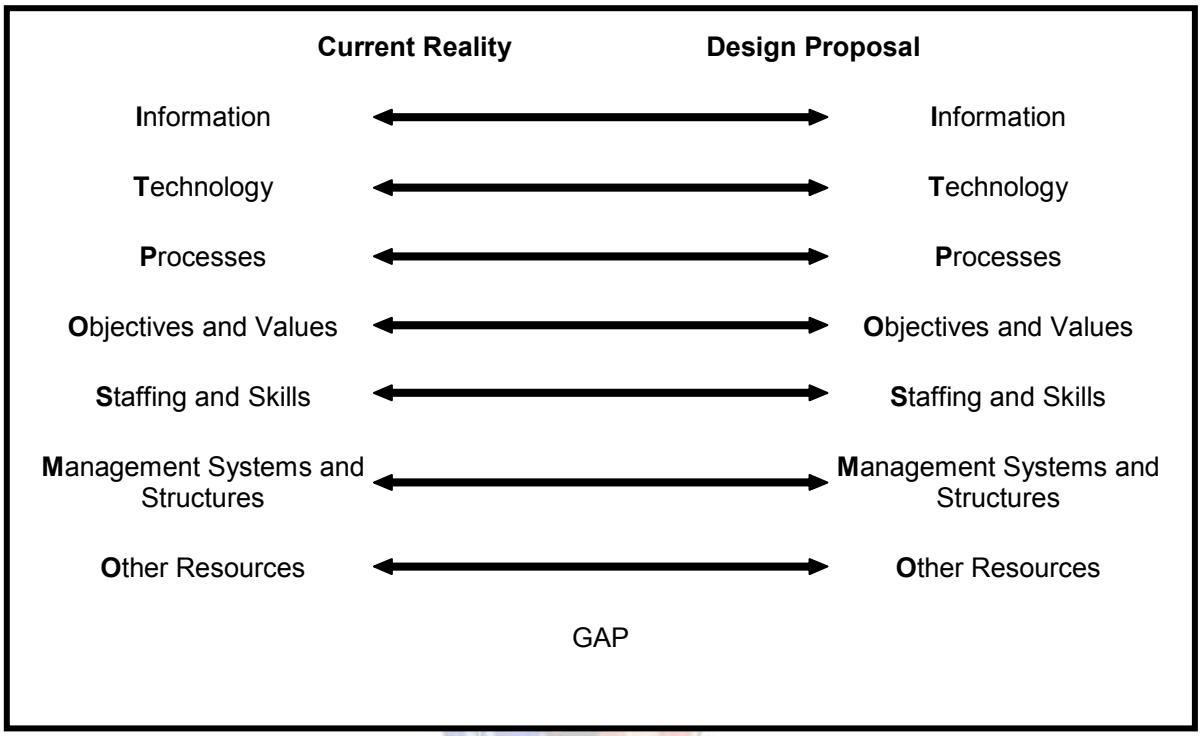
Information and communication technology systems should be designed to close the gap between reality and a need (Heeks, 2002:105). For these designs to succeed, the gap between the reality and the need should not be too wide. Unfortunately, these gaps are often vast in developing countries. Many barriers and shortcomings exist that are often difficult to overcome. The barriers were discussed in *Limitations and challenges of m-Government* on page 54.

This gap should be rated high, medium or low against the seven ITPOSMO dimensions (Heeks, 2002:106; Heeks, 2006:158). ITPOSMO represents the seven layers of an e-Government system, namely **I**nformation, **T**echnology, **P**rocesses, **O**bjectives and values, **S**taffing and skills, **M**anagement systems and structures, and **O**ther resources. If staffing and skills, which refer to the number of resources and their competence level, are currently inadequate to address the implementation of m-Government, then a rating of high, medium or low should be

assigned, depending on the difference between the current and the desired situation.

The ratings should be plotted on a scale such as the one in the figure below to provide an indication of disparity between design and reality and, therefore, an indication to the possibility of success or failure for the project.

Figure 19: Design–reality gaps in e-Government projects



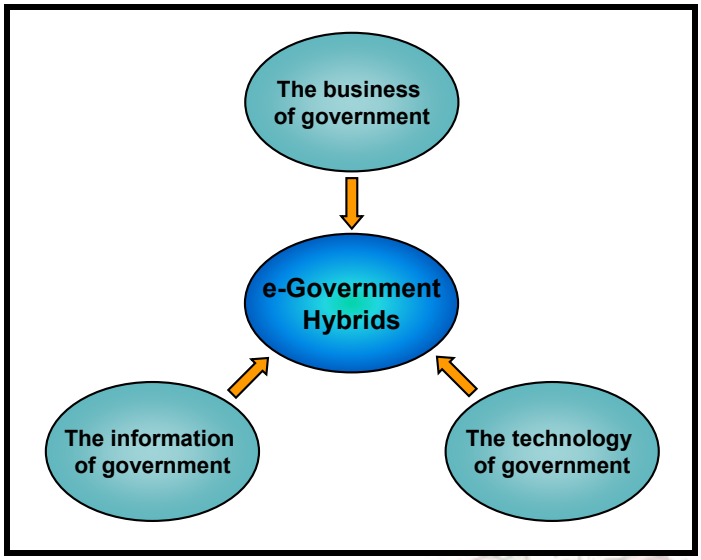
Source: Heeks, 2002:107

Heeks (2002:110) suggests that e-Government projects in Africa should legitimise and map the current reality and then look at modularity and incrementalism. This means that governments should not try and resolve all the issues at once. They should start with pilot projects that could be replicated in modular format to other areas. In this way the amount of risk is reduced and lessons learned along the way can be implemented further down the line. The best people to lead these projects are possibly “hybrid” managers who have an understanding of the business and information of government, but also the technology of government (Heeks, 2002:110; Heeks, 2006:94). Although Heek’s article refers to e-Government, the exact same principles can be applied to m-Government.

The analysis of the situation is being done through the PCCN Project (De Freitas, 2008; Provincial Government Western Cape (PGWC), 2008a) to get a holistic view

of the Province's connectivity. Individual teams address the various aspects of connectivity and the particular needs of business units in the Province.

Figure 20: Hybrids of e-Government projects



Source: Heeks, 2002:111

Learn from examples

It is not necessary to reinvent the wheel every time new technology is embraced. If the technology has been used and proven in the same or similar arenas, it is usually more cost effective to piggyback on the lessons learned from these "predecessors" (Goldstuck, 2003:23). Efforts are underway in the PCCN project (De Freitas, 2008; PGWC, 2008a) to learn from other examples. The Gauteng local government connectivity model, for example, is being considered to address local needs.

Address attitudes through education

Goldstuck (2003:28) states that the biggest obstacle preventing the use of mobile technologies in the public service is the attitudes of decision-makers. Goldstuck's (2003) study indicated that capacity and capability are not regarded as barriers to implementation of mobile technologies in government department, and that one of the most important aspects of employing new technology is for users and managers to be made fully aware of what can and what cannot be achieved by it. Information on the possibilities of mobile technologies therefore needs to be shared more readily to ensure that users and managers become more aware of the possibilities of using MWT to address service delivery challenges. The study

revealed that this also holds true for the PGWC. At present there is no specific initiative to address this.

Reform legislative obstacles

Five years ago the legal framework prohibited the commercial use of hotspots and ICASA needed to draft policies on the interpretation and exemptions of the law, if advances in m-Government were to be made (Goldstuck, 2003:36). Since then ICASA has been very busy drafting new policies and regulations. Regulation 918 of 2008 is one of the most recent amendments to the Electronic Communications Act, 2005 (Act No. 36 of 2005) and provides guidelines regarding exemption of licensing for electronic communications networks and services, including WLANs (Independent Communication Authority of South Africa (ICASA), 2008b).

SITA states that wireless LAN (WLAN) is a mature technology with practical advantages that should be looked into for use in the public sector. This will add cost-effective value to many services and employees. The biggest advantage is increased productivity for mobile users that require access to information and applications all the time, within their office or out (Goldstuck, 2003:53).

Taking services to the people

Various successes have been achieved by the Centre for e-Innovation (CEI) over the last two years in relation to MWTs. The Cape Gateway portal, which is accessible via cell-phones with internet capability, won an award for being one of the top eight best e-Government information portals in the world in 2007. This portal is not only accessible from the fourteen MPCCs, libraries and red doors across the Province, but the CEI is also in the process of establishing a mobile internet unit (Tshabalala, 2008), which will be deployable in any area of the Province. The unit will consist of eight computers mounted in an enclosed trailer that can be pulled on most rural roads.

The Department of Agriculture connected various remote sites and offices by means of wireless broadband connectivity. By 2008 five offices were linked wirelessly and 30 virtual wireless offices were installed. Connectivity costs were reduced considerably and farmers who had radio towers installed on their farms were granted free access to the internet. During this time a wireless network and computer centre for the JJ Rhode Farm School, which is on the Department of

Agriculture's land near Stellenbosch, was also completed (PGWC, 2007c:7; PGWC, 2008b:8; Diener, 2008).

Mobile workers

More than 600 employees within the PGWC make use of 3G/Edge technology to enable them to connect to the PGWC networks (PGWC, 2008b:8). Corporate e-mail users within the PGWC totalled in excess of twelve thousand and generates more than 600 thousand e-mails daily (PGWC, 2008b:8). Many of these e-mails were sent or received on MWTs.

6.3 m-Government activities

m-Government activities within the PGWC are about the resources that are assigned to it and the projects that address the challenges of finding mobile solutions to service delivery challenges and opportunities.

6.3.1 m-Government resources

The CEI and the PGWC have limited resources to address all ICT challenges within the Western Cape. Nevertheless, progress is being made with regard to e-Government and also m-Government. Besides funds, manpower and skills are a major challenge. Of the 340 posts there are 113 vacancies, of which only 63 are funded (PGWC, 2008l). This means that 15% of posts are unfunded and 18% of funded posts are vacant. In essence this means that 75% of the CEI establishment needs to deliver all PGWC ICT requirements. There is currently a drive to fill the vacant funded posts within the 2008/2009 financial year.

6.3.2 Projects related to m-Government

Projects within the PGWC relating to m-Government range from policy-related interventions to the provision of wireless connectivity of emergency vehicles (PGWC, 2008k).

CEI projects

Mobile solutions have been part of the CEI e-Government strategy since 2004 (PGWC, 2004). Various projects have been initiated to address aspects of m-Government. The broadband wireless solution for the provincial Department of Agriculture (Diener, 2008; PGWC, 2008k) provides fast access to provincial systems and data as well as internet access to regional offices and to certain farmers who house radio towers.

The Cape Access project (Tshabalala, 2008) is currently out on tender for the deployment of a mobile unit, containing eight computers, which will be used to take government services to rural communities. The Cape Access project has also established many MPCCs, where MWT are used in some instances to connect to the internet and provincial intranet.

The PCCN project was launched in 2008 to oversee all connectivity issues within the PGWC (De Freitas, 2008). It has a dedicated task team that focuses solely on mobile solutions. The PCCN forum was established to ensure that the main stakeholders responsible for service delivery within the Western Cape coordinate efforts and address challenges and opportunities in a collective manner.

Government services mobile application

The ISSA developed and launched an m-Government application in 2006 that provides contact information on basic services offered by provincial and local government through cell-phones or the internet (ISSA, 2008b). These services range from police, clinics, hospitals, schools, pension payouts, libraries, traffic and post offices to the local fire department (see Figure 21). The application is text based, works on old and new cell-phones, and is network independent. Requests cost about 1 cent each. ISSA hosts the service and it can be downloaded onto cell-phones from the website http://www.issa.org.za/GovServ.jad.

Applications like these could assist locals and tourists with the most basic of information. Combining this with location-based or GPS technology will enable authorities to make contextual and relevant information available to citizens when needed. Public transport schedules are but one example of how this can be used to make life simpler for citizens.

Figure 21: Government services information

Source: ISSA, 2008b

In South Africa and specifically in the Government, the biggest consideration is the state of the current backend systems. Backend systems need to be compatible with new technologies to ensure that solutions are more cost effective. Installing new technologies on ineffective backend systems could make matters worse. Goldstuck suggests that the solution is first to sort out the backend and align its processes with front-end technologies, and then compile a meaningful business case for new front-end technologies.

6.4 Research results

The research results are based on the survey using Kirsten's (2006) tool as well as on the semi-structured interviews among senior managers and technical staff within CEI. To complement the survey and questionnaire, statistics on the current number of mobile workers who perform official duties have also been included.

6.4.1 Mobile workers

The PGWC invests more than R2.5 million annually to provide cell-phones and data cards to employees to enable them to be in contact at all hours and to provide the ability to access the intranet and internet while on the move or away from the office (Strydom, 2008). Policies and organisational infrastructure exist to manage the allocation of these business tools. The majority of cell-phones and

data cards are provided to senior managers and field staff who require the functionality. Just over 200 and 150 respectively have been allocated to staff.

The vast majority of employees have their own cell-phones. Many of these employees also use their own phones for business purposes. This means that the Province is not only able to contact these staff at all times, but there is no cost related to supplying the technology. The cost and risk are mainly carried by the staff. In addition, many employees have their own computers at home or take issued laptops home with them. Many of these officials need to access the intranet and internet as well to work on provincial systems. These users make use of RAS.

The table below provides a breakdown of the RAS for the periods July 2007 to June 2008. Noticeably, the averages for data cards and dial-up differ significantly. This can be attributed to the fact that dial-up is currently more reliable and users only use data cards where access is good. Another reason is that a few of the users have both connectivity options and then opt for more reliable dial-up when connecting to the internet.

If one considers an average salary for users of around R155 per hour,[2] this constitutes an annual saving for the PGWC in excess of R2.7 million on 17,858 hours or 2,232 eight-hour days worked at home. This means that staff worked an additional nine years and four months.[3] The assumption is that these hours were outside official working hours and that staff were not paid overtime for them.

Table 11: July 2007 – June 2008 Remote Access Services

Total minutes	**1,071,537.41**
Total Hours: Minutes	**17,858:57**
Average Hours per user per month: Minutes ALL	**3:21**
Average Hours per user per month: Minutes Data Cards (G)	**0:42**
Average Hours per user per month: Minutes Analogue Dial-Up (H)	**4:05**
Data Cards (G)	**137**
Analogue Dial-up (H)	**307**
Total RAS	**444**

Source: Derived from data card statistics, PGWC, 2008j

[2] The hourly rate was calculated using the average hourly rate from salary level 8 to level 13 on 2007 salary scales.
[3] Calculated by dividing 17,858 hours by 8 to get the number of working days, and then dividing by 237 for the number of years. There were 237 working days from 07-2007 to 06-2008.

6.4.2 Interview results

Interviews were held with managers within the CEI to provide an overall view of m-Government within the PGWC. A list of the interviewees can be found in *Table 12: List of interviewees* on page 176. The questions that were put to interviewees are listed below with a summary of each question's responses. In some instances, the interviewees were asked follow-up questions and these answers have also been incorporated under the original questions.

Question 1a: How does your organisation define m-Government?

Interviewees define m-Government as part of e-Government and state that an internal policy for e-Government is in the process of being finalised. This policy contains a section devoted to the use of mobile technology.

Question 1b: Do you see m-Government as a separate issue to e-Government? Why?

The general opinion is that m-Government is part of e-Government as MWTs are also electronic devices and should therefore fall within the ambit of e-Government. All agreed that both m-Government and e-Government are a means of accessing information and services online. The feeling that m-Government is mostly about incorporating the ability to deliver certain services to citizens' cell-phones was also expressed. All agreed that the success of m-Government is dependent on e-Government successes on all levels.

Question 2: Do you have any m-Government related policies? Explain.

The PGWC does not have any policies that specifically relate to m-Government. A new policy is being finalised on e-Government that contains a section on mobile and/or wireless technologies. The PGWC currently sees m-Government as an integral part of e-Government and hence it is contained within e-Government strategies and policies.

Question 3: What examples of m-Government has your organisation successfully deployed?

The interviewees were able to list a wide range of examples, which included the enabling of mobile workers by issuing mobile 3G and EDGE cards and laptops. As mentioned earlier, these workers were mostly managers and this ensured that they were able to keep in touch with their colleagues from almost anywhere. This

same technology is sometimes used by employees who need to access the personnel or accounting systems hosted in Pretoria. Accessing these systems using mobile technology is mostly faster than through the LAN.

Hotspots have been created in certain venues where meetings are held to allow mobile workers with laptops to remain connected to the LAN wirelessly. Circuit managers in the Department of Education have had laptops with mobile cards for five years, enabling them to access education data from any site or school that they visit. A national initiative to provide all teachers with laptops that have access to the internet is likely to be realised in the near future. The intention is to provide the teachers with an internet connection as well. This has the potential to change the way teachers educate and will afford them opportunities of networking and access to information sources previously out of reach.

The Government Garage has installed vehicle tracking devices in their fleet. This affords them the ability to keep track of vehicles remotely using the GPS technology, thereby improving the management of the fleet and ensuring that vehicles remain on designated routes. The Department of Education has used similar technology to track assets. In addition to control over assets, the pilot project has led to the recovery of stolen equipment as well.

The Department of Agriculture (DoA) has established broadband connectivity to their regional offices by using radio technology. They also investigated and piloted the provision of training to developing farmers by means of a mobile unit. The unit had a live connection to the internet and the DoA network via satellite.

The Cape Access project makes use of MWT at their MPCCs to bring connectivity to rural areas where fixed lines do not exist. Cape Access will also have a mobile unit soon that will provide access to government services and an opportunity for educating rural communities. The mobile unit will also be used at jamborees and *izimbizo* to provide information to citizens in their “backyards”.

Question 4: What benefits are there for Government and/or the public regarding m-Government?

Respondents were quick to provide the benefits of mobile workers as well as employers. Having access to computers systems, real-time data and information

from virtually anywhere at any time is the most significant benefit to the PGWC employees.

The public benefits are also important as, without any benefit, no one would make use of them. The greatest attraction of using MWT for citizens is convenience and cost saving. m-Services are available from anywhere where cell-phone reception is possible: 95% of South Africa. Having information available when and where necessary can save citizens much time. Examples quoted included citizens and tourists looking for amenities or needing the latest bus schedules delivered to their phone.

Cell-phone penetration means that almost every household has at least one cell-phone. Government can theoretically get in contact with the vast majority of citizens in the event of an emergency. Most citizens can use a cell-phone, but the ability to operate a computer is less common. The youth and future employees of the country are very cell-phone and technology savvy. Ensuring that services are available in media that they understand and prefer will contribute towards client satisfaction.

The radio links that the DoA uses have reduced the cost of connectivity to their regional offices significantly, as there are no costs except maintenance once the technology has been deployed. In addition, the farmers who provide sites for the radio towers are provided free access to the internet in these win-win partnerships.

Mobile technology can also contribute to a safer environment by being employed in a crime-fighting role by security personnel and citizens alike. Timely information could literally make the difference between life and death. This also applies to medical, environmental or social emergencies. If a paramedic has access to a patient's medical records, better decisions can be made regarding the most correct treatment. In the event of a social or environmental emergency, government can send blanket warnings or information to citizens.

A follow-up question to interviewees was whether seeking mobile solutions was worth the effort. There was total affirmation of this, on condition that politicians and citizens were made aware of the potential benefits to all parties.

Question 5: What contribution has it made to public service delivery?

The greatest contribution was the ability to remain in touch with key personnel. This means that decision-makers could be reached even when they were abroad. Laptops and remote connectivity meant that employees could remain productive away from the office and after hours as well.

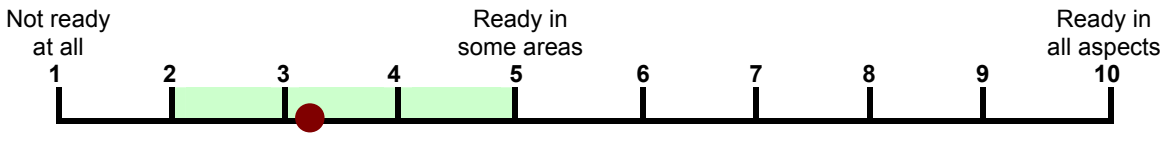
The Department of Agriculture's regional offices and remote users experienced improved reliability and faster responses than using the fixed line connectivity.

Question 6: Do you measure the benefit? How?

Actual benefits are not monitored, but key performance indicators are set for all objectives. The outputs and outcomes of projects to address the objectives are compared to the key performance indicators to provide a measure for the success. Interviewees could not provide any specific reason why benefits are not being measured, but did add that the Monitoring and Evaluation unit of the Department of the Premier should share this responsibility.

Question 7: On a scale of 1-10, how do you rate your organisation in terms of its e-Readiness and m-Readiness? On what terms do you base this measurement?

The scores in terms of ranking m-Readiness ranged from 2 to 5. This varied depending on the unit and there was a correlation in terms of the ranking and the actual adoption of mobile technology. The more examples of MWTs within a unit, the higher the rating. The average of the scores was 3.25. The rankings were all subjective and based on personal opinions. The low ranking means that in most cases the interviewees were realistic with regard to their own perceptions and either honest or leaning towards pessimism.



Interviewees felt that there was a high level of awareness, but that adoption had a long way to go. They stated various reasons for this, ranging from lack of resources (including policies, skills, and infrastructure) to absence of political will and inadequate governance. Although the WAN's infrastructure is comprehensive,

the technology to incorporate communication from mobile devices needed attention.

MWTs have not been one of the ICT priorities in the Province, but steps are being taken to address this in light of the fact that more people are enquiring about the possibilities of their uses and applications.

Some of the prerequisites mentioned for mobile adoption to succeed include:

- Establishing a development cycle (with regard to research, needs analysis, infrastructure evaluation, enterprise architecture, deployment, measurement / evaluation);
- Establishing standards for mobile and/or wireless technology in the PGWC; and
- Gaining political will and buy-in and maintaining it.

Question 8: What challenges are encountered or associated with m-Government?

The challenge for m-Government and e-Government go hand-in-hand. The "ebb and flow" of enthusiasm at all levels are indicative of the stop-start experience. Interviewees agreed that developing the necessary "**WILL**", especially among politicians and top management, is the greatest challenge. The common perception is that provincial top management and politicians do not understand or see the benefits and added value of using ICT and MWT. Getting political buy-in is very difficult, as politicians are often influenced by what is happening at a national level. The e-Natis debacle led to ICT losing a lot of credibility. Some indicated that top management were out of touch with citizens and their needs. Finally, the CEI needs the will to persevere in changing the mindsets of those opposed to, or unaware of, the benefits of innovation.

Policies need to be fast-tracked to ensure that a favourable environment is established for m-Government to take place. The language policy for the PGWC sets the challenge to deliver all the services equitably and therefore in all three official languages. Websites should also be available in Afrikaans, English and Xhosa.

Interviewees also indicated that guidelines regarding security and indemnity are not substantial enough. Policies regarding the content available to the public also need to be updated. Dependence on national e-Government initiatives often forces the Province to adopt a wait-and-see approach. Where the PGWC was a leader in e-Innovation a couple of years ago, there is a perception that it is lagging behind in some instances. Procurement policies and guidelines often mean that procedures are too protracted and prevent the PGWC from taking advantage of discounted offers.

As mentioned earlier, the limited **resources** are also a point of concern, but this links to "will" – both political and administrative. Funding is less of a problem than human resources and skills. Nevertheless, investing in mobile services is expensive and benefits are not always accrued immediately. The human resource issue is currently being addressed and interviewees believe this will help to alleviate certain issues. Organisational knowledge management needs to be improved. Beyond infrastructure, few skills and processes are being shared between units. It is said that the organisation's team function in a matrix, but little evidence and few examples of this exist.

The **infrastructure** needs much attention and the PCCN project is addressing these shortcomings, but it does mean that mobile solutions are not high on the list of priorities. Although there are many large broadband solutions, as soon as a service enters the internal network, the service works at the speed of the local network.

The WANs and LANs are in the process of being investigated to seek solutions to improve their speed. Talks have also been initiated with the City of Cape Town regarding connectivity.

Security over Wi-Fi and other mobile networks is a concern and solutions need to go through an authentication process before access can be granted to internal networks.

The structure of the **organisation** is geared towards addressing business needs stipulated in the annual performance plan of the Department of the Premier in a compartmentalised or silo manner instead of through a coordinated central plan.

This leads to transversal systems being developed independently from each user. Redundancy and duplication result that often complicate projects down the road, where coordination is required.

There are too many national departments overseeing e-Government. The DPSA, CPSI, GCIS, DST, Department of Education, SITA and the presidential national commission on Information Society and Development all have a role to play in delivering aspects of e-Government. Interviewees indicate that sometimes these role players are involved in “turf wars”, either to take credit or abdicate responsibility. Consequently various high-level projects at a national level draw all the attention, which means that provincial initiatives have little support at national level.

Other challenges mentioned include the social gaps between the “haves” and the “have-nots”, the closed environment enforcing the use of SITA and their designated service providers. e-Government has not evolved to the level of transaction yet. Hopefully the use of MWT can assist in this transition. Some argue that there are too few provincial services that could provide services through online transactions.

Question 9: How does your organisation overcome these challenges or limitations?

Possible solutions to some of the challenges have been addressed above, but further responses from interviewees include comments on policies, organisational structure, mindset, technology and cost.

A strategy to overcome current challenges regarding **policies** is in the process of being approved. This includes an updated e-Government strategy as well as various related policies to complement the strategy. Policies should be more citizen-centric and business focused.

Organisationally, a mobile technology task team has been established as part of the PCCN to address the associated challenges. This team is taking a holistic approach to solving mobile and wireless issues transversally by consulting with all the relevant role players and stakeholders in the Province and nationally to ensure that essential needs are addressed as a priority.

Interviewees consider the changing of senior staff's **mindsets** as one of the more challenging barriers to the adoption of mobile technology. They agree that a cultural and mind shift is required for the organisation as a whole. What exactly the interviewees meant by this was not articulated. The assumption is that there are "pockets" of negativity within and outside the CEI that have an influence on how the CEI functions operationally. Mindsets can be changed by creating awareness of, and focusing on, small successes. When benefits are realised and made public, buy-in will improve and minds will be changed. To achieve this, the primary focus should be on areas and projects where people, especially citizens, can benefit the most. For example, focusing on managers and field staff that require access to office information and systems while "on the road" would benefit state employees and the citizens being serviced by them. A feeling exists that the adverse effect of the perceived negative "forces" is not being addressed adequately at present.

It is a challenge to get **technology** to work in a way that business requires. Technology also changes rapidly and, if organisations do not keep up to date, the gap between what an organisation uses and what is available commercially can quickly widen. Nevertheless, the technology challenge is not insurmountable.

Although MWTs are costly, interviewees agreed that this was not a major stumbling block. If the advantages and benefits are clearly explained and linked to provincial strategic goals, funding would more than likely be made available or sourced through alternate avenues such as donations or public-private partnerships.

One interviewee summed up the way to address the challenges by highlighting four key aspects:

- Availability – of technology and skills to deliver information and systems that are required;
- Accuracy – information that the PGWC and CEI carries and shares needs to be accurate, relevant, current and timely;
- Access – services should be equitably accessible by everyone; and
- Agility – of systems need to be such that systems are adaptable to organisational climate change within cost and time constraints.

Question 10: What does the future hold for m-Government and how else can it be employed?

Responses to this question can be divided into three categories:

- Near – possibilities that are realistic and could happen in the near future;
- Medium – suggestions that are further down the road and would require considerably more effort to achieve success; and
- Wishful – absolute "nice-to-haves" and could not be considered as options for the present or mid-term.

There is no doubt in the minds of the interviewees that MWTs need to be incorporated into addressing ICT enabled service delivery. There is a perception that the corporate world is losing control of the periphery. The periphery "forces" organisations to come to the table with regard to offering services over any mobile device. If organisations do not respond, there is a possibility of losing clients to companies where these services are offered. Government cannot afford to be left behind. As citizens become more mobile-savvy, their expectations with regard to delivery of services expands to their mobile devices. As technology evolves and becomes cheaper, especially with regard to connectivity, more could be done with the available funds.

Interviewees also agree that the CEI should start by focusing on what their clients need. The "near" m-Government initiatives include mobile kiosks or MWT for rural areas that can take the internet and e-Services to communities that do not have access to it yet. The Cape Access project is already addressing this aspect of citizen needs.

Partnerships with local government and private enterprise should be sought actively. This will lead to the sharing of resources and information to address the major function of government at all levels: service delivery. There are many initiatives throughout the country, but a coordinated effort is required to enable replication of successes and avoidance or adaptation of problematic ideas. One requirement for this to happen is that national Government needs to create an environment where innovation and coordination can take place. A possible idea to address this could be the establishment of a centre of excellence, which could probably be hosted at and by SITA.

In the medium term the use of SMS could have a positive impact on business. Advertising government initiatives such as *izimbizo* and jamborees through bulk SMSs to a targeted geographic area or demographic sample could relay messages quickly and effectively in the citizen's mother tongue. Citizens could register for an SMS-type service, where the Province could notify them by means of SMSs about any specific event or intervention, for example, a reminder that the citizen's motor vehicle license needs to be renewed or that the crayfish season has started.

The use of IM can be used as an additional avenue of communicating with the citizen. The Cape Gateway project makes use of walk-in centres, a call centre, an e-mail service and the internet. Adding IM to this array of choices will make it much cheaper for the public to communicate with government. Examples of how the MXiT application can be used in this regard have already been given. Some managers and employees already make use of MXiT as an alternative and cheap means of communicating, especially when group decisions are needed in decentralised teams. The youth use MXiT more than SMS. The possibility of employing IM in education should be considered as a highly viable option.

As technology advances and becomes cheaper, greater numbers of citizens will have access to internet-enabled mobile devices and "demand" more services through their mobile devices. The people interviewed felt that it was important to invest now for the near future.

The "nice-to-haves" or future wishes included the development of the current website in a .Mobi-type format. Cape Gateway needs to leapfrog the current design and include enhancements for the small screen as well. A major challenge in this regard is the lack of skills and resources. In the future video streaming via the cell-phone could permit remote site inspections or even live broadcasts of *izimbiso*. When this technology becomes viable, the applications in the fields of education, health and security are numerous.

Part of e-Government maturity is the progression to a level where transactions are possible. The mobile device could also be used in this regard. Instead of standing in a queue to pay motor vehicle license renewals, an SMS could be sent to a registered number containing only the vehicle's registration number. The call

would cost the amount of the license renewal. This service is already being used in the field of entertainment and can be seen on television daily. The ability to pay for licensing, fines and taxes via cell-phone would be considered very convenient and most citizens would probably be prepared to pay for the SMS as well.

The m-Readiness questions as compiled by Goldstuck (2003:23) and included in this study as Table 6 can also be answered through the interviews. Question one referred to the readiness of the technology and the environment. There is some technology that is ready for the environment and some MWT is already being used. The environment is not ready in all aspects. There are legislative, technical and other barriers as mentioned above in question eight of the interview. Questions two and three both relate to the IT strategy. The PGWC e-Government strategy has a section that focuses on mobile and wireless technology, which means that MWT is addressed in the strategy and that provision has been made for the inclusion of MWT to address ICT solutions. regarding question four, the PGWC does have widespread use of mobile devices.

Question five asked whether the technology to enable the business requirement was mature. Government avoids employing technology that is not yet mature. In some instances small pilot projects allow for the testing of technology, which is then only employed on a wider scale if it is proven to work.

The question regarding standards of the backend system to allow for extension into mobile and wireless technology also holds true in the PGWC. Standards are set at national and provincial levels, and the business agreement and service level agreements with SITA further spell out standards of the backend system.

The simple answer to question seven is “no”. Backend databases cannot be accessed from any computing or data device, and information cannot be presented in a simplified format on a small screen. This is one area where much still needs to be done.

Question eight asked whether the technology in mind would enable a business requirement. Every proposed ICT solution has to address a business requirement and it is the task of the ICT committees to ensure that technology is not acquired for the sake of advancing in technological terms only. Every department must have

an ICT plan or master systems plan that is aligned to their strategic plans. The ICT plan provides clear indications of how business needs will be addressed through the use of technology.

Goldstuck (2003:23) asks whether the time it takes to implement the technology will be an obstacle to successful implementation use of the technology. The answer to this question depends on the technology that will be employed. In some cases the time it takes to implement could be an obstacle as technology advances so quickly, especially MWTs. The size of the organisation and the geographical spread of offices also add to the challenge of implementing solutions timeously.

The final question Goldstuck (2003:23) proposes regards justification of costs. All projects within the CEI have to submit business cases and a cost-benefit analysis is usually included. This means that the cost will always need to be justified and linked to strategic objectives.

To conclude this section and progress to the results of the survey, a quick comment on mobile workers is necessary. Mobile workers are gaining much attention and the ability for workers to work from anywhere at anytime is an attractive option for organisations. Access to internet and business systems from home or elsewhere makes it possible for the office space to be reduced. A mobile workforce does bring other dynamics to the fore such as the health of workers who are in touch 24/7 and the responsibility that comes with the “freedom”.

6.4.3 Survey results

The survey results were compiled in the same way that Kirsten (2006) compiled his survey results. The survey’s questions were mostly closed and respondents needed to make a choice from a list of options.

The first three questions related to the demographics of the respondents. Questions four and five provided respondents with the opportunity to select technology that had already been deployed within the organisation by marking check boxes. There was also an opportunity to list any technology not listed through an “other” option.

A matrix indicating the technology vertically and the level of staff horizontally in question six required respondents to mark all applicable options. Questions seven and eight wanted to ascertain, respectively, which mobile devices and applications had been incorporated in the organisation and what kind of related training was utilised. Once again check boxes were used to indicate the appropriate options. The last three questions were once again in matrix form and respondents needed to rate established technology in terms of its importance, indicate the level of sophistication of users in terms of mobile technology, and rate the level of importance of emerging technologies. The survey has been attached as *Annexure E: Survey questionnaire* on page 183.

The following sections are a summary of the findings and graphs in the same format as those that Kirsten (2006) created for his survey results.

6.4.3.1 Demographics (Questions 1 to 3)

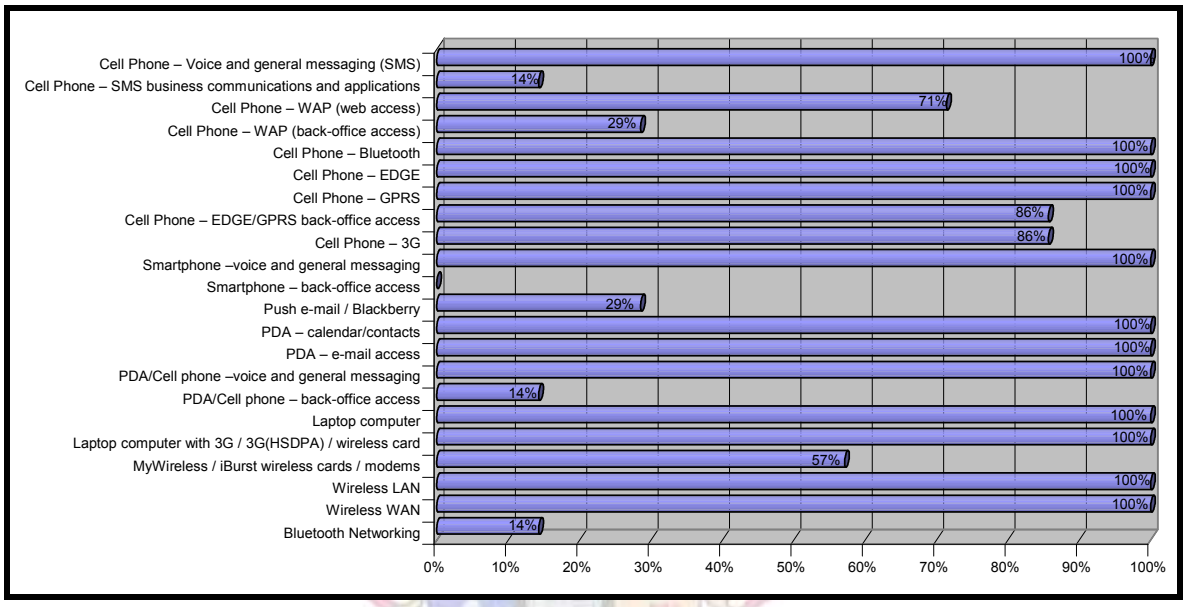
This study did not evaluate units individually, but rather the CEI as a whole and as the official ICT unit of the PGWC. Respondents were limited to managers and senior technical staff within the seven units within the CEI. Surveys were sent to ten staff members within the CEI, of which seven responded. The seven staff members who did respond provided a clear overall picture of the state of mobile technology within CEI. The staff complement within CEI exceeds 250, with an annual budget of more than R100 million, excluding cost of staff, to deliver the required ICT services for the PGWC.

6.4.3.2 Existing technology adoption (Questions 4 and 5)

The adoption of existing technology compares favourably with the results that Kirsten (2006:135) achieved. As in his results, there has been wide uptake of cell-phones to conduct business in the PGWC. The technologies least adopted according to the survey were “smartphone – back-office access”, “cell-phone – SMS business communications and applications”, “cell-phone – WAP (back-office access)”, “PDA/cell-phone – back-office access” and “Bluetooth networking”. Surprisingly, only 14% indicated that SMS was used for business communication. This is more than likely due to the fact that all CEI employees and most of their clients in the PGWC are on a central switchboard.

PDAs, laptop computers and wireless LANs and WANs have also been adopted throughout. It should be noted that respondents referred to their personal exposure to technology within the organisation. This means that, although some technology scored high, this should not be seen as the overall level of adoption, but rather that adoption of the technology exists within the organisation. For example, in reality there are few examples of wireless LANs and WANs (De Freitas, 2008; Gamiet, 2008; Frick, 2008).

Figure 22: Deployment of existing technology



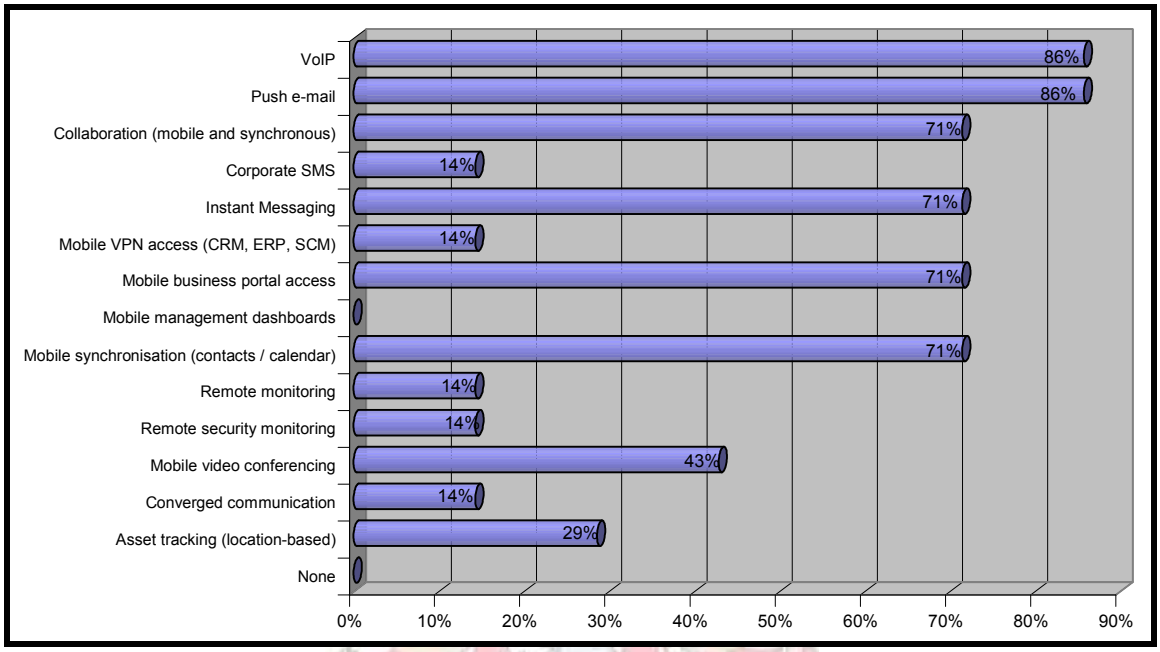
The adoption of mobile technology in business processes is illustrated in *Figure 23: Mobile adoption in business processes*. Unlike Kirsten's (2006:138) results, where mobile virtual privacy network (VPN) scored the highest, within the PGWC VoIP and push e-mail had the highest responses. Only two respondents indicated mobile VPN access. Corporate SMS is not used as widely as in the business world. This is possibly partly due to cost and consequently there is a higher level of instant messaging, probably because of the use of the MXiT mobile application.

Remote monitoring did not score very high and is not used extensively in the PGWC. The Government Garage tracking its vehicles and the pilot project in the Department of Education to monitor assets through GPS tools are possibly two of the few examples of remote monitoring (De Freitas, 2008; Gamiet, 2008).

Once again the indication that the technology has been adopted should be seen as a presence of the technology and not an overall integration of it into business.

Even though three respondents indicated that mobile video conferencing has been adopted in business processes, it is in an experimental phase and only used on a very small scale (De Freitas, 2008; Gamiet, 2008; Frick, 2008)

Figure 23: Mobile adoption in business processes



6.4.4 Mobile technology in the organisation (Questions 6 and 7)

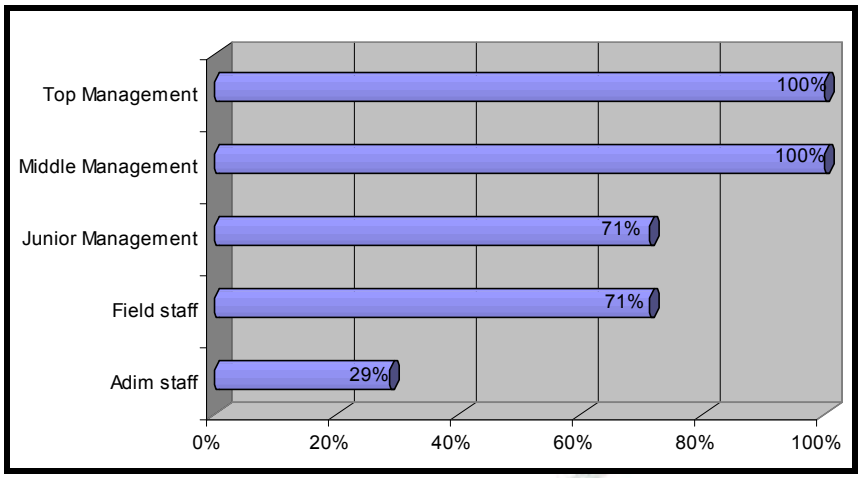
The same elements that Kirsten (2006:139) used to measure organisational adoption of technology were used in this survey as well. The various ways of using cell-phones and laptops were surveyed. The same graph format that Kirsten used for his results is used below for the findings of this study.

As in Kirsten's results, top management are also the greatest users of mobile technology. Contrary to Kirsten's (2006:139) proposal that this represents a "skewed" distribution of mobile technology, it is rather an indication that the need for this technology is being addressed at the right level. Top and middle management as well as field staff are the role players who need to be in constant contact. Junior management and administrative staff are based at headquarters and have access to other means to stay in touch with management and field staff.

Although the deployment of cell-phones is very widespread throughout the organisation as indicated in *Figure 24: Deployment of cell-phones (basic)* below,

most employees have their own personal cell-phone and mainly managers and identified field staff have work-issued phones.

Figure 24: Deployment of cell-phones (basic)



Cell-phones with GPRS/EDGE technology (*Figure 25: Deployment of cell-phones (GPRS/EDGE)*) are slightly less prevalent, but the two years since Kirsten's study have seen rapid advances in technology and most cell-phones on the market now have GPRS/EDGE capability. As with normal cell-phones, only identified staff with a business need have work-issued GPRS/EDGE-ready phones. Privately owned phones were not taken into consideration for this study, but as mentioned previously, the great majority of staff have private cell-phones.

Figure 25: Deployment of cell-phones (GPRS/EDGE)

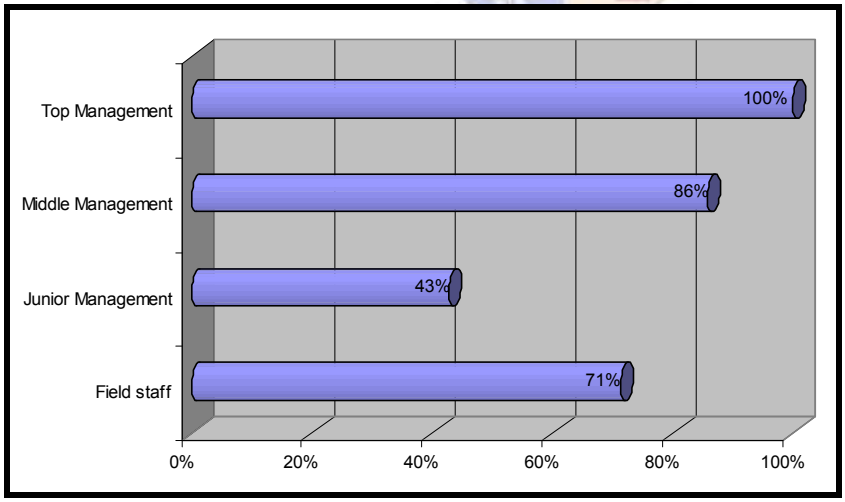


Figure 26 and Figure 27 below respectively refer to cell-phones and smartphones with 3G capability. As with GPRS\EDGE, the advances in technology mean that most phones on the market today are capable of utilising 3G. These advances

have also meant that the differences between cell-phones and smartphones have reduced significantly.

Packages offered by cellular service providers entice people to acquire the most powerful phone they can afford. Smartphone packages are still more expensive and the PGWC cell-phone policy specified which phones may be obtained. This is possibly the main reason why there is so little adoption of smartphones within the PGWC.

Figure 26: Deployment of cell-phones (3G)

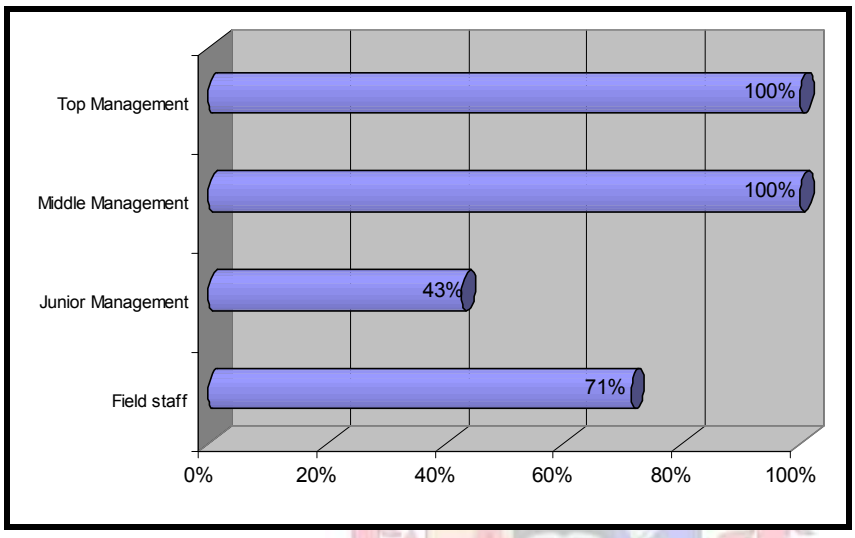
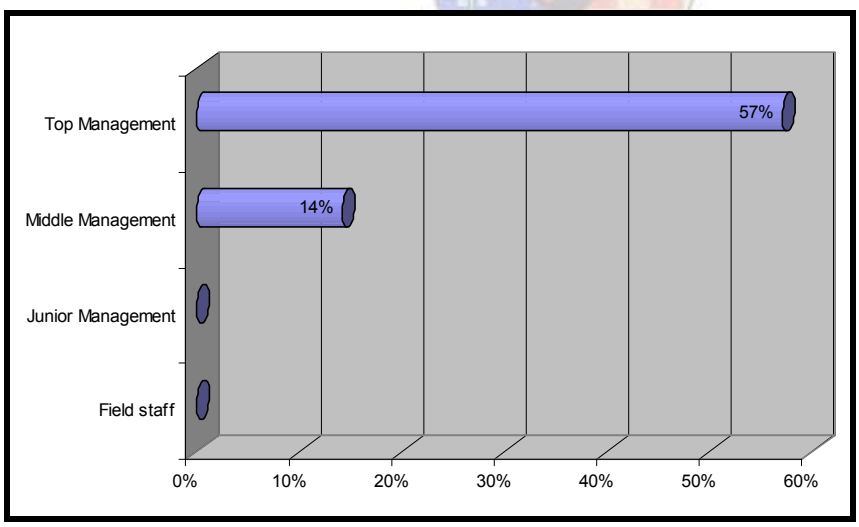


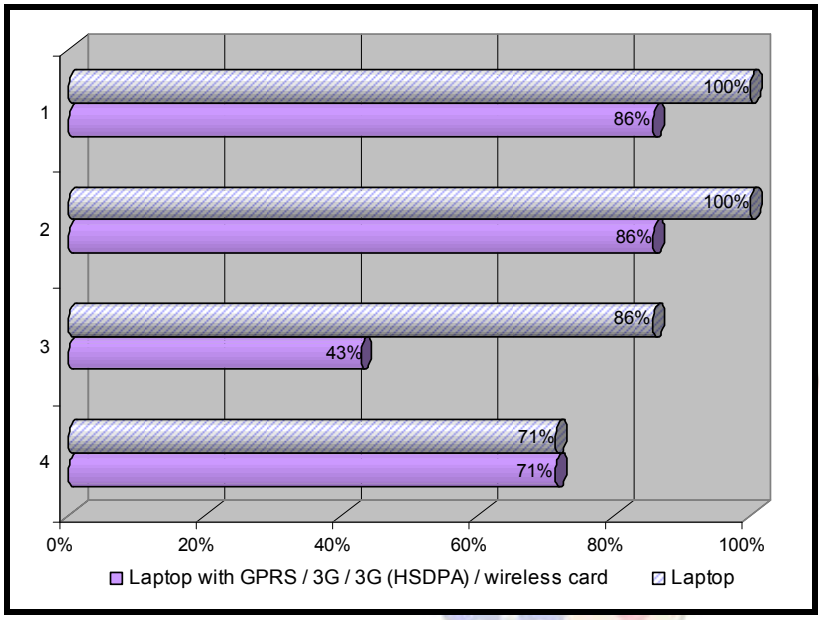
Figure 27: Deployment of smartphones (3G)



The PGWC cell-phone policy does not permit the acquisition of PDAs for work-related contracts. PDAs and cell-phone enabled PDAs were therefore not included in this study.

As Figure 28 below indicates, mobile computers are widely used in the PGWC. Most of these mobile computers come standard with Wi-Fi and Bluetooth. As technology is renewed and new computers are bought, these numbers are bound to increase. Laptop computers have become more affordable, even though their power and functionality have increased significantly. As a result, more users are opting for mobile computers when a new computer is due. Although the benefit of being more mobile is added, the additional risk of losing the equipment – and consequently the information – to theft or other causes should be considered.

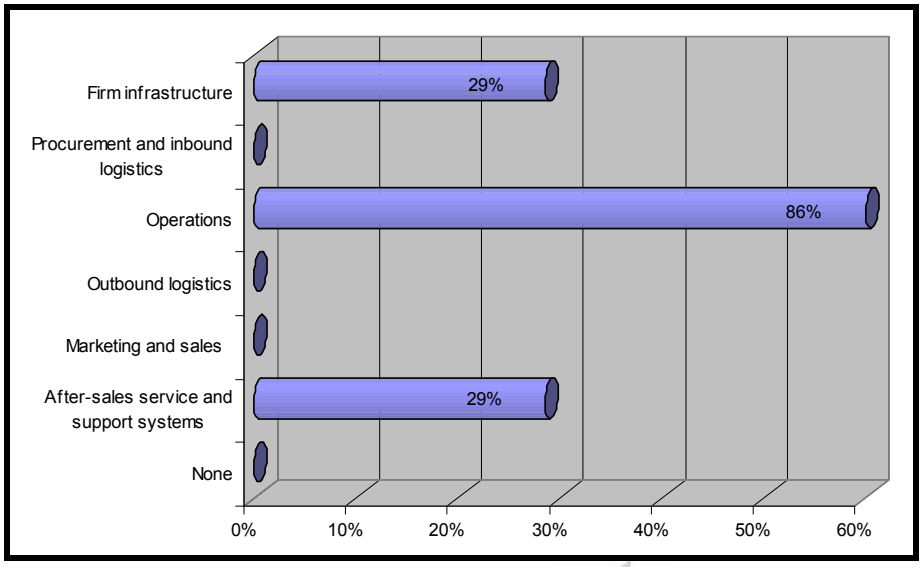
Figure 28: Laptops and mobile-enabled laptops



Mobile computers are provided as a business requirement and not as a perk to a position. Before any mobile device is acquired, a motivation needs to be submitted to a committee (DITCOM) that has to approve the investment.

Kirsten's (2006:143) study found that the value chain activity where mobile technology has been adopted the most is operations. This is no different in the PGWC. Surprisingly, two respondents initially indicated that mobile technology was not used at all in their environment, but on following up on their responses, it was found that they had misunderstood the question. Consequently they also indicated that mobile technology had been adopted in operations.

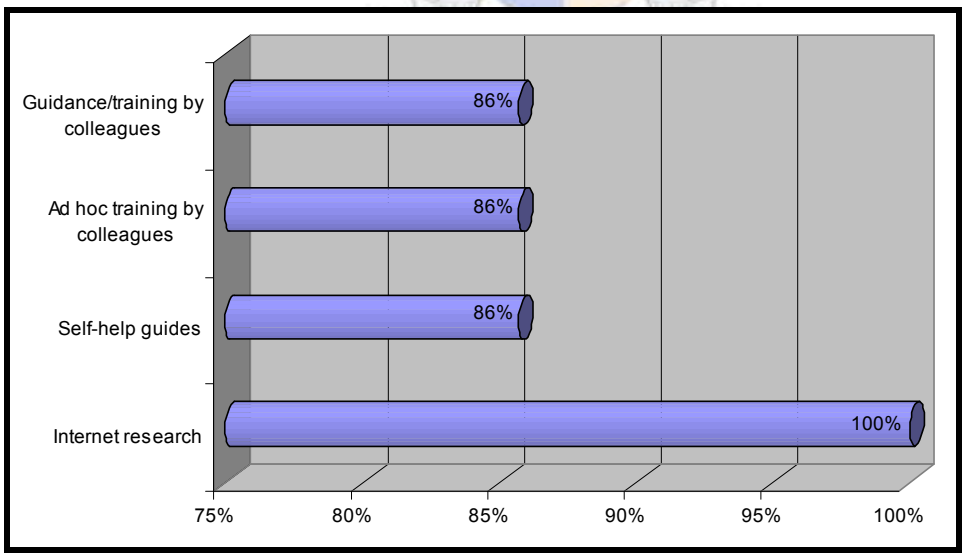
Figure 29: Mobile technology adoption in value chain activities



6.4.5 Mobile technology training (Question 8)

Kirsten (2006: 144) indicates that, although training is often an indicator of adoption, in cutting-edge technology it could be difficult to source and becomes redundant because of the speed of technological evolution. He adds that adoption in large organisations is difficult as technology has changed before it can be properly introduced at all levels. The finding in the PGWC is similar to Kirsten's in that training does occur, but all training is done informally and mostly happens on the internet.

Figure 30: Corporate training channels used for mobile technologies

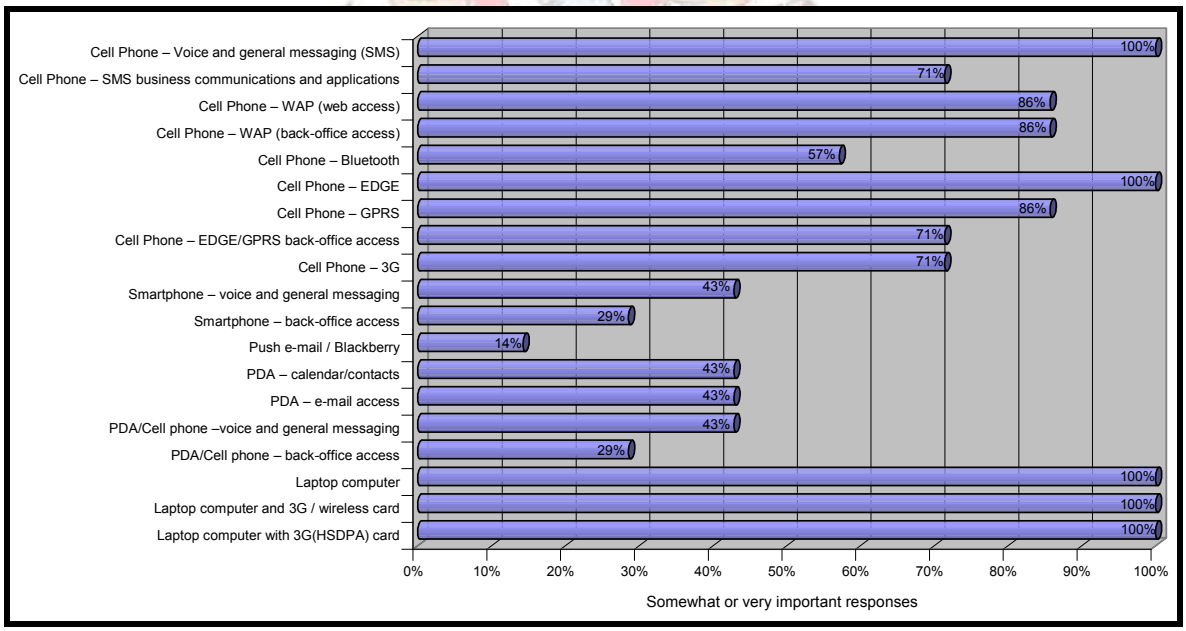


6.4.6 Importance of established technology (Question 9)

Respondents rated the importance of established technology on a five-point scale ranging from very unimportant to very important. Figure 31 below is an indication of the respondents who rated the technology as either somewhat important or very important.

Kirsten (2006:147) found that cell-phones, using voice and general messaging, as well as laptops were considered the most important by the companies he surveyed. The result in the PGWC was very much the same, but connectivity to the internet has also become an important aspect, either through EDGE or 3G. WAP-enabled and GPRS are also considered important. Kirsten's study found that adoption of 3G was not high. The two years since his study have seen significant improvement in the network coverage area and the cost of using 3G. These two reasons can be seen as the major contributors to the differences in the survey results.

Figure 31: Importance rating of established mobile technology

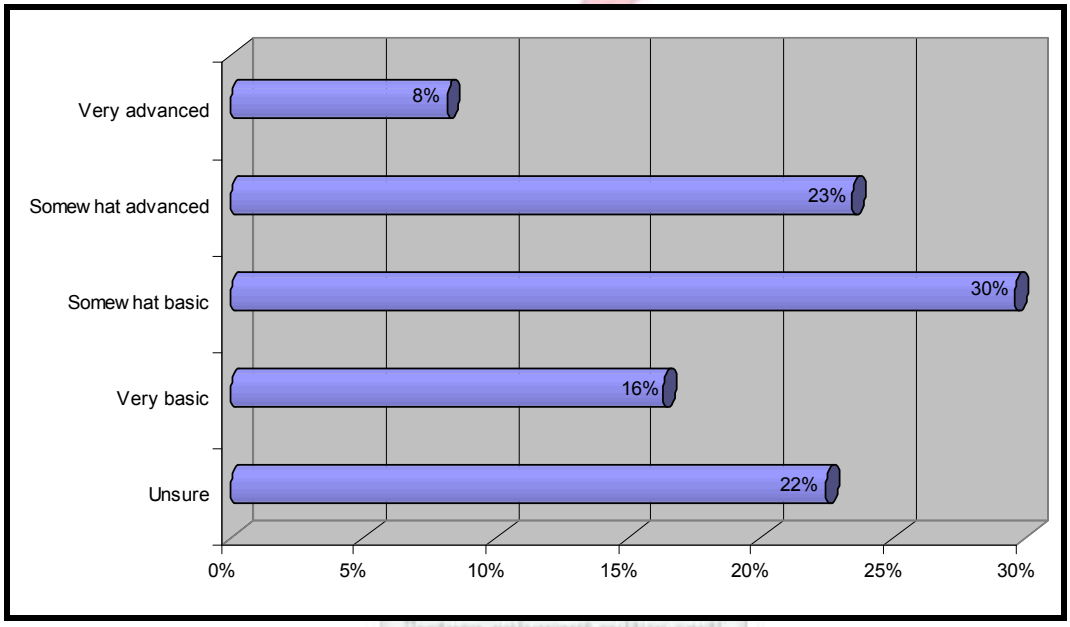


Unlike Kirsten's study, the importance of PDAs was not rated highly. Kirsten (2006:148) reasoned that this was to the result of the gap between PDAs, smartphones and cell-phones. These gaps have been closed over the last two years and most cell-phones now have calendar and e-mail capabilities.

6.4.7 Level of mobile sophistication (Question 10)

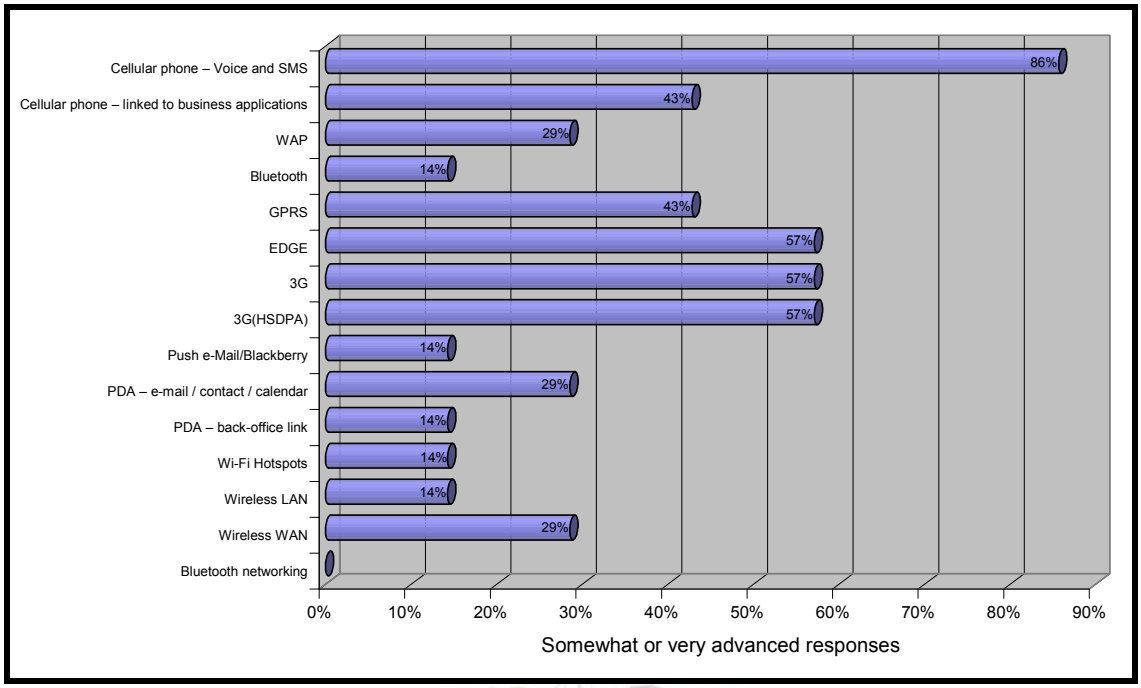
Fifteen categories (see Figure 33) of technology were rated for mobile sophistication ranging from very basic to very advanced. Figure 32 provides a summary of the ratings. Similar to Kirsten's (2006:148) results, the primary technology that respondents considered very advanced was cell-phones. This result also correlates with Kirsten's in that almost 70% of users have only basic levels of sophistication or understanding. This means that, as the organisation realises the advantages of MWTs and starts to use them to address business needs, more would need to be done to address the level of understanding and sophistication.

Figure 32: Overall sophistication for all technology categories



Using cell-phones to communicate either by voice or SMS has the greatest user sophistication, but the breakdown per technology indicates that users are also becoming more familiar with EDGE and 3G. Once again this can be attributed to the advances in technology over the last two years.

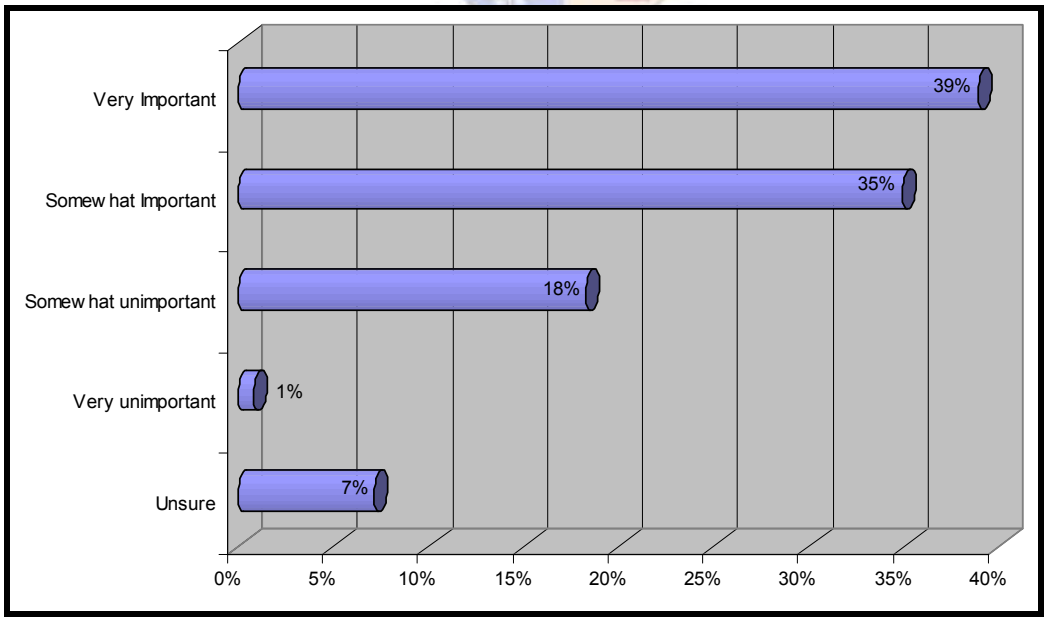
Figure 33: Sophistication rating for mobile technology



6.4.8 Importance of emerging technologies (Question 11)

Eighteen emerging technologies were rated on a scale of very important to very unimportant based on respondents' perceptions on the impact they could have on the organisation in the short to medium term. Figure 34 indicates that close to three quarters of respondents feel that emerging technologies are important.

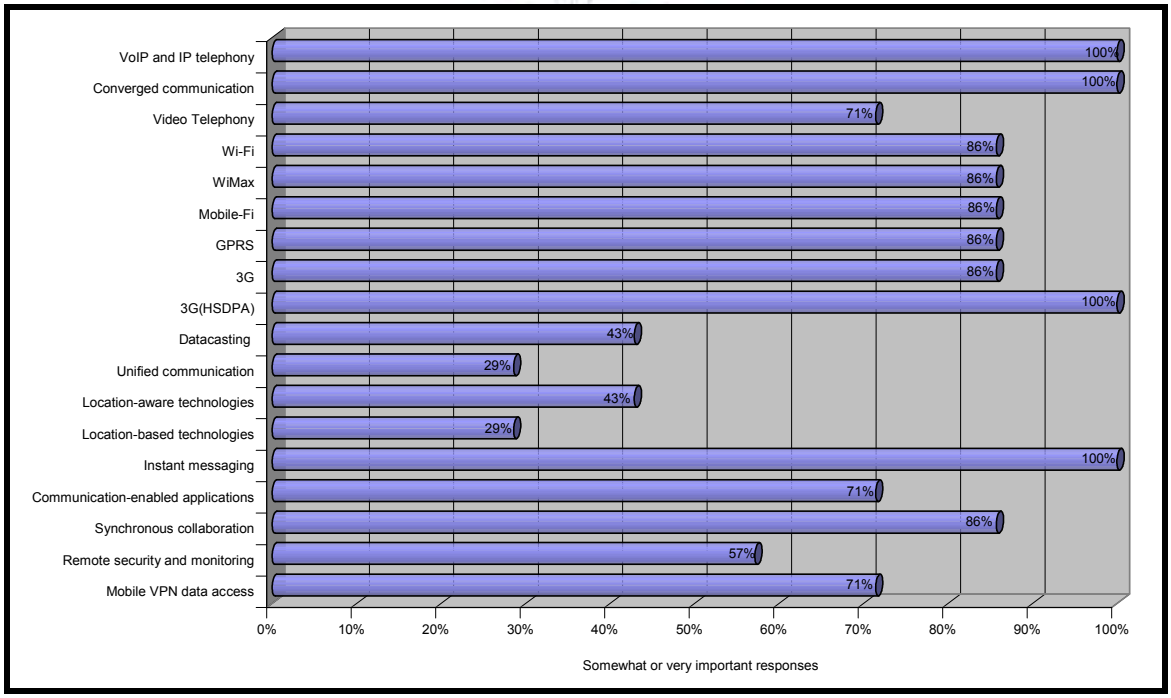
Figure 34: Overall importance for all emerging technology categories



The individual technologies' ratings that respondents considered either somewhat or very important are represented in Figure 35 below. VoIP, converged communication, 3G (HSDPA) and instant messaging are seen as the most important technologies for the PGWC to consider. This correlates with the interviews that were held and is also in line with the objectives of the PCCN mobility task team (De Freitas, 2008; Frick, 2008; Gamiet, 2008; PGWC, 2008a). VoIP is being addressed by another team of the PCCN, the telephony task team.

Wi-Fi, Wi-MAX, Mobile-Fi, GPRS, 3G and synchronous collaboration were also rated as very important to the future business of the PGWC. The third highest rating was giving to video telephony, communication-enabled applications and mobile VPN data access.

Figure 35: Importance of rating of emerging mobile technology



6.5 Summary

Chapter Six looked at existing recommendations on the table and examples of m-Government within the PGWC. The results of the interviews and the survey were also discussed and compared to the results of Kirsten's study in 2006.

The recommendation on the table, based on the literature and internal experiences of sources consulted, indicated that the PGWC is making use of

proven best practices. Services are being taken to the people in various ways using mobile technology and there is a realisation that much still has to be done with regard to changing the attitudes of top management and politicians.

m-Government projects in the PGWC have been around for close to five years. There have been many successes, such as the linking of the DoA offices and the Cape Access projects in rural areas, where communities are provided with e-Services by making use of mobile technologies. Many PGWC workers make use of MWTs to perform their daily duties, including cell-phones and laptops. Data on mobile workers indicate that using MWTs costing R2.5 million led to time spent using the technology with a possible value in excess of R2.7 million, meaning a potential saving of R0.2 million over a period of one year.

Based on the results of the survey, it can be said that adoption of MWTs in the PGWC has reached a level that is higher than the results reflected in Kirsten's (2006) study.

The interviews provide a different picture, though. If Goldstuck's (2003:24) reasons for not being mature yet are compared to the interviews, all five statements could be said to be true for the PGWC. Many potential users and managers are oblivious of how MWT can be used to enhance services. There are many top managers who see wireless technologies as hype and are only willing to invest in MWT that assists in getting the basics of government services in place. Potential applications for MWT have not been effectively identified, possibly because they are unaware of what MWTs are capable. Some of the technology is not fully mature yet and has not been proven sufficiently for government to invest in it. Impact on improving the bottom-line is not always obvious and therefore organisations are reluctant to invest in MWT, meaning that maturity of the technology is retarded in terms of user experience.

This means that, although adoption of MWTs has been substantial, there is much room for improvement. Chapter Seven will summarise the approach and findings of this study and make recommendations based on these findings.

CHAPTER 7: SUMMARY AND CONCLUSION

7.1 Summary of study

7.1.1 Introduction

Cellular technology has taken South Africa by storm and virtually every family has access to a cell-phone. Cellular service providers and the media play a vital role in informing citizens on what cell-phones can be used for. This means that citizens have a good idea of what is possible on cell-phones and they expect Government to offer services via these devices as well. The use of mobile technology to deliver government services is known as m-Government.

The aim of the study was to critically examine and evaluate the extent to which the PGWC is ready to implement m-Government. Various specific and secondary objectives were set that created expectations for the outcome of the study. The scope of the research, based on Kirsten's study in 2006 on the readiness of JSE-listed companies in South Africa, was to determine the level of adoption of MWTs and m-Readiness within the PGWC. The research design and methodology were an empirical, and largely qualitative, case study of the PGWC's state of m-Readiness.

7.1.2 Theoretical framework

Chapter Two provided definitions and explanations of the key concepts and terms used in the world of mobile and wireless technologies. The link between e-Government and m-Government was established, but the study revealed that within the PGWC m-Government is generally seen as a quintessential part of and inseparable from e-Government.

The legislative framework related to e-Government, and hence m-Government, provided the background to one of the challenges the PGWC faces in utilising MWTs. Government focuses on service delivery and a section was devoted to explaining how m-Government could contribute towards service delivery.

Examples of what m-Government entails in relation to various aspects of business, such as communication and transactions, were provided and explained. The

benefits, limitations and challenges of m-Government were discussed briefly. Global and national m-Government contexts were provided by means of statistics, and examples of services and technologies in use. The major role players giving effect to m-Government were summarised as well. The chapter was concluded by highlighting various provincial initiatives.

7.1.3 Readiness tool

The tool that was used to measure the level of adoption of mobile technologies was largely based on the study done by Kirsten in 2006. In addition, work done by Goldstuck and World Wide Worx in 1995 was used to compile questions used during a semi-structured interview with senior managers and technical staff in the PGWC. There is currently no tool that measures m-Readiness specifically, but the e-Readiness tools in use today were briefly discussed. The way in which results could be interpreted was briefly argued.

The model used focuses largely on the adoption of mobile technology, but does provide a clear indication of the PGWC's adoption of mobile technology and the current m-Readiness status in comparison to Kirsten's study.

7.1.4 Associated technology

The associated technology was divided into three categories: network connectivity, mobile and wireless devices, and mobile application services. Before the three categories were explained, a brief history of mobile technology was provided.

In the first category cellular technology such as HSDPA and 3G was addressed. Wireless technologies and the various kinds of relevant networks were also explained. The mobile and wireless devices that make use of cellular and wireless networks were divided into mobile phones, mobile computers and other mobile devices. As already mentioned, this study did not intend to provide comprehensive details on any of the technology. An overview of the essentials was provided.

The third category discussed operating systems and application software used on mobile devices. Although operating systems determine which applications can run

on a device, the choice of applications is so wide and varied that almost any required service could be sourced. Chapter Four was concluded by providing background to the standards relating to MWTs.

7.1.5 Data gathering and analysis

Chapter Five provided details on how the study was conducted. It highlights the variables in the study and explains the unit of analysis. The type and method of data collection, both primary and secondary, were explained. Secondary data were sourced mainly from statistics and a literature review, whilst the primary data were sourced through a survey and semi-structured interviews.

7.1.6 Research findings

The findings looked at existing recommendations and current projects. The result of the research can be separated into three sections. Information and data on the mobile workers indicate that in theory more than nine years were worked overtime and that, although the cost of the service is high, the return in real terms outweighs the cost.

The interviews and survey provided a good overview of the current state of mobile technology adoption within the PGWC. Although the overall picture is a positive one, there is much room for improvement and the identified challenges and barriers should be addressed if progress is to be made in m-Readiness.

7.2 Summary of findings

The study set specific and general objectives at the outset that were to be achieved.

7.2.1 Specific objectives

One of the specific objectives of this study was to understand m-Government within the e-Government context. Chapter Two defined these and many other related concepts and sketched the context within which they function. It is clear

that within the PGWC m-Government is seen as part and parcel of e-Government. It is believed that the two cannot be separated. However, the literature and the advances in the field of MWTs suggest that in future dealing with matters relating to m-Government might be handled slightly differently. It is unlikely that it will ever be seen as something completely different and separate from e-Government, but specialisation will be required. The current challenge of shortages of resources and skills will not ease in the near future, and MWTs will need specialists to ensure that the right technology and solutions are implemented to address the needs of the business.

A second objective was to understand how m-Government is utilised within the PGWC, especially regarding service delivery. Chapter Two highlighted many examples of MWT-related service delivery within the PGWC and Chapter Six listed further examples. The overall picture is that the focus is mainly on mobile workers and therefore internally focused, but there are many examples of utilising mobile technology ranging from m-Administration to m-Security. The Cape Access project makes use of MWT to ensure that MPCCs that do not have fixed-line connectivity, can also have access to Government's e-Services. The DoA have established a wireless network that connects many of their rural offices. The Department of Health notifies TB patients by SMS of forthcoming treatments. The Government Garage makes use of satellite tracking to manage its fleet of motor vehicles. These examples and many more illustrate that MWT is being utilised, albeit in an uncoordinated way. The establishment of a central forum to address provincial connectivity, the PCCN forum, should facilitate a more coordinated effort. The establishment of a mobility task team to look into the use of mobile technology in service delivery is a step in the right direction.

The final specific objective assessed the state of m-Readiness within the PGWC, based on a study done in 2006 by Kirsten. Chapter Six provides the data and information to this question. The result of the survey indicated that adoption of mobile technology is on a par with, or better than, what the survey results of Kirsten reflected in 2006.

Assessing the state of readiness in the PGWC meant a focus on the CEI, a branch within the Department of the Premier. The CEI is responsible for the oversight of

all the ICT needs of the PGWC, including LAN and WAN connectivity. This means that all efforts were focused on this unit to determine the readiness of the PGWC. Senior managers and technical staff within the CEI were approached to complete a survey and take part in a semi-structured interview.

As in Kirsten's (2006:135) study, the technology most widely adopted to conduct business is cell-phones. The PGWC also makes use of laptops, PDAs and wireless networks. With regard to MWT in business processes, VoIP and push e-mail scored high compared to mobile VPN in Kirsten's study. Corporate SMS is also used less in the PGWC, possibly because of the costs entailed. The survey reveals a presence of the technology, but does not indicate to what extent it is deployed. Although the survey indicates that most of the technologies surveyed are present, the interviews revealed that in many cases they are being used as pilot projects or on a limited scale. The cell-phone and laptop are the only two that are used extensively and have achieved a high level of integration into the business of the PGWC.

The way that cell-phones and laptops are deployed within the organisation also correlate with Kirsten's results. Managers and field staff are the biggest users of the technology, indicating that the technology is being utilised where it is needed most. Staff who need to be in constant contact and who need access to systems and data when away from the office have been given the tools to do business while on the road. The survey concentrated only on work-issued technology, which means that privately-owned cell-phones and laptops were not part of the survey. Interviewees were of the opinion that almost all employees, across all levels, have their own cell-phone or a cell-phone in the family.

As expected, the value chain activity that has the greatest benefit from mobile technology is operations. Both this study's survey and Kirsten's indicated that the greatest impact as a result of mobile technology was on operations. Another similarity is that both surveys indicated hardly any approach to formal training courses regarding MWTs. Almost all training on MWT happens informally and is either self-taught using the internet or self-help guides or through the assistance and guidance offered by colleagues.

Respondents indicated that both cell-phones and laptops are very important to business. The ability to connect to the internet and wireless networks with the mobile devices has also become very important. Most devices have some form of technology built in to allow for this to happen, which include EDGE, 3G and HSDPA. One challenge is that less than one third of employees are considered to be somewhat advanced or advanced users of MWT. This refers mainly to cell-phones using voice and SMS, but also slightly lower levels of sophistication regarding EDGE, 3G and HSDPA.

Emerging technologies that were rated as very important to the organisation included VoIP, converged communication, 3G (HSDPA) and instant messaging. Other technology also considered of importance included Wi-Fi, Wi-MAX, Mobile-Fi, GPRS, 3G and synchronous collaboration.

7.2.2 Secondary objectives

Secondary aspects that were addressed answered some of the questions that are associated with m-Government. What future applications can be used? What are the benefits, drawbacks, limitations and challenges associated with m-Government? What measures can be put in place to improve the level of m-Readiness of the PGWC?

Possible future applications of m-Government

The study has alluded to some of the possible future applications of mobile technology. The many pilot projects that are happening across South Africa can be seen as forerunners to mobile public services or m-Government in the near future. Government will mature to a level where e-Government allows for transactions on almost all services with citizens. These will include paying of licence fees, fines, taxes and other financial transactions. Once e-Wallets (a personal digital or virtual account linked to a normal bank account) have become part of everyday life, transactions of any form will be possible, including the payment of social grants.

Using MWT for education will provide rural students with access to the same resources as urban learners. As the cost and speed of connectivity over wireless and cellular networks become cheaper as a result of technological advances,

more people will have access to the internet. This will provide a channel for Government to communicate directly with citizens in all parts of the country. SMS, IM and VoIP will provide additional channels of interaction with citizens.

Benefits, drawbacks, limitations and challenges of m-Government

As mentioned before, the lack of a coordinated efforts to address m-Government at a national level is one of the challenges that face the public service. Dealing with mobile solutions in a case-by-case manner is not the most effective way to find solutions. Patel and White (2007:322) indicate that a central m-Government strategy and a Centre of Excellence are being looked at to focus on this weakness. A central strategy will allow government to negotiate better deals, thereby extending its ability to render m-Services. Patel and White see the Centre for Excellence as a PPP where mobile solutions can be researched and tested. At Provincial and local levels coordination of efforts is also of paramount importance to ensure that there is no duplication of efforts and that the limited resources, another challenge, are used optimally. The establishment of the PCCN forum should address this lack of coordination.

The challenge for the legislative process to be more dynamic and enabling, rather than being an obstacle, is something that needs to be addressed by the national role players such as the DoC and the DPSA. Legislation needs to be dynamic enough to keep in touch with ever-changing technology, especially in the fields of wireless and cellular communication. The number of changes and additions to legislation in this regard over the last two years is an indication that it is being addressed.

The most important limitation at present is the lack of bandwidth. The size of the "digital highway" is just not sufficient to allow for all the MWT possibilities such as live video streaming and video-communication. This is an area where improvements in the very near future can be expected. The City of Cape Town is investing in an optical fibre backbone within the city and as far as Stellenbosch and the Strand to allow for greater bandwidth. Local and provincial government, tertiary institutions as well as private businesses will benefit greatly from this investment. Another limitation in the PGWC is the lack of skills and expertise in

MWT. Unfortunately government cannot compete financially with private enterprise and many skilled public servants are lost to companies that offer higher salaries.

The greatest drawback of MWT is one that is possibly not fully understood yet and still needs to be studied. The effect on people being in touch at all times means that they will not have an opportunity to "switch off" from pressures from work. It is no longer unusual for a manager to receive a call while on leave to address some urgent matter at work. In future it might be mandatory for staff to hand in mobile devices when on leave to ensure that employees are afforded an opportunity to rest. An additional concern with regard to MWT is the amount of exposure to radio waves. The effect of the amount of radiation that people are exposed to has not been studied long enough to determine how adverse it is to people's health. The amount of radio waves is set to increase in future and exposure levels will certainly rise. Studies with regard to the impact on the health of citizens and employees will need to be done over long periods to provide meaningful results.

Notwithstanding the challenges and limitations, the possible benefits of MWT are evident in the many examples of how they are being utilised. The advantage to citizens is found in convenience and in cost saving. Instead of travelling to a government office, wasting time looking for parking and standing in queues for too long, using a cell-phone to pay for any public service makes a great deal of sense. Rates, accounts and fines can already be paid at a number of convenient places such as automated teller machines and grocery stores. Banks are already offering secure and safe banking through the cell-phone. It is a matter of time before citizens expect government to do the same. Transactions and communication over the cell-phone offers citizens the highest level of convenience; it is available at all times from anywhere. Offering government information via the two most common channels in use today, SMS and instant messaging (for example, MXiT), is an opportunity for citizens and government alike to benefit from the convenience MWT has brought.

Measures that can be put in place to improve the m-Readiness of the PGWC

On a national level there should be an attempt to consolidate efforts. A national audit is needed, where a central database could list everything that is happening. Lessons that have been learnt and best practices should be shared to prevent

duplication. Government is arguably the biggest corporation in South Africa, yet it functions as a collection of disjointed autonomous entities that somehow try and work towards similar goals. All want to make South Africa a better place to live in, but each department focuses strictly on its particular mandate. Yet there are many overlapping commonalities. One of these is communication. The world-leading innovations in mobile communication already being utilised in South Africa need to be expanded on and shared with all levels and spheres of government.

The most important considerations to improve m-Readiness within the PGWC is to ensure that there is a coordinated effort and that top management and politicians understand the benefits that ICT and MWT can bring to service delivery. The PCCN and the task teams on mobility and telephony can ensure that a coordinated effort and focus is maintained. Convincing top management and politicians of the benefits of MWT must be done through education and sharing of information. The use of existing examples and successes always facilitates this. It is not advisable for governments to utilise new technology that does not have a proven track record.

Ensuring that the e-Government strategy is kept up to date and includes a dedicated section pertaining to mobile technology is an important starting point. Standards need to be set and departments need guidelines on the use of the latest technologies. The CEI needs to manage the acquisition of new technology carefully to ensure that compliance with set rules is maintained.

As no recognised m-Readiness rating tool exists, the PGWC and the CEI should focus on improving their e-Government rating. The tool used by Kirsten (2006) has certain shortcomings, but does answer many questions relating to mobile adoption in an organisation. Based on the results of the survey conducted in this study, it is clear that an area to which attention can be given is training, where a more structured approach could address the limited skills in the PGWC.

7.2.3 Provincial services that could benefit from m-Government

The research done on MWTs revealed many examples of international and national services. These examples provide ideas on the possibilities for using

mobile technology to improve service delivery. Services can be divided into internal and external services.

Internal services

Internal mobile services contribute to the day-to-day functioning of employees.

By utilising SMS, employees could send their personnel number and additional details regarding any number of personal issues ranging from leave, performance, salary and any other personal query they might have. Not only will this create a record of interaction that could be important in tracking how a matter was dealt with, but it will also reduce the amount of red tape currently experienced.

Instant messaging (for example, MXit) could be used as conferencing tool, which would allow decentralised teams to meet in a virtual environment where interactive responses occur in real time.

Improved real-time access to intranets and information through a Virtual Private Network will allow for mobile office environments and mobile workers to evolve. This could reduce costs associated with office space. Companies worldwide are introducing the concept of virtual offices. Not all employees can become mobile workers, but technical support staff, developers, data capturers and many others are examples of employees who could do their job from anywhere in the world as long as they have secure access to their networks and data. One of the major considerations for mobile office workers is the maturity of the workforce. With mobility comes a certain amount of freedom, but also responsibility.

In nature conservation the real-time tracking of animal populations would improve the chances of eco-tourists seeing specific game such as one of the “Big 5”. They could SMS “Lion” to a service number of the game reserve and a GPS coordinate of the closest lion could be sent back to their position. Cape Nature Conservation could provide data on whales, penguins and baboons in and around the Peninsula in the same way. Mobile technology could also be employed in the fight against poachers and provide vital and timely information during natural disasters.

MWT has already been proven as an effective means to combat crime. The ability to send video and photos can assist security forces with immediate information

that could save lives. This not only assists government employees to do their jobs better, but citizens also benefit directly. This also applies to health services where paramedics can ask for assistance from a central doctor on duty via mobile technology on how to deal with a particular patient's medical emergency.

External services

External services are services that benefit the citizen directly. One of the most commonly quoted example is the ability of a citizen to gain access to government information by using a mobile device.

ISSA has already developed an application that provides contact details on government services in the Western Cape. The Cape Gateway project is also looking at expanding their services to a mobile version of the Cape Gateway website. This site can already be read on a cell-phone, but it was developed with normal computer screen in mind, not small cell-phone screens.

A student from the University of Cape Town recently won an international award for a mobile application that provides information on public transport using GPS technology. If a citizen, or tourist, sends an SMS to a number, his or her coordinates are captured and the system will know where the closest bus stop to him or her is. The system then returns the appropriate bus schedule to the person's phone within a matter of seconds. This same technology can be utilised for a range of applications. For example, a tourist arrives in Cape Town and wants to know where the closest restaurant that serves traditional South African food can be found. The system captures the tourist's coordinates and returns an SMS with the relevant information. The application of SMS technology is both simple and proven. An additional solution could be the ability to provide information in any of the most common tourist languages.

Government could invite individuals and companies to register, and possibly pay, for a service that would send notifications of new provincial tenders. The same could be done for quota licences for fishing, job alerts and many more.

As mentioned before, the inconvenience of standing in a queue at an office where parking is often difficult to find frustrates citizens. Being able to perform transactions over the internet and via cell-phones will provide an efficient

alternative that would save the citizen time and money. This is already happening for many non-government services, especially in entertainment such as music, ringtones and cell-phone wallpapers. Motor vehicle licensing is possibly the first examples that the PGWC could consider. Motorists could SMS their registration to a number where the appropriate amount would be deducted from their cell-phone account. Once this service has been established and proven, it could be expanded to other areas such as traffic violations, rates and taxes.

Mobile technology could be employed to provide education and training in rural areas on a range of topics. Emerging farmers could receive training on a range of agricultural topics, scholars could receive extra lessons on ICT, maths and science, and technology can even be used to teach basic literacy. The same technology can be used to deliver services that are normally difficult for citizens to access.

The examples in this study are based mainly on services that already exist in one form or another. The findings of this study were clear enough to allow for a conclusion to be drawn.

7.3 Conclusion

Goldstuck (2003:10-11) describes the way that mobile technology can be used in everyday life in the future. Although some of his suggestions sound like something from a science fiction movie, he indicates that all these options are possible already. Some of the examples he uses include the ability to check public transport schedules via a wireless application, booking and paying for sport or other events, digital post boxes where letters and accounts are received via handheld devices, being able to find loved ones through locator technology, handheld scanners for police to check for outstanding fines or warrants of arrest, signals from mobile devices to pay for parking or toll fees, and SMS notification of the arrival of any documents or mail.

Whatever mobile services or applications governments might want or need to deliver services are likely to exist already in some form or another (Goldstuck, 2003:43). Innovation and expertise are all around and if government does not

have the capacity to deliver these services, partnerships should be sought with private vendors who can. Currently, and as stated by Goldstuck (2003:53) more than five years ago, the greatest advantage of mobile and wireless technology is to increase the productivity of a highly mobile workforce. These results have already been seen in the Western Cape, where additional work of more than nine years was done as a consequence of the use of mobile technology within the last year.

Similarly to Kirsten's (2006:167) findings, this study indicates that the PGWC as a large organisation finds it challenging to adopt new technology, especially over the entire organisation. There is a very wide choice and deciding on the most appropriate one is not easy. In addition, advances in technology mean that by the time a solution is implemented across an organisation, it might already be outdated. This created the question of when to adopt a new technology. Should the organisation wait for technology to be proven and then adopt it, or take a chance with something new? As Kirsten's study points out, this dilemma is not something that only governments experience. Gartner Research (2008:8) provides a priority matrix (see *Figure 40* on page 192) that suggests when to adopt which new technology.

Government cannot afford to experiment with public funds. Only proven technology should be deployed, but this adds the risk that it could be outdated before it is fully implemented. Better risk assessment in this regard needs to be done by public officials making these decisions.

Cellular services have grown in South Africa at an astonishing rate since 1994, and are still growing. Stepping into the world of mobile services is not an easy decision to take. Government needs to deliver services economically, effectively and efficiently. Efficacy can be achieved by using mobile technology, but care should be taken not to use technology purely for the sake of using technology. If the service does not contribute to the organisational goals, it should probably be reconsidered.

This study provided a picture of the adoption of mobile technology in the PGWC. The results of the survey and the interviews indicated that mobile technology has been widely adopted in the PGWC. One of the shortcomings of the study is that

the tool does not provide an indication of the extent of this adoption of the technology. This means that there is a presence, but it does not indicate how widely it is used within the organisation. In addition, only one unit, the CEI as official ICT service provider to the PGWC, was approached for this study. The study showed many positive examples of what is being done with regard to MWT in the PGWC and South Africa. It also revealed certain shortcomings that could be addressed through the recommendations made in the next section and also provides some ideas for further studies related to MWTs.

7.4 Recommendations

The regulatory process regarding the ICTs and MWTs needs to be revisited. One of the challenges is that technology has advanced by the time that any changes have been made to laws or procedures. Singh and Sahu (2007:488) also suggest that laws and procedures should be compatible with the advances in ICT. This includes the acceptance of various forms of electronic communication including SMS, e-mail and facsimile when communicating or transacting with government and a virtual government repository where data and information are usable by all government agencies. Unfortunately, these are not decisions that can be dealt with at a provincial level. Nationally the major role players need to buy in to the process of coordinating the technology requirements of service delivery.

A multi-platform approach to e-Government should include the use of MWTs such as SMS and voicemail. Citizens should be allowed to communicate in the language and communication method of their choice, whether that is orally, in handwritten letters or by SMS (Singh & Sahu, 2007:488). Singh and Sahu also suggest that governments should devise strategies to provide as many services as possible to the citizen through telephones and mobile devices.

When investing in MWTs, it is important to have a balance between the backend infrastructure and the visible services (Ni & Ho, 2005:69). Ni and Ho provides suggestions specifically relating to the implementation of internet kiosks, but there are parallels with mobile and wireless technologies. Having a realistic strategic plan and strengthening communication with partners and stakeholders applies any

project. The same holds true for measuring performance and managing costs. Public reporting on services using MWT should include multi-year comparisons that will show the public and policymakers whether the investment is worthwhile. Such transparency may lead to greater accountability.

The corporate ICT world and government could form a PPP to deliver m-Services. Companies often look for avenues to show and invest in social responsibility. Ni and Ho (2005:68) agree that many e-Government projects are conducted through public-private cooperation, and they suggest that IT managers need to place more emphasis on intergovernmental relationships and PPPs. This is also a way for government to overcome the skills shortage.

Having the political will and buy-in does not replace the need for sound strategic planning (Ni & Ho, 2005:67). Ni and Ho also indicate that only proven technology should be adopted by governments. As Goldstuck (2003:37) warns, technology should not be used purely for the sake of remaining up to date with the latest hi-tech equipment. Technology should improve efficiency of existing services or address a new service or business need that has been clearly defined. However, and as argued by Singh and Sahu (2007:489), governments also have a responsibility to find innovative uses for e-Government and especially m-Government to benefit a wide range of citizens, not only the select few who have access to the latest technologies.

Further studies could be done on the social effects of MWT on employees who are in contact 24/7. How would people react and what effect does it have on them when they are “at the office” constantly as a result of the use of MWT? What are the options regarding the changes in the way we do things? What about the savings that stem from mobile/virtual offices? When will the maturity of the workforce allow for this? Do MWTs hold a health risk? These are some of the questions that this study cannot answer, but they offer opportunities for future MWT-related studies.

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Appendices

A: Primary data sources

Table 12: List of interviewees

#	Name	Organisation	Contact	Notes
1.	A de Freitas	PGWC (Acting CIO)	021 483 3911	Acting head of CEI and involved in all ICT projects in PGWC adefreit@pgwc.gov.za
2.	J Diener	PGWC: Agric (e-Government Specialist)	021 808 5111	Manages Agriculture ICT and spearheads radio connectivity on AgriNET johand@elsenburg.com
3.	M Frick	PGWC: ICTI (Network Technologist)	021 483 3911	Specialist in network connectivity including mobile connectivity mfrick@pgwc.gov.za
4.	F Gamiet	PGWC: HSD (Mobile Project Team Leader)	021 483 3911	Chairperson of Mobility Work Team for PGWC fgamiet@pgwc.gov.za
5.	G Grammar	PGWC: CG (e-Government Specialist)	021 483 3911	Manager of Cape Gateway portal development ggrammar@pgwc.gov.za
6.	V Klaas	PGWC: P&S (e-Government Specialist)	021 483 3911	Co-author of National and Provincial e-Government policies vklaas@pgwc.gov.za
7.	F Mbhele	PGWC: P&S (Director)	021 483 3911	Heads section doing research and evaluation of new technologies for and within PGWC fmbhele@pgwc.gov.za
8.	A van Breda	PGWC: OCIO/P&D (Project Office Manager)	021 483 3911	Head of Project Office and involved in Cape Gateway. Attended 1st world conference on m-Government. avbreda@pgwc.gov.za

Table 13: List of survey respondents

#	Name	Organisation	Contact	Notes
1.	J Diener	PGWC: Agric (e-Government Specialist)	021 808 5111	Manages Agriculture ICT and spearheads radio connectivity on AgriNET johand@elsenburg.com
2.	M Frick	PGWC: ICTI (Network Technologist)	021 483 3911	Specialist in network connectivity including mobile connectivity mfrick@pgwc.gov.za
3.	F Gamiet	PGWC: HSD (Mobile Project Team Leader)	021 483 3911	Chairperson of Mobility Work Team for PGWC fgamiet@pgwc.gov.za
4.	L Lategan	PGWC: ECAS (e-Government Specialist)	021 483 3911	Heads the Khanya project (connecting schools to the internet & intranet) llategan@pgwc.gov.za
5.	F Mbhele	PGWC: P&S (Director)	021 483 3911	Heads section doing research and evaluation of new technologies for and within PGWC fmbhele@pgwc.gov.za
6.	A van Breda	PGWC: OCIO/P&D (Project Office Manager)	021 483 3911	Head of Project Office and involved in Cape Gateway. Attended 1st world conference on m-Government. avbreda@pgwc.gov.za
7.	W Viviers	PGWC: EGA (acting Director)	021 483 3911	Heads section that delivers transversal services wviviers@pgwc.gov.za

Abbreviations used in above tables

Agric	Department of Agriculture
AgriNET	Agriculture network
CEI	Centre for e-Innovation
CG	Cape Gateway
CIO	Chief Information Officer
ECAS	Education, Culture and Sport
EGA	Economic Governance and Administration
HSD	Health and Social Development
ICTI	Information & Communication Technology Infrastructure
OCIO	Office of the Chief Information Officer
P&D	Planning and Development
P&S	Policy and Strategy
PGWC	Provincial Government Western Cape

B: Interview questions

1. How does your organisation define m-Government? Do you see m-Government as a separate issue to e-Government? Why?

2. Do you have any m-Government related policies? Explain

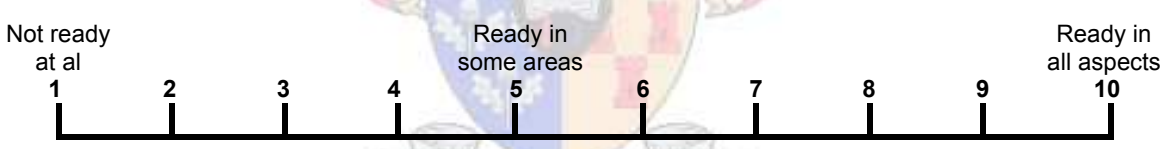
3. What examples of m-Government has your organisation successfully deployed?

4. What benefits are there for Government and/or the public regarding m-Government?

5. What contribution has it made to Public Service Delivery?

6. Do you measure the benefit? How?

7. On a scale of 1-10, how do you rate your organisation in terms of its e-Readiness and m-Readiness? On what terms do you base this measurement?



8. What challenges are encountered or associated with m-Government?

9. How does your organisation overcome these challenges or limitations?

10. What does the future hold for m-Government and how else can it be employed?

C: Research permission

CENTRE FOR e-INNOVATION
Provincial Government of the Western Cape

Enquiries Mr J du Preez
Reference SP
Extension 5079

Department of the Premier

CIO: e-INNOVATION

Attention: Mr F Mbhele (Director: Policy & Strategy)

RESEARCH PROPOSAL: M-GOVERNMENT READINESS OF THE PGWC

I hereby wish to apply for permission to conduct research on the state of m-Government readiness within the PGWC.

Title of research project: M-GOVERNMENT READINESS OF THE PGWC
Description: Public Service Delivery is an important and topical issue. The massive challenge regarding service delivery in especially rural areas needs to be addressed to ensure equality of service. e-Government is a significant contributor to Public Service Delivery. These contributions will not always be upfront and directly visible to the citizen, as many of these services happen in the background to allow direct services to be delivered smoothly.

In South Africa there are some examples of m-Government and these will be briefly explored to ascertain which of these examples could be utilised or expanded on within the PGWC. The study will aim to focus on m-Government services that could contribute to the achievement of Provincial and National goals within the Province, while ensuring its alignment with the national strategy for e-Government.

The proliferation of cellular technology allows for a myriad of possibilities regarding mobile service delivery. There are existing examples worldwide and in South Africa that include a range of services. These have led to new terms in the e-Services environment, such as m-Directory, m-Banking, m-Health, m-Learning, etc.

The aim of the study is to develop a measurement tool to determine m-Readiness and then to apply this tool to the situation within the PGWC. The result of which will be communicated to the relevant stakeholders and role players.

Period of research: 1 September 2007 to 31 August 2008

Attachments:

- Copies of Questionnaires attached
- Copy of registration attached
- Names of places where investigation will be done and
- Possible Respondents

Kind regards.

Jacques du Preez (53307984)

Date: 2008-4-7

CENTRE FOR e-INNOVATION
Provincial Government of the Western Cape

Enquiries Mr F Mbhele
Reference SP
Extension 2525

Department of the Premier

Mr Jacques du Preez
Persal No 53307984

RESEARCH PROPOSAL: M-GOVERNMENT READINESS OF THE PGWC

Your application to conduct the abovementioned research in the PGWC has been approved subject to the following conditions:

1. Managers and staff are under no obligation to assist you in your investigation.
2. You need to make all the arrangements concerning the investigation.
3. Normal work should not be interrupted.
4. The study is to be conducted by 31 August 2008.
5. A brief summary of the content, findings and recommendations is to be provided to the CIO: e-Innovation.
6. A copy of the completed dissertation/thesis/report is sent to:
   The CIO: e-Innovation
   Department of the Premier
   Provincial Government Western Cape
   Private Bag x9111
   CAPE TOWN, 8000

We wish you success in your research.

Kind regards.

CIO: e-Innovation

Date: 19/6/2008

D: Stellenbosch University letter

SCHOOL OF
PUBLIC MANAGEMENT
AND PLANNING

Learning for Sustainable African Futures

PO Box 610
Bellville 7535
South Africa
Tel: +27 21 9184442
Fax: +27 21 9184123
E-mail: naomi.burger@sopmp.sun.ac.za
Web: www.sopmp.sun.ac.za

Dear Respondent,

RESEARCH PROJECT: M-READINESS WITHIN THE PGWC

Mobile government (m-Government) as an integral part of e-Government is an important aspect of public service delivery.

Unfortunately, little research has been completed in South Africa with a focus on m-Government. The primary objective of the research project is to evaluate the readiness of mobile government in the Provincial Government Western Cape.

This is one of the research projects currently being undertaken by a student with the School of Pubic Management and Planning of the University of Stellenbosch. The research is conducted as part fulfilment towards a Masters degree in Public Administration. The supervisor for this research project is Ms Naomi Burger who can be contacted at 021-918-4442.

Your cooperation is highly appreciated.

Ms Naomi Burger
Senior Lecturer Information and Communication Technology

E: Survey questionnaire

SCHOOL OF
PUBLIC MANAGEMENT
AND PLANNING

PO Box 610
Bellville 7535
South Africa
Tel: +27 21 4835079
E-mail: 15257606@sun.ac.za

Learning for Sustainable African Futures

SURVEY

Dear Respondent,

Thank you for assisting me with this mobile government readiness survey. I realise how busy you are and I appreciate the time you will take to assist me. Please complete the following questionnaire.

ALL THE INFORMATION YOU PROVIDE WILL BE TREATED IN THE STRICTEST OF CONFIDENTIALITY – The University of Stellenbosch insists upon, and guarantees, the confidentiality of every individual response.

Please study the questions and place your responses in the appropriate field(s). If you are unable to answer a particular question, select the "Unsure" or "Unknown" option, but please try to limit these. Answer the questions in relation to the current situation IN YOUR ORGANISATION, not how you feel it should or could be.

The questionnaire should take no more than ten minutes to complete.

Thank you for your valuable time to assist us. If you have any questions or would like further information about this project, please call me or my promoter, Ms Naomi Burger.

Jacques du Preez
Project Manager: e-Innovation
021-483-5079
jdupreez@pgwc.gov.za

Promotor: Ms Naomi Burger
University of Stellenbosch School of Public Management and Planning
021-918-4442
Nmb1@sun.ac.za

Source: Kirsten, 2006:188

SCHOOL OF
PUBLIC MANAGEMENT
AND PLANNING

PO Box 610
Bellville 7535
South Africa
Tel: +27 21 4835079
E-mail: 15257606@sun.ac.za

Learning for Sustainable African Futures

Survey

1. Please provide your position in the organisation

_____

2. Please provide the size of the staff complement in your unit

_____

3. Please provide an indication of the annual budget for your unit

_____

4. To establish the adoption of mobile technologies in your organisation, please indicate which of the following EXISTING technologies have been deployed in your organisation (Please mark all applicable technologies).

- ☐ Cell Phone – Voice and general messaging (SMS)
- ☐ Cell Phone – SMS business communications and applications
- ☐ Cell Phone – WAP (web access)
- ☐ Cell Phone – WAP (back-office access)
- ☐ Cell Phone – Blue Tooth
- ☐ Cell Phone – EDGE
- ☐ Cell Phone – GPRS
- ☐ Cell Phone – EDGE/GPRS back-office access
- ☐ Cell Phone – 3G
- ☐ Smartphone –voice and general messaging
- ☐ Smartphone – back-office access
- ☐ Push e-mail / Blackberry
- ☐ PDA – calendar/contacts
- ☐ PDA – e-mail access
- ☐ PDA/Cell phone –voice and general messaging
- ☐ PDA/Cell phone – back-office access
- ☐ Laptop computer
- ☐ Laptop computer with 3G / 3G(HSDPA) / wireless card
- ☐ MyWireless / IBurst wireless cards / modems
- ☐ Wireless LAN
- ☐ Wireless WAN
- ☐ Blue Tooth Networking

Source: Kirsten, 2006:189

5. In terms of mobile technologies and combining it with (established) business applications, please indicate which of the following have been deployed in your organisation.
(Please mark all applicable choices.)

- ☐ VoIP
- ☐ Push e-mail
- ☐ Collaboration (mobile and synchronous)
- ☐ Corporate SMS
- ☐ Instant Messaging
- ☐ Mobile VPN access (CRM, ERP, SCM)
- ☐ Mobile business portal access
- ☐ Mobile management dashboards
- ☐ Mobile synchronisation (contacts / calendar)
- ☐ Remote monitoring
- ☐ Remote security monitoring
- ☐ Mobile video conferencing
- ☐ Converged communication
- ☐ Asset tracking (location-based)
- ☐ None
- ☐ Other (please specify

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6. Please indicate the level at which staff are provided with mobile devices.
(Please mark all applicable choices on each line).

	Top Management	Middle Management	Junior Management	Field staff	Admin staff	All staff	None
Cell phone (basic)							
Cell phone (GPRS / EDGE)							
Cell phone (with 3G)							
Smartphone (with 3G)							
PDA							
Cell phone enabled PDA							
Laptop							
Laptop with GPRS / 3G / 3G (HSDPA) / wireless card							

Source: Kirsten, 2006:191

7. In terms of the business value chain, please indicate in which of the following B2B/B2E fields your organisation have incorporated mobile devices/applications (Please mark all applicable choices).

- ☐ Firm infrastructure
- ☐ Procurement and inbound logistics
- ☐ Operations
- ☐ Outbound logistics
- ☐ Marketing and sales
- ☐ After sales service and support systems
- ☐ None
- ☐ Other (please specify)

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8. Training of staff in mobile technology can be conducted through many channels. Please indicate which channels your organisation utilises (Please mark all applicable choices).

- ☐ Formal training courses
- ☐ Ad-hoc training courses
- ☐ Online training courses
- ☐ Guidance/training by colleagues
- ☐ Ad hoc training by colleagues
- ☐ Self-help guides
- ☐ Internet research
- ☐ None
- ☐ Other (please specify)

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Source: Kirsten, 2006:192

9. The importance and perceived contribution of mobile technologies are indicators of adoption. Please indicate your organisation's view on the importance of the following ESTABLISHED mobile technologies in general.

	Unsure	Very unimportant	Somewhat unimportant	Somewhat important	Very important
Cell Phone – Voice and general messaging (SMS)					
Cell Phone – SMS business communications and applications					
Cell Phone – WAP (web access)					
Cell Phone – WAP (back-office access)					
Cell Phone – Blue Tooth					
Cell Phone – EDGE					
Cell Phone – GPRS					
Cell Phone – EDGE/GPRS back-office access					
Cell Phone – 3G					
Smartphone – voice and general messaging					
Smartphone – back-office access					
Push e-mail / Blackberry					
PDA – calendar/contacts					
PDA – e-mail access					
PDA/Cell phone –voice and general messaging					
PDA/Cell phone – back-office access					
Laptop computer					
Laptop computer and 3G / wireless card					
Laptop computer with 3G(HSDPA) card					

Source: Kirsten, 2006:192

10. Please indicate the general level of organisation wide sophistication of the users in terms of mobile technologies.

	Unsure	Very basic	Somewhat basic	Somewhat advanced	Very advanced
Cellular phone – Voice and SMS					
Cellular phone – linked to business applications					
WAP					
Blue Tooth					
GPRS					
3G					
3G(HSDPA)					
Push e-Mail/BlackBerry					
PDA – e-mail / contact / calendar					
PDA – back-office link					
Wi-Fi Hotspots					
Wireless LAN					
Wireless WAN					
Blue Tooth networking					

Source: Kirsten, 2006:193

11. The mobile industry is evolving continuously as new technologies are developed and rolled out. In terms of the short to medium term outlook, please provide your organisation's view on the importance of the following EMERGING mobile technologies and the impact it could have on business.

	Unsure	Not important at all	Somewhat important	Important	Very important
VoIP and IP telephony					
Converged communication					
Video Telephony					
Wi-Fi					
WiMax					
Mobile-Fi					
GPRS					
3G					
3G(HSDPA)					
Datacasting					
Unified communication					
Location-aware technologies					
Location-based technologies					
Instant messaging					
Communication-enabled applications					
Synchronous collaboration					
Remote security and monitoring					
Mobile VPN data access					

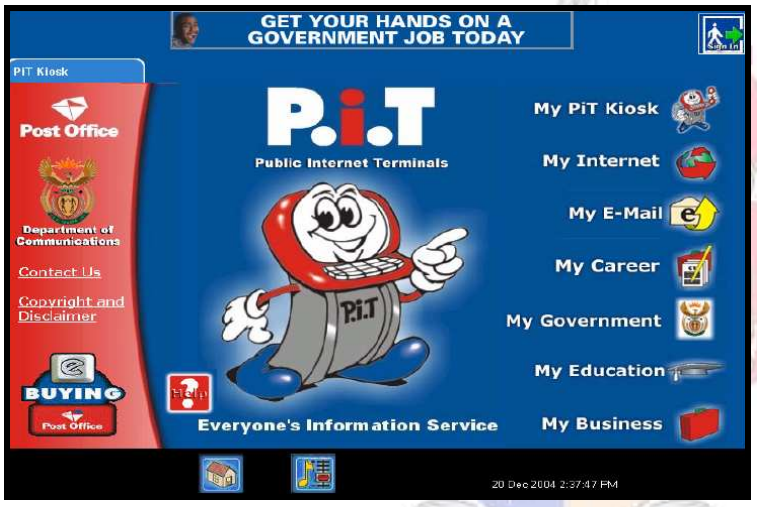
Source: Kirsten, 2006:193

F: Public Information Terminals

Figure 36: Public Information Terminals (South African Post Office)

Source: DPSA, 2007a

Figure 37: Public Information Terminal Services



Source: DPSA, 2007a

Figure 38: Public Information Terminal Government Services

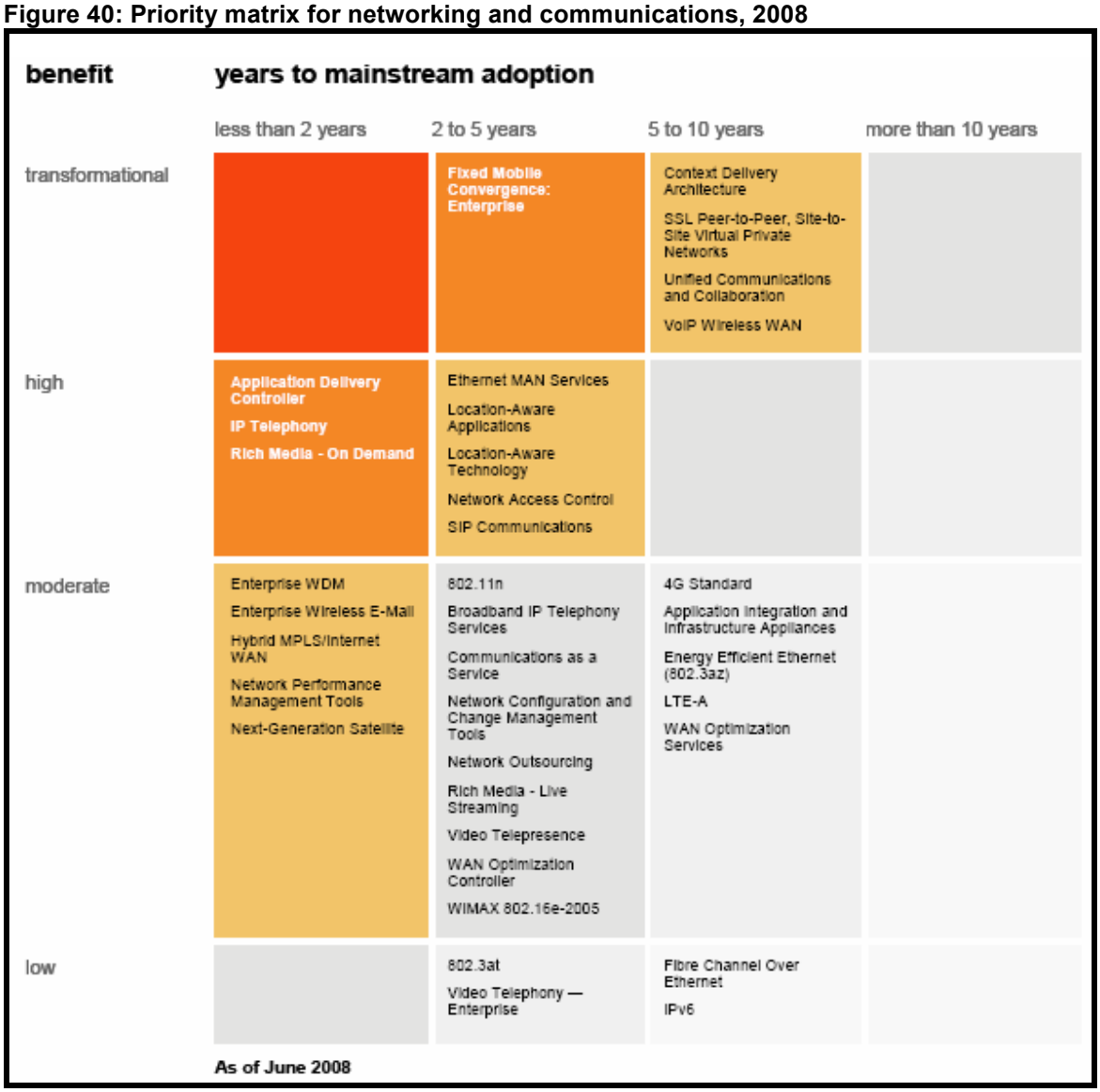
Source: DPSA, 2007a

Figure 39: Public Information Terminal mobile unit

Source: DPSA, 2007a

G: Networking and communication priorities

Figure 40: Priority matrix for networking and communications, 2008



Source: Gartner Research, 2008:8