

Exploring M-Government Readiness

The Case of Vanuatu

Willie Amos

**A thesis submitted to
Auckland University of Technology
In partial fulfillment of the requirements for the degree of
Master of Computer and Information Sciences (MCIS)**

2011

School of Computing and Mathematical Sciences

Primary Supervisor: Krassie Petrova

Secondary Supervisor: Professor Steve MacDonell

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Attestation of Authorship

“I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.”



Signature

Willie. K. Amos

28/09/2012

Date

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List of Abbreviation

1G	First generation
2G	Second generation
3G	Third generation
4G	Fourth generation
APEC	Asian Pacific Economic Cooperation
ATM	Automatic Teller Machine
AUTEC	Auckland University of Technology
B2C	Ethics Committee
BDN	Business to consumer
CCTV	Broadband Network
CID	Closed-circuit Television
CIO	Centre for International Development
CISCO	Chief Information Officer
CSPP	Computer Information System Company
DVB-H	Computer Systems Policy Project
e-Government	Digital video broadcast via handheld
EDGE	Electronic Government
EGPSR	Enhanced data rates for GSM evolution
EIU	Enhance GPRS
FOSS	Economist Intelligence Unit
G2B	Free open-source software
G2C	government-to-business
G2E	government-to-citizen
G2G	government-to-employee
GDP	government-to-government
GPRS	Gross Domestic Product
GPS	General Packet Radio Service
Gs	Global positioning system
GSM	Generations
HSCD	Global System for Mobile Communication
HSDPA	High Speed Circuit-switch Data
ICT	High-speed downlink packet access
	Information Communication Technology

IDC	International Data Corporation
IEEE	Institute of Electrical and Electronic Engineers
IM	Instance Messaging
IS	Information System
ISPs	Internet Service Providers
ITU	International Telecommunication Unit
IVRS	Interactive voice response system
JICA	Japanese volunteers
JSE	Johannesburg Stock Exchange
LAN	Local Area Network
m-Government	Mobile Government
MAP	Mobile Access Protocol
MMS	Multimedia message service
MWTs	mobile and/or wireless technology
NBV	National Bank of Vanuatu
NGOs	non government organizations
OS	Operating System
PCs	Personal computers
PDA	Portable Digital Assistants
PIKs	Public Information Kiosk
PINs	Personal Identification Number
PPP	Public private partnership
RFID	Radio frequency Identification
RTN	Reliability of Telecommunication Network
SARS	Sévère Acute Respiration Syndrome
SI	Satellite Internet
SMS	short messages
SOHITCOM	Social Health and IT for Rural Communities
SPCD	High-speed circuit-switch data
TB	Tuberculosis
TN	Telephone Network
TRI	Technology Readiness Index
TVL	Telecom Vanuatu Limited
UAS	Universal Access Services
UAP	Universal Access Policy
UN	United Nations
VAN	Value-added Network
VCC	Vanuatu Chamber of Commerce

VGO.....	Vanuatu Government Organisation
VNPF.....	Vanuatu National Provident Fund
VNSO.....	Vanuatu National Statistic Office
VPN.....	Virtual Private Network
VSAT.....	Very Small Aperture Terminal
VTR.....	Vanuatu Telecom Regulator
VTRAR.....	Vanuatu Telecommunications Regulator's Annual Report
WAN.....	Wide Area Network
WAP.....	Wireless application protocol
Wi-Fi.....	Wireless Fidelity
WiMAX.....	Worldwide Interoperability for Microwave Access
WITSA.....	World Information Technology and Services Alliance
WLAN.....	Wireless local area network
WMAN.....	Wireless Metropolitan Area Network
WPAN.....	Wireless Personal Area Network
WTN.....	Wireless Telephone Network
WWAN.....	Wireless Wide Area Network

Abstract

The notion of mobile government (or m-Government) can be considered closely related to electronic government (or e-Government) as it provides an additional channel for the delivery of public services and information to citizens. It has been known to have bridged the gaps and some of the limitations of e-Government by improving service delivery in areas where e-Government delivery of services failed. This study investigates how government organisations in Vanuatu currently use mobile technologies to provide government services, and evaluates the extent to which these organisations are technologically ready to invest in the deployment of m-Government.

A number of articles have been reviewed to find out how assessment of readiness and what tools has been carried out in similar studies. An m-Readiness framework has been created based on relevant articles. Approximately 20 government employees from various government organisations have been interviewed and also asked to complete a survey. Most of these government employees are senior managers and technical staff.

Even though the study has indicated that there is a certain level of mobile and wireless technology adoption, the m-Readiness level across government organisations is still low. There are few or no m-Government applications and services within the government organisations. The study has identified that a number of issues that need to be addressed in order to achieve a higher level of m-Government readiness. It is also believed that it will depend on the success of e-Government deployment.

The study has come up with a few suggestions on how to deal with the issues associated with the adoption of m-Government technology. An obvious suggestion is that it is crucial for the government to involve key stakeholders in the deployment of the m-Government project. Another example is to learn from relevant examples and adopting solutions that are proven to work.

Acknowledgments

I owe my deepest gratitude to the following people, who have assisted me in one way or another to complete this thesis successfully:

- My wife, Madlyne and my two sons Johnny and Pravin who has been very supportive and their unconditional love for keeping me motivated which contributed to my success;
- To my supervisor, Krassie Petrova, whose encouragement, guidance and support from the initial to the final level that enabled me to develop an understanding of the subject.
- To the proof reader, Diana Kassabova;
- My family and friends for understanding and support;
- To Godwin Ligo for his assistance in identifying and making arrangements with suitable participants from government institutions;
- To the respondents to my research; without them joining to providing research information, this study would have not been completed;
- To Pacific Internal Trust Company Ltd for financial support;
- The New Zealand government through the NZAID scholarship programme as the main sponsor for this research; without their sponsorship, this research would have not taken place; and above all
- To the Almighty God for his divine intervention and love, without which this assignment would have not come to its completion

The research project which involved collecting data from human participants, was approved by Auckland University of Technology Ethics Committee (AUTEC), reference AUTEC 10130_1108210.

Chapter 1 : Introduction and Problem statement

The trend in information communication technologies (ICTs) continues to evolve as their advancement enables people around the globe to communicate and share information. The adoption of mobile and/or wireless technologies (MWTs) in the delivery of services is apparent not only in the developed world but are also becoming to emerge in the developing countries.

According to Eyob (2004) and Lee, Tan and Trimi (2005), since the 1990s the public sectors across the globe at both local and national level have been applying the internet technology along with other ICTs in innovative ways to improve efficiency in service delivery and to engage citizens. It is a practice commonly known as Electronic Government (e-Government).

The explosion in the use of MWTs has forced governments to prepare for the transition from e-Government to Mobile Government (m-Government). While the concept of m-Government might be a relatively new specialised area, according to (Kushchu & Kuscu, 2003) m-Government cannot be seen as a separate entity to e-Government but as complementary. Lee, Tan, and Trimi (2006) also argue that though the concepts of m-Government with regards to services delivery using MWTs might be relatively new, MWTs are by no means brand new and have long been used in government organisations. For instance, MWTs have been extensively used by police squads' cars around the world. However, the recent development in MWTs makes various public information and government services available to government employees and the citizens on an "anywhere anytime" basis.

In summary, m-Government provides services and information to citizens using MWTs, especially to those who have access to the technology. MWTs include the use of portable digital assistants (PDA) and portable computers, as well as radio, cellular and satellite technology. M-government services that could possibly contribute to public services delivery will be discussed in detail in this study. The literature review in Chapter 2 explains the above concept in more detail.

1.1 The case of the Pacific island state of Vanuatu

The Pacific island state of Vanuatu is a democratic nation for the last 30 years, therefore service delivery is an important area that the government must consider while managing and controlling the affairs of the nation. Over the past few years the Vanuatu government has had to face criticism from citizens over poor service delivery. In various communities especially in rural areas, people have shown discontent and at times get frustrated by the government because election promises have not been kept. When it comes to service delivery, government faces massive pressure and challenges because services that had to be delivered to rural areas are not always delivered on time. There are several factors contributing to these challenges and the major one need to be mentioned here is due to the fact that Vanuatu is composed of over 80 small islands. Therefore, transportation is a great barrier to government service delivery.

The deployment of e-Government in many developed and some developing countries as a way of improving public service delivery. However, it has been observed that services provided by e-Government are not always visible to the public. For example, the recordings of data about the aspect of the life of citizen from birth to death are kept in

storage area that is not accessible by citizens. According to Burger (as cited in du Preez (2009)) the different phases in each of the citizens' life must be addressed in the national government strategy while developing e-Services that relate to each of these phases.

By way of service delivery e-Government may not meet the expectations and may not satisfy the need of communities as it does not deliver services directly to citizens; most of the services are delivered internally among government organisations. As du Preez (2009) pointed out, the operation of e-Services delivery within these government organizations is to cater for the smooth delivery of the direct services and this mostly takes place in the background. Further discussions on how e-Services and m-Services are delivered externally and directly to citizens will be covered in the literature review chapters along with some practical examples.

E-government has been introduced recently in Vanuatu and is still under development. Government employees and citizens are yet to realise its potential benefits. It is imperative for the government to take initiatives at this early stage of development to prepare in advance for a transition to m-Government. Government employees are expected to be more effective and efficient in providing service delivery if e-Government can be extended to the difficult to reach area.

Vanuatu, in the recent years has experienced a lot of changes in the way people communicate. According to Vanuatu National Statistic Office (VNSO) (VNSO, 2010), the cellular subscribers have surpassed fixed-line telephone users in 2002 (see Figure 1:1). This is due to the fact that almost every household in Vanuatu owns a cell-phone. Similar trend is obviously seen internationally in 2002 where there are more people

using mobile phones than fixed-line telephone (ITU, 2009). Cell-phones introduce new ways of communication. The ability to send short messages (SMS) text to communicate is one of the features of the cell-phone that is common and used widely all over the world. The ITU (2010) reported that the total number of SMS sent globally tripled between 2007 and 2010, from an estimated 1.8 trillion to a staggering 6.1 trillion. This means that an average 200,000 text messages are sent every second showing that SMS is the most favoured means for communication worldwide.

According to the International Telecommunication Unit (ITU), the recent facts and figures obtained at the end of year 2010 show that the total number of mobile cellular subscribers globally is estimated to be around 5.3 billion. Access to mobile networks is now available to 90 percent of the world population and 80% of the world population living in rural areas (ITU, 2010). It is crucial for governments to find ways to take advantage of this new trend in communication.

There is evidence (Nerenberg, 2011) that mobile technology has greatly improved service delivery to rural and difficult to reach areas in other parts of the world. For example, SOHITCOM (Social Health and IT for Rural Communities) is a program that was set up in such a way to enable women in the rural communities in Jordan to communicate with competent doctors by sending text messages via cell phone in an effort to overcome literacy and other social barriers. Based on this facts it can be assumed that Vanuatu can also have the same benefits. This is one of the motivations to conduct this research as explained in the following section.

Number of users

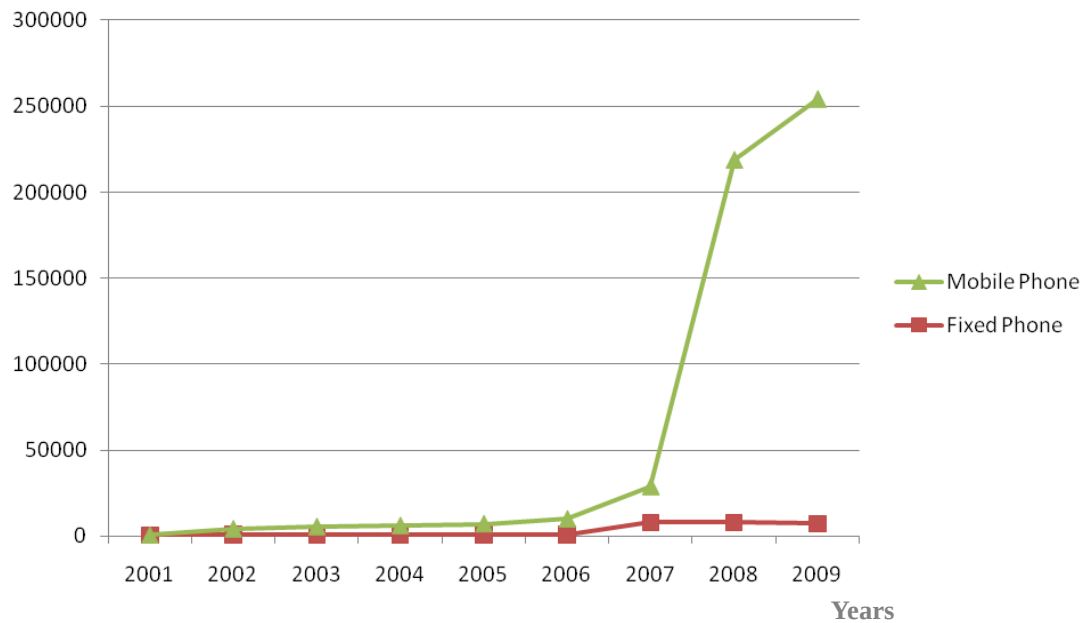


Figure 1:1 The growth of cellular and land-line phone users (VNSO, 2010).

1.2 Rationale of the study

The extent to which the use of m-Government is becoming recognised in many nations has to do with the mobile technology penetration. A number of new mobile services have emerged especially in countries with a high mobile technology penetration. More than 100 percent of mobile penetration was reported in over 30 European countries. It is obvious that almost everyone own a cell-phone, while few others may have more than one (Wallace, Hoffmann, & Scuka, 2002).

According to the Vanuatu Telecommunications Regulator's Annual Report (VTRAR) of 2009, Vanuatu had a penetration of mobile telephones of 43 telephones per 100 persons at the end of 2008. Return from the operator shows that at the end of 2009 Vanuatu has a total of 126,452 mobile telephones representing a penetration of 52 mobiles per 100 persons. The ITU considers that the rate of increase of the penetration of mobile

telephones over the last two years may have been a world record (Regulator, 2008).

The vast penetration of cell-phones in Vanuatu has created a number of possibilities for mobile service delivery. A recent report on the last population censuses prepared by VNSO indicates that there are more than 70% of the population have access to cell-phones (VNSO, 2010). MWTs have brought about new services (or m-Services) in addition to e-Services, such as m-Democracy, m-Directory, m-Banking, m-Health, m-Learning and m-Security. These m-Services will be examined further in the study.

Furthermore, Vanuatu is still at an early stage in its implementation of e-Government. There are a numbers of factors that triggers the initiatives to invest in e-Government such as maintaining political stability and the progressive political development. The withdrawal of the monopoly agreement by the Vanuatu government with Telecom Vanuatu Limited (Telecom Vanuatu Limited, 2009) (the sole provider of telecommunication services in Vanuatu) has resulted in establishment of a new telecommunication regulator. This has the advantage of giving other competitors the opportunity to invest in the telecommunication market in Vanuatu. As a result prices of mobile phones and Internet services have been greatly reduced and currently the number of people having access to mobile phones and Internet connections is increasingly rapidly. According to prior research, m-Government is 'inevitable' (Roggenkamp, 2004). Therefore, it is very likely that the Vanuatu government will soon be looking into investing in m-Government technology.

One of the most significant reasons for undertaking this study is the fact that cell-phone have greatly influenced the way people communicate in Vanuatu and elsewhere. Almost everyone around you have a cell phone and wherever you look people are busy making calls and most importantly sending text messages. Apparently cell-phone has now

become an essential part of our everyday life. One of the changes caused by cell-phones to the way people communicate is that not many people today write letters because a short text send can be received immediately within few minutes. Obviously there is an opportunity that some of the e-Services that cannot be delivered to rural areas can now be delivered using mobile devices (du Preez, 2009).

Furthermore, another motivation for this study is the way a few nations are making use of mobile technology to attract the democratic participation of citizens, especially in India, Brazil and United Kingdom (Wikipedia, 2010b). Encouraging the participation of citizens to exercise their democratic rights by using mobile applications is a service that the Vanuatu government may want to consider. Voting by means of SMS would somehow alleviate the cost involve during national election.

Around the world the so-called “mobile employees” are considered an essential part of many organisations. National governments are known to have a high number of mobile employees. For those employees who have access to portable computers or mobile phones, it is likely that they will be willing to do their work while they are out in the field. Service delivery in this way will also be examined.

When consulting various sources for relevant articles, it can be found that the number of articles related to m-Government is limited while many articles have focused on e-Government. Therefore, this study will contribute to the body of knowledge pertaining to m-Government.

At present government organisations in Vanuatu are not able to conduct any proper measurements to assess the e-Government readiness as the project for e-Government is

still being implemented. There are a number of existing tools that are available to government organisations to adopt for measuring e-Readiness. However, tools for measuring m-Readiness are non-existent.

In this study, a variety of sources will be used to create an m-Readiness framework that will refer to the m-Readiness model designed by Kirsten (2006) (as cited in du Preez (2009)). Although it looks specifically at South African mobile business adoption and readiness, the model can be used in government organisations as it specifically looks at the use of mobile technology. An m-Readiness assessment of Vanuatu will be conducted as explained in detail in Section 3.2.

The preceding sections have outlined the purpose and motivation of this study. This study will be exploring, describing and explaining the viewpoints of m-Government in Vanuatu. The section below explained the benefits of the research.

1.3 The potential benefits of the study

This study is intended to target government agencies and other stakeholders who can use the results obtained in this study to make informed decisions on how to capitalize on the potential benefits of services delivered through mobile technology. The state of m-Government readiness of Vanuatu government organisations (VGO) is the main focus of this study. It is hoped that the government will be able to use this report and its recommendations when considering future m-Government initiatives.

The Vanuatu government has established six provinces and is trying to coordinate

the process ensuring that all provinces are provided with adequate services. Since the introduction of mobile technology, especially mobile phones and wireless communication, the government has identified this technology as an important part of the communication between the government and these provinces. It is hoped that this research and its results will be able to assist the government and the provinces in decision making with regards to mobile connectivity within government organisations and the six different provinces. The national government may be able to use the recommendations put forward in this study as a starting point for further research and for establishing the practicality of m-Government in Vanuatu.

Furthermore, the research will contribute academically to the research community by building a theory about the application of mobile technologies and services especially in the area of public services delivery by government organisations. The results of this research will outline the potential benefits and the challenges of investing in m-Government technology. In addition, recommendations will be provided for the government to make appropriate decisions before investing in m-Government.

The purpose and the benefit of the study have now been identified and discussed. The study will present the research problem and objectives next.

1.4 Research Problem

Based on the previous discussion, the overall research question of the study can be formulated as follows: To what extent is the Vanuatu government ready to implement m-Government? The underlying assumption is that, although there are many examples of the use of MWTs, many shortcomings regarding m-Government readiness still exist.

The study will investigate the scope and type of m-Services currently delivered and will identify the benefits that future m-Services may bring to the citizens. Thus the main research objectives of the study are: 1) to investigate the use of mobile technology by government organisations are using mobile technology to provide government services, and 2) to identify the level of investing in the new technology within these organizations. The level of readiness of government organisations will provide an indication of the government organization's current use and ability to utilize mobile technology.

Furthermore, the study will:

- Provide a better knowledge of m-Government within the context of e-Government;
- Investigate on how the Vanuatu government has been utilizing m-Government especially in public service delivery;
- Outline some of the m-Government possible future applications in Vanuatu;
- Offer an important investigation of the benefits, drawbacks, limitations and challenges of m-Government;
- Instigate ways on how to improve Vanuatu m-Government level of readiness.

The above objectives however, will be discussed within a confined scope. The scope and limitation of the research will be discussed next.

1.5 Scope and Limitations

The m-Readiness of VGO is the focus of this study. A number of articles have been consulted in search for an m-Readiness tool that could be used to determine the m-

Readiness of Vanuatu government. Most of the UN e-Readiness assessment report has been referred to in this study but the study conducted by Kirsten (as cited in du Preez (2009)) was adopted as a baseline for this study. Du Preez (2009) used Kirsten tool to determine the provincial m-Government readiness in Western Cape in South Africa. The m-Readiness tool is discussed further in Sections 3.2. In this study the various government organisations in Vanuatu are the units for analysis and will be explained in detail in Chapter 3. The lack of m-Readiness tools is one of the limitations of this study and is presented below.

As previously discussed there are limited or no recognised tools that can be used to measure m-Readiness of an organisation. Therefore this study has mostly referred to the work by Goldstuck (2003), Parasurama (2000) and the study conducted by du Preez (2009). Most of their work correlates with the aim and purpose of this study. Chapter 2 present a detailed discussion on how the existing literature has been used to device a tool for this study. Due to the time constrains of this study designing a complete tool for measuring m-Government readiness is not possible as it would require much further research.

Although the study is limited to the case of Vanuatu, the results may be applicable to other developing nations as the research model is provided in the existing literature and builds on results from other studies with similar objectives. According to the author's knowledge there have been no other similar studies of developing Pacific Island nations.

1.6 Outline of chapters

A comprehensive overview of m-Government has been presented in this study including

the investigation of the current situation of Vanuatu m-Government readiness. Chapter 4 and Chapter 5 outlined a summary of the findings.

Chapter 1: The background and introduction of this study is presented in this chapter. This chapter also discusses the objective of the study and defined the research question. The scope and limitation of the study were also covered explaining the area to be researched and the challenges involved.

Chapter2: Literature Review. A comprehensive literature review of the study is provided in this chapter. It explained the m-Government local and global aspects and how it correlates with e-Government. The main concepts of the research are explained in this chapter. This chapter explores the various aspects of m-Government such as its applications, benefits and examples. The technology associated with m-Government such as mobile and wireless networks and the software and application involved are briefly discussed in this chapter.

Chapter 3: m-Government readiness: This chapter is devoted to defining and explaining m-Government readiness as part of the literature review covered in Chapter 2. It explores the various e-Readiness tools that exists and device and explained the m-Readiness framework compile for this study.

Chapter 4: Methodology. This chapter outlines how this study has been conducted and discusses the research approach and the method used. The gathering of data and its analysis are outlined. The methods of primary and secondary data collection related to m-Readiness framework are covered in this chapter.

Chapter 5: Research findings. The chapter addresses the core of the study, the research findings and the results of measuring the VGO m-Readiness. The research findings are based on data collected from within the government departments, ministries, and other statutory bodies on m-Government various aspects. The impacts of m-Government on the citizens are also covered in this chapter including m-Government resources and activities.

Chapter 6: Discussions and Conclusion. The final chapter summarises the findings and concludes the study. Recommendations are made regarding the future possibilities of utilizing MWTs within VGO.

1.8 Summary

The latest report of the census released by the VSO shows that over 70% of the population have access to cell phones. This shows that over the past few years many people in Vanuatu have been embracing mobile communication technology.

Vanuatu government has just recently introduced e-Government and it is still under development. Policies and strategies of e-Government services are yet to be decided. While e-Government services are yet to be delivered, the advances in technology mean that MWTs within the context of this study is becoming a new focus area. The widespread of cell-phone penetration creates an opportunity to capitalize on the services that could be delivered via mobile channel.

The adoption of mobile technology in government organizations today shows that many

government employees are becoming mobile employees. This means that important data in the office needs to be accessible by officers who are out doing field work and mobile employees need to keep in touch with the head office. In addition, there are examples and many opportunities of the use of mobile technology in various public services which have been covered in this research such education, health and security.

M-Government has the potential to contribute significantly towards public service delivery, but it is very much in its beginning phase. This study looks at how ready the VGO are to make use of m-Government to deliver their services using mobile technology. The purpose and motivation that drives this study and its main objectives are outlined in this chapter. The background of this study is also briefly discussed. The next chapter provides a literature review that covers the key concepts associated with m-Government, their definitions and other aspects in the area of MWTs.

Chapter 2 : Literature Review

A large part of this study is conducting a literature review related to the following three main areas: m-Government, e-Government and MWTs. This allows the build up of a theoretical background that supports the study. The literature reviews also includes exploring and studying the recent e-Government strategy of the Government of Vanuatu.

M-Government can be considered one of those contemporary issues related to emerging technologies that are only discussed in very few papers and books. M-Government in recent studies shows that its concepts relate to e-Government. Therefore, this study explores this relation between m-Government and e-Government. It is apparent that the changes and improvements in telecommunication industries around the world and especially in the area of mobile phones have resulted in many organisations considering mobile technologies as important tools for service delivery. This is not only the case with the private sector but the mobile technologies are becoming more useful in the public sectors as well. Hence there are an increasing number of articles and reports from over the world that provide meaningful and useful discussions on m-Government. The key concepts related to m-Government are explained further in this chapter.

The various aspects of m-Government are also discussed. This includes m-Government examples, benefits and the challenges. A brief review of the legislative context within which VGO as a unit of analysis for this study operates is also discussed in this chapter. In order to gain a better understanding of the m-Government applications and services it is necessary to understand the underlying technology infrastructure as well as the environment in which it operates. In this chapter the technologies used to deliver m-

Government services will be discussed. Firstly, the concepts of e-Government will be explored.

2.1 E-government

Since there are numerous research articles about e-Government it is reasonable to expect that several definitions for e-Government will be found.

The World Bank (2010) defines e-Government as “the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government”. E-Government can potentially control fraud and corruption as stated by Singh and Sahu (2008). According to Lallana (2008) “e-Government is about the improvement of public services by means of ICTs”.

The use of internet to enhance government information services to other government organizations, government officers, citizens and private business organizations is refer to as e-Government. This approach of government providing services using internet to these four different sectors is known as e-Government delivery model. There are four main components in the delivery model: government-to-government (G2G), government-to-employee (G2E), government-to-business (G2B) and government-to-citizen (G2C) (Goldstuck, 2003; Ya Ni & Tat-Kei Ho, 2005).

According to Heeks (2006) e-Government can be any process or task or services that are delivered electronically or by means of ICTs. Heeks considered the services to be

conducted on various mobile options. These include front-desk service as well as support services such as maintaining the network infrastructure.

Although e-Government is often thought of as online government or Internet based government, many non-internet electronic government technologies can also be used in this context (Wikipedia, 2010h). The following are some of these non-internet technologies: Telephone and fax; Bluetooth, smartcards; SMS and multimedia message service (MMS); Closed-circuit television (CCTV); Radio frequency identification; and few others are listed by Wikipedia (2010h).

The various definitions of e-Government discussed above all seemed to refer to electronic government technologies, specifically ICTs. As previously stated, delivery of government services can be conducted either directly or indirectly. Therefore, this study refers to e-Government as the delivery of service that is conducted through the ICTs either directly or indirectly. Direct delivery is having direct access to any of e-Government services and the indirect delivery is the maintaining of the back end system such as keeping the network infrastructure up and running. All these services provided by e-Government involve a number of e-Government indicators as depicted in Figure 2:1.

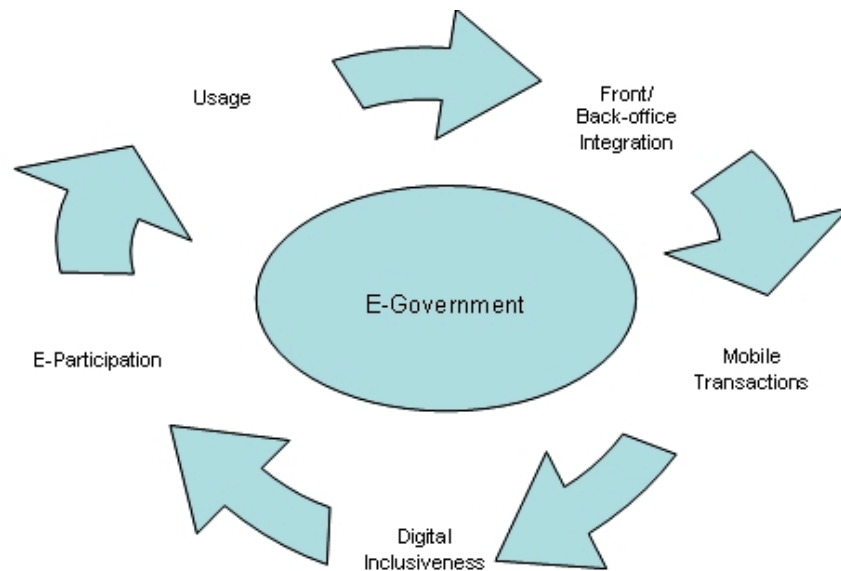


Figure 2:1 E-government indicators. Source (United Nations. 2008).

Furthermore, the services delivered by e-Government can be divided into different channels or different modes of delivery. The following section discusses these further.

2.1.1 e-Government Delivery Model

The primary delivery model can be divided into various segments. Heeks and Lallana (2008) looked at these various segments for public service deliver as a delivery channel while Wikipedia (2010h) call it the delivery model. Goldstuck (2003) explained this model of delivery as a delivery directions or market segments. The business world tends to divide its market broadly into consumer and business markets while the public sector considers the government and employee of government. The various channel of delivery is explained below.

Government-to-government (G2G) refers to the interdepartmental functions or services such as information sharing. It is the online non-commercial interaction among

government organisations, departments, and authorities. Government-to-Employee (G2E) refers to the employee having constant communication with the government where personal information can be addressed with the government by the employees.

Furthermore, government-to-citizen (G2C) is often referred to as government to consumer within the business context but in this study it denotes the interaction between government and the general public or citizens. G2C enables private individual to interact online with government. This online interaction can be any e-Government services that are provided online such as government web portal. This segment provides a number of services that include applications and issuing of passports and various certificates such as birth, marriage and death as well as many others. It has been noted that services provided in this delivery channel are not limited to the government portal but can be a direct communication such as email and media campaign.

In the segment of government-to-business (G2B), local and commercial business organizations interact online with the central government. G2B mostly involves business dealings between government and other business sectors through various services. These services can be recognised as business registration, import and export, taxation and also provide employment and online training. G2B also covers issues such as legislation and policies, labour and few others that relates to business.

2.1.2 Evolution of e-Government

The United Nations' (UN) spotlight resources (Nation, 2010b) show that e-Government goes through five different stages. Stage1 is the Emergence and looks at the government online presence. Stage II is the enhancement of public policies including laws and

regulations while stage III considers the interaction that enhances the convenience of citizens through interactive portal. Stage IV involves transactional which is a two-way interaction between government and citizens. It refers to the ability to make online transaction such as business license renewal and payment of tax. The final stage considers the connectivity especially the various connections between different levels of government to other sectors. A detail outlines of these stages can be obtained from the United Nations spotlight resources (Nation, 2010b).

Section 2.1 discusses the general knowledge of e-Government covering the definitions and the associated delivery model, as well as the evolution of e-Government. In the next section e-Government readiness will be discussed.

2.2. E-Readiness

Similar to e-Government having more than one definition, e-Readiness also have various definitions. The Bridges.org organisation (Bridge.org, 2008) defines e-Readiness as “the ability for a region to benefit from information and communications technology”. E-Readiness is “the ability to use Information and Communication Technologies to develop one's economy, to foster one's welfare” as defined by Penaloza (2010). In simple terms it can be defined as “the extent to which e-Services can be deployed”.

There are various ways of measuring e-Readiness and the UN (United Nations, 2010c) have used one of the most common measuring tool which incorporates three indices to determine e-Readiness level: “Web Measure Index, Infrastructure Index and Human Capital Index”. In addition, there is another related index, the E-participation, as

pointed out by Palvia and Sharma (Palvia & Sharma, 2007).

Within the indices of Web Measure index, a survey is carried out on the various services at each of the five different stages explained in the evolution of e-Government (see Section 2.1.2) to determine its Web Measure Index. The higher the value of the index, shows that each stages having greater number of services. Figure 2:2 shows the different phases of the Web Measuring Index (Nation, 2010c) .

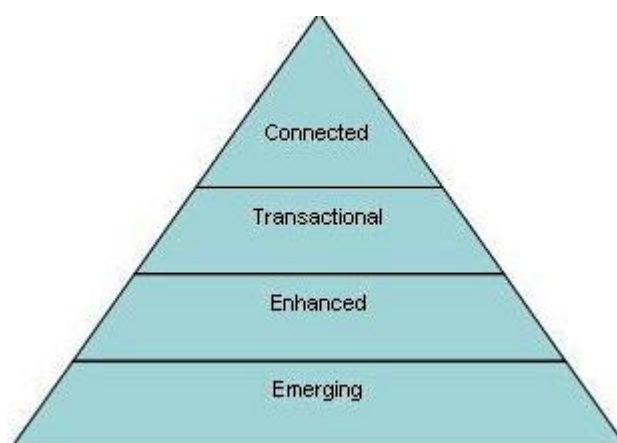


Figure 2:2 Phases of web measuring index. Source (Nation, 2010b).

Infrastructure Index refers to surveying infrastructural indicators by taking a composite weighted average index of six primary indices. The index is measured by surveying the number of people out of a 1000 who have access to the following six indicators: televisions at home, have a telephone line, access to computers, internet users and broadband users (Nation, 2010c).

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 carries one third (Nation, 2010c).

E-Participation Index is used to assess the quality and usefulness of information and

services provided by a country's government for the purpose of engaging its citizens in public policy issues. This index is indicative of both the capacity and the willingness of the country's government in encouraging the citizens in promoting deliberative and participatory decision-making and of the reach of its own social inclusive governance program (Nation, 2010c). Figure 2:3 show the e-Participation between citizens and government.

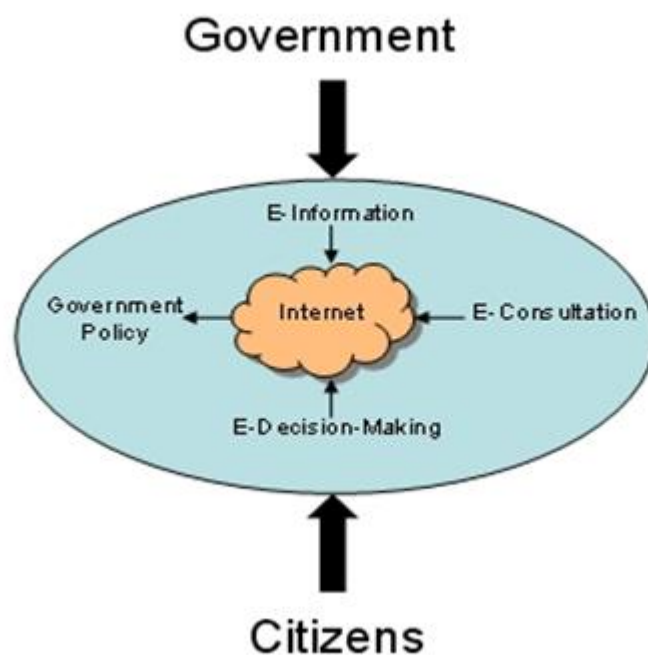


Figure 2:3 E-participation between government and citizens. Source (United Nations, 2010c).

The UN based on these indices has ranked 192 countries on e-Readiness status. The survey results for the Oceania region in 2010 is presented in table 2.1. The first top 10 countries shows Korea Republic is leading in the ranking followed by US and Canada.

Table 2:1 E-Readiness index for Oceania region. Source(United Nations, 2010a).

Country	E-Government 2010	Rank 2010	Rank 2008	Rank Change
 Australia	0.7863	8	8	--
 New Zealand	0.7311	14	18	+4 
 Palau	0.4189	103	183	+80 
 Fiji	0.3925	113	105	-8 
 Samoa	0.3742	115	115	--
 Tonga	0.3697	116	112	-4 
 Vanuatu	0.2521	155	154	-1 
 Solomon Islands	0.2445	156	147	-9 
 Papua New Guinea	0.2043	171	166	-5 
 Kiribati	0	184	183	-1 

E-Government Ranking of 192 countries for the Oceania regions recorded on year 2010. The recent survey conducted by UN (United Nations, 2010a) on 192 UN member countries indicated that only Australia and New Zealand are countries in the Oceania region that have a high ranking compared to other Oceania countries. The report shows that the small island nations of Oceania regions are not even below 100 in their ranking. Vanuatu was ranked 155 in the e-Readiness index of the world ranking and rank 7 among the other 14 countries of the Oceania regions. Vanuatu is one position lower in its ranking position compared to the last UN e-Government report of 2008. This could only mean that although there is government web presence, there is a need for the government to provide more functionality in the current government web portal in order to improve its ranking. In addition, the current e-Government project is still at its implementation phase and is not yet operational.

Low ranking of countries in this recent report is mainly due to the cost that is very expensive to deploy an infrastructure that is robust. It can also be the fact that e-Government policies have not been successfully implemented as argued by the UN (Nation, 2010a). Figure 2:4 show the e-Readiness level of Vanuatu since 2003.

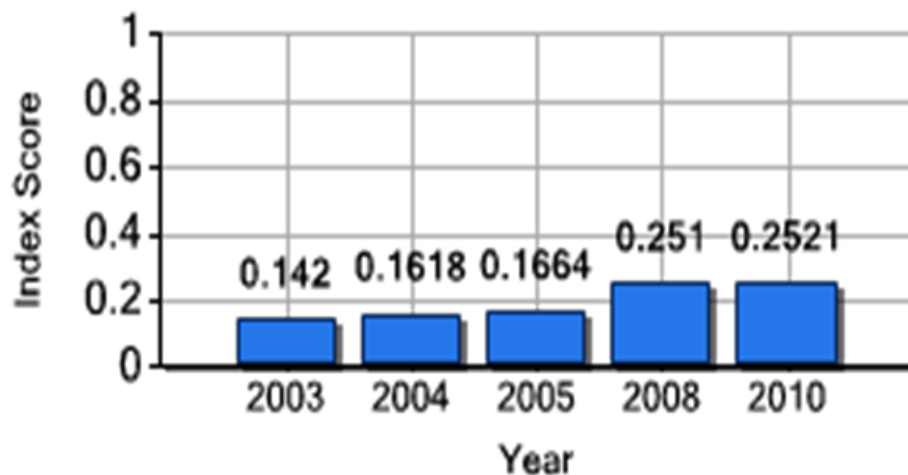


Figure 2:4 Vanuatu e-Readiness scores from 2003 – 2010 (Nation, 2010a).

If Vanuatu is compared to the rest of the Oceania countries, it does not really show a good picture as it was at an average position and if compared to New Zealand and Australia there is a huge margin in the e-Readiness scores.

M-Readiness can be defined as the extent to which m-Services can be deployed. In fact, this study is to investigate further the m-Readiness by using appropriate tools that already exist. The tool used in this study was compiled using various sources such as the study undertaken by Goldstuck (2003), and du Preez (2009). This will be explained in detail in Sections 3.2 of m-Readiness.

We have now covered the concept of e-Government and the related e-readiness assessment. The next section discusses m-Government aspects.

2.3 M-Government

It has been observed that even though a number of wireless technologies had been applied by various government organisations to improve employees' mobility long before the advent of the internet, modern m-Government practices are mainly based on the internet technology. M-Government today has been making use of the wide range of latest mobile and wireless technologies to deliver services, engage citizens and improve performance. Lallana (2008) argues that while “m-Government can refer to the use of mobile technology such as mobile phones, portable computers and PDAs devices to deliver any government services, it should also include a wireless local area network (WLAN)”. This makes it difficult to provide a definition to m-Government. Few of the formulated definitions given to m-Government are discussed below.

2.3.1 Definition

M-Government can be clearly understood with a precise definition if the difference between the term mobile and wireless first be established. Mobile means 'capable of moving or being moved'. In the context of ICT, a mobile device is one that is portable and can be carried by an individual to (almost) any place and still satisfies the communication needs (Chang, Kannan, & Fellow, 2003). On the other hand 'wireless' means 'without wires'. A wireless device is not necessarily capable of moving or being moved. For example a desktop computer can be connected to a local area network and the internet through a wireless router. It is a wireless device but not a mobile one. The most prevalent mobile communication devices include mobile phones, laptop computers, PDA, pocket PC and pagers.

According to Wikipedia (2010b) wireless is defined 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”. Communicating through devices that are not physically connected can be referred to as Wireless. In 1894, one of the earliest example is the transmission of radio signals wirelessly by Marconi (Goldstuck, 2003).

Therefore, governments need to make use of wireless technology in order to provide mobile services. It becomes obvious that the success of m-Government depends on both mobile and wireless technology. In their annual glossary of mobile and wireless, Gartner research differentiated further the term “mobile wireless” and “semi-mobile wireless” (as cited by du Preez (2009)). They explained that “mobile wireless means that the client stays connected to the network at vehicular speeds”. They refer to “semi-mobile wireless” when the device moves no faster than pedestrian speed while remaining connected.

According to Maumbe and Owie (2006) m-Government is the use of mobile technology to deliver government services and information. This includes mobile and wireless networks devices. They pointed out that Laptop should be considered as a portable device as it is not truly a mobile device. However, the advancement in the technology shows that now most laptop or portable computer devices are capable of accessing wireless networks using wireless Fidelity (Wi-Fi) and/or Bluetooth.

Singh and Sahu (2008) argue that m-Government should not be seen as a substitute for Web-based government. While mobile phones may have limitations in providing full internet functionality, their additional channel can still be used to have access to

government services.

Davidson (2005) provides a definition of m-Government by referring to m-Democracy services where it brings about the m-Government concepts to be part of the political process. Government information can be made accessible to citizens through m-democracy anywhere at any time. Therefore, within the context of this study m-Democracy can be referred to as citizens having the opportunity to use mobile technology to take part in the political process.

According to Kushchu and Kuscü (2003) m-Government is defined as “the strategy and its implementation involving the utilization of all kinds of wireless and mobile technology, services, applications and devices for improving benefits to the parties involved in e-Government including citizens, business and all government units”.

As described earlier, m-Government is not meant to replace e-Government but it is an add on to e-Government that is confined to the use of mobile technologies such as mobile phones, PDAs, Wi-Fi enabled devices, blue tooth and wireless networks for delivering services (Ghyasi & Kushchu, 2004). Similar definition is provided by Wikipedia (2010c): “the extension of e-Government services and applications which are only possible using cellular/mobile telephones, laptop computers, PDAs and wireless Internet infrastructure”. Furthermore Sing and Sahu (2008) argue that m-Government should not be seen as a substitute for Web-based government. In line with this definition Rossel, Finger and Misuraca (2006) conducted a study that focuses on mobile e-Government and explains how to motivate users to access e-Government services by extending the services to mobile phones.

The various definitions of m-Government presented above clearly show that the wireless and mobile technology cannot be considered separately when defining m-Government. It can be argued that mobile and wireless technologies are the main enablers of the adoption of m-Government. Therefore, our definition of m-Government in this study will refer to government providing services to employees, citizens, businesses, and other government organisations using MWTs. The next section explains public services by defining the electronic services using mobile applications and service that will assist in providing further definition of m-Government.

2.3.2 Mobile services and application

The term e-Services mean electronic services and has many applications that can be found in many disciplines. As discussed above, the context of this study is within the public sector. Therefore the use and description of 'e' or 'm' services in this study is limited to the context of e-Government and m-Government. This study refers to the services delivered by the use of ICT as part of public service delivery as e-Services. M-Services, on the other hand, are services that can be delivered by means of MWTs.

While e-Government in Vanuatu may still be at its early stage and is undergoing development, the Vanuatu government is yet to develop a central web portal that can incorporate all e-Government services. The current website of the Vanuatu government www.governmentofvanuatu.vu (see Figure 2:5) is still under development. Currently the site only displays general government information and services such as news, government contacts and other government related reports. Despite this, a few other government agencies have developed their own e-Services. For example the Department of customs website www.vanuatucustoms.org provides the ability for citizens to

download various application forms, etc.

There are various m-Services applications that are discussed in the next sections and Lallana (2008) identifies four of these applications.

There are at least four ways in which m-Government can be applied in the public sector as described by Lallana (2008): m-Communication, m-Transaction, m-Democracy, m-Administration. While Lallana (2008) may have listed four of these mobile applications, there are other m-Services that are also covered in this study. Other examples of mobile applications are m-Security, m-Conversation and m-Information.

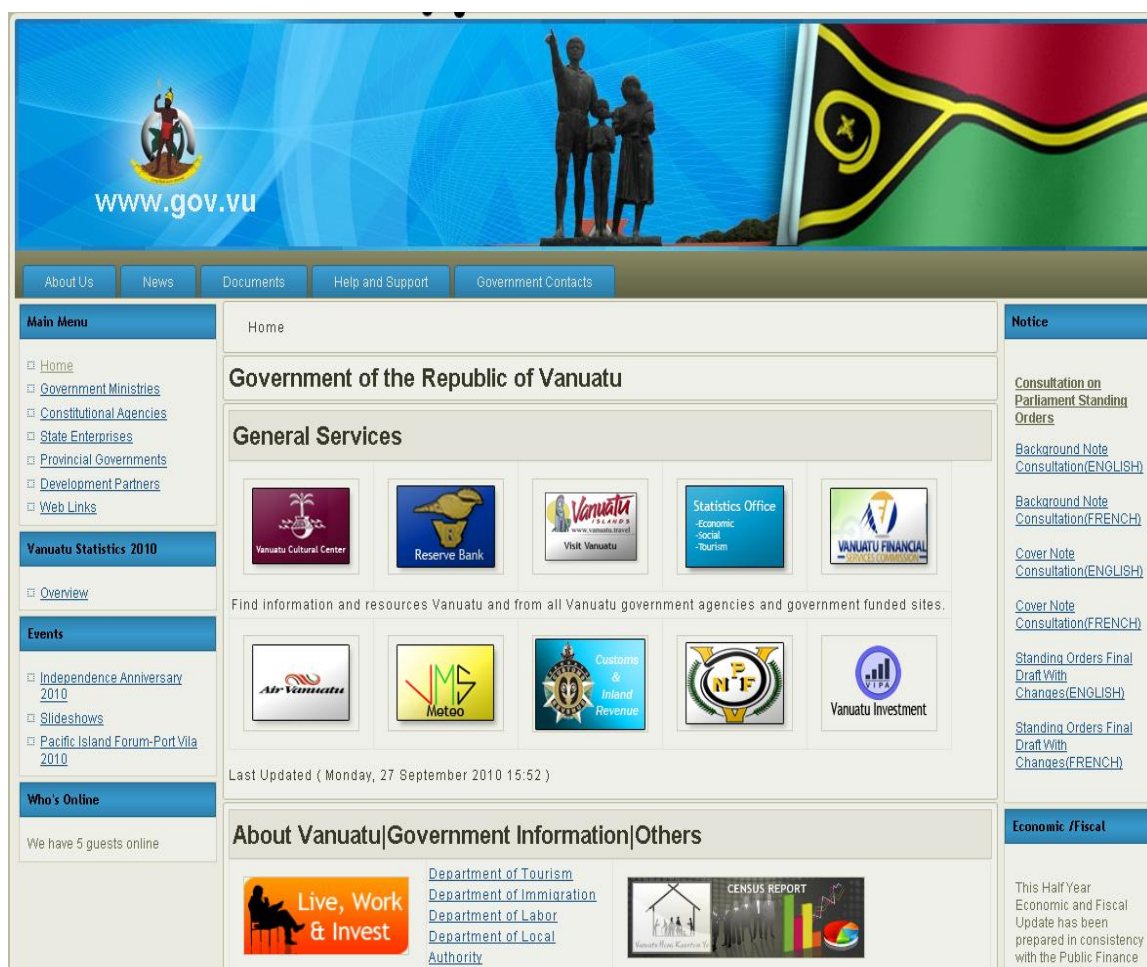


Figure 2:5 Vanuatu government online information. Source(The Republic of Vanuatu government, 2010).

M-Communication is possibly the most important aspect of m-Government within the four delivery segments that enhances communication. Communication facilitates the pushing and pulling of information before any other activities could take place. Citizens can make better decisions and encourage transparency and accountability only if they can have sufficient information. Using mobile devices makes it easy for government to reach out to citizens. There are a wide range of issues that government can notify citizens using a mobile phone. For example, alerting citizens of passport renewal, court sitting/hearing, medical examinations results, security threats, and parliamentary notice. These have already been implemented and used in countries such as Singapore, Malta and the United Kingdom (UK) Lallana (2008).

M-Transactions and m-Payments involve mobile application that can be used for making transactions and payments. Citizens interact with government service delivery using such application. As an example in Finland commuters send SMS ticket to pay for public transport. In addition, in Norway taxpayers can send special code and personal details to government via SMS once the return tax received by post is correct. Such a service has benefited over 1.5 million Norwegians in such a way that the form need not be return by mails (Lallana, 2008). In section 2.5 few examples are listed.

M-Democracy consider the use of SMS by citizens to participate in the democratic process of a country. There has been great concern over security and privacy, therefore m-Services has not been used widely yet. The use of m-Democracy is believed to increase if the associated application improves its security. Voters in Liverpool and Sheffield in 2002 elections have the ability to cast their votes via SMS if they are provided with personal identity numbers (PINs) (Lallana, 2008).

M-Administration looks at improving the operations internally within the public sector. Using mobile devices through MWTs and having access to intranet and internet can be useful to officials having access to real time data. This becomes really helpful to government officers doing field work and interacting with citizens face to face.

Lallana (2008) may have been describing m-Services using these four terms collectively, there are few other services that have been created. For example, m-Banking, m-Security, m-Health and m-Learning are services that were implemented as a result of mobile service delivery. These services were discussed in brief in section 2.5. M-Government drivers and other services and the technology involved will be discussed next.

2.3.3 m-Government drivers, services and technologies

The forces that influence the move from e-Government to m-Government activities include some major changes in the technological infrastructure and the advances in mobile telecommunication services. According to Kushchu and Kuscü (2003) the technological changes can be broadly grouped into three major trends: mobile device penetration; convergence of wired Internet and wireless telecommunication networks; and the move towards 3G – 4G services and higher data transfer rates. These trends help form the foundations for governments to build their mobile services, including service personalisation and location and context aware services.

Figure 2:6 presents data about predicted mobile phone penetration in Europe for 2001-2005. In the case of Vanuatu, a similar picture as presented in Figure 1:1 and anyone could tell that almost every person you meet in the city of Port Vila has a cell phone.

According to Davidsons (2005) since majority of the people in a society are using

mobile communication, it is expected that many people will be directly receiving government information. This has the advantages of targeting younger citizens to be able to communicate and interact with local authorities and government department as pointed out by Davidsons. In areas where there is limited access to PC and internet, services can still be delivered to these areas in a cost effective way especially via mobile access. In Japan, many homes uses mobile phone to access Internet because of limited space for home computer (Davidson, 2005). The above still holds true in most cases, though there is much big different compare to the situation in Vanuatu and other less developing countries. For mobile government services to reach citizens in rural areas it depends on the deployment of mobile centres in those areas.

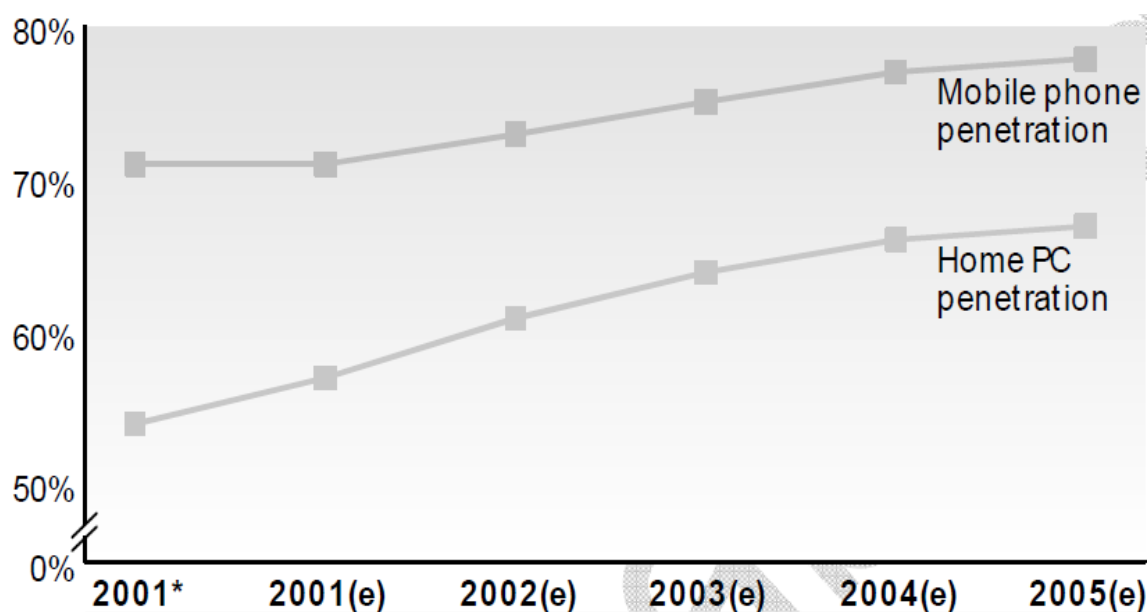


Figure 2:6 Estimated numbers of pc and mobile phone owners in Europe. Source (Kushchu & Kuscü, 2003).

In addition to the driving forces behind m-Government discussed above, Goldstuck (2003) argue that for a successful deployment of m-Government it should contribute to service delivery; Goldstuck identifies the following critical areas where the quality of service delivery can be improved.

Connectivity: It is important that employees are connected at all time and be able to have access to the right information at the right time. According to Goldstuck (2003) the mobile workers depend on the information they need and if there is no connectivity everything else fails.

Personal communications: Communicating and to keep connected with the mobile workers has been greatly improved through mobile devices and services especially the use of e-mail, instant messaging and SMS.

Information management: It has often been noted that if there is no accurate, accessible, and updated information, it is likely that users will hardly use the information even if connectivity is great.

Logistics: The use of MWTs can greatly assist governments dealing with everyday business logistics. For instance, government could improve in its management of resources by using mobile applications such as managing government assets.

Positioning and identifying: There has been a lot of improvement in the way emergency services are responding to emergency call using positioning software tools especially in location-based services. The technology use today provides the capability to identified customers or emergency callers. This types of applications can also be used to identify any criminal activities that are taking place or using GPS coordinates where road repairs are needed (Goldstuck, 2003).

Transactional: Goldstuck (2003) indicates that “improved interfaces and applications could be extended to services, such as paying of municipal fees, topping-up electricity accounts, motor vehicle license renewal”.

The delivery model (G2G, G2E, G2B, and G2C) can be improved with possible services within each of these areas discussed above. M-Government current examples provided in Section 2.8 present further knowledge of the MWTs possibilities. MWTs overview is discussed next.

2.4 Wireless Mobile Technology Overview

To better understand the m-Government applications and services, it is necessary first to understand the underlying technology infrastructure and environment that it operates upon. In this section the technologies that are associated with m-Government will be discussed briefly with a focus on wireless mobile technologies. Further in the text, “mobile” and “wireless” are used interchangeably

According to Chang, et al (2003) the “key characteristic of the wireless environment is ‘ubiquitous interactivity’ as presented in Figure 2:7. Second, a wireless device is distinctly personal, and its usage can be tracked to an individual rather than to a household as in the case with PCs and other devices. Third, wireless technology is ‘location aware’; it is an issue to track where the user is physically located as long as the wireless device is on”. Mobile applications and services are developed and implemented in order to utilize these three important characteristics.

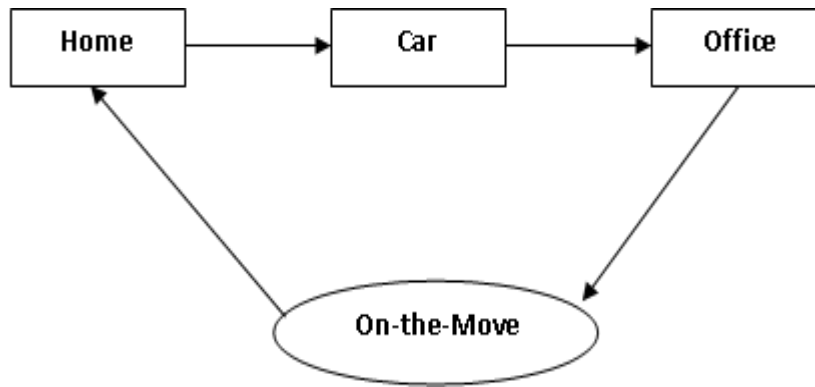


Figure 2:7 Key characteristic of wireless environment (Chang, et al., 2003).

However, it is important to consider the usability of mobile wireless devices as another important factor while designing and developing mobile applications. For example the limited size of the device can be a problem in displaying information. Chang et al (2003) also highlight one of the major issues surrounding the use of wireless mobile devices. The bandwidth for wireless transmission is a constraint that limits the use of wireless technology to predominantly text-based, less information-intensive exchanges and interactions.

Furthermore, Chang et al (2003) point out three important issues that must be addressed: security, privacy and application platforms. More of the discussions based on these issues can be found in the following sources Sharma and Gupta (2004), du Preez (2009), Gartner Research (Jones, 2008) .

Today the way many people work and live have been greatly influenced by MWTs. This can be a real challenge for government keeping up to date with new technologies because of its advancement that is growing at a very rapid pace. Most experts advise that because of this rapid advancement, only proven technologies should be adopted by governments as noted by du Preez (2009). These rapid advancements might not be

obvious, telecommunication companies in Vanuatu are deploying services such as general packet radio services (GPRS) using the 2.5G network which is an improvement over the current 2G network. With the great potentials of 3G network, it is expected that these companies will soon be looking at upgrading the network to 3G.

The mobile wireless infrastructure are implemented and maintained by service providers. According to the Vanuatu Telecommunication Act service providers are referred to as a person who provides or is entitled to provide a telecommunications service under a license or exception (Regulator, 2008). 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 Telecom Vanuatu Limited (Telecom Vanuatu Limited) held this role in Vanuatu and was responsible for establishing the telecommunication infrastructure. Mobile and wireless technologies have been used by TVL to deliver their services (Telecom Vanuatu Limited, 2009)

Cellular service providers had laid a great foundation in Vanuatu since the signing of the liberalisation of Vanuatu telecommunication market. TVL and “Digicel” the recent cellular operator in the market have been successful in providing mobile services in the past few years. The number of subscribers of cell-phone in Vanuatu is said to be increasing at a very high rate (Post, 2010).

2.4.1 Mobile and wireless device

Mobile and wireless devices ranges from mobile phones and computers to devices for

entertainments 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. The intention of this section is only to provide an introduction to some of the mobile devices that are commonly used today.

Mobile Phones

Mobile phones are known to be the widely used mobile devices today. Apparently, there has been a dramatic reduction in the cost of the technology to an extent that enables anyone to have access to mobile phone.

Mobile phones are often categorised into two major groups, namely low-end or features phone and smart phone. Feature phones (sometimes referred to low-end phones) have less computing ability, although they have that features that weren't available on most other contemporary mobile phones. Newer features phones can often run applications based on Java ME or BREW. They are mainly used for voice and SMS text. They have evolved over time and today many have functions such as alarm, calculator, calendar, games, stopwatch and basic scheduler. However, the feature phones have less advanced programming APIs and are unable to run native software. Some of the major distributors of these phones in Vanuatu are Coral, Motorola, Nokia, and Samsung.

Smartphone are a category of mobile devices that provide advanced capabilities beyond a typical mobile phone. Smartphone run complete operating system software that provides a standardised interface and platform for application developers (Wikipedia, 2010). Compared to feature phones, Smartphone usually have a standard phone keypad for input and have larger displays and more powerful processors. The two major

Smartphone platforms are Series 60 (by Nokia) and Windows Mobile for Smartphone (by Microsoft).

2.4.2 Mobile computers

Among the wide varieties of mobile computers that exists, laptops, notebooks, or tablets PCs are noticeably the most common. In the early 1990s is the emergent of the palmtop with Palm Pilot (Goldstuck, 2005). Then come the development of PDAs that incorporates such applications as appointment calendar, address book for recording contacts and a text editor. PDAs in the past were different from Smartphone, but this has changed seeing that both have become merged. This means that any PDAs marketed devices is similar to any market Smartphone devices (Goldstuck, 2005).

2.4.3 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). These devices are used in wide range of applications.

Another mobile device that has gained popularity is the Apple iPhone. It is a three-in-one device that combines a phone, an iPod, and an internet device with email and internet access. There have been already experiments with the use of such devices for education purposes in future.

2.4.4 Application and Software

The functioning of the mobile devices depended upon two types of software: the operating systems and the application software. The device must be loaded with the operating system (OS) before it can be operated. These are the instructions operating the device behind the scene (Goldstuck, 2005). The most common OS know today that drives mobile devices such as Symbian, Windows, and Palm OS.

The software applications depend on the OS to perform a particular function. Some of these popular mobile applications could be music applications to listen to music, viewing and managing of photos and text editor. Goldstuck (Goldstuck, 2005) provides more information on these different types of mobile OS and application software.

There are no standards sets on the use of these mobile devices OS and software applications within the level of any international government. However, there are currently a sets of standards regarding current MWTs and Goldstuck (2003) outlines some of the central issues regarding these standards. In Vanuatu, GSM is a standard that is use for mobile phones which is suitable for future mobile technology such as GPRS. Like in other countries Vanuatu's wireless network is driven by the Institute of Electric and Electronic Engineers (IEEE). Refer to the Wikipedia (Wikipedia, 2010e; Wikipedia, 2011b; Wikipedia, 2011c) for more explanation on this standard and its practical applications.

The preceding sections have explored the general overview of MWTs that are associated with the implementation of m-Government. The examples of m-Government are discussed next.

2.5 Examples of m-Government Services

In the preceding sections it has been observed there are various reasons that citizens needs to interact with government. For examples, citizens need to seek approval from the government authorities to start a business, building and many other activities. Citizens must pay taxes, duties and licences as required by the laws. On the other hand governments make donations, pay for subsidies and social pensions. At present these interactions could mostly be happening in a face to face interaction. However, there are currently other channels that services can be offered allowing for a different way of interaction such as through phone calls and accessing the internet.

Many of the examples of the used of mobile technology can be found in private and government organizations around the world. The examples of these different services can be classified into the following categories: m-Communication and m-Information services; m-Transaction services; m-Democracy services; m-Administration services; m-Education services; and m-Security services Lallana (2008). Many of the examples of the practical applications are not covered in this study, but can be refer to in the following sources; (Singh & Sahu, 2008), (Chevallerau, 2005), (Goldstuck, 2005), Goldstuck (2003), (Canada, 2009), (Kingdom, 2010), (Suarez, 2006), (du Preez, 2009). The benefits of m-Government are discussed next.

2.6 Benefits of m-Government Services

Heeks and Lallana (2008) state; “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”. As a result this will improve the quality of information supply, the processing time will be greatly reduced, the burdens of carrying out administrative task is reduce and the reduction in the cost of services. On the other hand, service levels are improved, increasing customer satisfaction and increase efficiency (EU, 2004).

These improved services will greatly improve the life of citizens with a high turn-around times. That is citizens now have the ability to interact with the government in various ways, the processes of transactions is much quicker and more transparent. If customers are satisfied with this improved delivery of services, there will be more users so thus reflecting an improved image on public authority (EU, 2004). This can motivates senior government officers, managers to investigate further the m-Government potentials and possibilities.

Davison (2005) suggests that information, services and communication that are readily accessible through m-Government is one of its biggest advantages. M-Government enables government to provide services in a timely fashion such as reporting problems (for instance, civil emergencies), and querying for any other related matters in less time. Government officers now have the ability process decision making by accessing real-time information through e-mail. This process of information can be delivered via mobile devices in anywhere any time bases.

M-government can also helps public servants to become more productive as pointed out by Heeks and Lallana (2008). This is especially in the case where government officials had the ability to record data in digital system while they are out of the office doing field work. This means that time spend on data activities is reduce and also improves

data currency. As previously stated real-time data helps officials in their decisions making and most of these data are made available in government intranet or internet and can be access using mobile device. The potential of m-Government ensures better services delivery of government information and government officials become more efficient in their job.

While m-Government improves the communication within government organizations and its official the same is realise in the interaction between citizens and government. Citizens now have instant access to government information and government now can reach the citizens with valuable and important information. For example, government giving out emerging warning of extreme weather condition. M-Government provides additional channel of communication for government to interact with stakeholders include citizens. This obviously leads to more participation between citizens and the government. If the time and effort taken to communicate with the government is reduced, more communication will be encouraged.

2.7 Limitations and challenges of m-Government

There are certain issues that must be considered which affect the delivery of services via the Internet. The quality of service delivered via Internet may not be improved. Citizens can greatly be affected if up to date information are not delivered via the usual method of conveying information such as newspaper and television, especially those who have no access to the Internet (Singh & Sahu, 2008). If it is difficult to locate right information users cannot spend much time searching for the information. Not so many people in Vanuatu who have access to PCs and very few have access to Internet as

explained previously. Many of the MWTs applications discussed in this study might benefit the poor communities with no technology but the cost for maintaining it can be very high.

2.7.1 Language and Literacy

Language is also a huge challenge. Holms (as cited in Singh and Sahu (2008)) states that “English is used in almost 90 percent of websites, even though more than three-quarters of the world population do not understand it”. Singh and Sahu argue that if local languages are used, the ordinary non-English people can easily be reached with the technology. This would be a costly exercise especially in countries where they have many dialects. For example in countries like India where there are more than 100 dialects and 18 official languages. Vanuatu www.governmentofvanuatu.vu website is currently presented in English that is the official language, but further upgrades to the side would expect the French version and also the national official language called the “Bislama” to be incorporated. However, the challenge in this area will still be significant in Vanuatu for some time. This is due to the fact that although Vanuatu with a very small population and small land mass it still has more than 80 different dialects. Having all three languages included in the website can be challenging due to the lack of available language practitioners. As Singh and Sahu (2008) stated, “it is almost an impossible task to have portals in all the languages given the limited resources of government”.

Ya-Ni and Tat-Kei Ho (2005) point out that there are always challenges with Public Information Kiosks especially if they are setup in rural areas where most people are

illiterate. These challenges are obvious in remote and rural areas of Vanuatu. The accessibility of mobile services depends on the majority of Ni-Vanuatu using it and also the level of poverty, literacy and unemployment that can affect people accessing these services. It requires innovative ideas for equitable services to be delivered.

2.7.2 Technology limitations

Heeks and Lallana (2008) state that transmitting or transferring complex data and large amount of information is easily accomplished in computer and is not so suitable via mobile phones. Many of the features of PCs and services offered are lacking in mobile phones. Obviously the size of the mobile phone affects the display of information capacities. M-Government can compare to an ATM machines where information are convenient and quick to process, however, to accomplish service delivery in this way requires a complex and costly infrastructure (Davidson, 2005; R. a. L. Heeks, E.C, 2008).

According to Brief (2003) governments face the challenge of fostering the development of m-Government while there is still great uncertainty regarding technological change and negative impacts (e.g. system vulnerability and illegal activities). Technological developments are moving very fast and it is difficult to anticipate future impacts in detail.

One other primary concern is the security of information. It is vitally important that sensitive information transmitted using wireless technology must be protected. The use of wireless network is known to be vulnerable because it operates under the public airwaves to transmit signals. This can be a problem for mobile phone numbers which

can be easily hacked.

2.7.3 Legislative and Regulatory Barriers

In order for e-Services, and by implication m-Services, to gain widespread acceptance, they must have the same standing as equivalent paper processes as argued by Brief (2003). Brief also pointed out that current frameworks based on the assumption that agencies work alone (e.g. performance management, accountability frameworks and an interdiction of data sharing) hindered collaboration.

Brief (2003) also stressed that confusion about what exactly is in the law is another problem. Service providers may need clarification on what they can and cannot do, particularly in the areas of data security and technical standards. This would really affect small organisations with few resources. The cost of developing an e-Government or m-Government project in the wrong direction or using the wrong standard can be potentially very expensive. However, Goldstuck (2003) argues that the challenges of legislative barriers can be overcome.

2.7.4 Challenges

Heeks and Lallana (2008) list the following challenges for developing m-Government services:

- Cost: the implementation the deployment of e-Government is a costly exercise and extending its service delivery through m-Government thus create additional

costs;

- m-Digital divide: only those people who have access to the technology will benefits, the poor and especially the old people would be left out.
- Mobile mindsets: using mobile phones as a tool for fun and entertainment by many, while more serious activities can be carried in doing business; it may be difficult to align these two mismatched worlds;
- Trust/security: good security must be in place for m-Government and users must be trustworthy; and
- Data overload: The level of stress increases especially if users are required to be always connected.

It is a difficult task to meet citizens' expectations regarding the delivery of services especially in countries where there is a wide gap between poor and rich. Vanuatu cannot be left behind from the rest of the world. While mobile technologies and ICT can create more jobs, it can be an obstacle to growth if there are not enough educated and skill workers.

It is often a challenging approach in making decisions based on mobile strategy as it has many dangers. A numbers of issues that could leads to disaster is explained by Goldstuck (2003). Security is the most obvious stated such that data can be easily compromise if there is lack of security. Security should not be considered unsolvable, even though it is one of the real issues.

The allege threat to security surrounding mobile and wireless solution is regarded as one of the main reason why they are being avoided. Data could be well protected if users adhere to rules, guidelines, and principles based on the regulated fields. Anyone with a

mobile devices could easily gain access within a “network’s footprint” if this access in this network is not secure. One can easily login to this “network footprint” if signals in that area can be detected. Hackers can be denied gaining access to the network if suitable security policies and user authentication are in place.

If services offered through mobile devices are difficult to use, this potentially frighten away possible users. Apparently most people will use the service and system that are easy to use. This is obvious especially in countries where human capital development is still a concern.

Standards is also an important area that must be considered as indicated by Goldstuck (2003). It is crucial to defined clearly any of the guidelines with regards to mobile devices and applications and also the architecture that will drive the delivery of services. It can be very difficult for the need to redevelop and can be costly for a replacement if this issues are not resolve. The standards must be flexible in a way that more than one manufacture and suppliers are used. These issues must be taken into consideration in dealing with mobile solution.

The World Wide Worx (2011) conducted a research in 2003 on mobile solutions have identifies four ways to categorise the applications base on whether to wait or replicated on the solutions (Goldstuck, 2003). Replicating mobile solution is the first category only if proven solutions are known to work through examples and pilots. This would have quick implementation and knowing the cost involve. To demonstrate where values need to be proven is the second category. Thirdly, mobile solutions that seems to have a lot of excitements from users or when there is hype about the mobile application, government and general public are warn not to implement these applications too soon

but to investigate the matter further as suggested by World Wide Worx. To wait for the mobile solution is the last category. That is the application is still under development and has not yet been proven for its values. These mobile solutions can only be considered after requiring much more proof.

The issues related to security, anonymity and usability still have many other important questions, but the interest in mobile communication has been established early in 2002 through pilot programs. All mobile solutions cannot only be provided through technical and procedural solution but requires additional controls through legislation as argued by Di Maio (2002).

2.8 m-Government examples within the national and global context

Nevertheless, there is proof that already few governments are making use of mobile services despite its advantages and advancement in MWTs. Table 2:2 below shows that few governments deliver m-Services via cellular phones and PDAs as presented by the UN (2008) e-Readiness report. About 30 percent uses e-mail as the main means for communication.

Table 2:2 Mobile service use. Source (United Nations, 2008).

	Number of Countries	Percentage
Messages sent to mobiles	14	7%
WAP/PDA access available	19	10%
E-mail sign-up option for updates	58	30%
Secure link indicated	19	10%
Government guarantees online account will be kept confidential	29	16%

It is important that government investigate further on the form of communication that citizens prefer and use it to communicate with citizens. To accommodate users' personal preferences, government must deliver information using a range of platforms. Many of the developing countries are trying to avoid the high cost of deploying a range of infrastructure platforms by adopting the use of wireless applications.

There exists international examples where mobile solutions have been employed and Singh and Sahu (2008) provided some of these examples. In Mumbai, India, the department of customs through an SMS-base query system provide the opportunity for clients check on their imports and exports. The systems works with a four digit numbers and uses the GSM standard. Similar system was introduced by the traffic police in Delhi where citizens send complains against taxis to a designated SMS number given by the police. M-Park is an application introduced by the Dublin city council in Ireland which allows citizens to use SMS to pay for parking. This process only takes less than 30 seconds.

There are various mobile solutions that were introduced by the Malta's government (Ranu, Saksing, & Mahlakoiv, 2010). Mobile information services such as notification of social payments, examination results, providing the updates on the status of complains, notify changes of court dates to witnesses or accused and the notification of license renewal. There is also an opportunity for citizens to order certificates from the central registry, using cell phones to pay for copies and have them delivered to their physical address. Some other useful services offered such as check bus schedule on the cell phone, job applications notification outcomes and updates, police force were informed of any incidence by citizens.

Another interesting examples is an experiment that was carried out in New Delhi by a computer software company to provide internet access to poor community by placing a computer in a wall (Goldstuck, 2003; O'Conner, 2002). This poor community is without better education and no training is provided, but the technology seems to have some impact on this community as the children begun to know how to use the computer of their own. This shows that it requires only minimal intervention to learn computer skills.

This is an example of a “digital doorway”. In the area where there is limited infrastructure of physical telecommunication especially in rural areas, it is most appropriate to use GPRS technology to have connectivity to Internet. If restrictions set by regulatory policies can be overcome or adhere to, educational and government institutions can be accessible from rural areas (Goldstuck, 2003). The case of Vanuatu in terms of mobile and wireless infrastructure is discussed next.

2.9 The case of Vanuatu

E-government cannot be successfully deployed if policies and regulations are not in place. The same applies to the deployment of m-Government. At the time of conducting the field study, it has been observed that there is currently no policy drafted that refers to e-Government. According to the Chief Information Officer (CIO) of the Department of Finance, the Ministry of Finance and the office of the Prime Minister are responsible for compiling policies that relate to e-Government.

Furthermore, the recent liberalisation of the telecommunication market in Vanuatu

resulted in the establishment of a new telecommunications regulator known as Vanuatu Telecom Regulator (VTR) and now telecommunication in Vanuatu is no longer control by the conditions of monopoly. As part of the separation between operation, policy making and regulation, the external regulations become necessary. The management of limited resources, interconnection and universal access/services are some of the main areas of regulation. In most countries regulating license is one common tool used for regulation. This is intended to control the number of operators and ensure that rules and regulations are adhered to.

One main objective of VTR is to ensure there is mobile coverage to difficult to reach area especially in rural area. In order to achieve this goal, the Universal Access Services (UAS) was established and managed by VTR to provide difficult to reach area with mobile coverage. In support of the UAA the Universal Access Policy (UAP) fund was developed to subsidize the delivery of mobile services to areas that are difficult to reach in Vanuatu (Regulator, 2008).

At the recent Pacific INET (PacINET1) conference held in Port Vila, the Prime Minister Edward Natapei pointed out the benefits gained by putting an end to the idea of monopoly. This results in greater phone coverage and cheaper prices with the next step being providing more access to the Internet across the country (Independent, 2010). He stressed the importance of networks communications as highways, ports and airports to the Pacific regions of development. Consequently, the revolution in the telecommunication industry in Vanuatu had led to a growth in the GDP at the time when the world economic was shrinking (Independent, 2010).

As can be seen from the above, the government is very willing to meet and accept the

changes in its policy in order to be able to address changes introduced by the advancement in technologies. It is expected that VTR will continue to adjust to situational changes that may occur in future as technologies continue to evolve.

While the e-Government policy is yet to be implemented, VTR is now effectively regulating the services provided by different services providers currently operating in Vanuatu. Since its establishment, VTR has issued six telecommunication licensees. In order to clarify further the purpose of this study, a few relevant areas are discussed below: the context of m-Government, the reasons for using it, examples, and benefits and limitations of m-Government.

This section discusses most aspects of m-Government, including explanations of the concepts, examples, the legislative framework, benefits and conceptualisation of m-Government globally and nationally. As the problem statement indicates, this study looks at the m-Readiness of VGO. The m-Readiness tool that is used for the study will be discussed in the m-Readiness section in chapter 3.

2.10 Summary

Apparently one can argue that the use of MWTs to contribute to the provision of service delivery in an innovative way is crucial. The world has filled with much novelty and expertise. In many countries all over the world, many of these technologies exist, if not locally. In order for Vanuatu to ensure that mistakes can be avoided or not repeated locally these vast resources that exist must be made use of. Also solution must be identified to gaps that are found in existing technologies.

The changes and advancement of mobile and wireless technology is occurring very rapidly. While there are many technologies that exist, the intention of this report is not to list all of these existing technologies. This chapter is only intended to present a general overview of mobile network connectivity, how communication is made through mobile devices. This chapter also provide a summary of few of the existing examples and touches briefly on the applications and software used to drive these mobile devices. Few of the examples of the services delivered via mobile devices refer to in this report shows the potential of mobile phone that can be used in the public services. This chapter also cover some of these examples that are directly related to public service delivery. It is likely that the advancement in the technology will results in the reduction of the cost and that many people will be able to buy them. Apparently, this is a new way of life as mobile devices have been adopted by many people and it has become part of everyday life. Now that the theoretical background of m-Government and the associated technology have been covered, chapter 3 is devoted to discussing m-Readiness framework and measuring tools.

Chapter 3 : M-Government Readiness Framework

“Technology readiness” refers to a country's ability or “readiness” to integrate ICT, in order to provide a baseline that can be used for regional comparisons and planning. It is essential to understand what it really means to be technology ready and conduct an evaluation based on objective criteria to establish any readiness tool. “Readiness assessment” determines whether the necessary infrastructure is in place, whether ICT is accessible to the population at large, and whether there is an appropriate framework to support its use.

Readiness of an organisation could also refer to the attitude of decision-makers towards the technology, which could become a obstacle to the implementation of technology. The regulatory environment is another factor which determines whether the implementation will be possible or not.

Readiness for e-Government is not restricted to the government body. It is also important to assess society, government institutional frameworks, human resources, existing budgetary resources, inter-department relationship, national infrastructure, economic health, education, information policies, private sector development and other issues related to e-Government readiness (Al-Omari & Al-Omari, 2006). This shows that the concept of e-Government has multiple dimensions and Al-Omari and Al-Omari have discussed these dimensions and identified them into organisational readiness, Customer Readiness, Competency readiness, Technology readiness and Legal readiness. In this study we are interested in the technology readiness and also an overview of employee readiness by considering their attitude towards the adoption of the technology in general.

The reform of public sector governance in many developing countries who have invested in the opportunities created by ICTs has increase the need to access their readiness level. The Vanuatu government over the past few years has been actively involved in promoting and encouraging ICTs investment. The objective of the study and the readiness questions regarding the country benefiting from the opportunities created by ICTs must be answered so that the implementation of strategies that are effective can be developed.

A number of e-Readiness assessments and surveys have been conducted to address the readiness questions. In addition, there are several e-Readiness initiatives aiming to help developing countries with assessing their e-Readiness, and numerous e-Readiness assessment tools have been device, each looking at various aspects of ICTs, society, and economy. According to Bridge.org (2008) more than 1,056 e-Readiness assessment exercises have been conducted globally and many of these measuring tools and models have been used specifically to measure the extent to which organisations are ready to deliver services with regards to ICTs.

These tools may have been designed to measure e-Government readiness. This study will explore some of the existing readiness tools that will provide ideas into compiling a new m-Readiness tool that will be used to measure m-Readiness of VGO. Bridges.org (2008) compiled a comprehensive list of some of the existing readiness tools. A comparative analysis and definitions of some of these readiness tools are provided by Vaezi and Bimar (2009). We cover a few of these tools in the following paragraphs.

3.1 e-Readiness tools

E-readiness is defined by (Sachs, 2000) “as the degree to which a community is prepared to participate in the networked world; a world in which everyone , everywhere has the potential to reap the benefits of connectivity to the network”. e-Readiness measured is in 19 different categories covering the physical infrastructure such as the bandwidth, reliability and affordability. It also considers other areas in the society such as the integrated current ICTs throughout business (e-commerce, local ICT sectors), communities (local contents, many organisations online, ICTs use in everyday life, ICTs taught in school), and the government (e-Government); strong telecommunication completion; independent regulation with a commitment to universal access; and no limit on trade or foreign investment (Sachs, 2000).

Choucri, Maugis, Madnick and Siegel (2003) define e-Readiness as the ability to pursue value creation opportunities facilitated by the use of the Internet. They highlight that the capacity to pursue specific opportunities is a key feature of e-Readiness.

The Economist Intelligence Unit's (EIU) “E-Readiness Rankings” defines “e-Readiness as 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" (Unit, 2007). The model used by the EIU uses an index out of 10 based on six weighted categories. The criteria set within these categories cover both qualitative and quantitative means for measuring the country's social, political, economic and technological development. The categories are presented in Table 3:1 with their respective weightings and their description according to the EIU.

Table 3:1 EIU readiness ranking. Source: (European Intelligence Unit, 2007).

Categories	Weight
Connectivity and Technology Infrastructure Looks at the penetration rates of Broadband, mobile phones, internets, PCs, Wi-Fi hotspots, internet security and electronic identification.	20%
Business Environment Considers the overall political and microeconomic environment, market opportunities, policies toward private enterprise and foreign investment, foreign trade and exchange as well as tax systems, financing and labour market.	15%
Social and Cultural Environment 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.	10%
Legal Environment 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.	10%
Government Policy & Vision Government policy and vision refer to the percentage that governments spend on e-Government strategies, and online procurement.	15%
Consumer and Business Adoption 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 series for citizens and business.	25%

The Asian Pacific Economic Cooperation (APEC) developed an “E-Commerce Readiness Assessment Guide” which defines e-Readiness as the “degree to which an economy or community is prepared to participate in the digital economy”. This guide has been designed to provide assistance for the government to implement their own regulatory policies to ensure a healthy e-commerce development. In this readiness tool

there are six different categories that are measured for readiness of the e-commerce readiness. Table 3:2 present these different categories.

Table 3:2 APEC e-Commerce readiness tool

Categories	Indicators
Basic Infrastructure and Technology	Speed, Pricing, Market Competition and Industry Standard.
Access to Network Services	Bandwidth, Industry diversity and Credit Card Regulation.
Use of the Internet	Use in Business, Governments and Homes.
Promotion and Facilitation	Industry led standard.
Skills and Human Resources	ICT Education and Workforce.
Positioning of the Digital Economy	Taxes and Tariffs, Government Regulation, Industry Self-Regulation and Consumer Trust

The Computer Systems Policy Project (CSPP) has designed a self-assessment tool consisting of questionnaires and report to help determined the readiness level of communities and individual participating in the “Network World”. There are five categories that have been looked at in determining the level of readiness. These are the existing infrastructure, applications and service economy, access and enablers. For each of these categories the assessment of the community has been rated base on the four progressive stages of development (Bridge.org, 2008).

A report based on the assessment of a national economy's e-Readiness, or capacity to participate in the global digital economy was prepared by the collaboration between McConnell International and the World Information Technology and Services Alliance (WITSA). A definition deduced from this report states that if any countries satisfied the following areas it can be considered e-ready: the use of computers extensively in schools, business, government, and homes; in a competitive market access is reliable;

free trade; training in schools and skill workers; creativity; partnerships in government business; government maintaining stability and be transparent; network securely in place information encryptions using digital signatures is enable by regulations. Five main areas are measured in the report; connectivity, e-Leadership, securing information, Human capital, and the climate of e-Business. Using a scale of one to three ('blue', 'amber', 'red') by the five categories countries were assess and rated. An extensive analysis was made and recommendation given based on this ratings. (Bridge.org, 2005, 2008).

A tool has been developed by Gartner to measure e-Readiness in Australia which can be adopted by other countries to measure the level of compliance (Harris & Roberts, 2006, as cited in du Preez (2009)). For instance the tool can be used to consider the level of development within a country. The tool can be useful in developing countries if it suits the countries limitations and requirements. By considering this, du Preez (2009) also pointed out that Gartner have also developed a balanced scorecard that was used in a study to measure e-Readiness in Bulgaria.

These tools that are used to assess e-Readiness are different and can be grouped by their main goal or aim and the area of application. E-Readiness assessment tools can be applied in three areas of a particular aim: "those assessing purely the ICTs infrastructure, those assessing e-Readiness of particular sectors of society and those assessing the society as a whole" (Shareef, Ojo, & Janowski, 2008). For the purpose of illustration Table 3:3 present a summary and representation of a few of these tools showing the domains, the aims of assessment as well as the indicators.

Table 3:3 E-readiness tools, domains, aims, and indicators. Source (Shareef, et al., 2008).

Assessment Tool	Domain	Aim	Indicators
World Telecommunication / ICT Indicators	ICT Infrastructure Readiness	Identify, define and produce statistics covering telecommunication	Over 100 indicators of telecommunication and ICT sector, including statistics on telephones, Internet and computers, National Indicators (e.g. GDP)
APEC E-Commerce Readiness Assessment	Sectoral e-Readiness	Help government develop their owned focused policies. It can be adapted to specific environment, e.g. for development of e-commerce	Basic infrastructure and telephone, Access to necessary Services, promotion and facilitation activities; skills and human resources, positioning of digital economy
CID's E-Readiness Assessment Guide	Society's e-Readiness	Provides the first step in creating a strategic approach to planning, for communities in the developed world.	access, learning, society, economy, policy

It can be argued that the readiness tools presented above are designed to specifically address the level of e-Readiness of a country covering wider aspects of an organisation, Societies, Communities, or Individuals. Though the study may not directly reference

any appropriate tools for measuring m-Readiness, ideas will be deduced from these tools to design the m-Readiness model. The m-Readiness model is discussed below.

3.2 Defining m-Readiness

Following m-Government definition explained previously in Chapter 2, it follows that m-Government readiness is define as government having the ability to communicate and deliver services among government organizations and to citizens via MWTs. In addition m-Government readiness can be defined as the people's readiness of using MWTs. To determine the m-Readiness of an organization, investigation must be on the usage of MWTs.

Goldstuck (2005) developed a framework (Table: 3:4) to investigate the level of e-Readiness with respect to mobile technologies. The framework considers both the readiness of organization and the technology. The organisation can be considered to adopt any of the wireless and mobile solutions if more than half of the questions are positively answered.

The answers to these questions may not provide enough information for the government to consider implementation in MWTs as the questions themselves are not enough to determine the technology readiness of an organisation. Technology maturity in an organisation is vital information that needs to be analysed.

In an institution decision-makers decide on what type of technology to used which is refer to as Institutional readiness. This can be identify as one of the barriers to

implementation Goldstuck (2003). Regulatory and policy environment are regarded as another obstacles. The decision to implement any mobile solution must adhere to the regulatory environment. MWTs can also be affected by the following issues: Wi-Fi limitations as per the Telecommunication Act, Electronic Communications and Transactions Act (Goldstuck, 2003).

Table: 3:4 M-Readiness questions. (Goldstuck, 2005).

	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 organization?
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 database 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 organization?
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?

Finally, it depends on the complexity of the use of the application that will determine users' willingness to use it or not. It is crucial that the process is not driven by technology but the needs of the business. It is important not to implement a system that is difficult to use as this will only drive the users away (Goldstuck, 2003).

According to du Preez (2009) Kirsten (2006) use a questionnaire to determine the m-Readiness of business in South Africa. The survey starts by asking the basic

demographic questions followed by questions regarding the organizations current technologies adoption. Responded are required to tick boxes indicating the most current mobile technology used in their organizations. The mobile technologies which are combined together with established business application such as corporate SMS, instant messaging and remote monitoring are looked at in question five.

Question six surveys which mobile technology is provided to which staff, e.g. after-sales services and support staff. Question eight is intended to investigate on the type of training offered in an organization with regards to mobile technology.

Responded were asked in question nine to provide any indication regarding the importance of the common technology listed in question four. A scale range from unsure, very unimportant, somewhat unimportant, somewhat important and very important was used by respondents. Respondents in question ten were ask to provide a measure of organization-wide sophistication of users. The choices for respondents to select ranges from unsure, very basic, somewhat basic, somewhat advanced and very advanced. A list of emerging technology is given in the last question. Respondents were asked to indicate the importance of the new technology and the impact on the business. A scale range from unsure, not important at all, somewhat important, important or very important is given for respondents to select from.

The Kirsten's readiness survey does not provide a measure as the EIU tool for example, but it does give an indication of the maturity of the organisation with regard to mobile technology adoption. In the following section the model compiled for this study will be discussed.

3.3 M-readiness framework compile for this study

The UN Readiness tool has been considered in this study but more attention has been paid to the ideas presented by Goldstuck (2005) and the study conducted by du Preez (2009) as their studies mostly address the use of mobile technologies and their applications within organisations.

More specifically this study includes questions either adopted as survey type questions from Kirsten's (2006) study, or adapted from the same study to become in-depth interview questions. All ten questions based on Kirsten's model are grouped in Part I of the overall study questionnaire.

The study has also incorporated the Technology Readiness Index (TRI) (Parasuraman, 2000) in part II of the data gathering instrument as the TRI was considered suitable for the gathering of data that meets the objective of this study. The questions related to TRI are survey type questions grouped along the following four dimensions:

- 1) **Optimism:** that looks at the positive view of technology and a belief that it offers people increased control, flexibility, and efficiency in their lives;
- 2) **Innovations:** looks at the tendency to be technology pioneer and thought leader;
- 3) **Discomfort:** considers a perceived lack of control over technology and a feeling of being overwhelmed by it;
- 4) **Insecurity:** explained the distrust of technology and scepticism about its ability to work properly;

The study presented here has made use of the TRI framework in order to assess the perceptions or the attitude of government employees towards the adoption and use of mobile and wireless technologies. In other words, this refers to measuring employees' readiness for the use of technology.

In addition, the study also considered the assessment of the reliability of the telecommunication network services (Parasuraman, 2000). As part of the instrument respondents were asked to rate the reliability of the telecommunication services according to their perceptions and experiences. The questions aim to assess the existing telecommunication network and services with respect to its role as m-Government enabler. Figure 3:1 depicts a graphical representation of the m-Readiness framework compiled for this study. The data gathering instrument design is discussed in more detail in section 4.5. The complete questionnaire is provided in Appendix A.

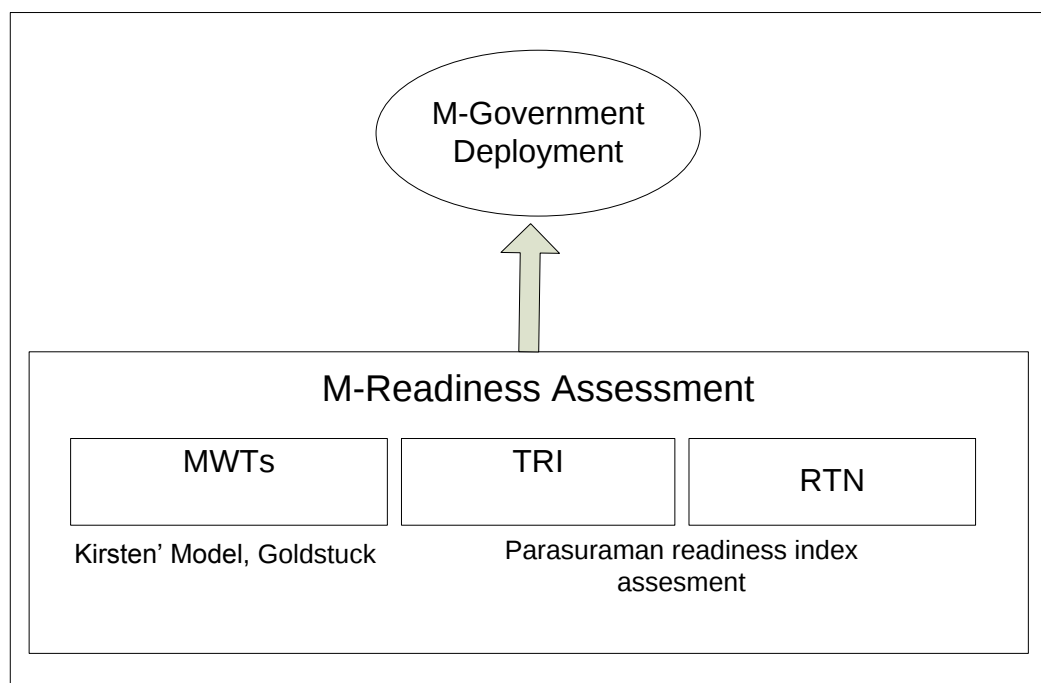


Figure 3:1 m-Readiness Assessment Framework.

The interview started out by asking about the level of responsibility or position held by the government officers within their respective government organisations. Respondents were then asked to provide examples of any existing mobile devices and applications currently deployed in their department. The next sections will discuss a few ways of measuring and interpreting the results will be discussed that will assist in measuring and interpreting in this study.

3.4 Measuring e-Readiness and m-Readiness

According to the UN (2010c) e-Government survey, Vanuatu was placed 155th position of the world ranking as previously discussed. This position showed that Vanuatu has dropped in its ranking by one position compared to the ranking of 2008. Among the least developing nations Vanuatu was placed in the 19th position of the 2010 survey. While there may be some form of in-house readiness assessment that may have been carried out within VGO, at the time of conducting this study no report related to readiness assessment that has been published. Though there may be signs of some web presence within VGO, this low ranking indicates that there is much more to be done by the Vanuatu government to deliver more e-Services and encourage citizens to access more of this online service.

3.5 Evaluating the results

IBM provides a prescriptive matrix that considers all the relevant factors in deciding whether a specific wireless application can be deployed. Governments can use this as a guide when making decisions on whether to adopt the technology or not. Each

associated factor ranges from “High” to “Low”. The prescriptive matrix includes four quadrants the “Stars”, “Low hanging fruit”, “Future Potential” and “Near Harvest” as shown in Figure 3:2.

Considering the matrix, it is obvious that the high level of readiness and low level of sophistication should be the first options to consider. This is referred to as “Low-Hanging Fruit” (Chang, et al., 2003).

Furthermore, the World Wide Worx (Worx, 2011) conducted a research that shows a number of challenges and barriers given by industry leaders that hinders the success of m-Government implementation. A checklist has been developed as proposed by Goldstuck (2003) based on these challenges and should be use on the outset of the implementation. This is so that it is easy to identify which barriers can be encountered and therefore dealt with accordingly. Table 3:5 presents a checklist of barriers and challenges developed by the World Wide Worx Survey (Goldstuck, 2003).

		Degree of Sophistication of Technology*	
		High	Low
Technology Readiness of Target Segment	High	Stars High-impact projects Mission-Critical applications of high strategic advantage should be undertaken; high-level commitment needed for success	Low-Hanging Fruit Go for immediate wireless deployment High probability of successful adoption
	Low	Future Potentials Wait and see Applications more complex; go forward with pilots; educate/train employees; wait for mature technology	Near Harvest Educate/train target segment Wireless deployment with extensive training; significant chance of success

Figure 3:2 Preparing for wireless and mobile technology in government. Source (Chang, et al., 2003).

Again this checklist can only be considered as a guide as previously discussed and a starting point for government organisations to decide on whether they are technology ready to deploy m-Government. As Goldstuck (Goldstuck, 2003) pointed out answering yes to all check list does not necessarily mean that MWTs implementation and deployment will be successful. However, it can assist managers in identifying any risks, issues or barriers that can be addressed at the earliest.

If Kirsten's model of measuring m-Readiness compared to the way UN and EIU model measures e-Readiness level, there is a huge gap. The model used by Kirsten's considers technology adoption while the UN and EIU use the indices that are more comprehensive.

Table 3:5 Factors to consider prior to implementation. Source (Goldstuck, 2003).

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 handsets 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 users 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 process is 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 the available m-Services	
Appropriate people within different government agencies are available	
Standardisation of systems is a priority need of each department or sector	

In order to provide a clear understanding of the adoption of mobile technology and the status of m-Readiness within VGO the Kirsten's model has been adopted. How this study was conducted will be discussed next.

Chapter 4 : Methodology

4.1. Introduction

This chapter describes the overall methodology followed in the study, including selecting the research approach, identifying the sample, the data collection and analysis instruments and processes.

This research was conducted in order to determine the state of m-Readiness of VGO. In order to achieve the research objectives as defined in Section 1.4, it was decided to obtain the views of government employees', especially public servants. The m-Readiness framework introduced in the previous chapter was used as a guide in designing the research process.

4.2. Research Approach

As mentioned there is a lack of an internationally recognised tool to measure m-Readiness. Thus the study uses a framework which adapts tools used to measure e-Readiness in order to provide meaningful measures and to allow evaluating the possibilities for implementing m-Government.

According to Collis and Hussey (2003) a case study approach can be applied when an existing theory is used to understand and explain what is happening. The approach was applied to the case of Vanuatu. Various sources were utilized to provide evidence including primary qualitative and quantitative data, including government

documentation, and prior research results.

According to (Hair, et al., 2007) quantitative data are measurements in which numbers are used directly to represent properties in a form that lends itself to statistical analysis. Quantitative data is a collection of detailed descriptions of an observable fact. (Hair, et al., 2007) points out that that quantitative data help “provide objectivity in that hypothesis are tested by applying statistical criteria to the measures” (p.74). An advantage of the quantitative approach to data collection is that it allows to mitigate and even avoid personal opinions by means of collecting and exploring information which describes the experience being studied using a relatively large sample of research participants.

On the other side the qualitative research places an emphasis on examining and understanding people’s words and actions without assigning numerical values directly (Cavana, et al., 2001). The focus is on the subjective perceptions of the research participant. On the other hand the qualitative data analysis may also be used to discover the patterns that emerge from the data and identify variables that may be used in a quantitative investigation (Cavana, et al., 2001, p. 135). Thus the quantitative approach method may lead to the formulation of a research hypothesis which can be later tested empirically using specific data set (Frankfort-Nachmias & Nachmias, 2000). An advantage of the qualitative approach is that it is more open to changes and allows to refine the research design as the study progresses.

This study used both a qualitative and a quantitative approach towards data gathering and data analysis in order to take advantage of the flexibility such a hybrid method offers. As pointed out by (Hair, et al., 2007) the two approaches complement each

other. The research participants answered interview questions and a structured survey questionnaire. All data collected were analysed and used to conceptualise further the m-Readiness evaluation framework introduced in the previous chapter, and to provide support for the theory emerging about m-Readiness. This study also made use of secondary resources such as published articles and other sources to provide additional insights to help interpret the findings and support the analysis outcomes.

4.3 Study Sample

All research participants were all public servants from government departments/ministries, and government statutory bodies. As mentioned earlier there are more than ten different government ministries. In each ministry there are at least one or more departments including the two government statutory bodies. Geographically all government organisations are located in the capital city of Port Vila.

The initial approach was to select one participant representing each ministry. Therefore, the total sample size for this study should be approximately 13 participants. However, a review of the research design by AUTECH (AUT Ethics committee) suggested that the sample size was too small for a true representation of the whole of government. Subsequently it was decided that a sample size of approximately 30 participants (with at least two research participants from each ministry) would provide more data and may therefore positively affect the validity and the reliability of the study.

Deciding on which participants to select for the interviews took into consideration the need to gather rich in-depth information. Potential candidates considered to possess

sound knowledge of the technology used and especially about MWT deployment in the various departments included directors, managers and other senior government officers. These participants were selected on the basis that they possessed significant skills and knowledge of ICT and were directly involved in operational issues within their respective department. As a result, the sample selected for this study is obviously biased toward the more educated and more ICT oriented government officers.

4.4 Primary Data Collection Methods

The collection of empirical data took place through interviews and reviewing published case studies, statistics and reports. The initial approach of the study was to employ a survey method for collecting primary data. However, after further consideration of an online survey, it was decided that the data collected using this method may not be suitable especially in the case of Vanuatu. There were issues of concern that data collected in this may not be a true representation of the unit being analysed and was considered an inefficient method for collecting data. For instance, there might not be many responses to the online questionnaire.

While data collection through an online survey is considered to cost less, it does have its limitations. For instance, the use of online survey in this study could not be relied upon for data accuracy. Also it would require participants to have access to the Internet. However, Internet usage is limited with the government departments. This means that if participants required a fast internet connection, there would be a cost involved when accessing the internet from an internet cafe in town. This may worsen the situation as potential participants might as well just ignore participating.

Therefore, an interview and a survey questionnaire completed at the time of the interview were decided to be used as methods for collecting primary data. Interviews are a method for collecting data in which the selected participants are asked questions in order to find out what they do, think or feel. An interview not only allows participants the opportunity to express their own views (in this case about the current use of MWT), but also provides them with a chance to ask the researcher questions related to the interview topic (MWT).

The interview and survey questions were designed based on research conducted by du Preez (2009), Goldstuck (2003), Kirsten (2006) and Parasuraman (2000). All questions are directly related to the research problem as formulated in Section 1.4. The overall structure of the data gathering instrument follows the m-Government readiness assessment framework introduced earlier (Figure 3:1).

It has to be noted that all questions referred to in the work of du Preez and Kirsten are close-ended and address the current use and application of MWT. In this study some questions were modified to take the form of interview questions. The answers to the survey questions were also solicited in an interview environment. As taking the approach of conducting an interview as a method for collecting data required an alteration of the instruments used in prior work and also changing the data collection method from survey to interview. Therefore, the findings of this study may not be directly comparable to the results obtained by du Preez and others.

4.5 Primary Data Collection Process and Instruments

A data collection method of conducting an interview may be considered costly. However, in this study cost is not so significant as the study only deals with a small sample size. In addition, all government departments are located in one city (Port Vila) and are in close proximity. Before starting the data collection process a list of contacts in all government ministries, departments and other government organisations was compiled. Phone calls were made to contact the selected government departments and to arrange for appointments with the senior managers or officers. On the day of the appointment, an information sheet and the questionnaires were handed out to participants with a brief explanation of the purpose of the interview. Further dates were arranged for the actual interviews giving the participants significance amount of time to read the information sheet and study the questions.

Interviews were started by explaining the reason for the interview and the concepts used. The process through which the results were obtained was explained during the interview. The actual interview was recorded using a digital recorder. The interviews were conducted using the national common language called “Bislama” thus an interpreter was required to translate all that was communicated into English. At the end of the interview participants were asked to sign two copies of consent form. The researcher kept one copy of the consent form and another copy was kept by the participant.

As discussed earlier results for prior work related to measuring e-Readiness were used to inform the design of the tool for measuring the m-Readiness of the VGO. The design of the data gathering instrument (the study questionnaire, provided in Appendix A) was

informed by the comprehensive literature review presented earlier and follows the assessment framework shown in Figure 3:1. The questions with the two parts of the questionnaire were ordered in a sequence that ensured a logical flow.

The design builds specifically upon the work of Goldstuck (2005) and Kirsten (2006) as the most relevant in terms of m-Government deployment. As their tool was designed to conduct an online survey on the current use of MWTs in business organisations, it was adapted for the purposes of this study. The other two frameworks used (TRI and RTN) were adopted from Parasuraman (2000).

The first part of the questionnaire is modeled on Kirsten's model and consists of 11 questions: closed-ended questions Q6, Q9, Q10, and Q11 adopted from Kirsten's model), and open-ended questions Q1-Q5, Q7, Q8, converted from survey questions in Kirsten's model to interview questions.

The open ended questions are designed as in-depth interview questions that gather data about the participants and about their experiences with mobile technology and services. These are supplemented by the set of close-ended questions where participants need to choose their response from amongst the options provided, as explained below.

- In question Q6 which relates to the use of MWT across departments participants identify the type of technology used and the relevant area of its use.
- The answers to question Q9 s regarding the importance and perceived contribution of mobile technologies are based on the following scale: Unsure | Very Unimportant | Somewhat Unimportant | Somewhat Important | Very Important.

- The answers to question Q10 regarding knowledge about and understanding of the use of mobile technologies are based on the following scale: Unsure | Very Basic | Somewhat Advanced | Very Advanced.
- The answers to question Q11 regarding the importance of the emerging technologies are based on the following scale: Unsure | Not Important at all | Somewhat Important | Important | Very Important.

The second part of the questionnaires comprises of five parts and a total of 17 survey type questions. The first four parts contain ten close-ended questions that follow the TRI framework proposed by Parasuraman (2000) as a tool for measuring technology readiness. As discussed earlier this tool was incorporated into the m-Readiness framework used in the study (Figure 3:1). It was designed in such a way that respondents were asked to indicate their rating for government's level of technology readiness on a 5 point Likert scale, i.e. five choices were provided for every question or statement. The different choices represent the degree of agreement each respondent has on the given question with 5 indicating strong agreement and 1 indicating strong disagreement.

The fifth part consists of seven questions that assesses the telecommunication network and the services it provides from the perspective of reliability as perceived by the participants. The questions were adopted from the RTN framework suggested in Parasuraman (2000), as also shown in the m-Readiness assessment framework (Figure 3:1). The participants respond on the same 5 point Likert scale used in the first 10 questions in Part II of the questionnaire.

This research instrument was easy for participants to respond to, and allowed the researcher to carry out the quantitative analysis effectively with the use of statistics for data interpretation. As the survey was completed at a meeting, the researcher was able to provide explanations in order to ensure comprehension in cases where respondents found it difficult to provide answers to the questions due to vague or difficult terminology.

It was attempted to avoid negative items and loaded terms to ensure that responses would be as objective as possible. It is apparent that possible bias in collecting data in the way described may be encountered. However, the respondents were carefully selected to be at either senior or middle management level and were directly involved in operational issues within the ICT section of each department. This ensured that they were both competent and willing to answer the questions.

4.6 Secondary Data

International and national statistical data were gathered from various research databases, including databases available at the AUT e-Library (e.g. Google scholar, ACM, Gartner Research, Science Direct), Vanuatu government sources such as the VNSO and the VTR, and websites.

There are two majors telecommunication companies currently providing telecommunication services in Vanuatu: TVL and Digicel. The various aspects of mobile technology regarding statistical data include the number of people who have access to the technology and also considering the penetration of mobile phone. Statistics

regarding international and national figures were obtained from reports by the UN, ITU, EIU, and the VNSO. Important data are obtained from annual report for data analysis from relevant organizations such as VTR.

4.7 Data Processing and Analysis

Data were analysed using both qualitative and quantitative methods of evaluation, following Collis and Hussey (2003). Interviews were recorded using a digital device recorder. These were conducted in the national language and were later translated into English. The open-ended interview questions were transcribed and the answers to each question from all responses were collated and summarised. The summaries were analysed to determine whether there was a shared understanding of organisational m-Readiness.

After gathering all the completed questionnaires from the respondents, the responses to the closed-ended questions in Part 1 were transcribed and tabulated in MS Excel format and the SPSS statistical analysis tool was used to look for trends and commonalities. The weighted means to represent each question were computed.

The responses of all respondents for every Part 2 question were transcribed and tabulated and the weighted mean, variance, maximum and minimum values of the mean were computed.

Statistical data were collected mainly from the two mobile service providers, Digicel and TVL, and from other sources such as VNSO and VTR publications, and from daily

and weekly news (from the newspapers the Daily Post and the Independent). Data about the total number of mobile users were recorded and the rate at which each provider registered new mobile users was taken into consideration. Summarising these data into meaningful terms such as knowing the total percentage of the population of Vanuatu, who have access to MWT helps to explain and determining the technology readiness of the government organizations and the nation as a whole.

4.8 Ethical Considerations

It is important that the ethical issues must be understood and addressed. This study requires the participation of human respondents particularly government employees. In order to ensure the safety and privacy of participants it is vital that ethical issues must be taken into consideration. The confidentiality and consent were among the significant ethical issues considered in this study. How this is accomplished is by informing the selected participants in advance of all important details of the study, including the purpose and aim of the study. This step is important in data collection method as it provides the respondent with the understanding of how important is their role in successfully completing the research.

Participants have the choice to either remain till the interview is over or withdraw during the process. This study ensured the participant confidentiality is maintained by not disclosing personal information or names. The study includes only of those relevant information that will aid in answering the research questions.

4.9 Summary

This study draws on work done by other authors and focuses on the Vanuatu government sector. Determining the m-Readiness and adoption of MWT by the Vanuatu government using the m-Readiness framework was done by collecting both secondary and primary data. Primary data were collected using interviews that consisted of both open-ended and close-ended questions. Secondary data were collected from other sources such as literature reviews, news articles and others. As shown in the next chapter the outcomes of the study indicate that the m-Readiness framework proposed for this study provides a measure of the readiness of Vanuatu to adopt in the future services offered by m-Government. While the study does not aim to compare the results obtained in the study to previous work, a further analysis may also identify how the case studied is different or similar to other cases.

Chapter 5 : Research Findings

The findings of this research study shows that although it can be argued that there are possibilities that m-Government can be deployed in Vanuatu, there is still a need to improve the level of m-Government readiness. This chapter presents the research findings. The empirical data were from 20 participants from 4 of 13 government ministries and 14 government departments and 2 government statutory bodies (Table 5:1).

5.1 Government resources and related initiatives

As previously discussed VGO does not have in place a proper central ICT system to manage all aspects of government IT resources. Though the IT section of the Department of Finance is currently providing various services to other government departments, many of them also have their own IT sections. There is currently an ongoing discussion about the possibility of centralising the government ICT function under one department. It is likely that this will take place in the next few months as the current e-Government project will soon be delivering its services.

While the e-Government project goes through the various phases of completion, mobile technologies have also been taken into consideration with the aim to integrate them seamlessly into e-Government. However, skilled labour and manpower will become the real challenges for the government once the e-Government starts delivering services. At the time of conducting the research, it was reported that an estimated number of 4,000 powerful computers would be required in the event of centralising all government unit ICT in one control centre. This really means that in the next few years the government

will face the challenge to provide skilled workers for these newly upcoming ICT projects.

It may be too early to discuss any m-Government related project in this study since the deployment of cellular network and even the term m-Government itself may be relatively new for Vanuatu. However, there are currently a few projects that directly relate to m-Government. An example is the project conducted by the Department of Civil Status that has introduced a system for birth and death registration using a mobile phone. According to Vanuatu Daily Post (Post, 2010), Vanuatu was first to introduce such a system. This project helps people to appreciate that mobile phone are not only for voice and text messages but can also be used to deliver other useful services.

Another upcoming m-Government project that will soon be implemented is the reporting of natural disasters or sending mass alert warning messages via SMS to people especially in the event of an earthquake, tidal waves, a cyclone and others. This project is negotiated by the Vanuatu Department of Meteorology with one of the major cellular providers, the Digicel Company.

Furthermore, the National Bank of Vanuatu (NBV) has just recently introduced mobile banking. NBV customers now have the ability to check their account balance through their cell phone.

Considering the mobile technology projects described above, it can be argued that service delivery through mobile technology is already emerging in Vanuatu. In the next section the results obtained from the interview and survey will be used to determine when the Vanuatu government will be ready to adopt mobile solutions to aid in the

delivery of its services.

5.2 Interview and survey data reported in this section

The research findings are the outcome of the interviews and surveys conducted with senior government officials and technical staff within VGO. In addition, the study has considered information about mobile government officials who are currently using mobile devices to carry out their official duties. This information complements the data collected through interviews and survey questionnaires.

5.2.1 Others mobility

The study had observed that not all government officials or organizations have been provided with mobile to enable them to have the ability to connect to the office while on the move. Policies and organisational infrastructure are yet to be implemented to control the distribution of these devices. Currently senior managers are provided with smart phones and laptops to help them do their work or connect to the office while they are out on official trips or other duties. In addition, as one respondent pointed out mobile phones are heavily used by drivers of vehicles in government organisations, especially in government ministries. Drivers are expected to be connected at all time and need to report their location back to the office while they are on the road.

Majority of government employees have their own cell-phones and many have used their phone to contact businesses. Staffs are responsible for meeting any of the cost and risk involves. Further, few employees work from home using their own computers

while others may take home issued laptops. Few of these government officials who work in local and other provincial systems need access to the department intranet and to the Internet. Intranets are not so widely used and only few units have their information available on the Web and accessible either on their intranet or the Internet.

5.2.2 Interview Results

Interviews were held with senior government officials within the IT departments of each government unit to provide an overall view of m-Readiness within the national government. The questions that were put to interviewees are presented below along with a summary of the responses obtained for each question.

Q1. What is your current position?

This question seeks to find out the level of responsibility of each respondent as it was initially intended to limit participation to senior government officials and senior technical officers. A few respondents indicated middle level management and other lower position especially in the case where the senior officer was not available at the time of the interview (see Table 5.1). Further, a few other senior managers who were not able to take part in the interview had authorisation to other officers to take part in the interview on their behalf. It has been observed that not all respondents were IT officers. This was due to the fact that many of the government units did not have IT sections of their own. However, most of the interviews had sufficient technical background and information regarding the use of computers, laptops, mobile phones, and the Internet in their respective work place.

Table 5:1 Representation of participants' position from government institutes

Position	Ministries	Departments	Statutory Bodies	Total
Senior Officers	4	10	2	16
Middle Management		2		2
Others		2		2
Total	4	14	2	20

Q2. Existing mobile devices used in organizations include among others ordinary cell phones, Smartphone, Blackberry devices, PDAs, laptops. Please give examples of how one or more mobile devices are deployed in your department?

All respondents provide answers to this question. This question is intended to find out if respondents are able to provide any examples mobile technologies that are deployed in government ministries or departments. The majority of the respondents indicated that ordinary cell phones and laptops were the most widely used mobile technology across government organisations (Question2:Table2, Appendix E). People that have access to these devices, particularly laptops and Smartphone are mostly used by senior managers in government ministries, departments and other government statutory bodies, for examples director generals and ministers.

“Mobile phone is one of the useful mobile technologies that are commonly use today, In the department laptops are very useful and only senior managers in the department are issued with Laptops”(Rp1q2, Rp3q2, Rp5q2, Rp6q2).

Only senior managers in government organisations use a Blackberry device and other Smartphone. As one respondent indicated that the director generals and state ministers use Blackberry to access their email. *“Black Berry devices are not too common in the*

department except for director generals and the state Ministers who used it to access their Emails” (Rp5q2).

Almost all interviewees reported that all government employees have access to privately owned mobile phones, especially an ordinary cell phone (Question2:Table2, Appendix E). In addition, one respondent indicated that they are planning to use PDAs devices for data recording in the future (Rp16q2) while the majority stated that they don’t use it. However, 6 of the respondents indicated that they did not know what a PDA was (Rp4q2, Rp5q2, Rp10q2, Rp11q2, Rp12q2, Rp14q2). It was observed that PDAs devices were hardly used and were rarely not deployed.

Q3 Existing mobile technologies used in organizations include Wireless LAN, Wireless WAN, GPRS, 3G, EDGE, Blue Tooth Networking. Please give examples how one or more mobile technologies are deployed in your department?

While the majority of the respondents indicated that they were aware of the technologies as outlined in the question, only Wireless LAN is used in most of the departments (Question3: Table3, Appendix E). However, 2 respondents indicated that they have access the Wireless LAN and Wireless WAN (Rp1q3, Rp15q3). For example the Department of Customs has some offices located outside the main building, for example at the international points of entry such as the main wharf and Bauville airport. The main use of these technologies is for collecting data within and remotely from the main office.

Many of the cell phones owned by the employees have GPRS and some had EDGE enabled. However, almost none of the respondents were aware of these technologies and

many admitted not knowing what these were and for what purpose could be used (Question3: Table3, Appendix E). Two responded stated that they are using 3G.

“I have bought a 3G mobile phone but don’t know how to use all the features in that cell phone, I only use it for receiving and making call and sending SMS”(Rp3q3).

“Here in the Ministry we use Laptop to access Wireless LAN. Only the directors are using 3G” (Rp5q3). However, later it was found out from one of the respondents who had been a technical adviser to TVL (a mobile service operator) and was now working as a CIO of the Department of Finance, that a 3G network has not yet been deployed. *“I used to be a marketing director at TVL and my understanding is that 3G network is not yet deployed. The network we currently have is the 2G and 2.5G network”(Rp20q3).*

It might be that many of the respondents are aware of the Bluetooth technology but hardly anyone stated having access to the device. One respondent said that they used it to transfer pictures and other media files such as music either from their laptop to desktop or cell-phone to cell-phone but hardly use for work. *“I am familiar with Bluetooth Networking as I use it to transfer photos and other media files from my cell phone to my computer”(Rp16Q3).*

Q4 Existing mobile applications and services use in organizations include Voice and General Messaging (SMS), SMS business communication and applications, WAP (web access), WAP (back-office access), Push e-mail access, Calendar, Contacts, e-mail access. Please give examples of how one or more mobile applications services are deployed in your department?

All respondents indicated that Voice and SMS were the most widely used mobile application services across government organisations (Question 4: Table 4, Appendix

E). This, of course is no different to other countries that have deployed mobile applications in government institutions. All government heads use voice or SMS to communicate with their other government employees within the department and externally to other government organisations. The majority of the respondents stated that since the introduction and the deployment of telephony and SMS application, they have been using them mainly to convey business information, for example sending text message to suppliers.

Use of WAP to access the web was limited only to the senior managers, director generals and state ministers. This imposed limits to the use of Push-email and email access from ordinary cell phones owned by majority of the government employees. One respondent stated that the limit to access WAP is due to the fact that services provided by service provider are not standard (Rp1q4). A few of the respondents explained that the major constraint was that the cost of having access to Smartphone was still too high. Furthermore, since the technology existed many would have liked to enable such capability on their privately owned cell-phones, however, as four of the respondents stated that the costs involve having access to such technologies was still too high. The participant considered cost to be the main reason that not all government employees had been issued with work mobile phones.

“It is also very expensive to have a mobile phone that can be used to access internet” (Rp1q4). *“Expensive to have phones with such capabilities”* (Rp3q4). *“I am aware Smartphone have that capability but who has the money to own such an expensive phone”* (Rp4q4). *“My opinion is that these application services are already there but the problem is that they are too expensive”* (Rp6q4).

WAP (back-office access) has not been deployed yet in any government organisation.

However, some services could be regarded as back office access. One respondent explained how SMS had been used to send alert message to technical staff about the power cooling system of the server room. The air conditioner in the server rooms was programmed in such a way that in the event of temperature rising, it would send out a warning text message to all IT staff and whoever was on duty would be able to attend to the warning message. *“We also have a system that can be regarded as WAP or the (back-office) access system. For example we have a system in place that keeps track of the cooling system temperature in our server room. When the temperature of the server room rises above the required limit, a warning message would be send to our cell phone. The staff who is on duty at the time will be able to attend to the problem”* (Rp8q4).

About 4 of the respondents are embracing the use of contacts and calendar features of the mobile phones as they are handy and make life much easier. *“We use calendar and contacts features in our cell phones because they are handy and make life much easier”* (Rp9q4). *“Yes the use of calendar and contacts features makes life much easier”* (Rp11q4). *“The ability to carry a mobile phone that has contacts and the checking of appointments using calendar make it a lot easier”* (Rp12q4). *“Yes the contacts and Calendar are really good features”* (Rp19q4).

Q5 Existing mobile technologies combining it with (established) business applications used in organizations include VoIP, Push e-mail, Collaboration, Corporate SMS, Instance Messaging, Mobile business portal access, Asset Tracking, Mobile video Conferencing. Please give examples of how one or more mobile applications combining it with business applications are deployed in your department?

Most respondents were not able to provide an example of any established business applications that were currently in use in their organization. The majority of the respondents indicated that they have not used any of these applications stated in the questions (Question 5: Table 5, Appendix E).

Out of all the technologies that are used for business applications, VoIP was to be used by various organisations. It has not yet been fully utilised but the government is introducing this technology in all government ministries and departments. The department of IT within the Finance Department is managing government networks and as one respondent confirmed, it is still under development and its full use would be realised once the e-Government project is complete.

“Of all the technologies stated here, I would say VoIP will be one of the applications that all government departments and ministries will be using. This is because the infrastructure of the current e-Government project has the fibre optic cable that connects all government buildings meaning there will be much greater bandwidth. This will mean that using VoIP as government telephone system will greatly reduce the cost of telephone communication.” (Rp17q5).

Most respondents indicated that they have access to VoIP, for example using Skype for private communication and hardly had it used for work. Push-email as explained above is still rarely used only by those senior officers who have Smartphone mobile devices have access to Push-email services. All respondents indicated that the other business applications did not exist. Most of the respondents indicated that these are new applications that would require training in order to be able to use them in government services. As one respondent indicated *“All these services do not exist yet within our department. I am taking note of it we might be introducing it later once we have the*

knowledge and skills of how they are use to enhance business activities“(Rp4q5).

Q6 Please indicate the level at which staff are provided with mobile devices?

The data collected as part of the answers to Q6 (cell phone basics) is graphically represented in Figure 5.1. Respondents had to indicate the level at which staffs were provided with mobile devices by selecting appropriate level as presented in the table (see Q6 in the Appendix A). All answers to respondents were entered into a spreadsheet to find the total frequencies of respondents to each level with respect to mobile devices they indicated (Appendix F). This study considered that presenting the data in percentage format is more appropriate for clarity and readability especially when they are plotted into graphs. Therefore all data were converted into percentages by taking the total number of responses to each level of respondents with respect to mobile devices divided by the total number of participant; in our case is 20 then multiple by 100 **((Total Responses /20) x 100)**. The results calculated for this question is represented in Table 5.2.

Table 5:2 Percentages of the staff having access to different mobile devices according to their position

	Top Management	Middle Management	Junior Management	Field Staff	Admin Staff	All Staff	None
Cell phone (basic)	50%	15%	10%	20%	10%	15%	25%
Cell phone (GPRS/EDGE)	45 %	5 %	0 %	0 %	0 %	0 %	50 %
Cell Phone (with 3G)	0 %	0 %	0 %	0 %	0 %	0 %	100 %
Smartphone (with 3G)	0 %	0 %	0 %	0 %	0 %	0 %	100 %
PDA	25 %	0 %	0 %	0 %	0 %	0 %	75 %
Cell Phone Enabled PDA	45 %	10 %	5 %	5 %	5 %	5 %	50 %
Laptop	95 %	70 %	25 %	40 %	15 %	0 %	1 %
Laptop (with Wireless card)	65 %	45 %	5 %	25 %	10 %	0 %	25 %

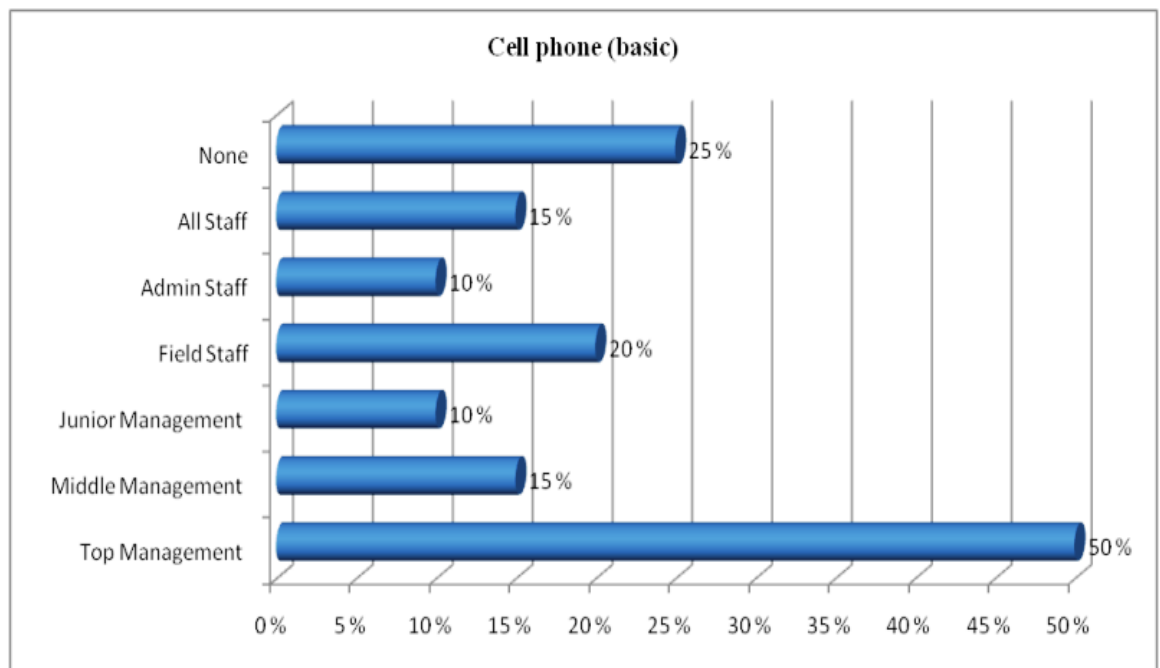


Figure 5:1 Basic deployments of cell phones

The findings show that top managers are the greatest users of cell phones in government organizations as can be seen from Figure 5:1. Although the use of mobile phone is widespread throughout the organisations, the fact is that the government does not provide mobile phones to all staff. It was that not all government employees have work-issued phones. The issuing of cell-phones is mainly for top management and field staff who need it to do their work. One respondent explained that mobile phones provided to top management were not given by the organisation but as part of promotional activities to the cellular providers. While the government does not provide cell phones to employees, one responded indicated that their organisation had made a special arrangement with the service provider where they provided basic cell phones to staff.

Some respondents indicated that while the government did not provide cell-phone to its employees, some organisations did have some form of benefits such as a certain amount of pre-paid credit usually paid to the employee account every month by the government.

Once this pre-paid credit is used up, the employee will have to pay for the cost to top up their mobile credit account. The widespread use of mobile phones as shown in Figure 5.1 only indicates that most employees have their own personal cell-phone.

Cell-phones with GPRS/EDGE technology are new and most government employees indicated that though the feature is enabled in their phones it was hardly used. As presented in Figure 5:2, mostly top management have cell phones with GPRS/EDGE technology. The graph only shows employees who have been issued with work cell phone.

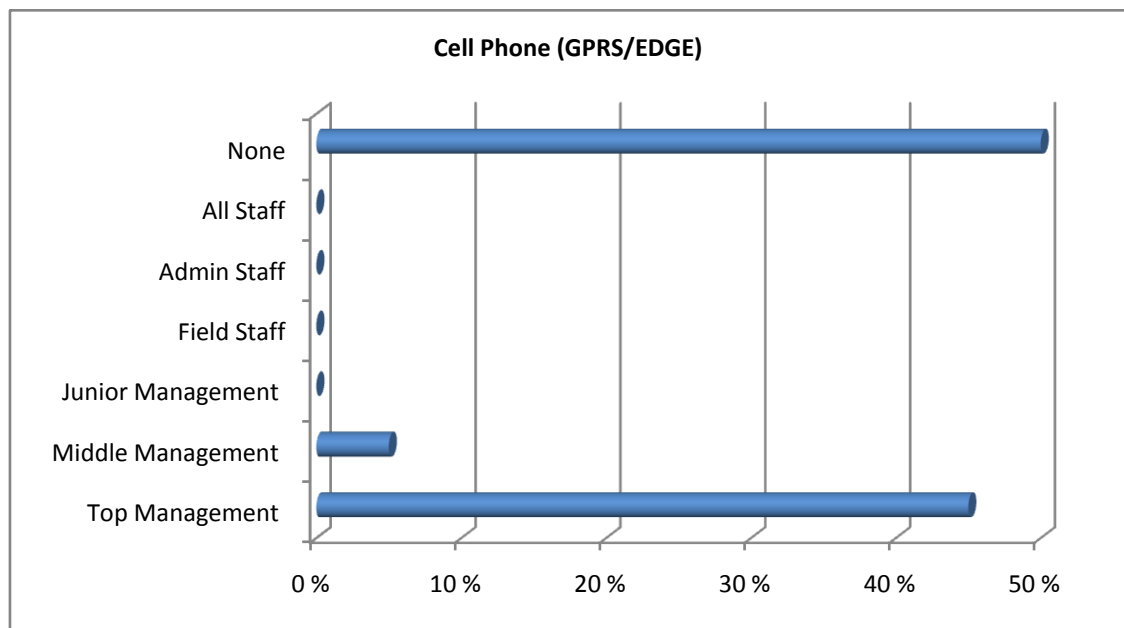


Figure 5:2 Deployment of cell phone (GPRS/EDGE)

At the time of conducting the interviews and survey, 2G and 2.5G was the mobile network currently servicing the country as provided by the two main services providers Digicel and TVL. It is expected that the 3G network will soon be deployed as the advancement in mobile technology means that most cell-phones today are capable of utilising the power of 3G. This advancement may greatly reduce the difference between

the basic cell phone and Smartphone. However, no useful data was collected with respect to rows 3 and 4 of question 6 as shown in Table 5:2.

While these service providers continue to work on upgrading their network, they encourage people to acquire the most powerful phone they can afford in order to fully utilise the capabilities of the network. Acquiring advanced mobile phones such as Smartphone can be very expensive. This could be one of the reasons there is very little adoption of Smartphone in government organisation. In this study the term Smartphone will refer to basic cell-phone and Smartphone with 2.5G enabled.

PDA use has also been investigated in this study and surprisingly hardly anyone in Vanuatu used it. When asked about the technology, many really don't know what it is. Further explanations of what the device does showed that few are aware of it. As mobile technology advances, most cell-phones and Smartphone have now PDA features. The graph below shows employees who have access to and used cell-phone enabled with PDA features. It is apparent that not only top management have access to cell-phones enabled with PDA features but a few other staff also use cell-phones enabled with PDA.

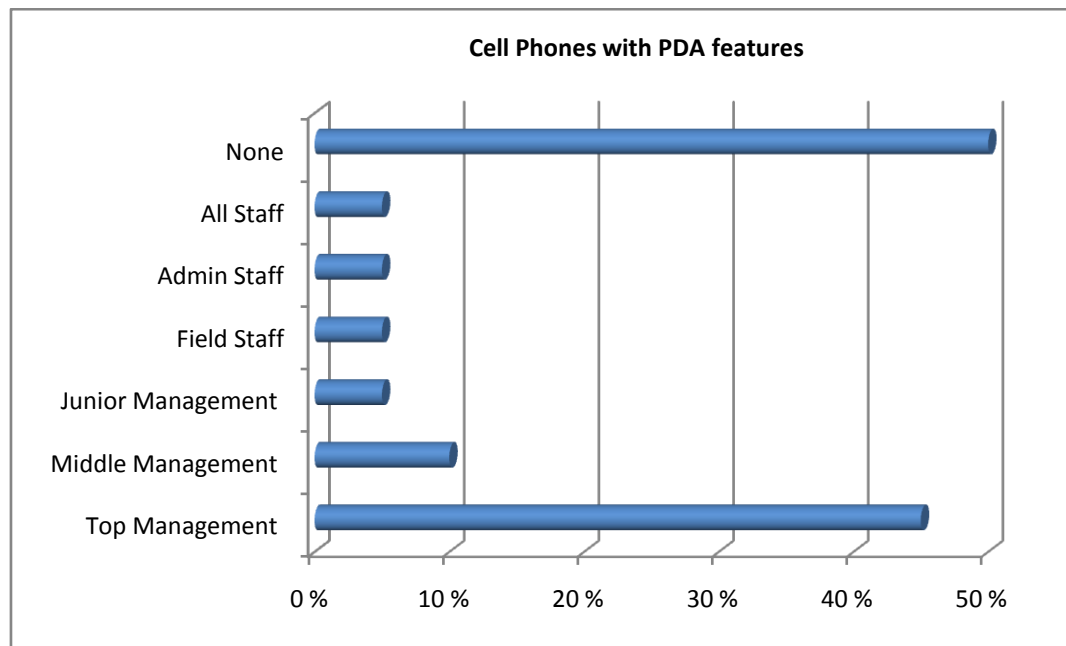


Figure 5:3 Deployment of cell phones with PDA features enabled

Mobile computers (laptops) are widely used in almost all government departments as shown in Figure 5:4. As mobile technologies advance, nowadays most of these mobile computer especially Laptops come standard with Wi-Fi and Bluetooth capabilities. They have become more affordable, despite the significant increase in their power and functionality. As a result more users are going for laptops when a computer replacement is due. Regardless of the benefit to be more mobile with mobile computers, the risk of losing the equipment cannot be ignored. Losing the equipment (or having it stolen) means you have the risk of losing your information, taking considerable efforts to avoid such risk is very important.

As previously stated service providers in Vanuatu are yet to upgrade from 2.5G to 3G mobile network to extend the benefit of using mobile technology. Laptop computers are widely used across all government organisations. This study takes note of the fact that 3G is not yet deployed and there are no laptops or cell-phone with 3G enable event if some of the laptops have the technology installed, they are not in use. The use of such

technology (mobile-enabled laptops) is rare, however, most employees are using laptop that have wireless card and are Wi-Fi enabled. Figure 5:4 shows laptops with wireless card installed or Wi-Fi enabled.

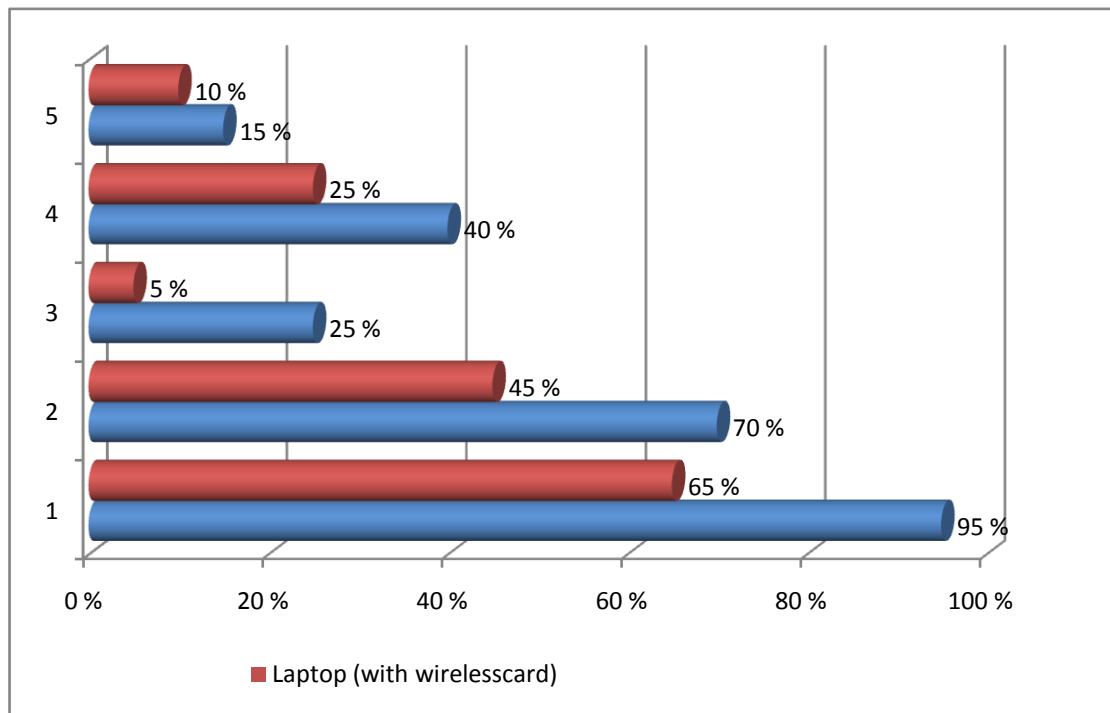


Figure 5:4 Use of laptops and mobile enabled laptops.

Q7 The business value chain (B2B/B2E) include Firm infrastructure, Procurement and inbound logistics, Operations, Outbound logistics, Marketing and Sales, after sales service and support systems. Please give examples of one or more business value chain (B2B/B2E) your department has incorporated mobile devices/ applications?

In this question the majority of the respondents did not provide any answers that directly address the business value chain stated in the questions and no examples given that occurs within their organizations (Question 7, Appendix E). However, many of the respondents indicated that they have some forms of conducting business using mobile phones and laptops.

“In our department we don’t have that capability to make transactions via mobile phone but instead we do make calls to our client using mobile phone” (Rp1q7).

“I think we only use SMS to conduct some form of business dealing especially with other business organization (Suppliers)” (Rp5q7).

“We are using cell phone to conduct client but invoicing the customer is done manually” (Rp8q7).

“Yes we normally use Laptop to records all our transactions” (Rp15q7).

“We simply don’t have any business dealings that are conducted over mobile devices. Making a call and SMS to other business organizations is all we do over cell phone but no any other ways of conducting business.” (Rp20q7).

One respondent indicated that they have used a cell phone to make contact with their customers. This is a case where employees are supposed to check regularly on an installed water cooling system for those clients who have requested it. Once the water cooler has been installed the customers are sent an invoice, often by SMS. *“Conducting business via cell phone does happen in our department. For example, we have clients where we usually supply water tanks and install water cooling system in their home. Most of the communication and payment transactions is done using a cell phone” (Rp6q7).*

It has been noted that while there are certain business activities occurring between government and other business enterprises, respondent have not given any further examples. If there are business activities, then obviously SMS and voice call could be the only mobile services currently used for this purpose (Question 7, Appendix E).

Q8 Training of staff in mobile technology can be conducted through many channels including Formal training courses, Ad-hoc training courses, Online training courses, Guidance (Training by colleagues), Ad hoc training by colleagues, self-help guides, internet research. Please give one or more examples of the type of training channel your department utilizes?

The responses indicated that there was hardly any formal standard of training provided by government organisations to employees specifically for mobile technology (Question 8, Appendix E). Most of the training conducted in each organisation is ongoing training conducted by IT staff and is only about the system applications the organization is using internal.

For the use of mobile phones users have to learn how to use mobile phones at their own cost. In the case of laptops, some government organisations make special arrangements for training of staff on how to use their laptops and it is only for the basic use of applications such as Word and Excel and training is mostly conducted by IT officers.

“Yes in the department we have some form of in house training but is only limited to computing applications such as word excel and how to use the department email system. There is no such training specifically for mobile technology.” (Rp1q8).

“In the Department, we do not give out training for mobile phones, only with Laptop and basic computing. Most staff do their own training at their own cost and internet research is probably the channel of training we have.” (Rp2q8).

“In the department we have basic training on Laptops. There is a special government organization that organizes and arrange for training of all government officers. There

are policies in how government can provide training to government employees” (Rp4q8).

In some cases, training of staff only takes place when the senior manager sees that there is a need for training. *“In the Ministry we don’t give out training except for human resource office, but some Political Appointee who doesn’t understand anything about computing and it’s hard for them, so the human resource officer has to contact trainings through the Department of Information Technology” (Rp5q8).*

Other respondents indicated that while they don't usually have any training system in place, the internet is the place where most of their learning takes place.

Furthermore, the Department of Finance which is taking care overall of the government network systems, have in place a number of channels for providing training to their staff, with funds allocated specifically for that purpose. For instance, one channel of providing training is to hire consultants from overseas to conduct training for staff. The department also sends individuals overseas to take short-term training mostly in the form of industry certifications such as Microsoft certification courses and CISCO certification. Most overseas training is conducted at the Woo Woo University in China. At times the department would arrange with Japanese volunteers (JICA) to conduct an audit of the level of knowledge and understanding of each staff member on the use of the current computing technology. Based on their assessment JICA would normally make recommendations for future training.

“Concerning training of staff, in the Department of Finance we do have provisions to provide training for our staff. Most of our training are short term training and mostly conducted in overseas, especially at the Woo Woo University in China. Our staff attend

training program under industry certification such as Microsoft certifications MCSE and CISCO. We also have volunteers from Japan (JICA) who provide in house training and usually conduct audit on the level of training staff are getting and making future recommendation on how to improve training in the future. We do not provide training for mobile technology” (Rp9q8).

It appears that there are no training provided specifically in the area of mobile technology. Few organizations provide training on how to use laptops but not in any other mobile related technologies. Most of the respondents’ answers show that there is no standard way of conducting trainings by the government. Each department has their own ways of providing some sorts of training to staff.

5.2.3 Mobile Technology awareness survey results

After completing the interviews, respondents were asked to complete the survey questions (Q9-Q11) and the survey base on technology readiness and assessment of the reliability telecommunication network (Q1 – Q10) and (Q1 – Q7) respectively. The researcher was present and provided clarification where the respondent had a question.

Q9. The importance and perceived contribution of mobile technologies are indicators of adoption. Please indicate your own view on the importance of the following ESTABLISHED mobile technologies in general.

All of the 20 participants attempted to answer this question. They indicated their own view on the importance of the established mobile technologies. Respondents rated the importance to unimportant of established technology on a five point scale ranging from

unsure to very important (Appendix A). Similar approach of coding the responses answers and computing for the percentage in question 6 was used. Data coded from respondent answers were presented in Table 6 in Appendix E. This data were used to calculate the total percentage of ratings from respondent on the importance of each mobile devices used . This data was used to derive the graph depicted in Figure 5:5. The graph only shows the established mobile technologies that respondents considered very important.

Table 5:3 Respondents rating of the importance of established mobile technologies

	Unsure	Very Unimportant	Somewhat Unimportant	Somewhat important	Very Important
Cell Phone – Voice and general messaging (SMS)					100%
Cell Phone – SMS business communications and applications	55%			15%	30%
Cell Phone – WAP (web access)	20%		10%	30%	40%
Cell Phone – WAP (back-office access)	40%			30%	30%
Cell Phone – Blue Tooth	25%		10%	20%	45%
Cell Phone – EDGE	65%			5%	30%
Cell Phone – GPRS	60%			10%	30%
Cell Phone – EDGE/GPRS back-office access	60%			15%	25%
Cell Phone – 3G	35%		5%	25%	45%
Smartphone – Voice and general messaging	25%		5%	25%	45%
Smartphone – back-office access	60%		5%	35%	10%
Push e-mail / Blackberry	40%		5%	5%	50%
PDA – calendar / contacts	40%		10%		50%
PDA – e-mail access	35%		10%	5%	50%
PDA/Cell phone voice and general messaging	45%		10%	15%	30%
PDA/Cell phone – back-office access	60%		5%	10%	25%
Laptop computer					100%
Laptop computer and 3G /wireless card	10%				90%
Laptop computer and 3G(HSDPA) card	10%				90%

Figure 5:5 shows that using voice and general messaging as well as laptops were considered the most important by the majority of the respondents. Respondents indicated that connectivity to the internet had become an important aspect, either

through EDGE or 3G. 50% of the responses indicated that PDA with email access, calendar and contacts and blackberry Push email were also considered important. This shows that even though PDAs were rarely used within government organisations and there was a wide gap between cell phone and laptop use, it was still rated as important. This could be that the gap has been narrowed as most advanced and even some basic cell phones have now enabled PDA features.

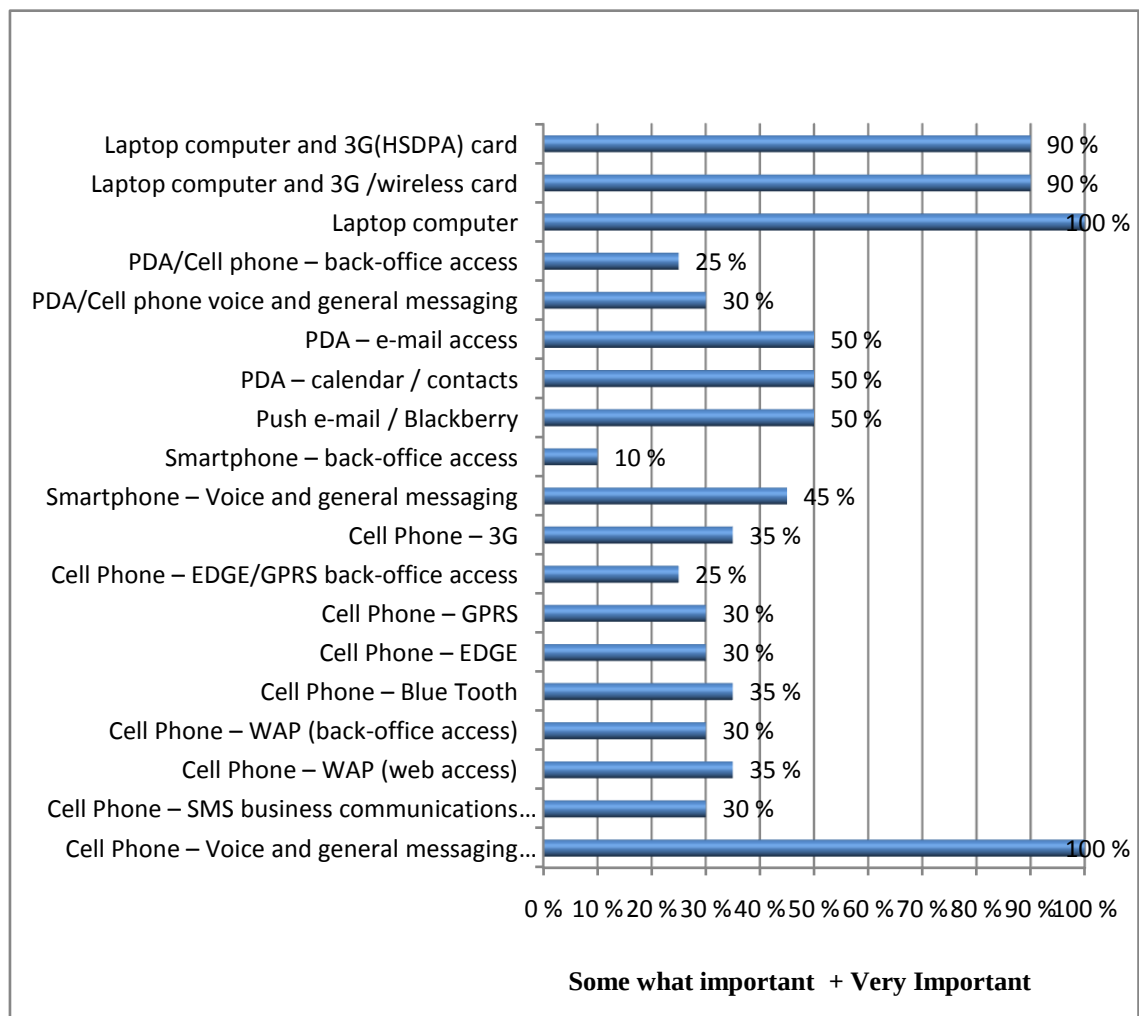


Figure 5:5 Importance of existing established mobile technologies (percentage of “Somewhat important” + “very important” of all responses).

Q10. Please indicate in general your knowledge and understanding of the use of mobile technologies.

All respondents attempted this question and for this question a four point scale was used ranging from unsure to very advance. Respondent answers were coded into a spread sheet as presented in the Appendix G. The percentage of all responses for each mobile technology was calculated similar to results of Questions 6 and was presented Table 5.4.

Figure 5:6 provides the average percentage of all responses of the ratings of difficulty when using any of the mobile technologies. Figure 5:7 presents all the possible mobile technologies that have been rated by respondents and how each of them was rated. Responses ratings range from very basic to very advance. The technology that respondents considered to be less difficult to use was cell-phones (Figure 5:7). Most responses indicated very advanced use of cell-phones. About 60% of respondents are unsure and about 20% having less difficulty in using the technologies. This means that, as government organisations realises the advantages of MWTs and start to use them to address business needs, more would need to be done to train staff.

Table 5:4 Respondents rating on the level of difficulty of using mobile technology

	Unsure	Very Basic	Somewhat Advanced	Very Advanced
Cell Phone – Voice and general messaging (SMS)	0	5%	25%	70%
Cell Phone linked to business applications	50%	15%	15%	20%
WAP	45%	10%	5%	20%
Blue Tooth	30%	20%	30%	20%
GPRS	80%	20%	0	0
3G	100%	0	0	0
3G(HSDPA)	100%	0	0	0
Push e-Mail/ BlackBerry	80%	10%	10%	0
PDA – e-mail/contact/calendar	75%	15%	10%	0
PDA – back-office link	100%	0	0	0
WI-FI Hotspots	40%	5%	5%	30%
Wireless LAN	40%	15%	10%	7%
Wireless WAN	30%	20%	10%	8%
Blue Tooth networking	45%	7%	10%	10%
PDA/Cell phone voice and general messaging	45%	15%	15%	5%
PDA/Cell phone – back-office access	100%	0	0	0
Laptop computer	0	15%	20%	13%
Laptop computer and 3G /wireless card	100%	0	0	0
Laptop computer and 3G(HSDPA) card	100%	0	0	0
Average	60%	10%	10%	20%

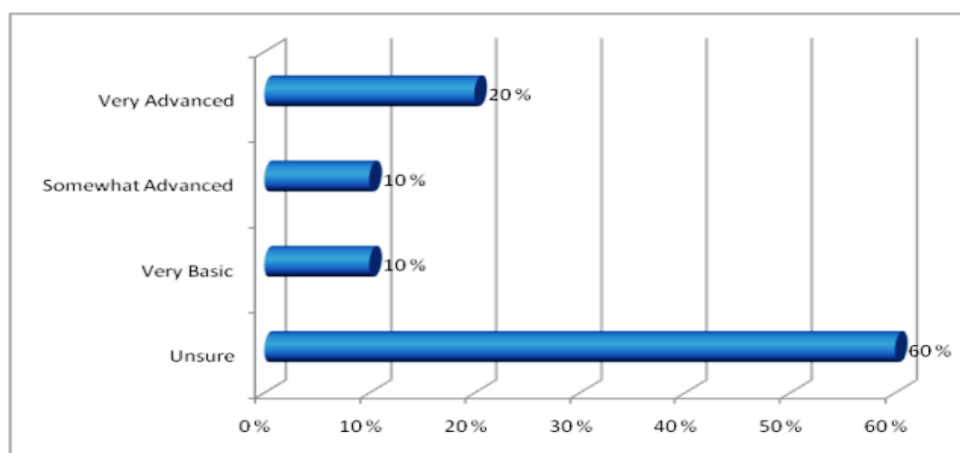


Figure 5:6 Overall levels of difficulties of use for all mobile technology (average).

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

technology over the last two years.

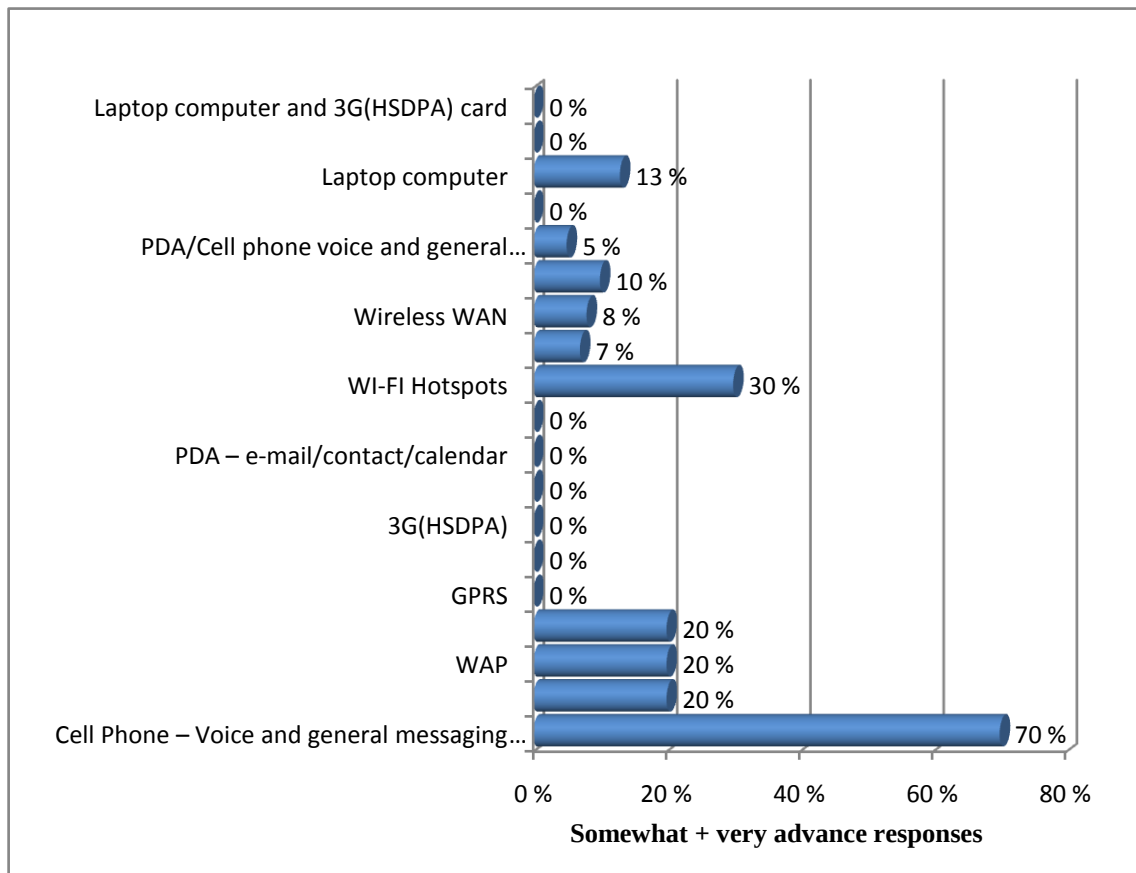


Figure 5:7 Rating of mobile technologies difficulty of use (percentage of “somewhat advanced” + “very advanced” of all responses).

Q11. 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 own view on the importance of the following EMERGING mobile technologies and the impact it could have on business.

All of the 20 participants provide their own view on the important of emerging mobile technologies. On a 5 point scale from unsure to very important, eighteen emerging technologies were rated by responses base on the table in Question 11 (Appendix A). This rating was based on respondents' perceptions on the impact these technologies

could have on the organisation in the short to medium term. All respondents answers were coded in a spreadsheet as presented in Appendix H. The average percentage was computed as in question 6 (Table 5:5) to derive the graph depicted in Figure 5:8 Overall importance of emerging technologies.

Table 5:5 Respondents rating base on the importance of emerging mobile technologies

	Unsure	Not important at all	Somewhat important	important	Very Important
VoIP and IP telephony	25%	0	5%	10%	60%
Converged communications	55%	0	5%	20%	20%
Video Telephony	35%	15%	0	20%	30%
WI-FI	35%	0	5%	15%	45%
WIMAX	40%	0	0	20%	40%
Mobile-FI	15%	0	5%	10%	10%
GPRS	10%	0	15%	15%	20%
3G	50%	0	0	10%	40%
3G (HSDPA)	45%	0	0	10%	45%
Data casting	60%	0	5%	20%	15%
Unified Communication	60%	0	0	25%	15%
Location-Aware Technologies	60%	0	0	20%	20%
Location-based technologies	45%	5%	20%	10%	20%
Instant messaging	35%	0	5%	10%	10%
Communication enabled applications	30%	0	5%	10%	55%
Synchronous collaboration	45%	0	0	10%	45%
Remote security and monitoring	45%	0	0	10%	45%
Mobile VPN data access	50%	0	0	10%	40%
Average	41 %	1 %	4 %	14 %	32 %

While approximately 40% of the respondents are unsure as shown in Figure 5:8 and approximately 35% feel that these technologies are very important to conducting business.

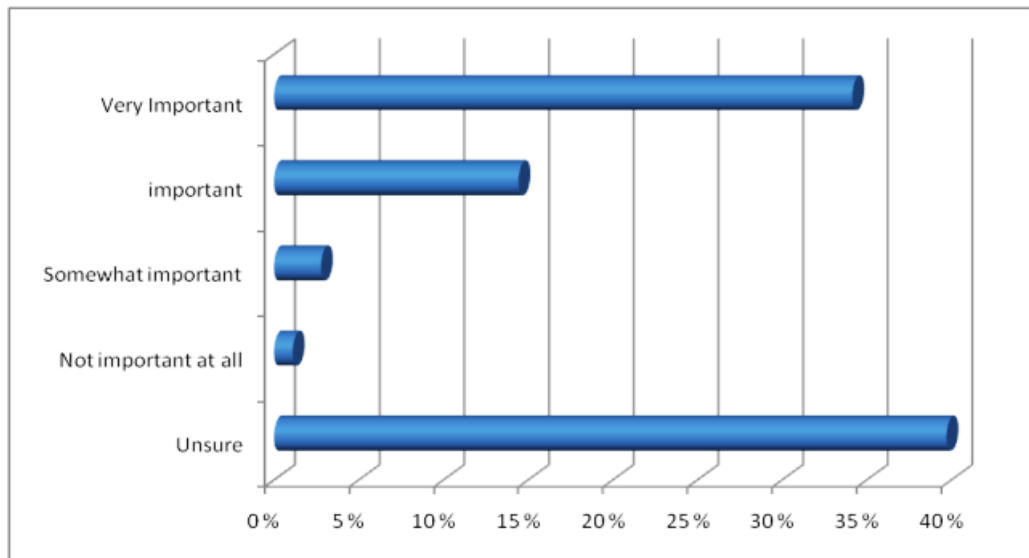


Figure 5:8 Overall importance of emerging technologies.

The individual technologies' ratings that respondents considered either somewhat + very important are represented in Figure 5:9. VoIP and IP telephony and Communication enabled applications are seen as the most important emerging technologies for government organization to consider.

Wi-Fi, 3G (HSDPA), Synchronous collaboration and Remote security and Monitoring were also rated as very important to the future business of government organisations. The third highest rating was given to Mobile VPN data access, 3G WIMAX and Video Telephony. The 40% of participants were uncertain about the importance of emerging technologies. This means that government employees need to keep up with the latest technologies and they need to receive more training on the use of these important technologies and become aware of their potentials benefits.

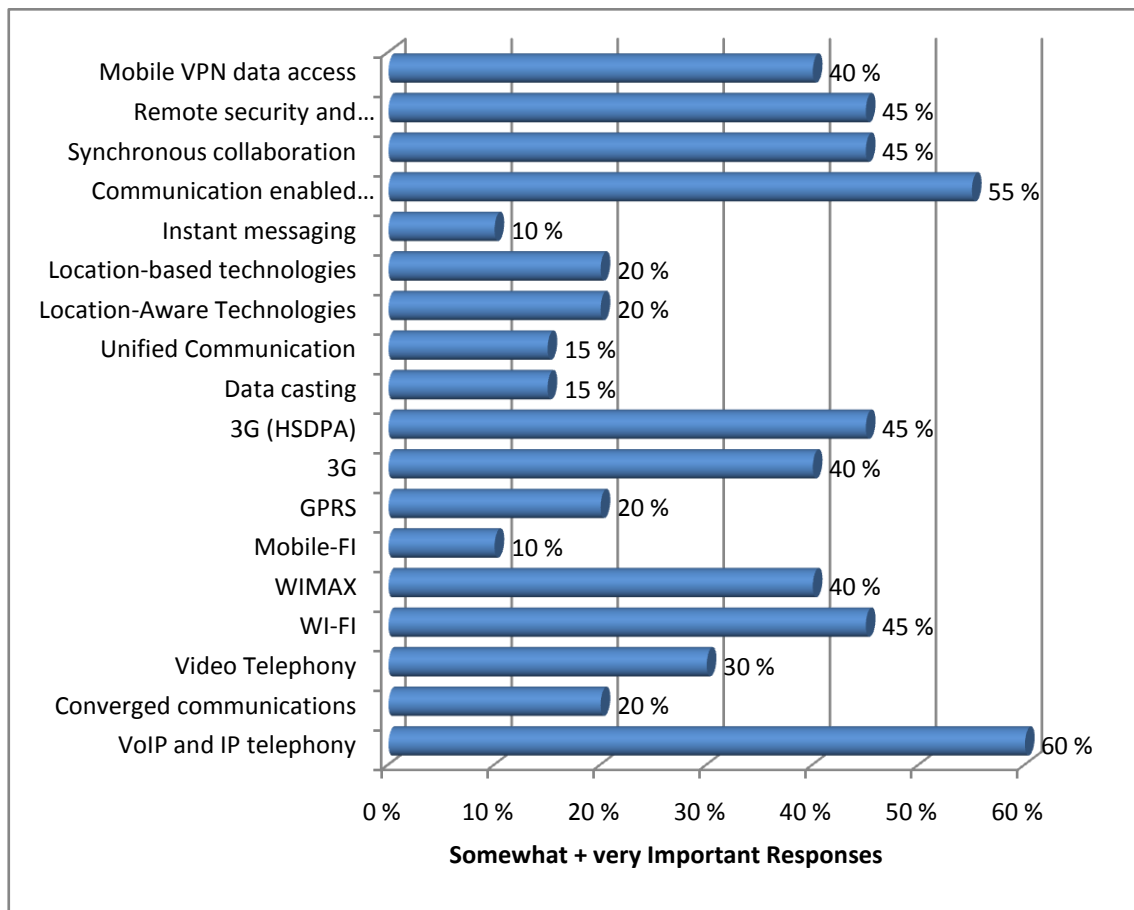


Figure 5:9 Importance of emerging technologies (percentage of “Somewhat importance” + “very important” of all responses).

5.2.4 Survey Results based on TRI

The TRI is part of the m-Readiness framework used in this study as discussed previously. It considered four aspects of technology readiness components such as Innovativeness, Optimism, Discomfort and Insecurity. All of the 20 participants attempted all the questions. Respondents were asked to provide their own perceptions of the TRI by using a 5 point Likert scale (Appendix A). All answers were recorded in a spreadsheet using SPSS tool (Appendix I). The SPSS statistic tool provides the functionality that is able to compute the mean and standard deviation from such data that were derived from a Likert scale as presented in Appendix G. Using this approach,

the mean, standard deviation, minimum and maximum value and the range of each TRI components were calculated (Table 5:6).

Table 5:6 Scores on TRI and its Component Dimensions

Component Scale	Innovativeness	Optimism	Discomfort	Insecurity	TRI
Mean	2.90	4.28	2.70	3.40	3.32
Minimum	1	3	2	2	2.71
Maximum	5	5	4	5	4.04
Range	4	2	3	3	1.33
Std. Deviation	1.12	.53	.66	.81	.34
Sample Size	20	20	20	20	20

The participants as a group scored high on optimism (mean = 4.28) and Innovativeness has scored low (Mean = 2.90) as presented in Table 5:6. The dimension of Discomfort scored very low, even lower than the average mean which is interesting in this case seeing that the Insecurity dimension is higher (mean = 3.40). The TRI overall mean average is 3.32 and minimum value of 2.71 with a maximum value at 4.02. In comparison to the general consumer owning technology-based products and services analysed by Parasuraman (2000) the TRI mean average for this group is high scoring 3.32 compared to 3.12. This shows that as a group in this survey respondent have a high technology readiness despite the low reading of the TRI values (2.71).

5.2.5 Reliability of Telecommunication Network Assessment survey results

The indention of this survey is to determine how reliable the telecommunication

network is. Respondents were asked to provide their own views base of the telecommunication network related areas as outline in T5 (Q1-Q7) in Appendix A. All of the 20 participants attempted all the questions. Similar approach taken in computing the results of TRI survey questions was used to derive the mean, variance, minimum, maximum and range of the RTN from the respondents answer (Appendix H).

Table 5:7 provide the mean scores of the respondents on the overall assessment of the RTN. As a group, the government employees with a high RTN scores feel very positive of the local area network (LAN) services (mean on LAN = 4.10). They are also positive about the wide area network (WAN) services they are utilizing (mean on WAN = 3.80) and also gave a high rating on wireless telephone network (WTN) (mean on WTN = 3.85).

Table 5:7 Reliability of Telecommunication Network Assessment.

Technology Results	LAN	WAN	ISP	BDN	SI	TN	WTN	Overall Assessment
Mean	4.10	3.80	3.40	3.20	2.95	3.55	3.85	3.55
Minimum	2	1	1	1	1	1	1	2
Maximum	5	5	5	5	5	5	5	5
Range	3	4	4	4	4	4	4	2
Std. Deviation	.97	1.15	1.23	1.15	1.05	1.19	1.18	.63
Sample Size	20	20	20	20	20	20	20	20

However, the telephone network (TN) seems to be rated near the average (mean on TN = 3.55), as a few of the respondents are not very positive about it (they may have based

their assessment on experiences in rural areas where they insist TN performance was not reliable). Government employees as a group feel that ISP services are not reliable (mean on ISP = 3.40) which is below the average mean.

The group also claimed that the broadband network (BDN) is not reliable so it scored lower than the average mean (mean on BDN = 3.20). The telecommunication service that has the lowest rating is the satellite internet (SI) (mean on SI = 2.70). Very few participants have indicated using it, while many have not used it or are not aware of these services so they cannot decide on this service. Though some of the telecommunication services are rated poorly, the overall average (overall assessment = 3.55) indicates that the telecommunication services are reliable across government organisations.

5.3 Summary

This chapter looks at a few examples of m-Government related projects. The results of the interview and the survey are also presented and discussed.

The literature review conducted and the internal experience of sources consulted indicates that service delivery to people is conducted in various ways using mobile technologies. The results obtained from this study shows that there is a realisation that there is still much to be done with regard to changing the attitude of top management and politicians in such a way that they can accept changes in how organisations can conduct business using mobile technologies.

The study shows that some m-Government projects have emerged over the past few

years. However, currently there are no m-Services delivered to people using mobile technologies as the projects discussed in this chapter are only pilot projects. Furthermore, government may not consider m-Government services for now as currently the project of e-Government is the priority and the focus of the government as the project progresses to its completion. Many government employees use cell phones and laptops to perform their daily duties.

Many potential users and managers are unaware of how MWTs can be used to enhance services. There are many top managers who see wireless technologies as hype and are only willing to invest in MWTs that assist in getting the basics of government services in place. Potential applications for MWTs have not been effectively identified, possibly because they are unaware of what MWTs are capable of. 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 MWTs, meaning that maturity of the technology is slow in terms of user experience. Based on the result of this study, it become apparent that although there are signs that a few organisations have tried to provide some kind of services using MWTs, there is still much room for improvement. In the next and final chapter the findings of this study are summarised further and recommendations are made based on these findings.

Chapter 6 : Discussion, Conclusion and Recommendations

Addressing the research objective of the study as stated earlier in chapter 1 and following the m-Readiness assessment framework introduced in chapter 3 empirical data about the framework indicators designed to measure the state of m-Readiness within Vanuatu government organisations were gathered and the relevant findings were presented in the preceding chapter. Considering m-Readiness as a precursor to m-government readiness, the study thus also evaluates the extent to which VGO these organisations are ready to introduce m-Government.

This section returns to the research question formulated earlier and discusses the findings presented in the previous chapter from the perspective of the study's stated research objectives. The future of m-Government in Vanuatu is also discussed, including an analysis of the service scope, benefits, and drawbacks, and the measures that can help improve the readiness of Vanuatu m-Government. The study data analysis revealed some interesting insights which informed the recommendations made.

6.1 The m-Readiness state of the VGO

Earlier m-Government was defined within the context of e-Government as m-Government extends the functionality of e-Government. The findings of this study indicate that within VGO, m-Government is indeed seen as part of e-Government. Although the literature reviewed differentiates between these two notions and often deals with the issues related to m-Government differently and separately from e-Government, in the context of Vanuatu defining m-Government as part of e-

Government is appropriately as it is unlikely that in practical terms m-Government will be completely separated from e-Government, given the state of existing developments in Vanuatu.

The first main objective of the study was to investigate how the government organisations were currently using MWT to deliver services to citizens. The investigation carried out by this study considered only services delivered internally within the country. A few examples of using MWT within Vanuatu government organisations were provided in the previous chapter, based on data collected from secondary sources. While there are many existing applications of MWTs that can be used to deliver services to citizens - ranging from m-Administration to m-Security, it can be seen that these are not used in any systematic or organised way as m-Government in Vanuatu is not yet introduced as a concept. These results were further corroborated by the findings related to interview questions 1-5 and 7-8, discussed below.

Evaluating the state of m-Readiness within VGO was the second major objective driving the research. M-Readiness was defined and discussed in chapter 3. Based on prior related work, an assessment framework was proposed in chapter 3 and used to develop the methodology applied to assess the state of m-Readiness (presented in chapter 4). Selected participants were interviewed face-to-face using the research instrument described in chapter 4.

Along with gathering qualitative data about the use of MWT, quantitative data about the attitude of government employees towards adopting MWT were also collected using TRI which forms a part of the m-Readiness assessment framework; therefore a TRI survey was included in the research instrument.

The findings provide evidence that MWT are well adopted across government organisations. However, this adoption is restricted to the everyday use of mobile devices and laptops. The analysis of the interview and survey results indicate that most of the advanced features of even the widely adopted mobile devices are not been utilised and the only features that are heavily used are SMS (text messaging) and voice calls. Most of the respondents admitted not knowing much about the advance features and the functionality they offered.

In addition the results of the interviews show that in general, there are no examples using MWT for m-Government services within the government organisations. Although these results are contextually specific and cannot be directly compared to results from other similar studies, and especially to the results obtained by du Preez (2009) (with the assessment instrument been slightly modified), one of the purpose of the interview is to investigate if there were any examples of m-Government applications currently in use was achieved.

The study discovered that government related information regarding the use of ICTs is not under one roof. Though the IT section of the Finance department is said to oversee many of the government organisations' ICTs, a few organisations also have their own IT sections. This means that to assess the state of m-readiness of VGO, the effort needed to be focused not only on the Finance Department's IT section but also on other units of VGO. In order to gather representative data, senior managers and technical staff within each organisation's IT units were approached and took part in the research.

The study revealed that mobile phones and laptops are the most widely used MWT devices whereas PDAs has not been used in government organisations. The business

process mobile applications such as VoIP, Push e-mail, and corporate SMS were used less, possibly because the technology is new and relatively more expensive. While the TRI survey results indicate that MWTs exists within VGO, the results from the open ended interview questions indicate that there is only very little use of some of these technologies.

The biggest users of the technology in this regard were the senior managers and field staff. This indicates that the technology has been utilised where it is needed most. Any staff that needs to be in constant contact and who needs access to systems and data when they are away from the office have been given the tools to do business while on the road.

The results about the value chain activities (question 7 of the interview) show that respondents did not react to/understand this question as expected; however it was found that respondents perceived 'operations' as the most likely business value chain element to benefit from using mobile technologies.

Perhaps explaining why many interviewees did not know about the more advanced features of the mobile devices, it was found that many of the organizations had no formal approach or policies with respect to training staff in the use MWT. Almost all training takes place informally and is either through the assistance or guidance offered by colleagues or in some cases by using Internet resources, or a self-help guide.

Furthermore, both cell-phones and laptops were considered very important by the research participants as it was becoming very important to be able to connect to the Internet and to wireless networks. While most respondents had limited knowledge about

and skills in the use of some of these technologies they acknowledged their growing importance; for example build in mobile device features such as 3G, EDGE, HSDPA were considered important. (For example only 30% of the respondents considered themselves to be somewhat advanced or advanced users of MWT, and even those mostly referred to using a cell-phone for voice calls and SMS).

As already mentioned, many of the respondents had insufficient or even no knowledge about the more advanced MWT. However after each of the technologies explored in this study were explained to them, respondents were able to provide their own views about the importance of the listed emerging technologies. Emerging technologies that were rated as very important to the organisation included VoIP, communication enabled applications, Mobile VPN, Remote security and monitoring, synchronous collaboration, 3G (HSDPA) and Wi-Fi. Other technology also considered of importance included Wi-MAX, Video Telephony, and GPRS, 3G, converged communication, Location-Base technology and Location-Aware technology.

Furthermore, the study has extended the investigation further in the area of employee technology readiness in the use of computing technology in general and the telecommunication infrastructure taking into account the employees perceptions of the overall assessment of telecommunication network services. Four factors were considered in determining the employee technology readiness; Innovativeness, Optimism, Discomfort and Security. Though the assessment of employee technology readiness does not directly addresses MWTs but the overview of the use of technology in general can assist in deciding on the adoption of MWTs for deploying m-Government. The TRI is useful for two important reasons. The individual scores can be used by government especially in identifying specific technology areas where training is

needed. Second, the individual scores on specific dimensions of optimism, innovativeness, discomfort and insecurity can be used to group employees into different segments based on their scores so that training can be tailored for the different segments with a view to ease the process of adopting new technology in this case MWTs.

The TRI is useful within the context of this study as a starting point for influencing employees' technology acceptance so that MWTs adoption can be smooth and efficient. In this study the TRI is considered to assist in providing the current state of m-Readiness (technology readiness of employees) and suggest means to improve their technology acceptance in the case where TRI scores are low. The study shows that even though there are some individuals with low TRI, as a group the respondent in the survey have in general a high technology readiness (Table 5:6). The reliability of telecommunication network services across VGO in general was rated high. However, this high rating is only realised in the city while few of the respondents rated it low as they insisted that the telecommunication services in the rural areas is still very poor (Table 5:7).

In summary it was found that in Vanuatu m-Government is virtually non-existent as there are very few m-Government applications and services within the government organisations. Government organizations use only the most common MWT features; staffs are not trained in MWT. Even though there is a certain level of adoption of various aspects of mobile and wireless technologies, there is lack of understanding of m-Government, and lack of planning for m-Government services. Still some pioneering services such as emergency alerts and birth and death registration have been or are about to be offered. It can be concluded overall that VGOs may not be ready yet to implement m-Government at a large scale but it can be expected that to see more m-

Government services on offer in the future, especially as the current initiative (implementing e-government) is seen in Vanuatu as a significantly broad one to include m-Government activities at a next stage. Comparing the results reported here to the m-Government critical success factors framework proposed in a recent work (Al-Khamsey & Lawrence, 2010) it can be seen that the current state of VGO is lacking in three important areas, related to government employees: IT project management skills, staff technology literacy, training provision. The issues related to these factors need to be addressed, as suggested further in the chapter; as pointed out in (Fidel, Scholl, Liu, & Unsworth, 2007), the role of the 'human actor' in implementing MWT is extremely important with respect to the success of such a project.

While m-Government may continue to be seen as inseparable from e-Government, there is still a need for a specialisation in the area (Rossel, Finger, & Misuraca, 2006). The national government faces the challenge to find the right people who have the appropriate skills to ensure that the right solutions and the right technologies are available to address the future needs of the government and the citizens of Vanuatu. Further implications are discussed next.

6.2 Towards an m-Government in Vanuatu

In previous chapters m-Government was defined and compared to e-Government, and its determining features were identified. The findings discussed here and in the previous section also identified some instances of use of MWT for m-Government type of activities. The discussion below considers further the issues related to the future of m-Government in Vanuatu, the applications and services to be used, the specific benefits,

drawbacks, limitations and challenges associated with m-Government, and the measures that can be put in place to improve the level of m-Readiness of the Vanuatu government. The mobile applications currently being introduced in Vanuatu are pilot projects or are still to be implemented. Implementing new mobile applications for public services may depend on the type of services delivered by e-Government. E-Government offers for example financial transaction services on line such as paying taxes, license fees, fines and others. These may be complemented in the future with adding mobile banking as a second payment channel, as the banks have already introduced mobile banking.

While there are a number of m-Government applications that VGO may consider another purpose that MWTs can be used for is education. It will enable students in remote locations, especially in rural areas and outer islands, to have access to the same resources that are only accessible currently to students in the urban area.

In general the advancement in the technology means that in the future there will be greater improvement in the speed of connection for cellular and wireless networks and it is expected for the cost to come down allowing more people to access the Internet. Consequently, the government will be able to communicate directly with people in remote locations. Apparently, mobile applications such as SMS, IM and VoIP will allow more interaction among citizens and the government.

However public service will be greatly challenged by the lack of a coordination of m-Government development if there is no attempt to change the way ICT is handled by each government organisation. The current ICTs service structures within VGO need to change into a more standardised system and to have only one department that controls the government ICT functions. This government will be able to achieve better deals,

thereby and thus to deliver better m-Services. In addition, coordination efforts should not only be made at national level; the six provinces and local districts are just as important as the national government and they are to be considered while addressing m-Government solutions in order to avoid any duplication of effort, and to make use of the existing resources, however limited they are. It is hoped that the challenges will be addressed once the government has in place a system that will coordinate all its ICT services.

Legislation is said to be one of the biggest obstacles that can affect the process of development. The government of Vanuatu seems to be in a good position to realise the importance of making necessary adjustments to the policies that govern the telecommunication industry in order to keep up to date with the advancement in technology. It is important that rules or policies defined keep up with the change in technologies field of wireless and cellular communication. The changes recently made to the required legislation show that the government is ready to address such issues. As a result Vanuatu now has an open market in the telecommunication industry.

During the interviews a respondent pointed out at one of the obvious and important limitations that would hamper the service delivery not only by m-Government but also e-Government, and that is the lack of bandwidth. The current 2 megabit bandwidth cannot support all MWTs functionalities such as live video streaming and video-communication. It is believed that this has been addressed at the initial phase of the development of the current e-Government project. While discussions about the possibility of integrating m-Government as part of the e-Government are on-going, it is an important area that must be improved in the near future. The current e-Government infrastructure deploys underground fibre optic cables that connect all government

departments. This is a sign of improvement in the bandwidth and hopefully this will be extended to remote areas. That would require the national government to invest in greater bandwidth for wireless broadband. Many other organisations will benefit from this investment including educational institutions, provincial government and also private sectors.

The lack of skills and expertise in the area of MWTs is another limitation also identified in prior research; VGO will also be challenged by this limitation. This is one of the issues the government has to address and sometimes it is difficult to find qualified and experienced people in this area. One reason for this is that the government may have been paying very low salaries and qualified employees move to work in private organisations who offer them higher wages.

Finally one of the problems with deploying MWTs is the concern about the exposure to radio waves as pointed out by du Preez (2009). There have not been enough studies on the effects of radio waves on people's health. The level of exposure to radio waves is expected to continue to rise in the future. This problem has not been fully understood yet. To provide meaningful results of the effects of MWTs, more studies must be carried out over a long period of time. The exposure may also negatively affect people who are always connected at all time. Those with higher level of responsibilities are likely to be the one affected by such a situation and may resist a broader utilization of MWT.

Despite the challenges and limitations of MWT, the benefits of utilising MWT are obvious as demonstrated by the many examples covered in the previous chapters. Citizens have realised the potential of using MWTs both for cost saving and improving the livelihood of people living in rural areas, especially in the islands. There is no longer

the issue of long distance travel to a place with a land line to make a call, especially in rural areas. People make calls wherever they are either at home or while doing farming and gardening or fishing.

While Vanuatu has yet to fully realise the great potential of MWT, many countries have already been enjoying the benefits of MWT with respect to government services. The Vanuatu government is expected to do the same before too long. Citizens will have the convenience to interact with government anywhere and anytime. It will become convenient for citizens to communicate and conduct transactions via a cell-phone once m-Government is deployed. One of the greatest advantages of utilising MWTs is the convenience of exchanging information between citizens and government using SMS and IM which are found to be at low cost and most widely used.

However it is imperative for a proper feasibility study to be carried out before work is undertaken on project. The government needs to learn from other countries experience and share the best practices to prevent costly mistakes. An attempt to consolidate efforts must be considered by the government. It would be highly beneficial if a proper audit is carried out and a central recording system or a database is put in place to keep track of all activities related to the deployment of m-Government. Looking at past experiences it is apparent that many funded projects have failed due to the lack of proper auditing of the project. The Vanuatu government at times has come across situations where a project had not been completed only to find out that the money allocated for the project has been diverted by a corrupt individual. The Vanuatu government depends mostly on aid donors to assist with the country's limited resources for improving its economic development. If money donated is not used wisely and for their intended purpose, then the country's reputation will be jeopardised which may result in aid donor countries not

willing to fund future projects.

Perhaps, in order for the government to improve its m-Readiness level all responsible government employees and senior managers as well as politicians need to understand the great potential of ICT and MWT for service delivery. Education and sharing of information is considered one of the effective ways for convincing politicians and senior government officials about the benefits of MWT, also facilitating understanding it with illustrative existing examples. At the early stage of decision making regarding technology use, it is advisable for the government not to utilise new technology with unproven track record.

While the current e-Government deployment project is making a good progress towards completion, the e-Government policy is yet to be implemented. It is imperative for the design of e-Government policy to have a dedicated section pertaining to MWT and ensuring that it is kept up to date. One way the government can maintain standards across all government organisations is through consolidation of all departmental ICTs. In that way all departments can be given guidelines and are updated with the use of the latest technologies.

In addition the government should promote the use of one laptop per child¹ (OLPC), a concept that was introduced in the recent PacINET conference mentioned earlier. The idea is that all children having access to the technology at an early age will greatly boost the learning process which in future can help assist with the issues of lack of trainings and skills. Educational and training, especially early age education may help e-

¹ OLPC is a project of One Laptop per Child Association, Inc. OLPC, is a U.S. non-profit organization aiming to “create educational opportunities for world’s poorest children by providing each child with a rugged, low-cost, low-power, connected laptop with content and software designed for collaborative, joyful, self-empowered learning” (Wikipedia, 2011d)

Government including m-Services reach a future, more mature stage where citizens will start to participate in policy making, in addition to consuming service (Sing, Das, & Joseph, 2004).

This study has introduced many examples from different countries where national services have utilised MWT. A further categorisation of the emerging m-Government applications across different geo-political entities can be found in (Trimi & Sheng, 2008). Such examples can assist the government when considering adopting MWT for public service delivery.

6.2.1 Services within VGOs

SMS is considered the most widely used mobile application service. Employees could send their request such as leave, performance, salary and any other personnel related queries. Next to SMS services is the use of IM that can be used as an interactive real time conference tool. This would be considered a best choice for services in educational institutions where all heads of schools around the country can collaborate over the phone using IM.

Another MWT services that the government can utilize is to create, for each department, a virtual private network (VPN). The benefit of using a VPN is to reduce the cost associated with office space since it would enable the utilisation of mobile office environments. The concepts of virtual office are now embraced in many organizations around the world. This service will be of great benefit to mobile workers who are out doing their regular visits to the islands since they would always be connected to the office. In fact, not all offices need to become mobile offices, but technical support staff,

developers, data-entry operators for example could accomplish their tasks from anywhere provided that they have a secure network and that they can have secure access to the data.

The use of mobile technology to fight crime is one of the major benefits of using MWT. Perhaps this is one of those obvious mobile applications and services that everyone is aware of. The security forces can be assisting in many ways to save lives such as providing immediate information especially the ability to send photo graphs. Recently, police have been using mobile communication to communicate with the general public to help search for prisoner escapees. MWTs can assist not only government officers to perform jobs but also it can directly benefit the citizens. The same is true in providing health services. For instance, by using a mobile phone a paramedic can communicate directly with a doctor on duty and obtain the required information that is needed in such a situation where a patient need medical emergency.

6.2.2 Services to citizens

Some services to citizens have been already introduced, for example the birth and death registration mobile application (as a pilot project at the time of writing). A similar approach could be applied to health services as stated above. In the islands where transportation is a problem, the use of mobile phone is the solution. For instance, a citizen may communicate directly with the local doctors or nurses for any emergency relief. Usually, the local hospital would be sending in a vehicle to transport the sick person to the local dispensary. Citizens get the benefits of live saving especially in rural areas. Furthermore, citizens in rural area can have access to education via mobile

technology and even trainings on a range of topic. This could also benefit the famers in rural areas where they can obtain information on a range of topics in the area of agriculture. Further training can be made available to schools on topic such as ICT, math, science and even teaching basic literacy via mobile technology.

Accessing the Internet over a cell phone to perform transactions means citizens will have the benefits of cost saving and time. This has already begun other services such as downloading music, cell-phone wallpaper and ringtones. There are a few mobile applications services that government can quickly implement. In addition to the death and birth registration, another possible application would be motor vehicle license registration where motorist could SMS their registration where their cell-phone account would be automatically deducted for the exact amount being charged for.

6.3 Concluding Remarks

This study shows that there is a potential in Vanuatu to develop MWT based services which will be of benefit both to the Vanuatu government and to the citizens of Vanuatu. Many of these benefits and the use of mobile technology are described by Goldstuck (2003). In his report Goldstuck indicated that many of the mobile applications are already possible today. For example, using a wireless application to check for public transport schedules, making bookings and paying for sports events and few others that have been discussed which are not included here.

In order to take the approach of delivering services via mobile technology, it is advisable for the government to adopt mobile applications that already exist for

whatever services the government decides to deliver via mobile technology. The government always faces the challenge of limited resources such as skilled labour and funds to invest in the latest technology. In a case where it is not possible for government to deliver these services, it is best to hire expertise or partnership with other private organizations that are able to assist. Increasing the productivity of mobile workers is considered one of the greatest advantages of MWTs.

Findings of this study indicated that it is a challenge for VGO to decide on the adoption of new technology for the entire set of government organisations. Judging from the results obtained from this study, there seems to be a very wide range of choices that makes it difficult to decide which technologies are the most appropriate ones. In addition, the current technology advancement can be a real problem for government organizations especially if they are not up to date with the technology. A solution that is implemented can be outdated. This places the government in a position where decisions have to be made when a new technology can be adopted. The government has a choice either to wait for the technology to prove its worthiness before adopting the technology or can take a chance to try out something new.

There is always a risk involved for the government to take on either approach. To adopt only proven technology poses the risk for the technology to be out of date before it is implemented. To take the approach of adopting the latest technology mean using public funds for experiments and this can be a waste if it is not successful. One approach to deal with such a challenge is for the government to have in place a process for risk assessment that can be carried out by public officials before making the decision.

In the next few years, it is expected that cellular services in Vanuatu will grow at a very

high rate. Lessons learnt from other nations who have adopted MWT for delivery of service show that decisions are not easy to take. However, services that are delivered by the government need to be efficient, effective and economical. One way for government to achieve efficacy is to invest in mobile technology.

With respect to the research question of this study about the state of m-Readiness of VGO, the findings and results obtained allow to evaluate the level of m-Readiness from several perspectives. First, it was established that mobile technology has been widely used within government organisations. However, with respect to m-Government services offered, the overall state of the IT function governance, employee readiness and telecommunication services reliability, it can be concluded that the state of m-Readiness within VGO can be characterised as is relatively low, with very few examples of existing m-services, no training provided specifically for MWT, lack of coordination of ITCs within VGO, no deployment of a 3G network, lack of knowledge about the advanced features of mobile phones, limited access to Smartphone, telephone network in rural area is not reliable, broadband network not reliable. However the study identified some good examples regarding MWT in Vanuatu such as VNPF introducing a system that will enable members to enquire for their retirement fund balance using a cell phone.

The study involved a limited sample of participants and these were recruits senior government officers and therefore the problem may need to be investigated further. Furthermore, the study does not focus on user capacity and evaluation in M-readiness. While the scope of the study does not cover this aspect, it will be needed to explore the user aspects further in order to substantiate and refine any practical recommendations. However the study identified some of the issues that need to be addressed in order to achieve successful deployment of m-Government. The overarching recommendations

derived from the study are outlined below.

6.4 Recommendations

Most importantly, cellular service providers together with the government must continue to use the media to increase the awareness and to promote any new mobile technology especially the functions of specific applications, how to use them, and the benefits they provide. MWTs services such as SMS and voice mail should be included in a multi-platform approach to e-Government. Any method of communication implemented should provide citizens the ability to communicate either orally, handwritten or by SMS in their own choices of language (Singh & Sahu, 2008). Singh and Sahu also suggest that strategic plans should be developed by government regarding the use of telephones and mobile devices to provide as many services to the citizens. Further, it is the government responsibility to find ways on how a wide range of citizens not only those accessing the latest technologies can benefit from using the m-Government.

6.4.1 Improve Telecommunication Legislation (Regulation)

There is a need for the government to review its regulatory process regarding the ICTs and MWTs. Though there has been a recent change and improvement in the policy regarding telecommunications industry, the challenges discussed earlier about the technology advancement still exist. The government will need to continue reviewing the law and procedures to meet the continuous changes brought about by the advancement in technology. The advances in ICT should be compatible with Law and procedures

(Singh & Sahu, 2008).

6.4.2 Improve Analysis

Heeks (2002) propose the reality-gap model shown in figure 6:1 that shows how to design information technology so that the gap between reality and need can be closed. This model has been used to analyse the South Africa e-Government system, but the same ideology can be used for analysing the m-Government situation in Vanuatu. The gap between the need and reality should be narrowed in order for the design to succeed. Using a scale of high, medium or low, the gap can be rated against each of the seven dimensions. Figure 6:1 shows the ratings plotted on the scale to indicate the possibility of success or failure for the project. Heeks (2002) suggests that for any issues encountered during the development of any projects, government should in turn solve one issue at a time and not to have them all solve at once. Aloudat and Michael (2011) also suggest avoiding the ad-hoc approach in designing mobile solutions; therefore a new m-Service development can start with a pilot project that can be replicated in other areas to reduce the amount of risk along that line it can be implemented. Heek (2002) argues that the best people to lead and manage the project are managers with the skills to manage and understand government information and dealing with business. Unfortunately, these gaps are often very wide in developing countries; this study for example has identified some gaps, for example in the ‘staffing and skills’ area. As shown in Figure 6.1, the gaps identified can be compared relative to each other based on the findings of the study.

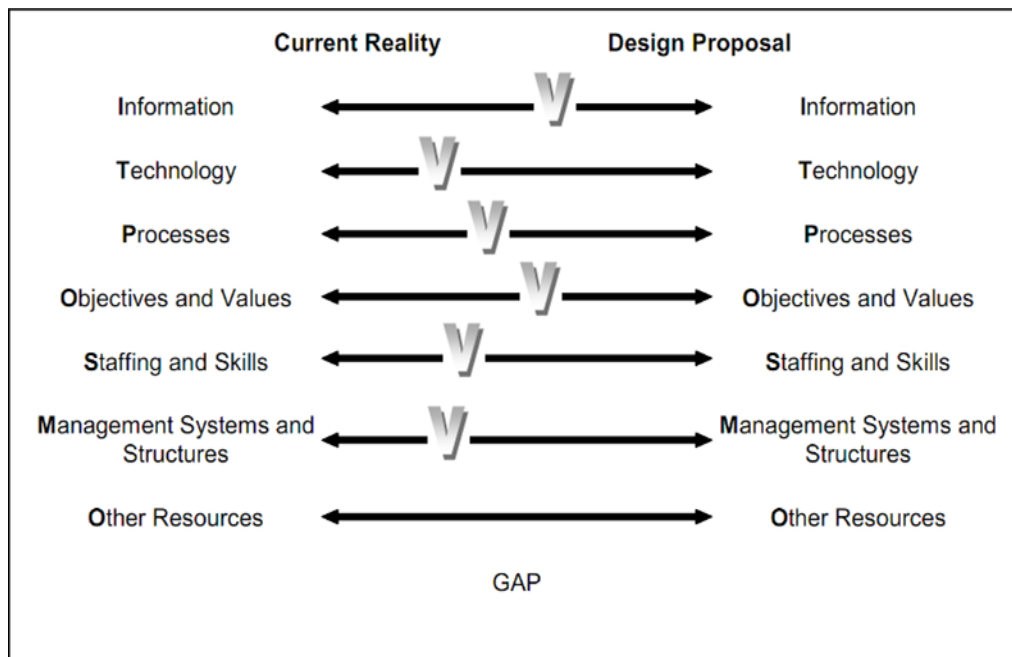


Figure 6:1 Analysing reality gaps in e-Government project. Source (R. Heeks, 2006).

6.4.3 Upgrading the Mobile Telecommunication Infrastructure

In order for citizens to embrace other mobile services apart from SMS and voice calls, there is a need for mobile service providers to start looking at improving and upgrading their mobile network to 3G network technologies. This will provide the ability for citizens to have an improved speed to access internet on their cell phones. Once this service is in place, the government Web portal need to be improved in such a way that it can be accessed via a cell phone with Internet capability. Wireless broadband connectivity must be improved to avoid the hassle of physically connecting all government offices and minimize the cost that is involved.

6.4.4 Learning from Examples

According to Coldstuck (2003), every time a new technology is embraced, it is not

necessary to reinvent the wheel. It would be more cost-effective to adopt and build on technologies that are proven to work in similar area and learn from others who have successfully deployed and used the technology.

6.4.5 Address Attitudes through Education

The attitude of decisions makers is said to be one of the biggest obstacles that prevent the use of mobile technologies in the public services (Goldstuck, 2003). It is important that employees and even managers take note of what can and cannot be achieved by employing new technology (Kervenoael, Cakici, & Guner, 2010). To make certain the possibilities of using MWTs be made known to users, it is imperative that the information of these possibilities is readily shared to address the challenges of service delivery.

6.4.6 Addressing Skill Shortages

One approach for government to address the problem of skills shortages is to conduct the project in such a way as to allow for the public and private sectors to work together on developing big projects such as e-Government and m-Government. In addition, it is important that senior officers or IT managers stresses the importance on the intergovernmental relationships and PPPs. The government could form a PPP with the ICTs corporate world to deliver m-Government services (Ya Ni & Tat-Kei Ho, 2005).

It is important that a balance must be maintained between the visible services and the backend infrastructure when investing in MWTs (Ni & Ho, 2005). Ni and Ho provide

suggestions specially relating to the implementation of Internet kiosks, but there have to be in parallel with mobile and wireless technologies and provide an additional channel for service deliver as also suggested in (Germanakos, Samaras, & Christodoulou, 2005). Any project initiated should have a realistic plan and communication must be strengthen with stake holders and partners. The same holds true for measuring performances and managing costs. Ni and Ho also pointed out that transparency in public reporting on services using MWTs can lead to greater accountability. This can help policymakers to decide on whether it is worth investing in the technology base on the report of MWTs services from the past years.

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Appendices

Appendix A: Questionnaires

Part I: Mobile Technology Assessments

To take advantage of the potential of mobile technology and to leverage investments made in the m-Government efforts, government agencies must ensure that government employees have access to necessary mobile technology resources. This sub-theme highlights the importance of the access to mobile devices such as mobile phones, PDAs, Smart Phones, and Laptops etc. This access is essential to the establishment of a supportive enabling environment for m-government.

- Q1 What is your current position in your department?
- Q2 Existing mobile devices used in organizations include among others ordinary cell phones, smart phones, Blackberry devices, PDAs, laptops. Please give examples of how one or more mobile devices are deployed in your department?
- Q3 Existing mobile technologies used in organizations include Wireless LAN, Wireless WAN, GPRS, 3G, EDGE, Blue Tooth Networking. Please give examples how one or more mobile technologies are deployed in your department?
- Q4 Existing mobile applications services use in organizations include among Voice and General Messaging (SMS), SMS business communication and applications, WAP (web access), WAP (back-office access), Push e-mail access, Calendar, Contacts, e-mail access. Please give examples of how one or more mobile applications services are deployed in your department?
- Q5 Existing mobile technologies combining it with (established) business applications used in organizations include VoIP, Push e-mail, Collaboration, Corporate SMS, Instance Messaging, Mobile business portal access, Asset Tracking, Mobile video Conferencing. Please give examples of how one or more mobile applications combining it with business applications are deployed in your department?
- Q6 How would you describe the levels at which staff are provided with mobile devices?

	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 (HSDFA)/ wireless card							

- Q7 The business value chain (B2B/B2E) include Firm infrastructure, Procurement and inbound logistics, Operations, Outbound logistics, Marketing and Sales, after sales service and support systems. Please give examples of one or more business value chain (B2B/B2E) your department has incorporated mobile devices/ applications?
- Q8 Training of staff in mobile technology can be conducted through many channels including Formal training courses, Ad-hoc training courses, Online training courses, Guidance (Training by colleagues), Ad hoc training by colleagues, self-help guides, internet research. Please give one or more examples of the type of training channel your department utilizes?
- Q9 The importance and perceived contribution of mobile technologies are indicators of adoption. Please indicate your own 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 and 3G(HSDPA) card					

Q10 Please indicate in general your knowledge and understanding of the use of mobile technologies.

	Unsure	Very Basic	Somewhat Advanced	Very Advanced
Cell Phone – Voice and general messaging (SMS)				
Cell 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				
PDA/Cell phone voice and general messaging				
PDA/Cell phone – back-office access				
Laptop computer				
Laptop computer and 3G /wireless card				
Laptop computer and 3G(HSDPA) card				

- Q11 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 own 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 communications					
Video Telephony					
WI-FI					
WIMAX					
Mobile-FI					
GPRS					
3G					
3G (HSDPA)					
Data casting					
Unified Communication					
Location-Aware Technologies					
Location-based technologies					
Instant messaging					
Communication enabled applications					
Synchronous collaboration					
Remote security and monitoring					
Mobile VPN data access					

Part II

Technology Readiness Questions

The following ten questions are used in a survey to measure technology readiness: The following questions were answered on a Likert-type scale ranging from strongly Disagree (1) to strongly agree (5)

T1: Innovativeness

Q1 I can usually figure out new hi-tech products and services without help from others.

	Select only one choice (tick)
Strongly Disagree	
Disagree	
Neither agree nor disagree	
Agree	
Strongly Agree	

Q2 In general I am among the first in my circle of friends to acquire new technology when it appears.

	Select only one choice (tick)
Strongly Disagree	
Disagree	
Neither agree nor disagree	
Agree	
Strongly Agree	

T2: Optimism

Q3 I like the idea of doing business via computers because you are not limited to regular business hours.

	Select only one choice (tick)
Strongly Disagree	
Disagree	
Neither agree nor disagree	
Agree	
Strongly Agree	

Q4 Technology gives people more control over their daily lives.

	Select only one choice (tick)
Strongly Disagree	
Disagree	
Neither agree nor disagree	
Agree	
Strongly Agree	

Q5 Technology makes me more efficient in my occupation.

	Select only one choice (tick)
Strongly Disagree	
Disagree	
Neither agree nor disagree	
Agree	
Strongly Agree	

T3: Discomfort

Q6 New technology is often too complicated to be useful.

	Select only one choice (tick)
Strongly Disagree	
Disagree	
Neither agree nor disagree	
Agree	
Strongly Agree	

Q7 When I get technical support from a provider of a high-tech product or service, I sometimes feel as if I'm being taken advantage of by someone who knows more than I do.

	Select only one choice (tick)
Strongly Disagree	
Disagree	
Neither agree nor disagree	
Agree	
Strongly Agree	

T4: Insecurity

Q8 I do not consider it save giving out credit card information over a computer.

	Select only one choice (tick)
Strongly Disagree	
Disagree	
Neither agree nor disagree	
Agree	
Strongly Agree	

Q9 I do not feel confident doing business with a place that can only be reached online.

	Select only one choice (tick)
Strongly Disagree	
Disagree	
Neither agree nor disagree	
Agree	
Strongly Agree	

- Q10 If you provide information to a machine or over the internet, you can never be sure if it really gets to the right place.

	Select only one choice (tick)
Strongly Disagree	
Disagree	
Neither agree nor disagree	
Agree	
Strongly Agree	

T5: Reliability of the telecommunication – Assessment

Having access to a reliable telecommunications infrastructure is key to establishing an enabling environment for m-Government. This sub-theme raises awareness about the need for reliability across all components of the telecommunications infrastructure. The reliability of the infrastructure is a composite of the reliability of all the various components, including the telephone network, the broadband digital network, the satellite network and Internet Service Providers (ISPs), among others. Government leaders must be aware of the interdependencies among all of these components and the need to pay attention to the reliability of these components in a consistent and ongoing way. The statements draw attention to the idea that overall reliability of the telecommunications infrastructure is based on the reliability of each of the component parts and that the operation of each of these components within specific regions or sectors must be considered independently as well as collectively.

- 1 Local Area Networks (LANs) in government offices are reliable.

	Please Tick
Strongly Disagree	
Disagree	
Neither agree nor disagree	
Agree	
Strongly Agree	

- 2 Wide Area Networks (WANs) accessible from government offices are reliable.

	Please Tick
Strongly Disagree	
Disagree	
Neither agree nor disagree	
Agree	
Strongly Agree	

- 3 Internet services providers in our jurisdiction provide reliable service.

	Please Tick
Strongly Disagree	
Disagree	
Neither agree nor disagree	
Agree	
Strongly Agree	

- 4 The Broadband Digital Network in our jurisdiction provides reliable service.

	Please Tick
Strongly Disagree	
Disagree	
Neither agree nor disagree	
Agree	
Strongly Agree	

- 5 The satellite Internet in our jurisdiction provides reliable service.

	Please Tick
Strongly Disagree	
Disagree	
Neither agree nor disagree	
Agree	
Strongly Agree	

- 6 The telephone networks in urban areas in my jurisdiction are reliable.

	Please Tick
Strongly Disagree	
Disagree	
Neither agree nor disagree	
Agree	
Strongly Agree	

- 7 The wireless telephone networks in my jurisdiction are reliable.

	Please Tick
Strongly Disagree	
Disagree	
Neither agree nor disagree	
Agree	
Strongly Agree	

B: AUT Ethic Approval



MEMORANDUM

Auckland University of Technology Ethics Committee (AUTEC)

To: Krassie Petrova
From: Charles Grinter Ethics Coordinator
Date: 11 August 2010
Subject: Ethics Application Number 10/130 Exploring m-government readiness: The case of Vanuatu.

Tena koe Krassie

Thank you for providing written evidence as requested. I am pleased to advise that it satisfies the points raised by the Auckland University of Technology Ethics Committee (AUTEC) at their meeting on 14 June 2010 and that I have approved your ethics application. This delegated approval is made in accordance with section 5.3.2.3 of AUTEC's *Applying for Ethics Approval: Guidelines and Procedures* and is subject to endorsement at AUTEC's meeting on 13 September 2010.

Your ethics application is approved for a period of three years until 11 August 2013.

I advise that as part of the ethics approval process, you are required to submit the following to AUTEC:

- A brief annual progress report using form EA2, which is available online through <http://www.aut.ac.nz/research/research-ethics/ethics>. When necessary this form may also be used to request an extension of the approval at least one month prior to its expiry on 11 August 2013;
- A brief report on the status of the project using form EA3, which is available online through <http://www.aut.ac.nz/research/research-ethics/ethics>. This report is to be submitted either when the approval expires on 11 August 2013 or on completion of the project, whichever comes sooner;

It is a condition of approval that AUTEC is notified of any adverse events or if the research does not commence. AUTEC approval needs to be sought for any alteration to the research, including any alteration of or addition to any documents that are provided to participants. You are reminded that, as applicant, you are responsible for ensuring that research undertaken under this approval occurs within the parameters outlined in the approved application.

Please note that AUTEC grants ethical approval only. If you require management approval from an institution or organisation for your research, then you will need to make the arrangements necessary to obtain this. Also, if your research is undertaken within a jurisdiction outside New Zealand, you will need to make the arrangements necessary to meet the legal and ethical requirements that apply within that jurisdiction.

When communicating with us about this application, we ask that you use the application number and study title to enable us to provide you with prompt service. Should you have any further enquiries regarding this matter, you are welcome to contact me, by email at ethics@aut.ac.nz or by telephone on 921 9999 at extension 8860.

On behalf of the AUTEC and myself, I wish you success with your research and look forward to reading about it in your reports.

On behalf of Madeline Banda, Executive Secretary
Auckland University of Technology Ethics Committee

Cc: Willie Amos gtd9708@aut.ac.nz

Participant Information Sheet



Date Information Sheet Produced:

24 May 2010

Project Title

Exploring M-Government Readiness; The case of Vanuatu.

An Invitation

My name is Willie Amos. I am currently working on my Master thesis at Auckland University of Technology (AUT). I would like to invite you to participate in my research project taking part in a one-one interview on the topic of mobile technology readiness within government organizations in Vanuatu. I would appreciate very much your willingness to participate in this research. I believe your experience, knowledge and expertise will help in evaluating the technology readiness and making necessary recommendations for implementation and deployment of mobile government in Vanuatu. Your participation in this research is entirely voluntary and you may withdraw at any time without any adverse consequences.

What is the purpose of this research?

The main aim of this project is to investigate how government organizations are using mobile technology to provide government services, and evaluate the extent to which these organizations are technologically ready to continue investment in m-government. The results of the research will be included in my Master thesis and may also be published at AUT scholarly Commons.

How was I identified and why am I being invited to participate in this research?

You were chosen as a senior officer and knowing that you do possess some knowledge and background relating to Information Communication Technology especially in the use of mobile devices such as PDAs, Laptops, Mobile phones etc.

What will happen in this research?

The research involves gathering and analysing data with respect to the government technology readiness to invest in m-government. Participants will be given the opportunity to ask any questions or share their own views after providing answers to the questions in the questionnaires. This conversation will be recorded using a digital recorder and later transcribed by me personally.

What are the discomforts and risks?

While there may not be any risks or discomforts involve in this project, participants may need to obtain permission from their senior managers in order to take part in the research.

How will these discomforts and risks be alleviated?

Additional information will be provided if approval is required by your senior manager in order to consider the invitation.

What are the benefits?

The research will contribute academically to the research community by building a body of theory of mobile technologies and its application and services especially in the area of public services delivery in government organizations. The results of this research will outline the potential benefits and the

challenges of investing in M-government technology. In addition, recommendations will be provided for the government to make appropriate decisions before investing in M-Government.

How will my privacy be protected?

While participants' identities may be known to the researchers, their personal details will not be included as part of the data gathered. Take note that participant's identities and their respective government organizations will not be disclosed. Furthermore the recorded digital data and any of the transcriptions will only be accessible to the researcher.

What are the costs of participating in this research?

The interview will take 30 to 45 minutes overall but not more than 60 minutes.

What opportunity do I have to consider this invitation?

Please respond to my invitation within one week of receiving it. Please also let me know whether further information about the research and the project is needed.

How do I agree to participate in this research?

If you agree to participate in the research could you please complete the attached Consent form and email it to me as an attachment.

Will I receive feedback on the results of this research?

If the Master thesis is successfully completed it will be published on the web. I will send the link to the participants.

What do I do if I have concerns about this research?

Any concerns regarding the nature of this project should be notified in the first instance to the Project Supervisor, Krassie Petrova, Krassie.petrova@aut.ac.nz, 09-921-9999 x. 5045.

Concerns regarding the conduct of the research should be notified to the Executive Secretary, AUTEK, Madeline Banda, madeline.banda@aut.ac.nz, 921 9999 ext 8044.

Whom do I contact for further information about this research?

Researcher Contact Details:

Willie Amos, School of Computing and Mathematical Sciences, AUT University.

Email: qtd9708@aut.ac.nz or kalowil@gmail.com

Phone: 640210753907.

Project Supervisor Contact Details:

Krassie Petrova, Senior Research Lecturer, School of Computing and Mathematical Sciences, Auckland University of Technology (AUT).

Email: Krassie.petrova@aut.ac.nz

Phone: 09-921-9999 x. 5045.

D: Consent Form

Consent Form



Project title: **Exploring m-government readiness. The case of Vanuatu**

Project Supervisor: **Krassie Petrova**

Researcher: **Willie Amos**

- ☐ I have read and understood the information provided about this research project in the Information Sheet dated 24 May 2010.
- ☐ I have had an opportunity to ask questions and to have them answered.
- ☐ I understand that notes will be taken during the interviews and that they will also be audio-taped and transcribed.
- ☐ I understand that I may withdraw myself or any information that I have provided for this project at any time prior to completion of data collection, without being disadvantaged in any way.
- ☐ If I withdraw, I understand that all relevant information including tapes and transcripts, or parts thereof, will be destroyed.
- ☐ I agree to take part in this research.
- ☐ I wish to receive a copy of the report from the research (please tick one): Yes ☐ No ☐

Participant's signature:

Participant's name:

Participant's Contact Details (if appropriate):

.....
.....
.....
.....

Date:

Approved by the Auckland University of Technology Ethics Committee on *type the date on which the final approval was granted* AUTEC Reference number *type the AUTEC reference number*

Note: The Participant should retain a copy of this form.

E: Answers to Interview Questions

Question 1: Table1

Code	Respondent Answers
Rp1q1	Senior Manager
Rp2q2	Senior Manager
Rp3q2	Technical officer
Rp4q2	Senior Manager
Rp5q2	Senior Manager
Rp6q2	Middle Manager
Rp7q2	Senior Manager
Rp8q2	Senior Manager
Rp9q2	Middle Manager
Rp10q2	Other
Rp11q2	Senior Manager
Rp12q2	Senior Manager
Rp13q2	Senior Manager
Rp14q2	Senior Manager
Rp15q2	Senior Manager
Rp16q2	Senior Manager
Rp17q2	Other
Rp18q2	Senior Manager
Rp19q2	Senior Manager
Rp20q2	Senior Manager

Questions 2: Table2

Code	Respondent Answers
Rp1q2:	Mobile phone is one of the useful mobile technologies that are commonly use today, In the department laptops are very useful and only senior managers in the department are issued with Laptops.
Rp2q2:	The department does not provide cell phone to staff but each staff has their own private cell phones. We do have laptops but only the department senior officers have access to them. Laptops are useful tools in the department to provided services of the Government, each senior manager are provided with laptops.
Rp3q2:	Seniors Managers in the department are issued with laptops. It is handy to carry round and we use it a lot while visiting the islands or other official trips overseas, The Department use laptops to make Recording in all the Department Data. Our department does not provide cell phones to staff but each staff owns their own private cell phones.
Rp4q2:	Laptops are useful technology that we use a lot in the department. Don't know whether there exists such a device as PDA. What is it? Mobile phone is widely used today. Political appointees are not provided with cell phone, only for civil servant.
Rp5q2:	Black Berry devices are no too common use in the Department except for DG and the Minister, they use to access their Emails, and Officers in the Department are not provided with Free Cell phone. Laptops are useful in the Department and all Senior Managers are entitle to each laptop. What is a PDA?
Rp6q2:	Senior managers in the department are entitle to a Laptop. The department does not issue cell phones to staff but almost every staff has their own private cell phone. No Smartphone and PDA devices use in our department
Rp7q2:	Yes our department issue just a basic ordinary cell phone with a minimum of credit added to it for every month. Once this credit is used up staff at their own cost need to pay for credit to top up their cell phone. We have laptops but only accessible by senior officers.
Rp8q2:	All Officers are Using Ordinary Cell phones but they are not provided by the Government. Laptops are provided for each section in the department. No PDA and Smartphone devices.
Rp9q2:	
Rp10q2:	The department issued basic cell phone and only few staff are entitle to it. It depends on the type of activities they are doing, especially for official trip to the islands or overseas. No Smartphone or what is a PDA anyway?. We don't use it.
Rp11q2:	Within our department we don't distribute cell phone to each staff, but they have there own personal phone, however we give out Laptops but to senior managers and field staffs only. Sorry but what is a PDA? No we don't use PDA and Smartphone.
Rp12q2:	Senior officers are issued with laptop. Unfortunately the department cannot afford to supply cell phone to staff because of the cost. Almost every staff has their own cell phone and they often use it in government services. We don't use PDA, or what is it? Smartphone, no we don't have or I think some staff are using Smartphone.
Rp13q2:	Before the E-Government comes to Effective, I don't think its reliable because of Money Problems in the Country. Problem Of internet Connection. In the Department we access to our own saver so that we can Access internet.
Rp14q2:	Cell phones are not provided in the department, but laptops yes we have and only senior managers are entitle to laptops. Ordinary cell phone are mostly used in the offices but I don't think anyone here using Smartphone and I don't know about PDA is that a computing device? No we don't have it.
Rp15q2:	Smartphone, black Berry and laptops are useful devices but we only use laptops in the office. Staff has their privately own cell phone.
Rp16q2:	Ordinary cell phones are used for work purposes, also SMS to send messages to the Public. Laptops are used for training and the department will be introducing PDA purposely for data collection and recording. Blackberry devices and Smartphone, not all using it in any ways.
Rp17q2:	We have use laptop to do work for the department. Only senior officers use them especially when they are out of the office doing official trip. No PDA, no one using Blackberry. All staff have basic cell phone but not provided by the department. Most often we use our private phone for office work.
Rp18q2:	Ordinary cell phones are used, but in the future it is likely that we will be using Smartphone to communicate with the other provinces and easy for New Birth Registration in the Provinces. Laptops technology is widely used in the departments in Vila and also the Islands in Vanuatu. No use of PDA, we don't have it.
Rp19q2:	All staff has access to ordinary cell phone but these are privately own phones and are mostly used to conduct government services. It is used mainly for communication. No PDA devices and I can say that no one have access to Blackberry devices because it is expensive.
Rp20q2:	Laptops are distributed to senior managers in the departments. Most senior officers in our department are using Smartphone for email communication and accessing the internet using these Smartphone devices. We don't use PDA as it does not exist.

Question 3:Table3

Code	Respondent Answers
Rp1q3	We have access to wireless LAN and wireless WAN. I am not familiar with EDGE 3G and GPRS technology or few have very little knowledge about it. We don't have any use of it in the department. But I believe the directors are using 3G on their mobile phone.
Rp2q3	Yes in this department we are accessing Wireless LAN but not wireless WAN. Not familiar with EDGE, 3G and GPRS technologies. We don't use them here.
Rp3q3	I am not familiar with all these technologies terms, I have bought a 3G mobile phone but don't know how to use all the features in that cell phone, I only use it for receiving and making call and sending SMS. In the department, the government provides credit for manager cells phones.
Rp4q3	No we don't have access yet to the wireless technology as mention here. All other technology mention here, I am not familiar with their use. We just don't have any use of it.
Rp5q3	Here in the Ministry we use Laptop to access Wireless LAN. Only the directors are using 3G. No idea of EDGE and GPRS, what are those. No use of this technology in the Ministry
Rp6q3	Yes we have access to Wireless LAN using laptops, no Wireless WAN. Not familiar what is 3G, EDGE, and GPRS. These does not exist yet so no use of it.
Rp7q3	Wireless LAN is mostly used in the Department, but we sometimes access Wireless WAN if there is a Good Coverage of Network and also we can use Google talk.
Rp8q3	The director general and minister are provided with Blackberry phones so they can receive emails but here in the department we can access our email through wireless LAN. No EDGE or GPRS technologies and not too sure about its usage. No we don't have it.
Rp9q3	same to Respondent 8
Rp10q3	We have access to wireless LAN but not wireless WAN. I am not familiar with these technologies, 3G, EDGE and GPRS. We don't use them I suppose.
Rp11q3	We only have access to wireless LAN. No use of 3G, GPRS or EDGE.
Rp12q3	Same as Rp11q3
Rp13q3	We don't have access to any of these technologies. Wireless LAN and wireless WAN will soon be deploy in the coming months.
Rp14q3	We have access to any of these technologies. We use only LAN to connect to our laptop.
Rp15q3	In our department, we have access to Wireless LAN and wireless WAN. We also use Bluetooth using our cell phone. No use of 3G, EDGE or GPRS technologies as they simply don't exist.
Rp16q3	We don't have access to wireless LAN or wireless WAN but I am familiar with Bluetooth Networking as I use it to transfer photos and other media files from my cell phone to my computer. No use of 3G, GPRS or EDGE. They are not there yet.
Rp17q3	None of these exist in our department
Rp18q3	Wireless does not exist in our department, however we have connections in some other places where Doctor have access for direct communications to others doctors locally and internationally.
Rp19q3	We don't have such technologies; hope to be able to have access to them in the near future.
Rp20q3	We have practical application of wireless LAN and wireless WAN in the department. I used to be a marketing director at TVL and my understanding is that 3G network is not yet deployed. The network we currently have is the 2G and 2.5G network. Hope our ISPs will deployed 3G network so many people can enjoy the benefits of the 3G technology.

Question 4: Table4

Code	Respondents Answer
Rp1q4:	We only have access to email and it is only this application we are using and only through LAN not via Mobile. For other use of applications mention here, we don't use them. The services provided by the service provider are not standard. It is also very expensive to have a mobile phone that can be used to access internet. Voice and general SMS is common here. We use it to communicate with others.
Rp2q4	Email is the most commonly use application for communication in our department and is through the local area network. Everyone used it mainly for communication and exchanging information between other government departments and business organization. Other application stated here does not exist so we have no use of it.
Rp3q4	Not many officers access to email using their cell phone. Expensive to have phones with such capability. Other mobile application stated here, we don't use them except, voice and general SMS is widely use in the department and almost everyone is aware of this application
Rp4q4	We only have basic cell phones; therefore don't have access to email using our cell phone. I am aware Smartphone have that capability but who has the money to own such an expensive phone. Other mobile business application stated here, we don't use them. Maybe in the future
Rp5q4	Same as Rp4q4 and Rp3q4. We are using government mail system but not via cell phone. Voice and SMS are the most widely used and it is for normal communication for conducting business.
Rp6q4	My opinion is that these application services are already there, but the problem is that they are too expensive. I am referring to accessing email via cell phone. Only the Minister can receive email and access internet. Apart from other application stated here only Voice and SMS are widely used and for communication purposes with others
Rp7q4	In our department we use Voice and general SMS are common in their use for communication. The work issued cell phone from department have basic feature and are not able to access internet. I believe few of us can access internet with their own private phone. We also use contacts and calendar features of the mobile phone. Most basic phone now has these applications.
Rp8q4	Voice and general (SMS) are commonly used by everyone either for private use or for work. Almost all in the department have used it. We also have a system that can be regarded as WAP or the (back-office) access system. For example we have a system in place that keeps track of the cooling system in our server room. When the temperature of the server room rises above the required limit, a warning message would be send to our cell phone. The staff who is on duty at the time will be able to attend to the problem.
Rp9q4	We use a lot of Voice and SMS for work and private used. We use calendar and contacts features in our cell phones because they are handy and make life much easier. Apart from that others services stated here does not exist yet or do we have such a service?
Rp10q4	Same as Rp6q4
Rp11q4	We have just been introduced to cell phones in the last decades so i don't think most of the services stated here are not yet use or deployed. But Voice and SMS are the only application everyone is using at work and at home. Yes the use of calendar and contacts features makes life much easier.
Rp12q4	The department uses government email systems mainly for communicating with other government officers. Of course I would say Voice and general SMS are the most widely use mobile application in our departments. The ability to carry a mobile phone that has contacts and the checking of appointments using calendar make it a lot easier. We don't have email access through cell phone. Not aware of other services stated here as we just don't use them maybe in the future.
Rp13q4	Same as Rp11q4. Person in charge of our IT system is out of the country
Rp14q4	Same as Rp2q4 and Rp3q4
Rp15q4	We don't use mobile phone to access those services stated here but we do use laptop sometimes to access the internet and check on our email. All this is done through LAN connection. Voice and SMS are common and yes we use them at work and at home for business communication and other private use. Other application services do not exist yet.
Rp16q4	Similar answer to Rp12q4. Email system is more popular.
Rp17q4	Same response as Rp15q4
Rp18q4	Voice and general SMS are easy and commonly used for work purposes and private use. The other features in the cell phone are too complicated to understand its usage. I am able to access internet through my cell phone but it is difficult and the network coverage is very poor.
Rp19q4	Voice and SMS are mobile applications commonly used in the department. Yes the contacts and Calendar are really good features. We use government email system. I haven't access internet or email yet using my cell phone hope in the future. Other services mention are not yet deployed or implemented.
Rp20q4	Similar to Rp19q. I like to use the calendar and contact features. I use them to stored contact details of work mates and friends and check appointment using the Calendar

Questions 5: Table 5

Code	Respondent Answers
Rp1q5	I would say none of these technologies current exist in our department. These are new technologies and we still not aware of using such applications to conduct business activities.
Rp2q5	We really don't use any of these technologies and would be good to have the knowledge what they are and there usages.
Rp3q5	I would say corporate SMS that we use. Is that similar to the general SMS? These are new technologies and it might take sometimes before the department will be introducing it.
Rp3q5	We don't use any of these.
Rp4q5	All these services do not exist yet within our department. I am taking note of it we might be introducing it later once we have the knowledge and skills of how they are use to enhance business activities.
Rp5q5	In the department we don't use any of this services but it is worth knowing them and how it could be useful to our department
Rp6q5	Same as Rp3q5
Rp7q5	We don't have these technologies yet but hope they are there to make it easier to conduct business activities.
Rp8q5	Same as Rp7q5
Rp9q5	I am not familiar with these technologies and their usages as we currently don't use them, maybe in the future
Rp10q5	These are interesting to know that business activities can be enhanced using these technologies. Hope we will be introducing some of this in the future.
Rp11q5	I am familiar with the use of VoIP, but currently we are not using it in the department. With the current deployment of e-Government this will become more useful maybe for video conferencing. Maybe most of these technologies will become into use while e-Government become available to all government departments.
Rp12q5	I would say we have used VoIP especially Skype in our department to conduct business communications with other organizations who have Skype account. Other technologies mention here, we are not aware of their use.
Rp13q5	I think we use asset tracking in the department that is we use cell phones to keep tract of department vehicles.
Rp14q5	No. None of these technologies are used within our department.
Rp15q5	We are using VoIP or Skype is that what you mean. Yes we use Skype and we also use mobile business access to communicate with our customers to make payments and to record financial transaction and that is where we make small revenue for our department. Other technologies do not yet exist.
Rp16q5	We use VoIP but only for simple communication and charts with other officers who have Skype account. Not familiar with the others but it is good to know what they are.
Rp17q5	Of all the technologies stated here, I would say VoIP will be one of the applications that all government departments and ministries will be using. This is because the infrastructure of the current e-Government project has the fibre optic cable that connects all government buildings meaning there will be much greater bandwidth. This will mean that using VoIP as government telephone system will greatly reduce the cost of telephone communication.
Rp18q5	Among the technologies stated here, in our department we don't recommend voice over IP or the use of Skype as it slows down the government network. Many officers are abuse the system as they would normally spend office hours chartings using Skype.
Rp19q5	We simply don't have any of these technologies in our department, but I'm sure these are technologies that will become useful in doing business in the future.
Rp20q5	We currently don't have any of these technologies but it is worth knowing it as technology continues to change our current system need to be up grated so I believe the use of these system will become realised.

Q6. Survey data collected: Table 6

	Top Management	Middle Management	Junior Management	Field Staff	Admin Staff	All Staff	None
Cell phone (basic)	10	3	2	4	2	3	5
Cell phone (GPRS/EDGE)	9	1	0	0	0	0	10
Cell Phone (with 3G)	0	0	0	0	0	0	20
Smartphone (with 3G)	0	0	0	0	0	0	20
PDA	5	0	0	0	0	0	15
Cell Phone Enabled PDA	9	2	1	1	1	1	10
Laptop	19	14	5	8	3	0	1
Laptop (with GPRS/3G/3G(HSDFA)/wireless card	13	9	1	5	2	0	5

Question 7: Table 7

Code	Respondent Answers
Rp1q7	In our department we don't have that capability to make transactions via mobile phone but instead we do make calls to our client using mobile phone.
Rp2q7	Our department is not a business oriented enterprise. We collect Tax but we don't sell and we at times we call our customers using a cell phone.
Rp3q7	We don't conduct any sort of business using any of the mobile devices in our department.
Rp4q7	Same as Rp3q7
Rp5q7	I think we only use SMS to conduct some form of business dealing especially with other business organization (Suppliers).
Rp6q7	Conducting business via cell phone does happen in our department. For example, we have clients where we usually supply water tanks and install water cooling system in their home. Most of the communication and payment transactions is done using a cell phone.
Rp7q7	Same as Rp3q7
Rp8q7	We are using cell phone to conduct client but invoicing the customer is done manually
Rp9q7	We are using SMS to conduct staff of other department instead of calling the office landline as it is cheaper that way.
Rp10q7	We don't conduct any business dealing via mobile phone or any other mobile devices
Rp11q7	We make direct call to our clients using mobile devices. It is worth to mention that we have our own website but we don't use a lot to do business
Rp12q7	In our department we decentralize most of our data. We create our own website where our customer can register online. Our strategy is to make a join email system for staff and have all members register under the department.
Rp13q7	We don't conduct any business activities using any of those mobile devices. If I understand the questions all transactions takes place at the department of finance.
Rp14q7	Don't really know the idea of doing business using mobile devices.
Rp15q7	Yes we normally use Laptop to records all our transactions
Rp16q7	In my understanding there are no examples of such business conducted through mobile devices in our department.
Rp17q7	Same as Rp16q7
Rp18q7	I cannot provide any examples of business activities in the department that were carried out using mobile devices. I would say SMS and making a call to suppliers that is all about it.
Rp19q7	Same as Rp18q7
Rp20q7	We simply don't have any business dealings that are conducted over mobile devices. Making a call and SMS to other business organizations is all we do over cell phone but no any other ways of conducting business.

Question 8: Table 8

Code	Respondent Answers
Rp1q8	Yes in the department we have some form of in house training but is only limited to computing applications such as word excel and how to use the department email system. There is no such training specifically for mobile technology.
Rp2q8	In the Department, we do not give out training for mobile phones, only with Laptop and basic computing. Most staff do their own training at their own cost and internet research is probably the channel of training we have.
Rp3q8	In the department we have basic training on Laptops. There is a special government organization that organizes and arrange for training of all government officers. There are policies in how government can provide training to government employees
Rp4q8	In the department, there is no training provided specifically for mobile technologies related area. We do get basic training on how to use our internal system. Most often technical people from the Department of Finance who assisted us in the use of computers.
Rp5q8	In the Ministry we don't give out training except for HRO, but some Political Appointee who doesn't understand anything about computing and it's hard for them, so the HRO has to contact trainings through the Department of Information Technology.
Rp6q8	We don't have any training in mobile technology area. We do have other forms of trainings.
Rp7q8	With laptops and Computing we do have trainings but in basic areas but with Mobile Technology there no training on that particular area.
Rp8q8	We don't have any training in the area of mobile technology.
Rp9q8	Concerning training of staff, in the Department of Finance we do have provisions to provide training for our staff. Most of our training are short term training and mostly conducted in overseas, especially at the Woo Woo University in China. Our staff attend training program under industry certification such as Microsoft certifications MCSE and CISCO. We also have volunteers from Japan (JICA) who provide in house training and usually conduct audit on the level of training staff are getting and making future recommendation on how to improve training in the future. We do not provide training for mobile technology.
Rp10q8	We give out basic computer training to our staff but not in the area of mobile technology.
Rp11q8	We do organize part time training in computing area but not in mobile technology. We do not allow for our staff to take full time training because it is expensive.
Rp12q8	In our depart, yes we do have training in mobile technology especially the use of cell phones. The training is provided by the service providers who give us mobile phone to use.
Rp13q8	No specific training for mobile devices, but have some trainings on the use of Laptop.
Rp14q8	The department attended training in other work related area but not in IT area and no training in the mobile technology related area.
Rp15q8:	Same as Rp14q8
Rp16q8	Yes we do give out training to our staff member but only in computing area and no training in the area of mobile technology
Rp17q8	We provide training in work related area but no training in computing and mobile technology area.
Rp18q8	same as respondent Rp17q8
Rp19q8	We only give basic training on computing but not in mobile devices
Rp20q8	Same as Rp19q8

F: Survey data collected

Question 9: Table 9

	Unsure	Very Unimportant	Somewhat Unimportant	Somewhat important	Very Important
Cell Phone – Voice and general messaging (SMS)					20
Cell Phone – SMS business communications and applications	11			3	6
Cell Phone – WAP (web access)	4		2	6	8
Cell Phone – WAP (back-office access)	8			6	6
Cell Phone – Blue Tooth	5		2	4	9
Cell Phone – EDGE	13			1	6
Cell Phone – GPRS	12			2	6
Cell Phone – EDGE/GPRS back-office access	12			3	5
Cell Phone – 3G	7		1	5	9
Smartphone – Voice and general messaging	5		1	5	9
Smartphone – back-office access	12		1	5	2
Push e-mail / Blackberry	8		1	1	10
PDA – calendar / contacts	8		2		10
PDA – e-mail access	7		2	1	10
PDA/Cell phone voice and general messaging	9		2	3	6
PDA/Cell phone – back-office access	12		1	2	5
Laptop computer					20
Laptop computer and 3G /wireless card	2				18
Laptop computer and 3G(HSDPA) card	2				18

G: Survey data collected for Question 10

Question 10: Table10

	Unsure	Very Basic	Somewhat Advanced	Very Advanced
Cell Phone – Voice and general messaging (SMS)	0	1	5	14
Cell Phone linked to business applications	10	3	3	4
WAP	9	2	5	4
Blue Tooth	6	4	6	4
GPRS	16	4	0	0
3G	20	0	0	0
3G(HSDPA)	20	0	0	0
Push e-Mail/ BlackBerry	16	2	2	0
PDA – e-mail/contact/calendar	15	3	2	0
PDA – back-office link	20	0	0	0
WI-FI Hotspots	8	5	1	6
Wireless LAN	8	3	2	7
Wireless WAN	6	4	2	8
Blue Tooth networking	9	7	2	2
PDA/Cell phone voice and general messaging	9	3	3	5
PDA/Cell phone – back-office access	20	0		0
Laptop computer	0	3	4	13
Laptop computer and 3G /wireless card	20	0	0	0
Laptop computer and 3G(HSDPA) card	20	0	0	0

H: Survey data collected for Question 11

Question 11: Table 11

	Unsure	Not important at all	Somewhat important	important	Very Important
VoIP and IP telephony	5		1	2	12
Converged communications	11		1	4	4
Video Telephony	7	3		4	6
WI-FI	7		1	3	9
WIMAX	8			4	8
Mobile-FI	15		1	2	2
GPRS	10		3	3	4
3G	9			2	9
3G (HSDPA)	9			3	8
Data casting	12		1	4	3
Unified Communication	12			5	3
Location-Aware Technologies	12			4	4
Location-based technologies	5	1		2	12
Instant messaging	7		1	2	10
Communication enabled applications	6		1	2	11
Synchronous collaboration	9			2	9
Remote security and monitoring	9			2	9
Mobile VPN data access	10			2	8

I: Survey data collected for TRI survey questions (Q1 – Q10)

Participants	q1	q2	q3	q4	q5	q6	q7	q8	q9	q10
1	4	3	5	5	5	2	2	2	2	2
2	4	4	4	3	4	4	3	3	3	3
3	3	3	5	5	5	3	1	5	5	5
4	2	2	4	3	4	4	2	4	4	4
5	4	4	4	5	5	3	4	3	5	4
6	2	1	5	5	5	3	1	5	5	1
7	1	2	3	3	4	4	4	4	4	3
8	5	3	5	5	5	3	4	4	1	3
9	2	2	3	4	5	3	3	2	2	3
10	2	2	1	5	5	3	2	5	5	5
11	5	2	5	3	5	5	1	5	1	3
12	4	3	3	3	5	2	1	4	4	4
13	3	3	4	4	5	3	3	3	4	4
14	3	2	4	4	4	2	4	4	3	2
15	5	5	5	3	5	3	2	3	2	2
16	4	4	5	5	5	3	2	3	3	3
17	1	2	5	3	5	3	1	3	3	3
18	1	4	4	4	5	2	2	4	3	4
19	4	4	4	4	5	3	2	4	2	3
20	1	1	3	4	5	4	2	4	4	4

J: Survey Data collected for RTN assessment

Participant	q1	q2	q3	q4	q5	q6	q7	meanq1_q7
1	4	1	1	1	1	4	4	2
2	4	4	3	3	3	3	4	3
3	4	4	4	4	3	4	5	4
4	3	3	2	3	3	4	2	3
5	5	3	3	2	3	3	5	3
6	5	4	5	5	5	1	5	4
7	3	3	3	3	3	5	5	4
8	5	5	1	2	5	3	4	4
9	4	4	4	4	3	4	4	4
10	5	5	5	5	1	2	4	4
11	5	5	5	5	3	4	5	5
12	4	4	4	3	3	3	3	3
13	2	2	2	2	3	3	3	2
14	4	2	4	2	4	4	2	3
15	2	4	4	4	1	5	4	3
16	4	4	3	3	3	5	5	4
17	5	5	3	2	3	5	3	4
18	5	5	4	4	3	4	4	4
19	5	5	5	4	3	4	5	4
20	4	4	3	3	3	1	1	3