THE READINESS FOR M-GOVERNMENT IN A SOUTH AFRICAN PROVINCIAL GOWERNMENT

by

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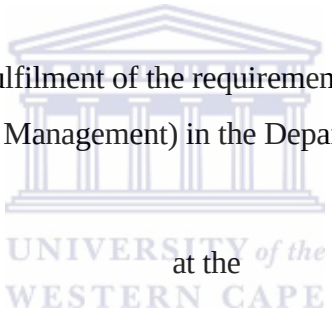
A thesis submitted in fulfilment of the requirements for the degree of Master of Commerce (Information Management) in the Department of Information Systems



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Abstract

This study aims at determining the m-Readiness of a Province for m-Government from a context of its Provincial Government (PG), the underprivileged citizens of the region and the mobile fluency thereof. In answering the research question, i.e., "*What is the extent of readiness of the government and that of the underprivileged citizens for introduction of m-Government within the region under study*", literature was reviewed and existing models synthesised, and from that, a conceptual model was presented which acted as a reference point. The research process used a quantitative method and utilised a stratified random sampling method in determining and adequately representing the populations under study, namely, underprivileged citizens and IT managers and specialists from the PG's office. Descriptive statistics were adopted in analysing the collected data used in answering the research questions and findings presented. The findings show that the Province is m-Ready for m-Government services, from the studied contexts of the PG, underprivileged citizens and mobile fluency. The reference model, that is, the Provincial Mobile Readiness Measurement Model (PMRMM), was developed from a perspective of the Province under study, therefore, its theoretical generalizability to other Provinces has to be first studied before being implemented. Secondly, the study only looked at three segments of the government service delivery value chain, which are the Government-to-Citizen (G2C), Government-to-Employee (G2E) and Government-to-Government (G2G). The contributions of the study are twofold, firstly as a practical decision-making guide regarding introduction of m-Government and secondly, it adds to the conceptual understanding of government readiness for introduction of government services via ICT mobile platforms.

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DECLARATION

I declare that "*your thesis title here"* is my own work, that it has not been submitted for any degree or examination at any other university, and that all the sources I have used or quoted have been indicated and acknowledged by complete references.

Full name: Shadrack Mehlomakulu

Signed: .....

Date: Thursday, 02 October 2014

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LIST OF ABBREVIATIONS

2G	Second Generation
3G	Third Generation
4G	Fourth Generation
CDMA	Code Division Multiple Access
CMM	Capability Maturity Model
CRI	Citizen Readiness Index
CSMT	Common and Standard Mobile Technologies
EASSY	East African Submarine Cable System
EDGE	Enhanced Data rates for GSM Evolution
FVM	Fit-Viability Model
G2B	Government to Business
G2C	Government to Citizen
G2E	Government to Employee
G2G	Government to Government
GPRS	General Packet Radio Service
GSM	Global System for Mobile communication
HCI	Human Capital Index
ICT	Information and Communications Technology
IS	Information Systems
IT	Information Technology

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ITU	International Telecommunication Union
LLE	Living Labs Europe
LTE	Long Term Evolution
MDS	Mobile Digital Service
MFI	Mobile Fluency Index
mGaaS	m-Government as a Service
MIS	Mobile Internet Service
MMS	Multi-Media Message Service
MRI	Mobile Readiness Index
MTN	Mobile Telecom Network
MTS	Mobile Transacting Service
MWT	Mobile and Wireless Technologies
NPO	Non-Profit Organisation
OECD	Organisation for Economic Co-Operation and Development
ORI	Organisation Readiness Index
PC	Personal Computer
PDA	Personal Digital Assistant
PG	Provincial Government
PMRI	Provincial Mobile Readiness Index
PMRMM	Provincial Mobile Readiness Measurement Model
PPP	Public Private Partnership
PPR	Public sector Process Rebuilding

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RICA	Regulation of Interception of Communications and Provision of Communication-Related Act
SA	South Africa
SIM	Subscriber Identity Module
SMS	Short Message Service
TAM	Technology Acceptance Model
TEAMS	The East Africa Marine System
TII	Telecommunications Infrastructure Index
TRA	Theory of Reasoned Action
TTS	Text To Speech
UC	University Council
UMTS	Universal Mobile Telecommunications System
UN	United Nations
UNDP	United Nations Development Programme
USSD	Unstructured Supplementary Service Data
VoIP	Voice over Internet Protocol
WAP	Wireless Application Protocol
WiMAX	Worldwide Interoperability for Microwave Access
WLAN	Wireless Local Area Network
WMI	Web Measure Index
WWW	World Wide Web

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C H A P T E R 1

INTRODUCTION

1.1 Background

Machiavelli (2012) said "*There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success, than to take the lead in the introduction of a new order of things*". This quote definitely applies to the adoption of new services such as mobile services or "m-Services" that are or can be offered by service providers to clients and potential clients of that particular service. As has been seen throughout the world, companies such as Information and Communications Technology (ICT) service providers and those in financial institutions, are competing for a greater portion of the market through the implementation of m-Services to deliver better and more convenient services for their clients (Abdelghaffar & Magdy, 2012). Therefore, governments cannot be left behind when services of this nature are being undertaken, reason being, m-Services offer a boundless communication and interaction between various parties and entities on a 24/7 basis (Kirsten, 2006). That is why the government should seriously consider services such as these when implementing public IT projects.

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The high emergence of m-Services around the world and within the South African private sector shows that the South African government can also partake in delivering m-Services to the citizens. E-Government efforts aim to benefit from innovative forms of IT, particularly web-based Internet applications, in improving government fundamental functions (Misuraca, 2009). In addition, South Africa (SA) has not yet seen much advancement in e-Government services compared to other developing countries outside Africa, and this is due to a number of reasons ranging from a slow Internet penetration rate to high broadband prices.

Mobile government, also known as “m-Government”, is a relatively novel concept which is attracting immense attention internationally. Even though m-Government can be measured as a new focused area, it should be seen as corresponding to e-Government activities (Kushchu & Kuscu, 2004).

With the arrival of m-Government, several questions were raised. These raised questions sought to understand the chances of m-Government being a substitution for e-Government. However, the e-Government services and delivery of government information are complementary to the existing in-person and phone-based methods. Therefore, m-Government is complementary to e-Government (Gyanendra , 2007). In addition, m-Government is not there to take over from e-Government, but is rather a new, convenient and more accessible means of delivering public services and information to the citizens (Antovski & Gusev, 2004). Despite being in its early stages, m-Government seems to have a substantial influence on the set of complex strategies and tools used for e-Government efforts and on their roles and functions (Kumar & Sinha, 2008).

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There has been a high increase in the number of people using mobile phones and mobile internet connection (Miniwatts Marketing Group, 2011). The mobile access concept of anytime-anywhere is becoming a natural growing trend and a daily part of life, and the government will have to transform its activities according to this demand of convenience and efficiency of interactions for all parties. For developing countries like SA, that are in the early stages of e-Government strategy and implementation phases, the implementation of m-Government services can be seen as an advantage because there is a low fixed line and wireless internet penetration (Goldstuck, 2011). Therefore, m-Government services are likely a key method for reaching citizens, and promoting communication, and information exchange, especially when used in remote areas where there is little or no fixed line and wireless Internet connection and there is high acceptance of mobile phones.

Therefore, in such a case, m-Government can be considered of great importance to all stakeholders, namely the Government, business, and the citizens.

The value of m-Government comes from the capabilities of applications supporting mobility of citizens, businesses and internal operations of the government (Gyanendra , 2007). For SA, m-Government implementations would be a great value-added feature for the integrated and flexible data communication and exchange mechanism among government departments (Goldstuck, 2011). However there remains a question of "mobile readiness" (m-Readiness), of whether the SA government is ready to deliver m-Services to the citizens and whether the citizens are ready to adopt and utilize m-Services delivered to them.

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1.2 Statement of research problem

Since, the Province experiences a much higher mobile phone penetration rate than that of the personal computer (PC) based internet; many underprivileged citizens are deprived of using "classic" e-Government services (Beger & Sinha, 2012). This is also due to a lack of provision of public amenities via mobile and wireless technologies (MWTs) platforms – so called mobile government or m-Government. However, it is still unknown to which degree the government and citizens are ready for the introduction of m-Government – this is particularly true when the citizens from underprivileged communities are in question.

1.3 Research questions

Below are the question and sub-questions that the study intends to answer and focus the research on.

The main question:

What is the extent of readiness of the Government and underprivileged citizens for introduction of m-Government in the studied Province?

1.3.1 Research sub-questions

- How advanced, ready, and accessible are the mobile technologies and services for m-Government in the province?
- How m-Ready is the Provincial Government to deliver efficient and reliable m-Government services to its residents?
- To what extent are underprivileged citizens from the province under study, ready for m-Government services?

1.4 Research objectives

The main objective of this study is to see to what extent are both the e-Government service providers and the underprivileged citizens ready for the introduction of m-Government services.

In particular, the research objectives are:

- To determine the mobile fluency and accessibility of mobile services by the underprivileged people from the province under study.
- To determine the m-Readiness of the PG for delivering efficient and reliable m-Government services.
- To determine the level of m-Readiness of the underprivileged citizens from the province under study for utilising m-Government services.

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1.5 Research methodology

The chosen research method for this study was quantitative in nature. It included the use of questionnaires, which were suitable to answer the research questions. The questionnaires were distributed to both units of analysis, namely, the IT manager and specialists from the PG office and citizens of the province, mainly those from the underprivileged communities. In addition, an investigation was conducted in determining the mobile fluency of the studied province.

1.5.1 Research sample

Due to the nature and form of the research objectives derived from the research questions, the sample was selected from the research's units of analysis, that is, the

IT managers and specialists from PG, and 200 underprivileged citizens from the province under study. In selecting the sample for determining the citizen's m-Readiness, the study adopted a stratified random sampling in order to achieve adequate representation of the main underprivileged citizens of the province under study. A simple sampling method was adopted in determining the m-Readiness of the PG for delivering m-Government services, where, a sample of 20 IT managers and specialists from the PG IT office was selected through means of availability.

1.5.2 Ethical considerations

Before the researcher commenced with data collection from the units of analysis, ethical clearance was applied for and granted by the University's relevant Senate Committee.

1.6 Results

The presentation of the results was categorical and done according to each indicator from the PMRMM. Data was analysed to determine the score of each indicator under each index from the PMRMM, which is the Citizen Readiness Index (CRI), Provincial Readiness Index (PRI), and Mobile Fluency Index (MFI). Therefore, in determining each indicator's score that was later used to determine the overall PMRI score, the researcher defined a scoring system that started from 1 to 5, where 1 = lowest, 2.5 = average, and 5 = highest, was used. This was based on the Living Labs Europe (LLE) Mobile Readiness Index (MRI) scoring technique. From the analysed data, it was found that the m-Readiness of the previously mentioned indices, that is, CRI, PRI, and MFI that made the Provincial Mobile Readiness Index (PMRI) were, 4.1, 3.5 and 3.4 out of 5, respectively. Therefore, from those results, it was concluded that the Province is ready for m-Government services, from the context of the underprivileged citizens, the PG, and the mobile fluency of the province.

1.7 Contribution of this study

The contribution of this study is twofold, firstly as a practical decision-making guide regarding the introduction of m-Government and secondly, it adds to the conceptual

understanding of government readiness for introducing its services via the ICT mobile platform, i.e. m-Government.

The study was conducted in order to help with decision making by the PG towards determining the Province's readiness in improving information access, reducing the digital divide that is currently being experienced by underprivileged citizens and later providing electronic democracy e-Democracy via mobile platforms. The study can be used as a feasibility base for determining whether the province is ready for m-Government or not. Therefore, from this study informed decisions can be made to avoid failure due to lack of adoption by prospective users or maybe failure to deliver by the PG.

In addition, the study provides a conceptual tool which can be later improved where needed and utilised in determining the readiness of other Provinces for m-Government services, from a context of a full government service delivery value chain, that is G2G, G2C, G2E and G2B.

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1.8 Limitations of this study

The purpose of the study is to determine the m-Readiness of the PG for delivering m-Government as well as that of the underprivileged citizens for utilising m-Government services, taking into account the mobile fluency of the province. Therefore, the study does not cover the full government service delivery value chain, but looks at three segments namely, G2C, G2E andG2G.

In addition, the recognised and existing m-Readiness tool (that is the LLE's MRI tool as reported in the reviewed literature) was not designed for the developing countries, thus disregarding certain aspects that are critical in determining whether a Province from a developing country is m-Ready or not. Therefore, more research was conducted in order to find a way of synthesising existing researches and utilised the models and tools that they used in studying m-Readiness of a Province or organisation within a developing country.

As this study was conducted in a particular SA Province, the results might not be generalizable for other provinces. In order to increase generalizability of the results of this study, further research in other provinces is recommended.

1.9 Chapter Outline

The thesis is organised as follows: in Chapter 1, we sketch the background of the research being undertaken and discuss the statement of the research problem, which is later converted into research questions. In Chapter 2, both related e-Government and m-Government literature is reviewed and assessed from the viewpoint of previous as well as present e-Government and m-Government technologies and their respective level of readiness identifiers and metrics. This chapter will also research and assess the available legislatures on e-Government policies as well as the m-Government frameworks proposed by the researcher of the field. This is followed by a discussion on the research method that was employed and the technique that was used to gather data, and how it was analysed, this all is in Chapter 3. In Chapter 4, we discuss the findings from the analysis undertaken in the previous chapter. Chapter 5 concludes the work by presenting an overall evaluation of the outcomes of the study and suggestive future work.

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Chapter 2

LITERATURE REVIEW

2.1 Introduction

This chapter discusses the literature review. The literature consulted includes previous and recent literature on e-Government, m-Government, m-Readiness stages as well as Mobile and/or Wireless Technologies (MWT). As currently seen, m-Government forms part of e-Government, therefore this means that relations between e-Government and m-Government have to be studied. Due to high penetration of cell phones internationally, a high majority of people see the cell phone as an important tool in service delivery, not only serving the private sector, but seeing potential also in the public sector (Goldstuck, 2011, p.12).

In this study, the researcher's objective was determining the m-Readiness of the PG and that of the underprivileged citizens of the Province, also looking into the province's mobile fluency. However, a related study on m-Readiness of a PG, focusing on the Western Cape government, was undertaken previously by Du Preez; "Assessing the M-Government readiness within the Provincial Government of the Western Cape". In his study, Du Preez only investigates the m-Readiness of the PG of the WC. Therefore, this study builds up on his research by including the citizens, mainly from under-developed provinces and looking into the mobile fluency that will drive m-Government in the province.

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2.2 Key Concepts

When research about new notions is undertaken, there lies a need for one to delineate new and existing concepts and strategies as a means of validating that there is common understanding. Therefore, m-Government is no exception. There are quite a number of terms and concepts that are related to MWT. Elaboration of those

terms that were seen as holding major importance and which really influence the presence of m-Government, were discussed. Rationally the concept of e-Government took preference when discussing these related concepts and strategies.

2.2.1 E-Government

Studies have elaborated the matter of m-Government being a supplementary of e-Government and experts from the field of MWTs gave different explanations about the study of m-Government and e-Government (Kirsten, 2006). Therefore, below the researcher starts by discussing various e-Government definitions and what the government agencies seek to achieve from this notion. These explanations are from different experts who seek to define and explain the objectives of e-Government.

2.2.1.1 Objectives and definitions of e-Government

For one to understand the idea of e-Government, he/she must first understand government in general (Almarabeh & AbuAli, 2010). Pardo (2000) said, "*Government is actually a dynamic mixture of goals, structures, and functions*". E-Government is more than a website, e-mail, or processing transactions over the internet (Pardo, 2000). The e-Government intensified existing concepts such as transparency, accountability, and citizen participation in the evolution of government performance (Hiba, 2009).

If broadly understood, e-Government incorporates all the facets of ICT, irrespective of the size, how it is used, and its desirable location of use (Gyanendra , 2007). E-Government includes the use of facsimile to the use of wireless palm tops and all MWT devices, to facilitate the daily administration of government (Al-Khatib, 2009). However, like e-commerce, the popular interpretation of e-Government is the one that describes it exclusively as an internet driven activity. E-Government improves citizen access to government information, services, and expertise to ensure citizen participation in, and satisfaction with, the government processes (Hiba, 2009).

According to the United Nations (UN) (United Nations and American Society for Public Administration, 2001), e-Government is a permanent commitment by the government to improve the relationship between the private citizen and the private sector through enhanced, cost-effective and efficient delivery of services, information and knowledge. This study gives an understanding and overview of what e-Government is and what it entails. This research does not give much discussion about the different views and perspectives from the vast number of experts from the field of e-Government. However, below the researcher will give numerous definitions from different researchers in the field of IS and ICT as a whole.

1. E-Government definitions

As has been seen, different researchers and specialists gave different but related definitions of the concept of e-Government, but all of these definitions are centred on governments employing ICT services in order to deliver efficient, robust and reliable services to reach those who were unreachable when governments were still using methods other than the internet, to deliver services. Below are the numerous definitions of e-Government from different specialists from the field of ICT, particularly Information Systems (IS).

I. World Bank[1]definition: "*E-Government refers to the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government. These technologies can serve a variety of different ends: better delivery of government services to citizens, improved interactions with business and industry, citizen empowerment through access to information, or more efficient government*

[1]www.worldbank.org

management. The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions."

II. UN[2] definition: "*E-government is defined as utilizing the Internet and the world-wide-web for delivering government information and services to citizens.*"

III. Gartner Group's definition of e-Government "*the continuous optimization of service delivery, constituency participation, and governance by transforming internal and external relationships through technology, the Internet and new media.*"

IV. Definition of the Working Group on E-government in the Developing World[3]: "*E-government is the use of information and communication technologies (ICTs) to promote more efficient and effective government, facilitate more accessible government services, allow greater public access to information, and make government more accountable to citizens. E-government might involve delivering services via the Internet, telephone, community centres (self-service or facilitated by others), wireless devices or other communications systems*."

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While definitions of e-Government by different specialists and researchers in the field of ICT may vary widely, there lies a common theme. E-Government involves the use of ICT, especially the internet, to improve the delivery of government services to the citizens, businesses and other government agencies. Below, the researcher looks at m-Government and its definitions and looks at the reasons why it is advisable for the government to adopt its services.

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[2] (United Nations, 2005)

[3] (www.pacificcouncil.org, n.d.)

2.2.2 M-Government

M-Government is a subset of e-Government. In addition, m-Government is particularly suited for the developing world where internet access rates are low but mobile phone penetration is growing rapidly (OECD/ITU, 2011). Globally, the number of mobile phones has significantly surpassed the number of fixed/wired phones by a huge margin (Roggenkamp, 2007). The advancement in mobile wireless technologies and infrastructure, as well as high mobile penetration, should form part of the driving force behind the adoption of m-Government services (Zukang et al., 2011). The technological changes can be broadly described under three major trends, namely: mobile device penetration, convergence of wireless telecommunication networks, and the move towards a significant fourth generation (4G) coverage services and higher data transfer rates (Kushchu & Borucki, 2004). The three major trends will be further discussed later in the following sections of the chapter, but first the researcher highlights some of the definitions of m-Government given by various experts in the field of IS and ICT as a whole.

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2.2.2.1 Various m-Government definitions

Below are the various m-Government definitions from different researchers within the field of IS.

I. According to Kushchu & Kuscu[4],"*m-Government may be defined as a strategy and its implementation involving the utilization of all kinds of wireless and mobile technologies, services, applications and devices for improving benefits to the parties involved in e-Government including citizens, businesses and all governmental units*".

II. "*M-Government is defined as a subset or a complement to e-Government through the utilisation of different mobile and wireless technologies,*

[4]Kushchu, Ibrahim, and M. Halid Kuscu. "From E-Government to M-Government: Facing the inevitable." *mGovLab*, 2004: 2.

services, applications and devices to provide information and services to citizens, businesses and all government units thus creating better opportunities for the public to participate and communicate with government" (Antovski & Gusev, 2004).

III. According to Arazyan[5] "*m-Government is a strategy and its implementation involving the utilisation of all wireless and mobile ICTs, services, applications and devices for improving benefits to the parties involved in e-Government*".

IV. "*The concept of m-Government stands for the use of mobile wireless communication technology within government administration and its delivery of services and information to citizens and firms*" (Nava & Davila, 2006).

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According to the above definitions, m-Government is mainly about service delivery to the citizens, businesses, and government officials by use of mobile and wireless technologies. The study adopted a definition by Kushchu & Kuscu (2004). Their perspective of m-Government, which is, viewing the concept from a strategic point of view, influenced the researcher's decision to adopt their definition of m-Government. Therefore, that guided the researcher into how he would determine the m-Readiness of the PG by determining whether the organisation has an IT Strategy and whether that strategy catered for data mobility and ubiquity. Below, some of the reasons that can drive the adoption of m-Government as a Service (mGaaS) are discussed.

[5] Arazyan, H. "m-Government: Definitions and Perspectives." *Development Gateway*, 2002.

2.2.2.2 Reasons for introducing m-Government

The reviewed literature suggested that there are a number of reasons for introducing m-Government. These reasons were mainly related to the benefits that come with the adoption and implementation of an m-Government strategy. As this research is based on m-Readiness of a government and the citizens of a Province, the researcher looked at benefits for both the government and the citizens.

1. M-Government – benefits for the government

The benefits for the government are, but not limited to: (I) Mobility and Ubiquity, (ii) Increased accessibility and wider reach, (iii) User-centric design,(IV) Cost effective, (v) Better management and faster information flow, (VI) Increased participation and democracy. These reasons can serve as driving forces behind the adoption and implementation of m-Government in a country and its provinces.

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I. **Mobility and ubiquity.** Because people carry their mobile phones all the time everywhere they go, while a computer is connected to a fixed specific location, public services offered via mobile phones would be accessible everywhere, at all times. In a study conducted by Mitrovic & Klaas (2012, p.4) on "*the perceived benefits of m-government services in the Western Cape*", the prospective users, which were the units of analysis of that study, gave an argument that, certain m-Government services can be automated to expose 24/7 availability. Like many mobile-based business service models, they believed that these models can lower the need for citizens to access government physical offices in order to utilise particular services, giving examples of the current mobile banking services that are well developed and used in the province. There was also the perception that using wireless networks and mobile devices can be relevant for public safety and emergency (Mitrovic & Klaas, 2012).

II. **Increased accessibility and wider reach.** Because of high mobile penetration which exceeds the internet penetration, limited public services are currently offered to a limited (the literate working class and beyond) number of people via the desktop internet, The new system would be available to a greater number of people irrespective of the province that one lives in. In addition, mobile phone penetration extends outreach and access to often difficult to reach groups, such as seniors, people with disabilities and citizens living in rural areas (OECD/ITU, 2011).

III. **User-centric design.** Unlike computers shared amongst a number of users, mobile phones are meant for personal use. Therefore, information can be distributed to preferred users according to their mobile addresses such as SIM (Subscriber Identity Module) cards, especially now that the South African government has passed the RICA (Regulation of Interception of Communications and Provision of Communication-Related Act). This means that every SIM belongs to a specific user who would account for it. In addition, there can be a provision of location-based service through the possibility of locating an individual's exact physical location, and this could accelerate the reform of government organisational structures to become more horizontal and more simplified (OECD/ITU, 2011).

IV. **Cost effective.** M-Government would provide many cost effective mechanisms for the government as well as the citizens (data gathering, sending a stamped letter vs. the price of one SMS). According to Mitrovic and Klaas (Mitrovic & Klaas, 2012), the prospective m-Government providers are convinced that by providing m-Government services, cost reduction will be realised by virtue of users using their own mobile devices instead of the government providing PCs and internet access centres at high cost as is the case at present. In addition, streamlined processes, shared and co-ordinated data access, the introduction of mobile communication,

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processing, and transacting can develop a huge cost saving model (OECD/ITU, 2011).

V. **Better management and faster information flow.** The management of allocating financial and human resources by government officials can be improved through mobile technologies and their services as they possess the potential thereof (OECD/ITU, 2011**).** Through these services, remote or rural offices and operations can deal with needs and situations as they occur. In addition, there can be faster flow of information through real-time and location-based processes. Therefore, the introduction of new technologies would improve the way government officials manage their day to day tasks, like human resources and procurement management and reduce corruption through the elimination of the need for citizens to make payments over a teller, to a government official. Electronic transactions means that citizens will avoid queues and loss of important documents.

VI. **Increased participation and democracy.** Public opinion from a large group of citizens can be synchronous with public officials and the extended outreach can promote government accountability and transparency to a larger citizen base with more citizen participation in policy developments and democratic decision-making (OECD/ITU, 2011**).** In addition, technologies like SMS can be helpful for those who are hearing-impaired, as the majority of hearing-impaired people find text messaging to be an ideal form of communication, as no audible conversation is needed. However, those who are visually impaired are less likely to use text messaging. As with other factors, multiple channels of message delivery such as Text To Speech (TTS) must be considered (Rannu et al., January 2010).

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2. M-Government – benefits for citizens

Mobile technologies and services can play a huge role in empowering and improving interaction and engagement of the citizens with their government in all

aspects of their daily lives (OECD/ITU, 2011). The accessibility and the affordability of mobile phones compared to PCs as well as its ease of use and the comfortability the users have with it, can affect the adoption of m-Government in a highly positive way. M-Government can affect the activities of any public sector agency, ranging from tax and customs administration to health, social security and personal identification with various technologies such as social medias and Web 2.0 tools (OECD/ITU, 2011).

Below the researcher looks at the benefits that currently exist for citizens given the adoption of m-Government. These benefits range from, (I) Convenience and access, (ii) Health and public safety, (iii) Financial management, (v) Education. Below each of the benefits are individually discussed.

I. **Convenience and access.** Mobile technologies and services activate convenient access to government information, forms and business processes (OECD/ITU, 2011). For most citizens, mobile devices remain a common part of their daily lives, it is a tool for being interconnected and included. Through these technologies, citizens can make payments, register for specific notifications, and interact with service providers and government leaders.

II. **Health and public safety.** Citizens residing in remote rural and inaccessible areas can receive mobile health (m-Health) assistance, monitoring, notifications and emergency medical alerts. For instance, mobile devices such as mobile phones or handheld devices can be used in public health for providing real-time information on transmissible diseases and on how to manage non-transmissible diseases amongst health practitioners and their patients as well as knowledge sharing between the practitioners. In addition, through these technologies, the public can easily record or report criminal activity as well as improper conduct by government officials increasing transparency and accountability (OECD/ITU, 2011).

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III. **Financial management.** Mobile payment applications are fully adopted in both first world countries and third world countries. Therefore, various applications are available for banking and financial services, money transfers, remittances, emergencies and grants, loans and social money transfers. In addition, these services are empowering citizens who previously had difficulty in securely undertaking money transfers, deposits and withdrawals, payroll credits and other banking activities (OECD/ITU, 2011). Through these services, the government can reach the masses including those in remote inaccessible provinces, providing them with value-added services such as grants pay out, salaries and other government disbursements via secured payment services.

IV. **Education.** At present, in universities around the world, in both developing and developed countries, content is delivered to students through mobile technologies. Students are able to access exam and test results, and decisions on bursary and finance applications through their mobile devices (OECD/ITU, 2011). Projects like electronic (e-Learning) and electronic teaching (e-Teaching) can be accessed anywhere at any time over mobile devices, thus eliminating the need for universities informing students via traditional mailing systems about special exams as is the case in some SA universities. With m-Government, students can be informed in real-time irrespective of the area the students reside in.

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Table 1 below gives a tabular summary of the benefits that come with m-Government adoption, looking from both a citizen and an organisation's perspective.

Table 1: m-Government benefits

Benefits of m-Government adoption	**Organisation benefits**	**Citizen benefits**
	Mobility and Ubiquity	Convenience and access
	Increased accessibility and wider reach	Health and public safety
	User-centric design	Financial management
	Cost effective	Education
	Better management and faster information flow	

	Increased participation and democracy	

In any environment, before the adoption and implementation of a new project, there should underlie a business value and objective. Therefore, for the government, the aforementioned benefits should be seen as returns associated with the adoption of m-Government. As part of the literature reviewed, the researcher looked at existing maturity models, briefly starting with the existing e-Government maturity models, as it is the foundation of m-Government.

2.3 Underlying Maturity Models

The reason for looking at maturity models of e-Government is that, the models determined the current standing and the level of maturity notion (Wiinbladh et al., 2006). Therefore, this is partly related to why m-Government should be adopted by the PG, as that will help frog leap from the current maturity of e-Government to a more advanced stage of m-Government without the need for major infrastructure deployment required for the implementation, such as the one required for a more advanced e-Government platforms (Zukang et al., 2011). Therefore, presenting e-Government maturity models will help identify similarities and how e-Government can be advanced through mobile technologies into m-Government at a very low cost as it would be when advanced in its current form of e-Government.

2.3.1 E-Government maturity model

From the concept of government in general, as well as of e-Government, we can distinguish between three groups: Citizens, businesses and services, and governmental departments of the country. According to Tamara Almarabeh and AbuAli Amer (Almarabeh & AbuAli, 2010), implementing e-Government is a continuing process, and most often the development is conceptualized in stages.

A maturity model is a method for judging the maturity of the processes of an organization and for identifying the key practices that are required to increase the

maturity of these processes (Windley, 2002). Several maturity models exist for a number of processes. The most well-known maturity model is that of the software engineering industry which refers to it as a Capability Maturity Model (CMM), developed by the Software Engineering Institute at Carnegie Mellon University. An e-Government maturity model gives guidance on how to gain control of processes for developing and maintaining e-Government services and how to evolve towards championing the deliverance and management of e-Government services. Windley (2002) stated that an e-Government maturity model provides us with guidance on how to gain control of our processes for developing and maintaining e-Government services and how to evolve towards a culture of excellence in providing and managing e-Government. Numerous maturity models exist. These models are developed either by institutions or by individual researchers. Below the researcher discusses the various e-Government maturity models developed by various institutes and individual researchers.

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I. Layne and Lee's four-stage model (2001)

Based on technical, organizational, managerial feasibility, Layne and Lee (2001) regarded e-Government as an evolutionary phenomenon and proposed a four-stage model. Figure 1 below shows Layne and Lee's e-Government maturity model.

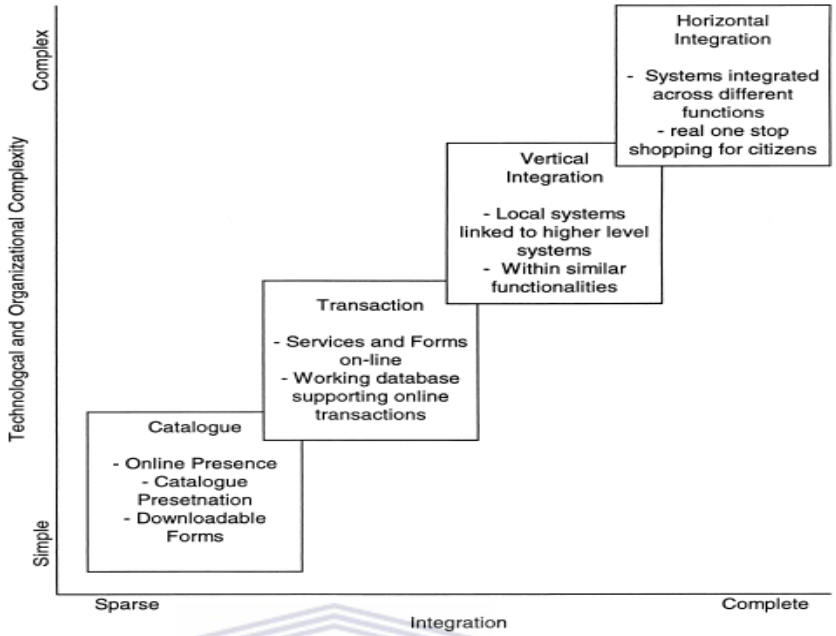

Figure 1: Layne and Lee Maturity Model (Source: Layne & Lee, 2001)

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- **Catalogue** - This stage delivers some static or basic information through websites.
- **Transaction** - This stage extends the capability of catalogue and enables citizens to do some simple online transactions such as filling in government forms.
- **Vertical integration** - This stage initiates the transformation of government services rather than automating its existing processes. It focuses on integrating government functions at different levels, such as those of local government and state government.
- **Horizontal integration** - This stage focuses on integrating different functions from separate systems to provide users with unified and seamless service (Layne & Lee, 2001).

II. Andersen and Henriksen PPR Maturity Model (Andersen & Henriksen, 2006)

Andersen & Henriksen (2006) developed an e-Government maturity model mainly for Public sector Process Rebuilding (PPR). This model is developed by increasing the level of complexity and integration from (1) to (4). Figure 2 depicts the PPR maturity model by Andersen and Henriksen.

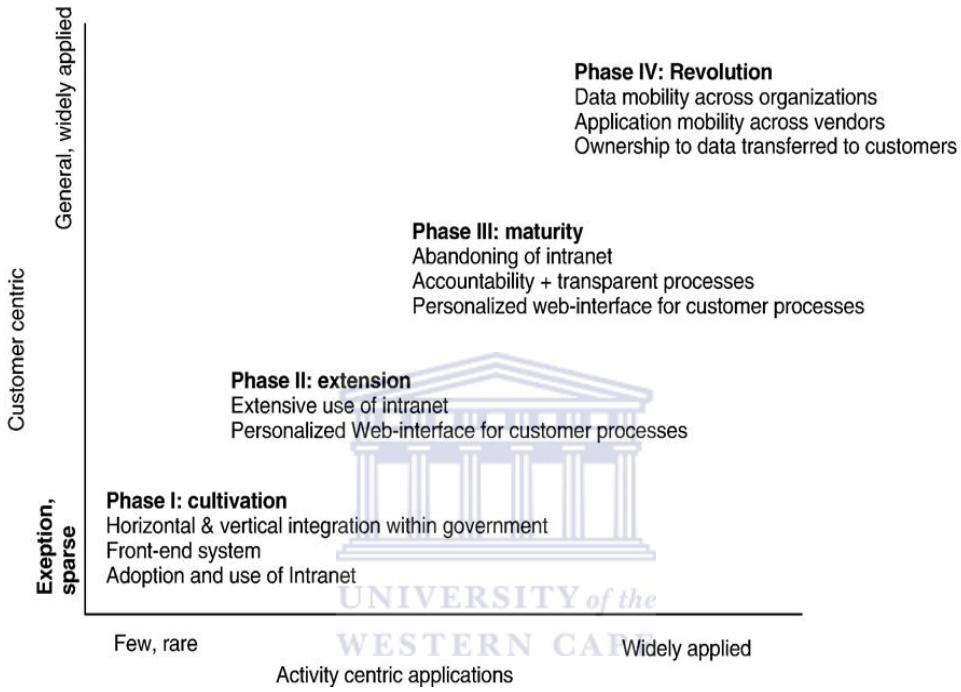

Figure 2: Andersen & Henriksen PPR Maturity Model (*Source*: *Andersen & Henriksen, 2006*)

Andersen and Henriksen complement the maturity model with strategic ambitions of governments' use of IT, and present what they call the PPR. Andersen and Henriksen argue that the Layne and Lee model build on the same foundations that have dominated the traditional motives for IT adoption, i.e. an increase in information quality, efficiency and effectiveness (Almarabeh & AbuAli, 2010). The PPR model expands the e-Government focus to include the front-end of government (Almarabeh & AbuAli, 2010). The major difference between the Layne and Lee model and the PPR model is the activity and the customer centric approach rather than the technological capability (Almarabeh & AbuAli, 2010).

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2.3.2 M-Government Maturity Models

The field or the notion of m-Government is still in its infancy stage in terms of Research and Development (R&D). Due to this, there is currently limited literature and research focusing on m-Government maturity models. Therefore, the researcher will touch upon the few existing maturity models developed for m-Government. These models are mostly derived from literature reviewed from e-Government models, simply because e-Government and m-Government are not two separate entities and the latter builds upon the first (Maranny, 2011).

I. Tozsa and Budai[6] m-Government Maturity Model.

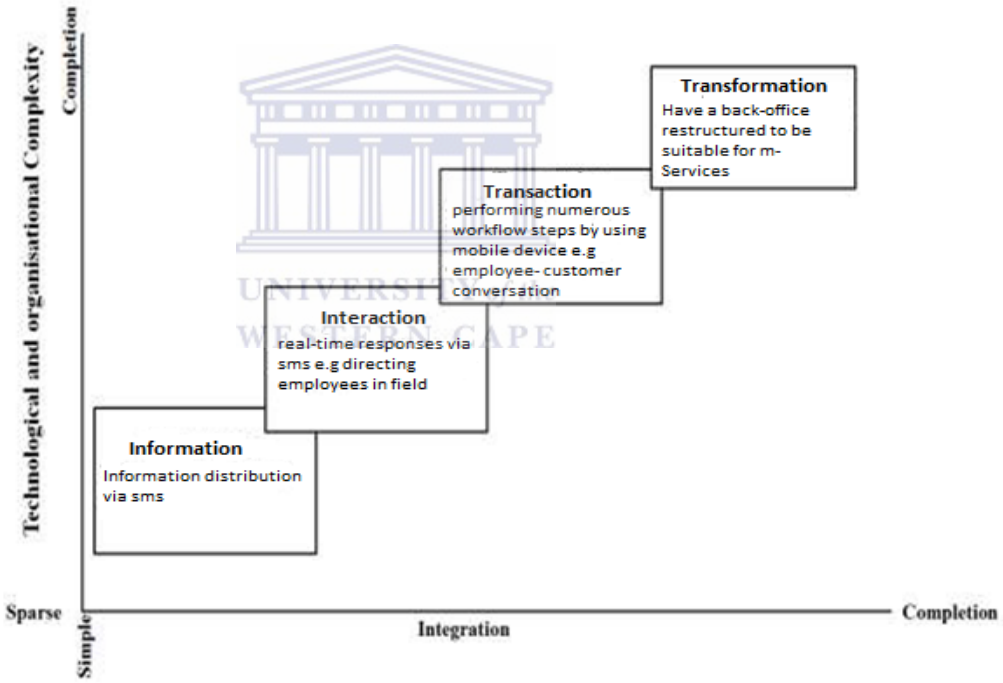

Figure 3: M-Government Maturity Model (Source: Tozsa & Budai, 2005)

[6] Tozsa, I. & Budai, B., 2005. *M-Government, M-Workflow in Hungarian Research*, Budapest: M-Governemnt Study Group.

- **Information level- In** this phase communication is via SMS, where information is sent to the intended recipient via SMS over a mobile network and response is over the same channel.
- **Interactive level** – This phase encompasses the collaborative type of transactions with instant response via SMS or MMS technologies.
- **Transaction level -** The phase offers services that process various stages of a transaction using mobile devices over a mobile network.
- **Transformation –** This level is about systems with back-end functionality that can process mobile administrative services that are dependent on mobile devices over a mobile network.

I. Sandy and McMillan Maturity Model (Sandy & McMillan, 2005)

- **Initial level –**Provides basic wireless access with brochure aware, non-interactive responses such as set answers to interrogation from citizens.
- **Enhanced level** - Delivers updated information such as weather forecasts, traffic conditions, policy changes or periodically, enhanced material
- **Interactive level –** This level allows formal interaction between citizens and government service providers. Providing a more sophisticated level of access enabling users to directly access information based on their specific interest or needs. Users can reach specialised databases, download forms and applications or submit them from mobile devices or wireless connection; make appointments with officials.
- **Transactional level –** This level is a mature interface that provides a single entity interaction for mobile and wireless users. Regardless of department or agency, a mobile wireless request is actioned through

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a single governmental interface with disregard for time and place. It will provide non-critical transactions with payment.

- **Fully interactive** – This level offers a secure mobile wireless transaction for payment, ordering and billing services. Agency independent, it offers the users 24/7, anytime anywhere access from a mobile wireless device with secure identification and authorisation. It offers the ability to use critical data regardless of the device's size and susceptibility to loss or theft.

In the following sub-section (2.3.3: The prospective drivers of m-Government maturity in SA), the researcher looks at some of the existing stimuli of m-Government maturity in the province. These range from mobile device penetration, coverage of wireless telecom networks and the emergence of Internet, 3G convergence and the introduction of LTE to name a few.

2.3.3 The prospective drivers of m-Government maturity in SA

2.3.3.1 Mobile Device Penetration

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According to the African Mobile Observatory (2011), the mobile industry in Africa is booming, with over 620 million mobile connections as of September 2011. Africa has overtaken Latin America to become the second largest mobile market in the world, after Asia (Phillips et al., 2011). During the past five years, a very fierce competition amongst mobile operators has been witnessed. The high competition has been the driving force behind the drop in prices and an increase in mobile penetration. Operators reduced prices on an average of 18% between 2010 and 2011, making mobile connectivity more broadly available to the masses (Phillips et al., 2011).

This drop in prices and an increase in mobile penetration can be utilized in many forms, especially by the governments to bridge the gap of "Digital Divide" that is still experienced on the African continent. The digital divide is stimulated by the low

internet penetration rate, which in turn is driven by the high prices of PCs and broadband prices that are the cause of a monopolized "Local Loop", (a phrase used in the telecommunications and technology industries to describe the technologies and processes used to connect the end customer to a communications network). Below the researcher shows the comparisons between the internet penetration and the mobile penetration in SA.

The statistics show the internet penetration percentage of the population, per World Wide Web (www), and for the mobile penetration rate, the penetration percentage of the population, per individual. Below, table 2 shows the penetration rates for both internet penetration and mobile penetration.

Table 2: Internet penetration vs. Mobile penetration (2010 Source: Africa & Middle East- telecom week)

Segment	Subscribers (millions)	Penetration (%)
Internet	6.80 million	13.8%
Mobile	51.6 million	105%

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2.3.3.2 Coverage of wireless telecom networks and the Emergence of Internet

The technology and the speed of the mobile internet have evolved through various Generations (Gs'). Initially mobile telephony systems were analogue, circuit-switched, voice links were poor, capacity was low, and security was almost non-existent. Then, came the second-generation (2G) protocol using digital encoding such as the Global System for Mobile communication (GSM) and Code Division Multiple Access (CDMA). These technologies are in use around the world and support a high rate of voice but limited data transfers. They offer auxiliary services such as data, facsimile and SMS (Short Messaging Service). Following these technologies came the 2.5G that extended the 2G protocols to provide additional features such as packet-switched connection i.e. the Global Packet Radio Service (GPRS) and enhanced data rates, then the introduction of Enhanced Data rates for Global Evolution (EDGE), which is a powerful enhancement to the GPRS

introducing high throughput rates and network capacity. Third-generation (3G) protocols support much higher data rates and are intended primarily for applications other than voice, however still on a limited scale, not yet fully fledged and deployed in certain parts of the country with each service provider deciding on where to offer coverage, based on business driven decisions.

As Table 2 displays, it is evident that mobile penetration can be seen as one of the driving forces towards the adoption of m-Government services in SA. According to the Mobility 2011 (Goldstuck, 2011) research project by World Wide Worx, 39% of urban South Africans and 27% of rural users are now browsing the internet on their phones. The study does not include the deep rural users, and represents around 20 million South Africans aged 16 and above. This means that at least six million South Africans have internet access on their phones. This high mobile phone penetration influences mobile phone internet browsing. The volume of penetration of mobile devices will put severe pressure on m-Government implementations. The citizens will want to have government services (those which are appropriate for mobile technologies) to be delivered and accessible anywhere and anytime. This will lead to m-Government activities reaching a larger base in a more convenient manner. Below are the images depicting the current GPRS(2.5G), EDGE, and 3G coverage from the top two mobile network service providers in SA, namely MTN and Vodacom.

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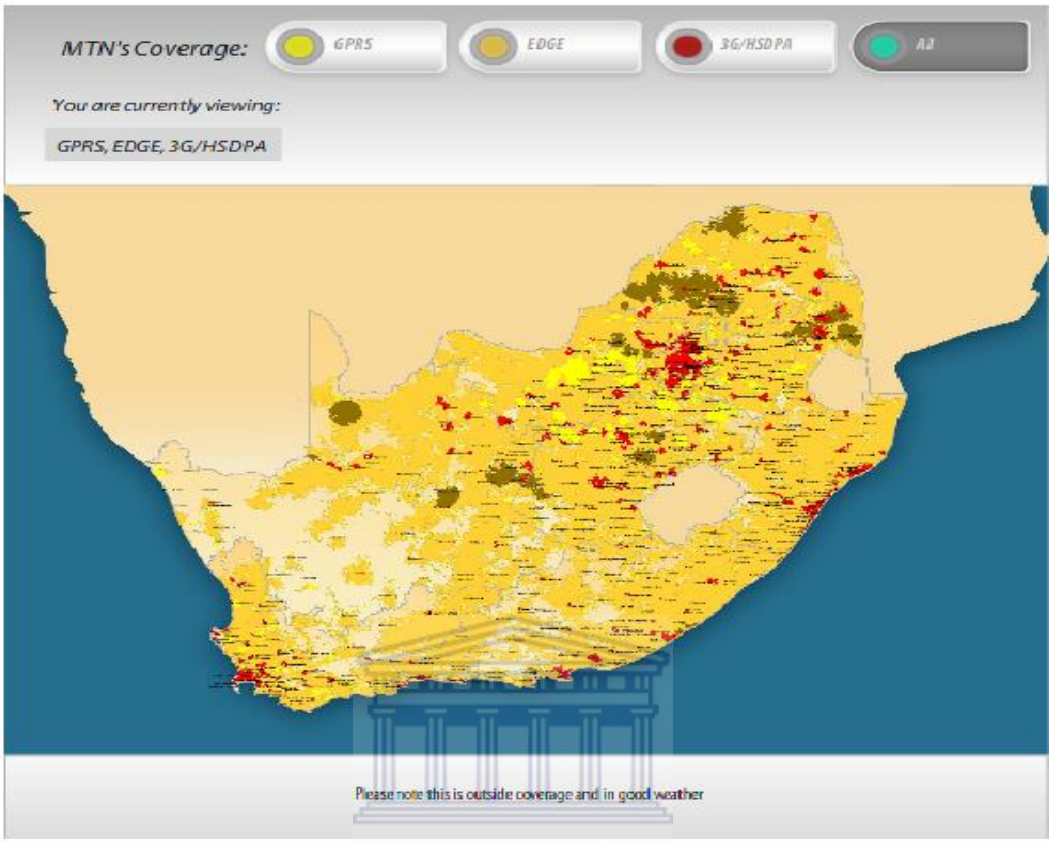

Figure 4: MTN Network Coverage (3G, GPRS, EDGE) (Source: MTN)

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Figure 4 depicts the network coverage of MTN within SA. This image shows the areas that MTNs different network technologies cover, with yellow indicating the GPRS coverage, mustard the EDGE coverage, and red the 3G coverage. This image does not properly show the GPRS network coverage, because the colour mustard and yellow are almost similar, which leads to yellow being neutralized. Therefore, below we show the GPRS network coverage map separately.

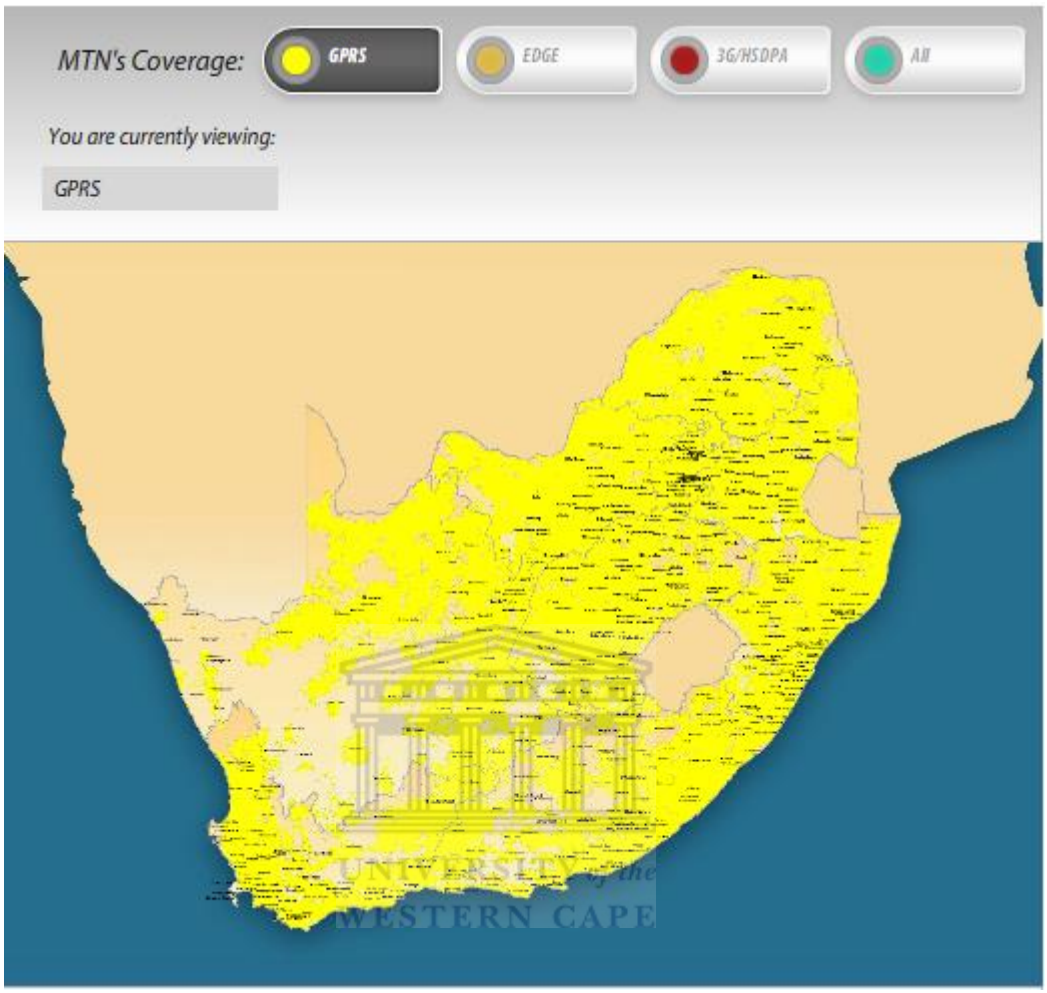

Figure 5: MTN Network Coverage (GPRS) (Source: MTN)

Figure 5 depicts only the GPRS network coverage by MTN. This image shows that EDGE and the GPRS are almost evenly distributed within the nine provinces of SA, with Northern Cape trailing behind the other eight provinces.

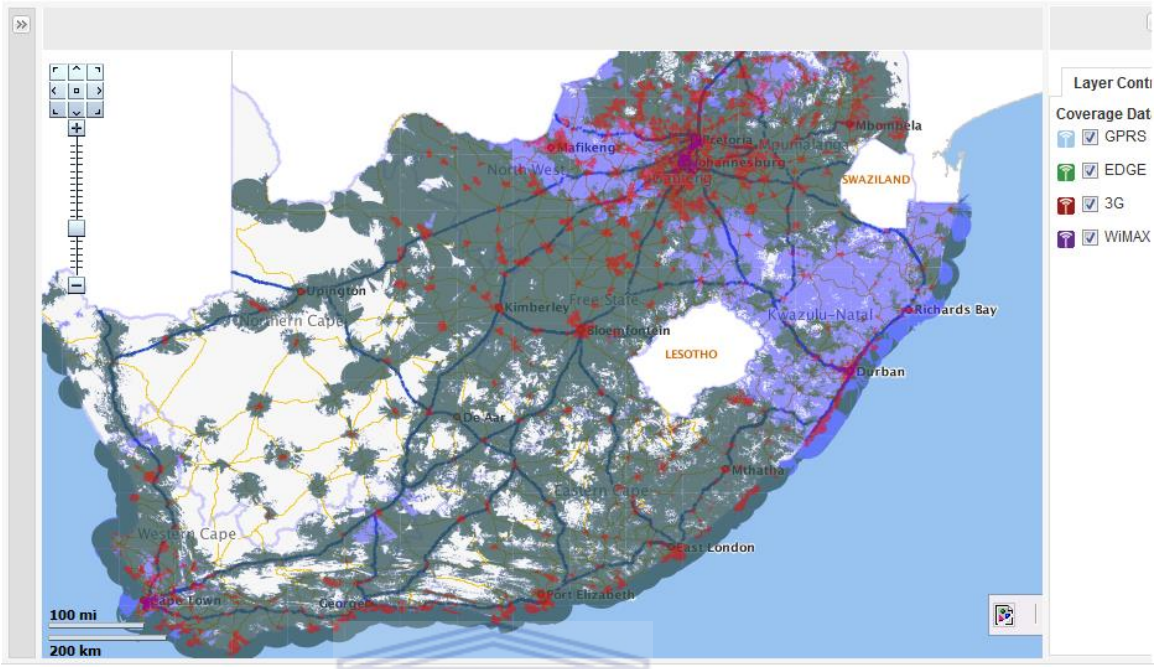

Figure 6: Vodacom Network Coverage (GPRS, EDGE, 3G, WiMAX) (Source: Vodacom SA)

Figure 6 displays Vodacom's network coverage of GPRS, EDGE, 3G, and a bit of the new technology, namely WiMAX (Worldwide Interoperability for Microwave Access) which is part of a 4G wireless-communication technology distributed in SA. Each wireless-communication technology is represented by its own colour, where blue represents the GPRS, green the EDGE, maroon-red the 3G and purple the WiMAX (4G). As in Figure 6 (MTNs coverage map), the GPRS and the EDGE overlap in most of the provinces with little coverage in the Northern Cape, but in this one there is also limited coverage of EDGE in Kwa-Zulu Natal (KZN). According to Figure 6, the WiMAX technology is only deployed in Gauteng province.

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2.3.3.3 Move towards a 3G coverage service

Below we show the current 3G coverage services of both MTN and Vodacom in SA. The 3G in SA is still on a limited scale; therefore, not everyone has access to 3G communications technology. Figure 6 shows the 3G coverage service offered by MTN and Figure 7 shows the one offered by Vodacom.

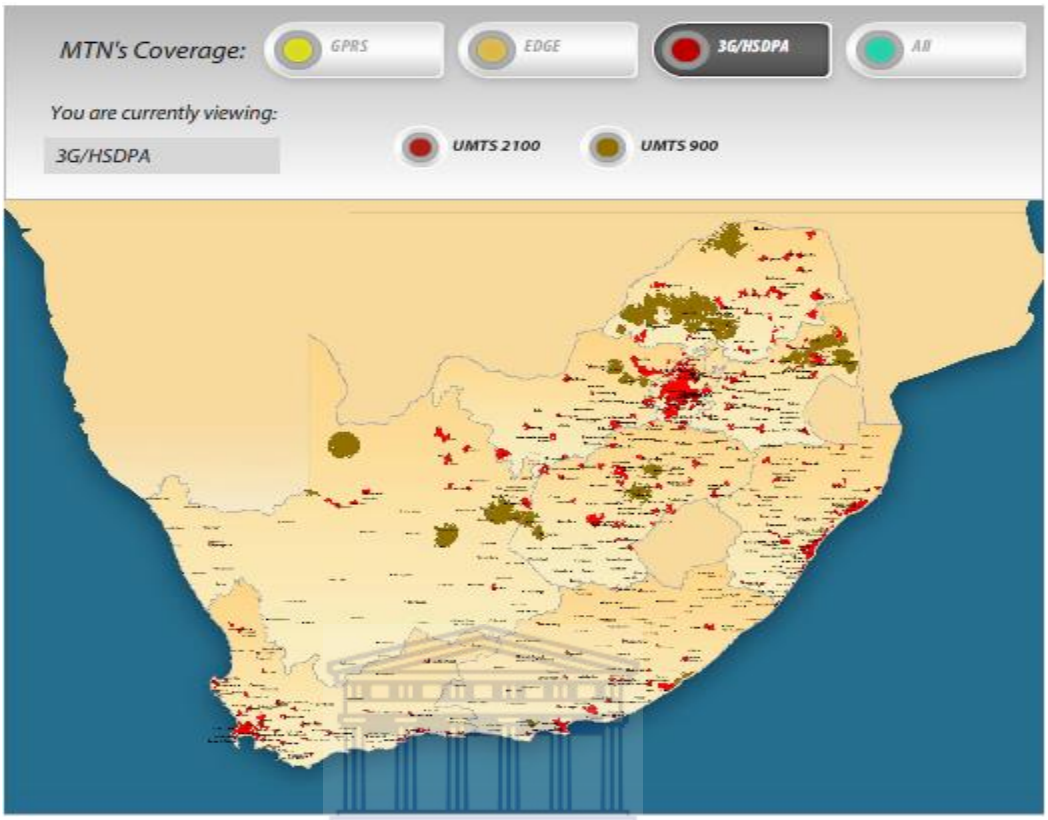

Figure 7: MTN Network Coverage (3G) (Source: MTN SA)

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Figure 7 portrays MTN's 3G-coverage map, with the red colour showing the Universal Mobile Telecommunications System (UMTS) 2100 standard and the olive green colour illustrating the UMTS 900 standard, which is a 3G standard based on the GSM standard. These dots illustrate where MTN's 3G network is located and which parts of the country can connect using the technology.

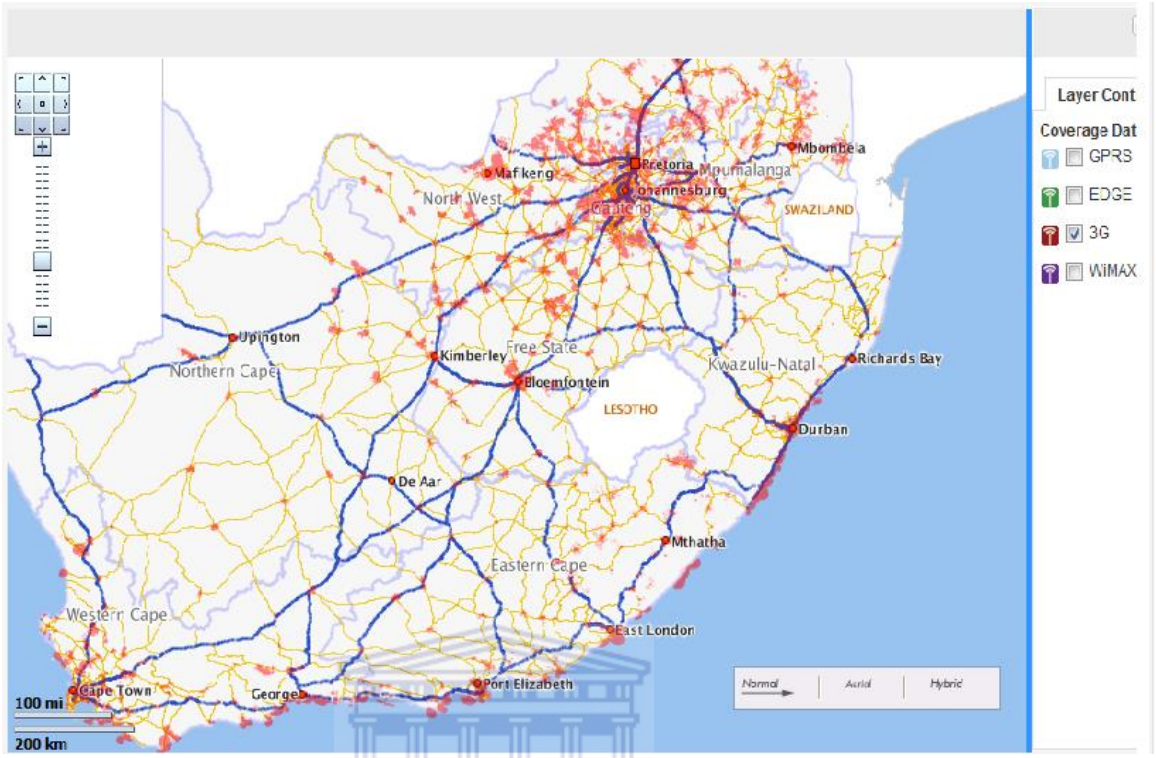

Figure 8: Vodacom Network Coverage (3G) (Source: Vodacom SA)

Figure 8 illustrates Vodacom's 3G-coverage map, with the red dots portraying where the 3G-signal can be detected in the different provinces of SA.

SA's3G-coverage service is still limited to certain parts of the country, more specially the urban areas, where more mobile usage is seen. With mobile network operators expanding their 3G networks, there lies a potential of a fully-fledged 3G network to deliver on more communication traffic other than voice, such as video conferencing, digitized voice, and multimedia. The introduction of the undersea cable within the African continent will see more of a decrease in bandwidth prices for cell phone and internet customers, including businesses in Africa. The deployment of these cables such as Kenya's TEAMS (The East Africa Marine System), SEACOM for Southern and Eastern Africa, and EASY (East African Submarine Cable System), will see more deployment of 3G and 4G technologies which will see an increase in data services that will be able to support complex systems.

Maturity models help in benchmarking the province's status and the level of its e/m-Government maturity. As you can see from the paragraphs above, the researcher looked briefly at existing maturity models of both, e-Government and m-Government, as well as the drivers of the latter. In the following section, the researcher will look at models that are of interest to this researcher, namely the e-Readiness and m-Readiness models.

2.4 Underlying Readiness Models

There currently are a limited number of models used in assessing the readiness of a province for the introduction of new services. According to Vaezi, Sattary and Bimar (Vaezi et al., 2009), an e-Ready society is one that has the necessary physical infrastructure (high bandwidth, reliability and affordable prices); integrated current ICTs throughout business (e-commerce, local ICT sector); communities (local content, many organisations online, ICTs used in everyday life, ICT taught in schools); the government (e-Government); strong telecommunication competition; independent regulation with a commitment to universal access; and no limits on trade or foreign investments (Vaezi et al., 2009). Below, the researcher looks at both the e-Readiness and m-Readiness assessment models. The e-Readiness assessment has a very important indicator in relation to this study as it also looks at the human capital index of a region and this has a huge influence in the user readiness and willingness of the citizen readiness index. This is due to the fact that, the user's background and education level can affect the user's perceptions and the willingness to participate in a change.

2.4.1 E-Readiness assessment

Electronic readiness "e-Readiness" measures how well a society is positioned to utilize the opportunities provided by Information and Communications Technology (ICT) (Ojo et al., 2007). ICT infrastructure, human capital, regulations, policies, and internet penetration are crucial components of e-Readiness. The purpose of e-

Readiness assessment is to investigate how the different spheres of society - health, security, education, governance, etc. are able to utilize the opportunities created by ICT, particularly the internet (Ojo et al., 2007). There are a number of factors that should act as a source of stimuli to government in advancing e-Readiness. First, ICT promises great returns towards solving economic and social problems, for example job creation through the ICT industry or productivity enhancements for ICT-intensive sectors (Al-Khatib, 2009). There is also a high risk in becoming digitally isolated and non-competitive if that particular government is not e-Ready (Almarabeh & AbuAli, 2010).

The United Nations' Division for Public Economics and Public Administration (UNDP) developed one of the existing e-Readiness models. This index is an indicator of the progress the UN member countries have made in implementing e-Government services (United Nations, 2005). It takes a number of parameters and factors into consideration when determining the readiness of an organisation. These include, web presence measures (indication stages of government websites), telecommunications infrastructure measures which define the capacity of the country's ICTs (indicators are internet hosts per 10000 people, percentage of a nation's population online, and PCs, telephone lines, mobile phones, and televisions per 1000 people), and human capital measures (using the UNDP human capital index , the information access index, and urban/rural population ratio as indicators) (Ojo et al., 2007).

The 2005 Readiness Index is a combination measurement of the capacity and willingness of countries to use e-Government for ICT-led development (Jain Palvia & Sharma, 2007). It is a composite index comprising the Web Measure Index, the Telecommunication Infrastructure Index and Human Capital Index. The most related is the E-Participation Index. Below the three indexes are further described.

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2.4.1.1 Web Measure Index

Web Measure Index of 2005 is based upon a five-stage model of e-Government framework (E-Government maturity model).This index value is improved by an improvement in the number of amenities at each stage of the model. Figure 9 below is the model of the web measure Index.

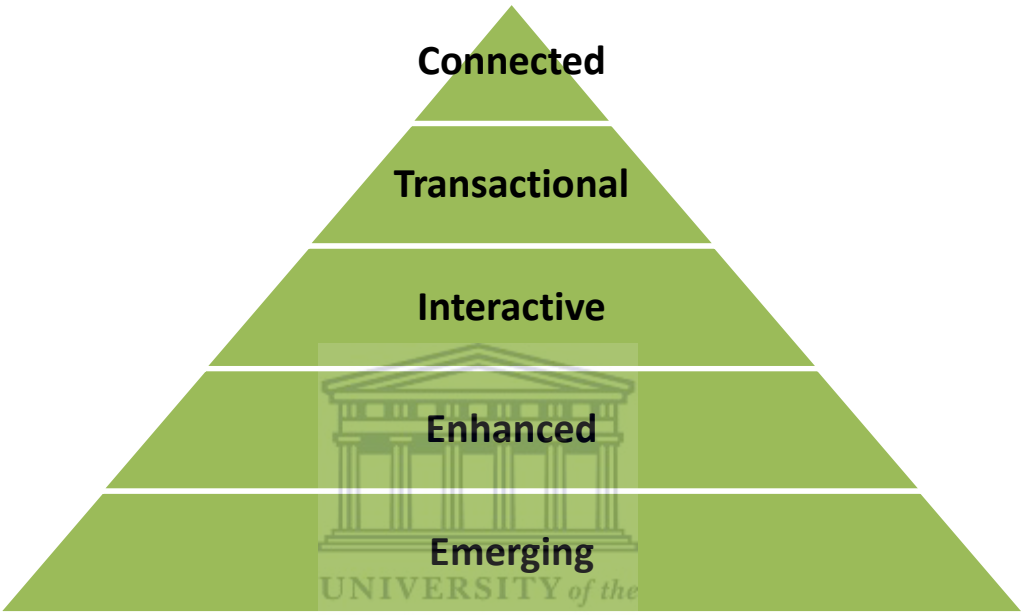

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Figure 9: Phases of Web Measure Index (source: OECD/ITU, 2011)

2.4.1.2 Telecommunications Infrastructure Index

This is a composite weighted average index of six primary indices based on basic infrastructural indicators. The six indicators are the number of people out of a 1,000 with access to PCs, who are internet users, have a telephone line, and are mobile phone users, and broadband users with a television set in their home.

2.4.1.3 Human Capital Index

The human capital index is a composite of the adult literacy rate and the combined primary, secondary, and tertiary gross enrolment ratio. The adult literacy carries two thirds of the weight and the gross enrolment ratio one third.

Following these indices, the UN ranked 192 countries' e-Readiness status. Table 3 shows the results of this survey for 2008. The results show the top five nations in the world, the top three in Africa, and four developing countries collectively known as BRIC, namely Brazil, Russia, India, and China.

Table 3: e-Readiness table as per UN e-Government survey 2008 (Source: United Nations, 2008)

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

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The study, conducted by the UN in 2008 on 192 countries, indicated that there were no countries from Africa, which featured in the list of the top 35 nations. The UN attributes this mainly to the high cost of deploying robust infrastructure, but also to the fact that many developing countries have been unsuccessful in fully implementing their e-Government policies. The continent is faced with more important social challenges related to health, education, and employment that still need to be tackled with tight budgets.

The purpose of this study is to investigate the mobile readiness (m-Readiness) of the PG as well as that of the citizens of the province, concentrating more on the previously disadvantaged, as they are the ones hit more by the digital divide. Following the definition of e-Readiness, it follows that m-Readiness refers to "*the extent to which m-Services can be deployed*" (Abdelghaffar & Magdy, 2012). As has been seen, it is extremely difficult to divorce m-Government from e-Government and that is why we started by discussing e-Government, which is what m-Government complements.

2.4.2 M-Readiness Assessment

Due to m-Government research not being in as a matured state as e-Government, there was not as much literature on m-Readiness assessment models as there was on e-Readiness. Hence the majority of the content in this section is based on the publications by Goldstuck (2005) and Kirsten (2006) with regard to determining whether organizations are prepared to deploy mobile technology to enhance their service delivery. The researcher also looked at the publications by the Living Labs Europe (Living Labs Europe, 2007), which investigated the m-Readiness of some cities in Europe, referred to as the mCluster by using the Mobile Readiness Index (MRI) they created.

This sub-section focused on these researches, not only because of the lack literature on m-Readiness but also because the first two concentrate on the SA context of m-Readiness and the latter gives more insight into determining the readiness of a city through looking at various factors in the province in question. In this section, the researcher also discusses the concept of user needs, from user readiness, user willingness, user requirements and also touches on the fit-viability model (FVM). This will help in understanding how to go about determining the readiness of the citizens. The researcher will start by discussing m-Readiness and its measuring tools.

2.4.2.1 M-Readiness models

Section 2.3.2 (M-Government) looked at m-Government and briefly pointed out why it is important to adopt m-Government as part of the e-Government strategy. Section 2.3.3.2 discussed the prospective driving forces behind m-Government, highlighting three main forces, namely mobile penetration, coverage of wireless telecommunication networks and emergence of internet, and the move towards a 3G network. In addition, the researcher looked at the benefits of employing m-Government within an organization and the benefits of deploying m-Government services for the citizens.

As the problem statement of the study mentioned, the researcher seeks to look at m-Readiness of the PG as well as the readiness of the citizens to adopt and utilize m-Government services. In this sub-section, the researcher looks at the m-Readiness models that enabled a properly perceived m-Readiness of the PG as well as the underprivileged citizens of the province.

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1. *World Wide Worx (WWW) Goldstuck (2005)) m-readiness model*

Goldstuck (2005) used ten metrics to determine the level of m-Readiness. They focus on whether both the technology and organization or department is ready. According to Goldstuck, if half the metrics are satisfied and in place, the chances are the organization may be in a positive position to initiate a wireless and mobile solution. Below is the list of the WWW metrics.

Table 4: m-Readiness questions (Source: Goldstuck, 2003)

	M-Readiness Metrics
1.	The technology should be ready for the environment. The environment should be ready for the technology.
2.	The IT Strategy should allow for easy inclusion of mobile and wireless technologies.
3.	The IT strategy should make provision for mobile and wireless technologies.
4.	There should be a widespread use and presence of mobile devices (cell phones, laptops, PDAs, etc.) in my department or organizations.

5.	The maturity of the technology that will enable this business requirement is critical.
6.	The backend system should operate on standards that allow for extensions to mobile and wireless technology.
7.	The backend databases should be accessible from any computing or data device and information should be presented in a simplified format from a small screen such as those on cell phones.
8.	The technology I have in mind should 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.	The cost should be justified by the business case for the technology.

1. **The technology should be ready for the environment and the environment should be ready for the technology.**

   The indicator looks at whether the technology to be used is mature enough for adoption through determining the duration of its existence, making sure that it's not solely adopted because of the hype around it, but its business success and market acceptance. In addition, there should be adequate human resources with the necessary skills set relative to the technology and a clear view and commitment from senior management.

2. **The IT Strategy should allow for easy inclusion of mobile and wireless technologies.**

   Within the organisation's strategy, there should be a software strategy that caters for a cross-platform independent back-office.

3. **The IT strategy should make provision for mobile and wireless technologies.**

   The software strategy within the IT strategy should not be dependant on only one platform so as to allow integration from different technologies.

4. **There should be a widespread use and presence of mobile devices (cell phones, laptops, PDAs, etc.) in my department or organization.**

   This is to make sure that the environment i.e. the workforce is comfortable with using mobile devices as to eliminate the possibility of technology rejection by the intended users.

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5. **The maturity of the technology that will enable this business requirement is critical.**

   It is critical that the technology be matured in order to mitigate the risks of the solution not being accepted by its intended market. This is also to make sure that the adoption of the technology will not be based only on hype surrounding the technology itself, but the business value aligned with it.

6. **The backend system should operate on standards that allow for extension to mobile and wireless technology.**

   The technology standards implemented should be cross-platform, robust and scalable.

7. **The backend databases should be accessible from any computing or data device and information should be presented in a simplified format from a small screen such as those on cell phones.**

   The system must have a smart back-office for determining the type of device used for the data request in order to provide the appropriate screen rendering.

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8. **The technology I have in mind should enable a business requirement of my department or organization.**

   The technology to be adopted must be aligned with the business processes and fulfil business goals.

9. **Will the time it takes to implement the technology be an obstacle in the successful implementation and use of the technology?**

   What effect does time have on the successful implementation of the technology? Is there a specified date? and does it affect the adoption and acceptance by the users?

10. **The cost should be justified by the business case for the technology.**

    The cost for implementation should be compensated for by the business value which the project holds, i.e. there should be a return on investment.

When implementing new MWT, one of the most important aspects to consider is the maturity of the technology. Therefore, the metrics above are not 100% adequate in deciding on whether to embark on implementing new technologies. Hence, below I look at Gartner's hype cycle on technology maturity, which determines the maturity of the technology to be adopted.

Gartner Hype Cycle for Networking & Communications (2011)

Gartner provided a hype cycle that can assist in determining whether the technology in question is at the right level of maturity for implementation. Figure 10 depicts the Gartner hype cycle (2011).

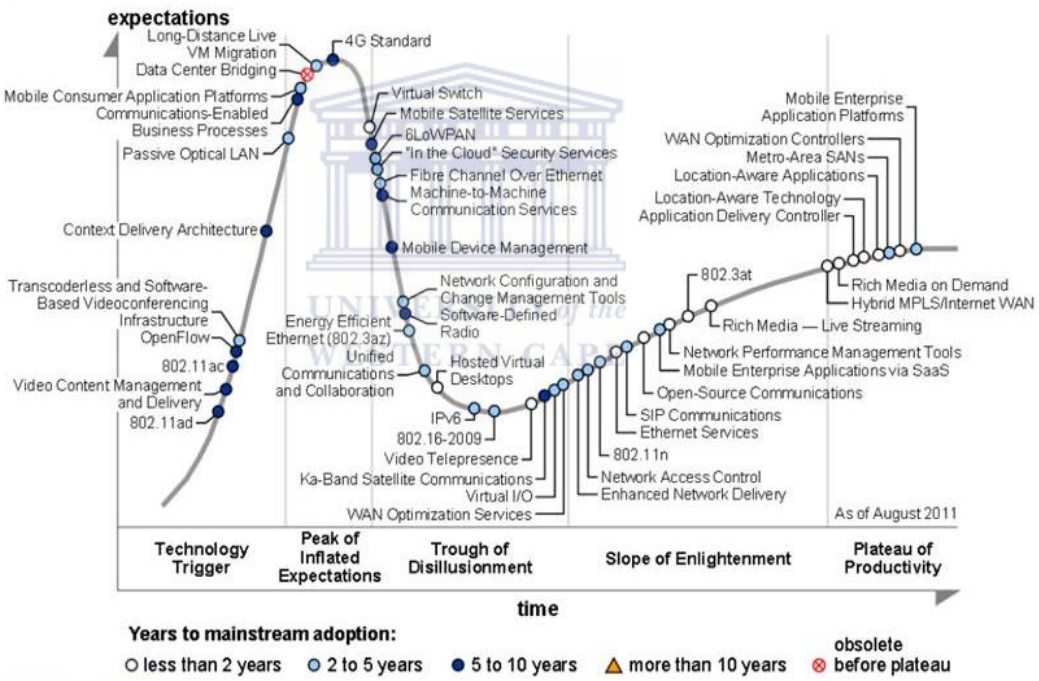

Figure 10: Gartner hype cycle for networking and communications, 2011(Source: Gartner, 2011)

Gartner produces hype cycles on a regular basis for a range of ICTs (Willis, 2011). The research conducted by Gartner provides an indication of technology adoption according to market acceptance and business success, and provides organizations with an idea of whether or not to consider the technology for their own business solutions. Therefore, the hype cycle will be used interchangeably with Goldstuck (2005) m-Readiness metrics, where the hype cycle can be used in determining the

maturity of the technology before adoption. The August 2011 networking and communications hype cycle (Willis, 2011), shows that the majority of the mobile and wireless technologies will be mature enough in two to five years.

2. *Kirsten's model (2006)*

Kirsten's study, (Kirsten, 2006) focuses mainly on the SA context and employs various resources in creating an m-Readiness model. In his research, he used a questionnaire to test the readiness of businesses in SA for mobile technology adoption. In this questionnaire, he adopted different styles of questioning, from closed questions to scale questions.

Question one to four of the survey start out by asking basic demographic questions, with question four asking about the established adoption of current technologies in the organization, with the most common current mobile technologies listed and where respondents are required to tick checkboxes indicating technologies that are already in use in their organizations.

Question five and six look at mobile technologies and business applications that have been adopted within the organisation, such as push e-mail, Voice over Internet Protocol (VoIP),remote monitoring and management dashboards as well as the level at which the work force has been supplied with mobile devices.

Question 7 and 8 respectively determined which department of the business has deployed mobile services/applications and what type of training the organisation provides for its workforce, if there is any, in order to improve the technical skill of its staff.

Question 9 and 10 respectively look at both the organisation and the users' (employee') view on the importance of the listed mobile technologies for their organisation, as well as the level of technical proficiency in the listed mobile technologies. The last question provides a list of evolving and emerging technologies and asks participants to indicate how important the new technology is with regard to how likely it will have an impact on their business. Below is the list of the metrics derived from the questions, other instances can be a combination of

questions but excluding the demographic questions, as they do not hold much significance for the current study.

Table 5: Kirsten's list of m-Readiness indicators (source: Kirsten, 2006)

	M-Readiness indicators
1.	Deployment of mobile technology in the organisation
2.	Available training for mobile technologies
3.	The importance of established mobile technologies
4.	Level of mobile sophistication
5.	Importance of emerging mobile technologies

1. **Deployment of mobile technology in the organisation (Questions 6 & 7)**

   This metric investigates the deployment of mobile technologies in different levels of management occupations within an organisation. The investigation is conducted using different elements of mobile technology.

2. **Available mobile technology training (Question 8)**

   According to Kirsten (2006), training is one of the clearest indicatiors of adoption. This metric seeks to determin the level of training that the respondents have been given in the mobile technologies that Kirsten enlisted.

3. **The importance of established mobile technologies (Question 9)**

   This metric investigates the importance of established mobile technologies through the participant's response about his/her company's views on the matter, where it is determined on a scale ranging from very unimportant to important.

4. **Level of mobile sophistication (Question 10)**

   This metric seeks to determine the sophistication level of various mobile technologies by asking respondents to rate them from very basic to very advanced. This will help determine the level of user sophistication or their level of understanding in terms of mobile technologies (Kirsten, 2006).

5. **Importance of emerging mobile technology (Question 11)**

   The metric seeks to determine the organisation's view of the importance of evolving or emerging mobile technologies for the short or medium term and the impact it may have on their business. This metric also tries to get a business

view on when is it safe for their organisation to adopt mobile technologies, whether they consider the technologies' maturity level, or not.

3. Living Labs Europe MRI

The Living Labs Europe's MRI is based on three main indices, which are sub-divided into more indicators that will guide in determining the m-Readiness of both an organisation and the community. Figure 11 below is a representation of the MRI, showing the three indices stretching further down to their sub-indicators. The MRI is based on a scale of 1-7, where, 1 = lowest, 3.5 = average and 7 = highest.

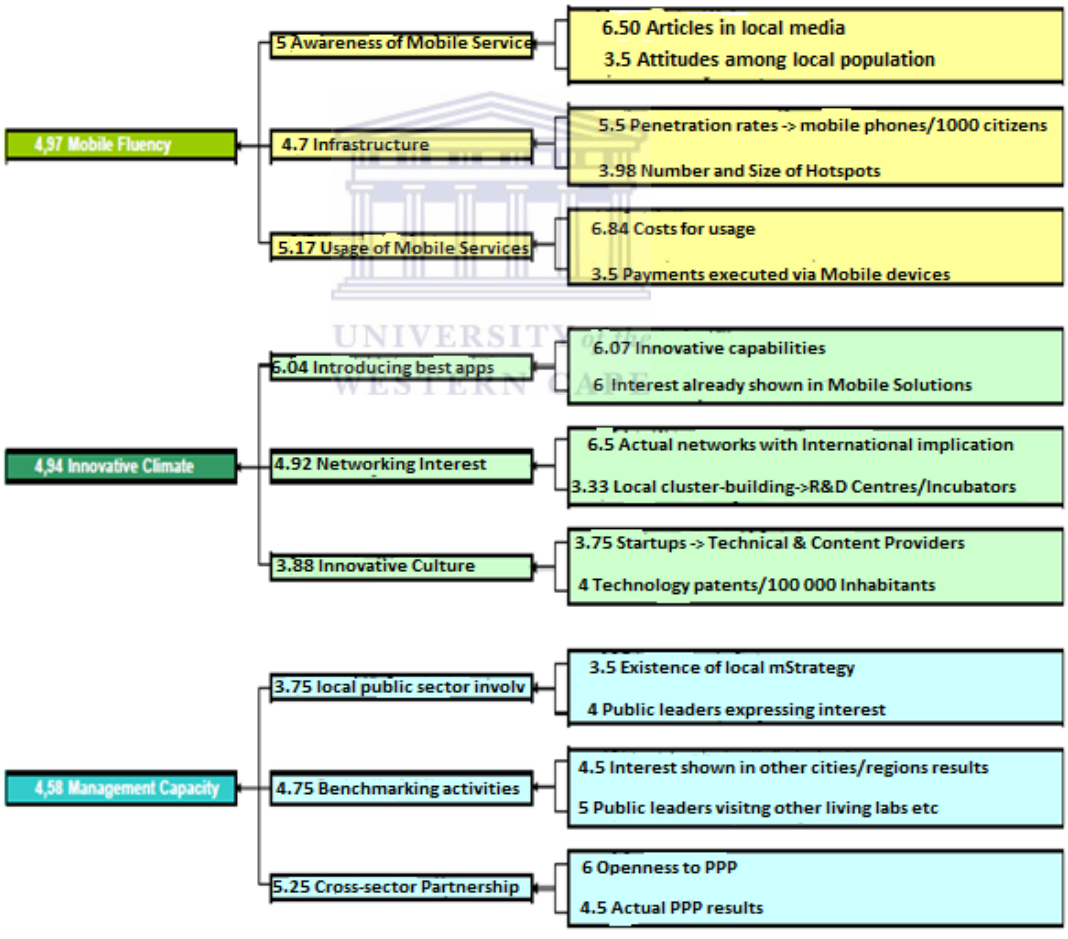

Figure 11: Mobile Readiness Index (Source: Living Labs Europe: 2006)

The LLE Mobile Readiness Index uses three main indexes to investigate m-Readiness, mainly: **Mobile Fluency**, **Innovation Climate** and **Management Capacity**. Within these indices, each has several metrics that stretch separately to investigate using more detailed and specific factors as the main indices are generic. Below is the description of the main indices, with their respective indicators further discussed.

- **Mobile Fluency:**

    - **Awareness of mobile services:**

      This indicator first looks at customer centricity through checking how aware the population is of mobile services by looking at articles related to m-Services in local media. Secondly, it determines the attitude of locals towards m-Services within the community. With these two indicators, it seeks to determine the awareness of the citizens of m-Services to determine part of the mobile fluency.

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    - **Infrastructure**

      Another step of determining the mobile fluency is through infrastructure. Infrastructure constitutes, but is not limited to, mobile phones, Personal Digital Assistants (PDA), Wireless Local Area Networks (WLAN) also known as Wi-Fi hotspots, as well as the convergence of telecommunications networks. Determining mobile fluency through infrastructure is achieved by determining the mobile penetration rate, i.e. the number of mobile phones per 1000 citizens and by investigating the number and the size of Wi-Fi in that particular province.

    - **Usage of mobile services**

There are many mobile services developed every year, and many institutions and individuals invest time and money in services of this nature. However, not all of those mobile services get a warm reception from the community. This may be due to a number of reasons, ranging from the cost of use to the user experience of the actual service, where the intended customer finds it difficult to use or not appealing. This indicator investigates the cost of utilising available mobile services and the level at which one is comfortable in executing a mobile payment and whether they have executed a payment of that type.

- **Innovation Climate:**
    - **Ability to introduce killer applications**

      This indicator investigates the citizens' innovative abilities by checking the number of recently developed mobile solutions within the province. It also monitors and tracks the interest already shown in mobile solutions by the citizens, Non-Profit Organisations (NPO) and businesses at large within the province.

    - **Networking interest**

      The indicator investigates the network capabilities with the international mobile community and the number of networks with actual international implication. It also determines the rate and level at which research and design (R&D) is advancing mobile solutions, the number of incubators in the province, and whether there are enough science and technology parks or not.

    - **Innovative culture**

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This indicator seeks to determine the level of the provinces' innovative culture through determining the number of start-up companies, whether the focus is on technical or content delivery or on both, but in the mobile solutions sphere. It also investigates the innovative culture by looking at the number of patents produced per 100000 inhabitants.

- **Management capacity**
  - **Local public sector involvement**

    This indicator investigates whether a mobile strategy (m-Strategy) exists that will be used to guide development of m-Government. It also seeks to check if the public leaders express an interest in m-Government for the province.
  - **Benchmarking activities**

    The indicator investigates whether the public leaders do show interest about progress made by other provinces in m-Government. This also determines whether the leaders visit incubators and start-ups that develop solutions which can help with m-Government implementation.
  - **Cross-sector partnership**

    This indicator determines how open is the leadership with regard to Public-Private Partnership (PPP) with existing companies that develop solutions that can improve or form part of the m-Government solution. It also checks on the actual results from existing PPPs.

Below the researcher will look at models and ways of measuring m-Readiness, which will help in perceiving the m-Readiness for both the PG and the citizens of the province. The models discussed above will be utilised in formulating a model that looks at both parties, the deliverer of the solution and the intended consumer of the solution.

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2.4.2.2 *Measuring m-Readiness*

1. *IBM m-Readiness matrix*

IBM used the matrix in Figure 12 in its report on MWTs for government to provide a rough guide on whether to adopt technology or not. The guide compares the readiness of technology with its sophistication and both can be categorized as "High" or "Low" (Goldstuck, 2003). The four categories clearly indicate that a high level of readiness and low sophistication are the first options that should be considered. IBM refers to these as the "low-hanging fruit". As Goldstuck suggests, this categorization is not as detailed as often required, but it does serve as a good starting point.

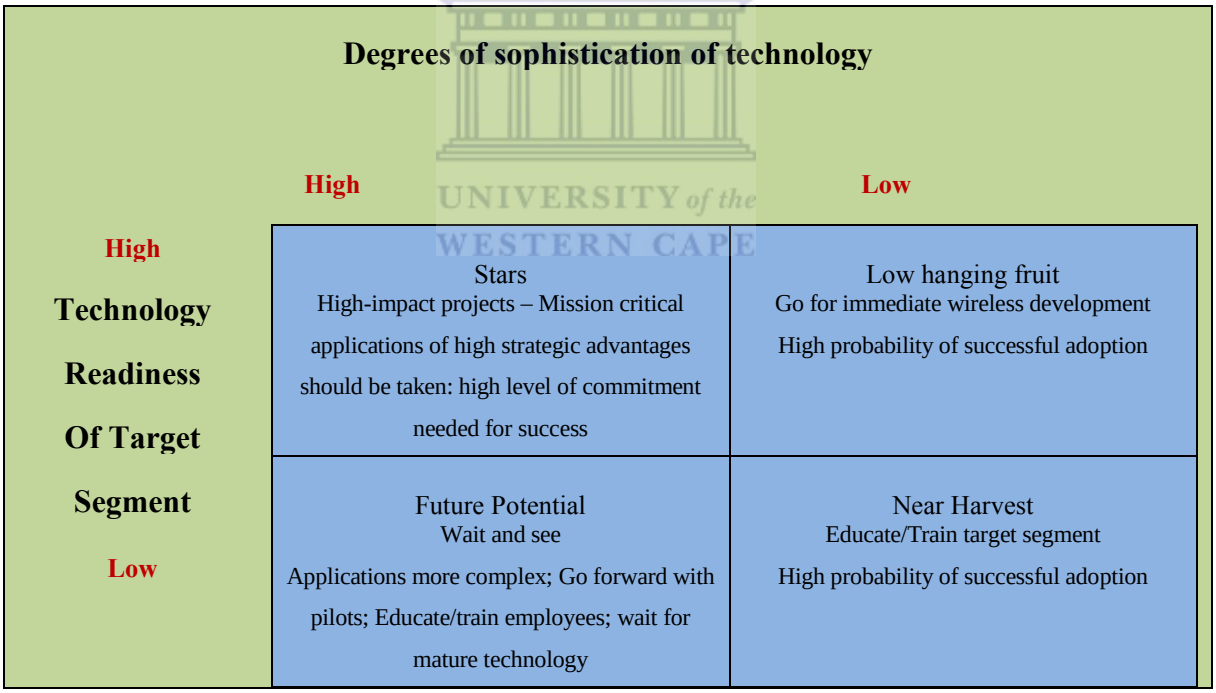

Figure 12: Preparing for mobile and wireless technologies in government (Source: Goldstuck, 2003)

In both the SA public and private sectors, the biggest consideration is the state of the current backend systems. Backend systems need to be compatible with new technologies to ensure that solutions are more cost effective. Installing new

technologies in ineffective backend systems could make matters worse (Zukang et al., 2011). Goldstuck (2003) suggests that the solution is first to sort out the backend and align its processes with front-end technologies, and then compile a meaningful business case for new front-end technologies (Goldstuck, 2003).

2. M-Government projects checklist

Research conducted by World Wide Worx (Goldstuck, 2003) showed that industry leaders indicated a range of barriers and challenges to successful implementation of m-Government. Goldstuck suggested that a checklist should be formulated using these barriers. This checklist should be consulted at the outset of the implementation to provide an indication of which barriers could be encountered. Taking preventative and corrective measures at the outset will ensure that buy-in from stakeholders is not detrimentally affected. If this is not done, the project could be doomed and rectifying the damage could be difficult. The checklist below is an adaptation of the barriers and challenges that were identified by the World Wide Worx survey.

Table 6: M-Government project checklist (Source: Goldstuck, 2003)

Factors to consider prior to implementation	**Y/N**
Education	
The level of user education is adequate for the technology to be deployed.	
If user education is lacking, training will be provided.	
Business and client expectations and requirements have been matched.	
Hardware	
The service/application is compatible with varying end-user devices and handsets	
Devices and handset are available at a reasonable cost.	
Costing	
The service is affordable (airtime cost).	
An investment appraisal and return on investment has been conducted.	

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Costing has been done for the provision of blanket mobile coverage.	
Costing has been done for bandwidth (High and low).	
Communication	
Limitations on bandwidth have been considered.	
Management	
The questions from senior stakeholders (power blocks) have been addressed.	
The suppliers are experienced enough to deliver the product.	
Redress/fault logging system is/will be in place to address user concerns.	
The legal aspect of running data and voice within the same carrier are in place.	
Security	
Security of data on mobile device has been/will be addressed.	
The procurement processes are streamlined (not lengthy and cumbersome).	
Old, custom-designed processes and data-hungry legacy applications have been avoided	
If old systems to be interfaced exist, they will be rewritten.	
Wireless infrastructure exists to extend m-Service to roaming officials.	
Appropriate people within different government agencies are available.	
Standardization of systems is a priority in the organizations.	
There is an understanding of the needs of each department sector.	

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Answering yes to all these statements will not guarantee success, but at least it will assist managers to identify any significant risks or areas that would need to be addressed. In addition, the notion of institutional readiness, which refers to the attitude of decision makers towards the technology, has to be assessed in investigating the readiness of the entire stakeholders as well as the technology before implementing a project. Goldstuck (2003) noted this as one of the most challenging barriers to implementation. Another obstacle could be what determines

whether implementation will be possible or not, which is the policy on regulatory environment. Among the issues that will have an impact on MWTs are: Wireless networking (Wi-Fi limitations as per Telecommunications Act), open-source software, electronic bill payment and presentation (Electronic Communications and Transactions Act), and general regulations affecting implementation (such as tender procedures that could hamper PPP) (Goldstuck, 2003). Lastly, the simplicity of the application will determine whether the user will utilize it. It is critical that the business needs drive the process, not the technology. If people find a system difficult to use, they will not use it (Goldstuck, 2003)

3. Understanding user needs

According to Roggenkamp (Roggenkamp, 2007), over and above all the technological requirements for delivering m-Government, there are users who have to accept and work with new applications to realize the estimated gains. They themselves have their own set of possibilities and requirements, sometimes in sharp contrast to the technically possible and the procedurally needed (Roggenkamp, 2007). In the process of developing new mobile applications, existing processes need to be scrutinized extensively, neither from a technological nor a government perspective, but from a user point of view in order to properly match these user needs with processes. This will lead to new services that may demand new modules, a re-building of processes and products. In other words, user requirements build the first filter. Therefore, the outcome should be matched with technological possibilities and government requirements. Social shaping factors are certainly necessary to understand and bear in mind in planning, technology development, and in business strategy. A failure to consider such factors will potentially undermine the commercial opportunities (UMTS Forum, 2003).

I. User readiness

Roggenkamp (2007) claims that before considering fancy applications which promise to have an enormous impact but are dependent on a vast user experience,

the current level of available user experience and the readiness of users on the in-and outside of a providing organization, has to be determined (Roggenkamp, 2007). Users are not only citizens coming to pick up their ID books or passports or coming to book a driver's license, but are also employees of an administration or other governmental organizations, and both groups have to be considered. Once someone has learned how to type on a Personal Digital Assistant (PDA), it will be a lot easier to ask this person to handle complex tasks on such a device. (Palen & Salzman, 2002). Therefore, user readiness has to be assessed not only from the citizen's perspective, but also from the public servant's perspective.

II. User willingness

User willingness to use applications and services is obviously linked to previous encounters with similar functionalities. This summons certain perceptions of the utility of new services. Sometimes this carryover model is helpful but at other times, it can be misleading (Palen & Salzman, 2002). To avoid confusions the real benefit has to be revealed to designated users. Within government structures, several measures can be taken to increase user willingness, and the first should be training and supporting users. According to Roggenkamp (2007), taking measures is a lot more problematic when offering services to the public (Roggenkamp, 2007). Not only is there a multitude of devices, operating systems and transmission networks, for many users, communicating with government is not part of their job, but plainly their duty as a citizen. For this user group, readiness to accept a technology is generally easier to achieve than creating the determination to use it for interacting with government services. Whereas simple information services can be marketed as being of value in certain, mostly mobile moments, more complex services risk not being approved by users as necessary on a mobile device without offering incentives (Roggenkamp, 2007). This is especially when they cause additional cost, e.g. for downloading information or sending SMS's to invoke a process.

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III. Adopting Technology Acceptance Model (TAM) for user needs

The TAM is a brainchild of (Davis, 1989), based on the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975) in psychology research. The TRA posits that individual behaviour is driven by behavioural intention where behavioural intention is a function of an individual's attitude toward the behaviour and subjective norms surrounding the performance of the behaviour (Masrom, 2007). In other words, it states that one's behaviour and the intent to behave is a function of one's attitude toward the behaviour. Figure 13 below depicts the TAM.

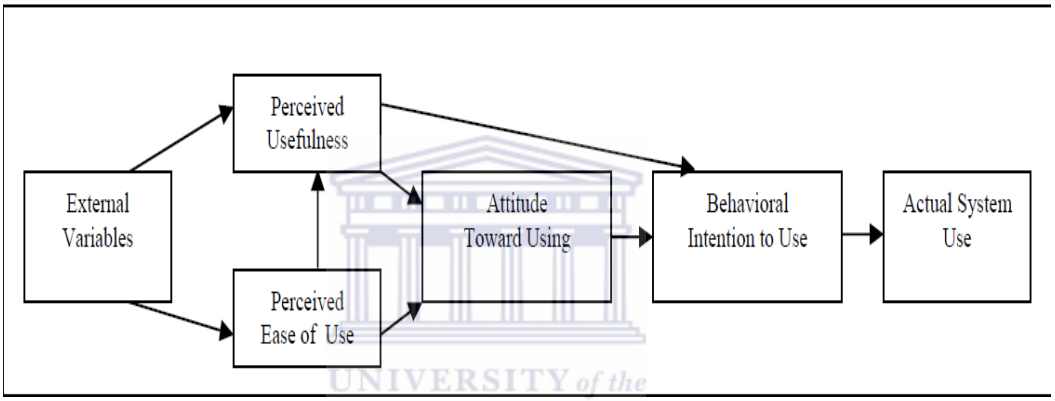

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Figure 13: Technology Acceptance Model (Source:Davis, 1989)

TAM proposes that perceived ease of use and perceived usefulness of technology are predictors of user attitude towards using the technology, subsequent behavioural intentions and actual usage. The perceived ease of use was also considered a factor in influencing perceived usefulness of technology.

- **Perceived Usefulness**

  The degree to which the user believes that using the technology will improve his or her work performance.

- **Perceived ease of use**

  Refers to how effortless he or she perceives using the technology.

Below we propose a conceptual m-Readiness measuring model using factors extracted from the various models already discussed within the literature.

4. Determining the fit-viability

According to Liang, Huang and Yeh (Liang et al., 2007), the fit-viability framework (FVF) is a model that was provided by Liang and Wei (2004) by means of combining the theory of task and technology fit with the general notion of organisational impact of IT. The FVF is of a matrix form with two dimensions, where, the vertical axis is for the viability and the horizontal axis for fit. Figure 14 below gives a graphical representation of the model.

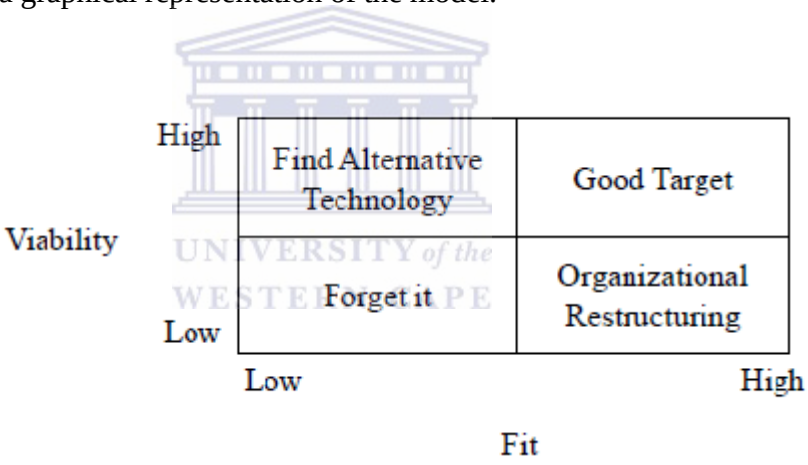

Figure 14: Fit-Viability Model (Source: Liang, et al., 2007)

The vertical axis of the model, that is, the viability, was used to measure the extent to which the organisation is ready for the application, such as economic costs and benefits, users' readiness, and the infrastructure maturity of the organisation for MWTs (Liang et al., 2007). In addition, according to Liang, Huang and Yeh (Liang et al., 2007), since MWT is defined and driven by mobility and accessibility, fit measures the extent to which the capabilities of MWTs meet the requirements of the task, such as the location-sensitivity and time-critical need of a particular service. This model is made up of four categories that can be used in projecting the best

strategy of each MWT to be adopted. The categories were identified as being: good target, organisational restructuring, finding alternative technology, or forget it, see figure 16.

2.5 Proposed conceptual m-Readiness measuring model for the studied Province

In developing the model, the researcher utilised existing literature with the purpose of determining m-Readiness of an organisation or a province. From the reviewed literature, one was by Goldstuck (Goldstuck, 2003), the other by Kirsten (Kirsten, 2006) and the last one by the LLE (Living Labs Europe, 2007), Provincial m-Readiness Measurement Model (PMRMM) was conceived. However these researchers employed different forms of methods in determining m-Readiness, as one adopted a project checklist, the other a questionnaire and the last one a framework. From those techniques, the researcher extracted concepts and metaphors that were seen as relevant to this study and developed the conceptual model to be used as a reference model to guide the study.

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The study concentrated on the perceived m-Readiness of the Province under study, that is, looking at both the m-Readiness of the PG as well as that of the local population and the mobile fluency of the Province. Therefore, the proposed PMRMM (see Figure 15) is divided into three main sections, Government m-Readiness, Citizen m-Readiness, and mobile fluency of the province. Below is the proposed model representing the different indicators that investigate the readiness of both the PG and the local population, looking mainly at the previously disadvantaged regions. These are the indicators that should be taken into consideration when determining the m-Readiness of the province.

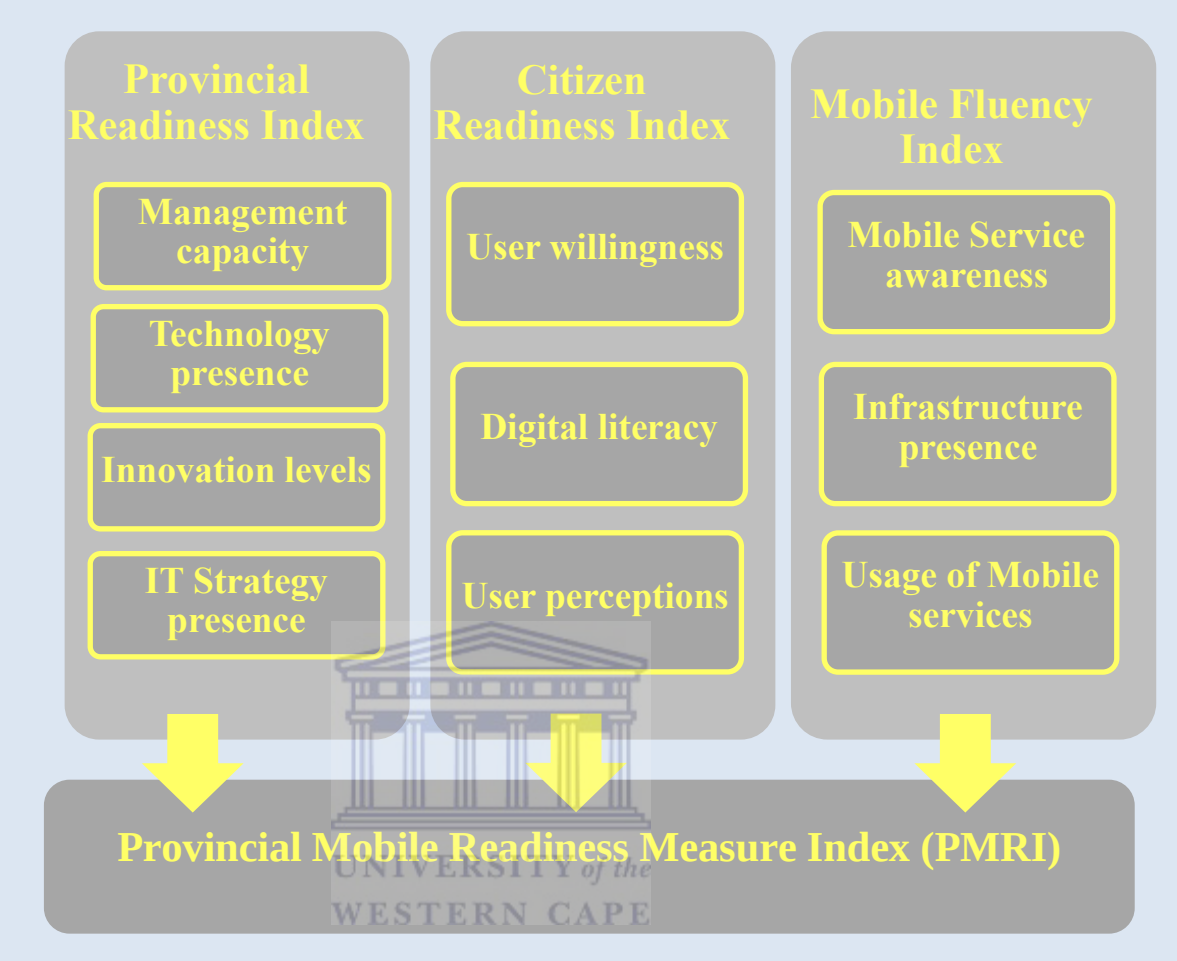

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Figure 15: Proposed Provincial m-Readiness Measure Model

2.5.1 Provincial readiness Index (PRI)

This model was used in determining the m-Readiness of the province in adopting and delivering m-Services, looking at the PG, the citizens, and the mobile fluency within the province. This comes with a list of indicators that put various factors that affect the adoption of m-Government under a microscope. These indicators are Management capacity, Local Incubators and innovation level, Technology, Strategy, and Regulations. Below the researcher further discusses the list of indicators within the PRI.

2.5.1.1 Management capacity

1. This indicator investigates whether the organisation does provide mobile technologies to its leadership and the interest they show in those technologies.
2. Seeks to determine the views shared by the management regarding the importance of evolving or emerging mobile technologies for the short or medium term and the impact it may have on the organisation.
3. Checks to see if the organisation's management has an existing relationship with local companies or existing incubators that deliver mobile solutions.

2.5.1.2 Innovation level

1. This indicator rates the interest shown in mobile solutions and determines the number of start-up companies that develop these mobile solutions.
2. It checks to what level the organisation promotes Research and Development (R&D).
3. It determines whether the organisation provides or supports necessary technological training for its workforce for performance improvement.

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2.5.1.3 Technology presence

1. It determines the existence and use of mobile devices in the organisation.
2. The current backend system should operate on standards that allow for extension to MWT's with databases that are accessible from any computing or data device with information presented in a simplified format.
3. It rates the organisation's interest in mobile solutions based on current mobile technologies which it uses.

2.5.1.4 Strategy

1. This indicator checks for the organisation's IT strategy.
2. It checks if an IT strategy exists, and if it does, then it should allow for easy inclusion of mobile and wireless technology.

2.5.2 Citizen readiness index (CRI)

This was used in determining the m-Readiness of the underprivileged citizens in adopting and utilising m-Government services. This came with a list of indicators that put various factors that affect the adoption of m-Government by the public under a microscope. These indicators are User willingness and User's digital literacy levels and the perception and expectations.

2.5.2.1 User perceptions and expectations

1. This indicator seeks to understand the attitude of the citizens towards mobile technologies and services.
2. It seeks to determine the citizen's level of trust in mobile solutions.
3. It seeks to understand whether the users will find m-Government useful or not.

2.5.2.2 Users' digital literacy levels

1. This indicator seeks to understand the user's level of mobile digital literacy.
    - Seeks to understand the users' knowledge of mobile technologies and services.

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2.5.2.3 User willingness

1. This indicator seeks to find out whether, given the training on mobile technologies and services, if one has no knowledge thereof, whether they would use the technologies listed to interact with the government or organisation.

2.5.3 Mobile Fluency Index (MFI)

This index was used in determining the province's mobile technology presence, i.e., looking at the awareness of mobile services in the province, the infrastructural development, and Usage of mobile services.

2.5.3.1 *Awareness of mobile services*

1. This indictor checks the attitude that the local population has towards existing mobile services.
2. This indicator checks whether the local population has knowledge of the current existing website of the provincial government and the services it delivers.

2.5.3.2 *Infrastructure presence*

1. This metric seeks to understand the province's infrastructural standing by looking at the province's mobile penetration rates and the number of Wi-Fi hotspots that are deployed in the province as well as the mobile telecommunication networks.

2.5.3.3 *Usage of mobile services*

1. This indicator seeks to understand the user's views on the current costs of mobile technologies and their services at large.
    - Understanding whether they find mobile tariffs expensive or not.
2. It also seeks to understand whether the prospective users of m-Government have performed transactions via their mobile devices, e.g. bill payments, money transfers.

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The model elaborated above will be adopted in determining both the readiness of the PG as well as the readiness of the citizens for m-Government services in the WC. Below is the tabular summary of the metrics with their respective objectives as well as references to where they are derived from.

Table 7: Summary of conceptual m-Readiness

	Metric	Objective	Reference
Government readiness measure	Management capacity	Investigate whether the organization makes provision of mobile technologies to its management and theirs views on emerging technologies and whether they have a relationship with local incubators.	(Wiinbladh et al., 2006), (Kirsten, 2006)
	innovation levels	To determine the interest shown in mobile solutions and the availability of local	(Wiinbladh et al., 2006)

		incubators as well as promotion of R&D.	
	Technology presence	Is to determine the maturity of the technology and how ready it is to be utilized for m-Services and the standards it is built on and existence of mobile technologies in the organization.	(Wiinbladh et al., 2006), (Goldstuck, 2003)
	Strategy	To check if an IT strategy exists and that it caters for seamless inclusion of MWTs.	(Wiinbladh et al., 2006), (Goldstuck, 2003)
	Policies & regulations	Checking for the existence of regulatory policies and standards to govern and accelerate the adoption of m-Government.	(Zukang et al., 2011)
Citizen readiness measure			
	User's perceptions & expectations	It seeks to understand the user's attitude, level of trust and whether they find significance in having m-Government.	(Kirsten, 2006), (Masrom, 2007)
	User's digital literacy levels	Understand the user's level of digital literacy.	(Kirsten, 2006)
	User willingness	This is to see if the local population would use mobile services to interact with the government.	(Kirsten, 2006), (Fishbein & Ajzen, 1975)
Mobile Fluency measure	Awareness of mobile services	This indicator checks the attitudes and knowledge about existing mobile technologies and services amongst local population.	(Wiinbladh et al., 2006)
	Infrastructure presence	This checks the mobile penetration rates and advancements in mobile networks as well as existence of Wi-Fi.	(Wiinbladh et al., 2006)
	Usage of mobile services	This seeks to understand the costs of using mobile technologies and services and whether the local population uses the technologies to transact.	(Wiinbladh et al., 2006)

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2.6 Summary

In this chapter, the researcher discussed the key concepts that play an enormous role in the process of advancing public service delivery by the government through technology. We discussed how some of these concepts such as e-Government and m-Government could be measured in order for the government to see and understand the level of maturity and development. We also discussed the relevant

indicators and metrics that determine the readiness of the state and that of the citizens to deliver and utilize the system respectively.

The purpose of this study is to investigate the level of m-Readiness of a provincial government to deliver m-Government services as well as the level of m-Readiness of the citizens of a province to utilize m-Government services. Three m-Readiness measuring models by Arthur Goldstuck, Etienne Kirsten and the Living Labs Europe have been discussed extensively see (2.4.2.1M-Readiness). These models were synthesised and employed in developing the conceptual PMRMM which was used as the reference point of the study in determining whether the PG is ready for delivering m-Government services and whether the underprivileged citizens of the Province under study are also ready for utilising m-Government services.

In section 2.3.2 see (0 Figure 3: M-Government Maturity Model (Source: Tozsa & Budai, 2005)

- **Information level- In** this phase communication is via SMS, where information is sent to the intended recipient via SMS over a mobile network and response is over the same channel.
- **Interactive level** – This phase encompasses the collaborative type of transactions with instant response via SMS or MMS technologies.
- **Transaction level -** The phase offers services that process various stages of a transaction using mobile devices over a mobile network.
- **Transformation –** This level is about systems with back-end functionality that can process mobile administrative services that are dependent on mobile devices over a mobile network.

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II. Sandy and McMillan Maturity Model

- **Initial level –**Provides basic wireless access with brochure aware, non-interactive responses such as set answers to interrogation from citizens.

- **Enhanced level -** Delivers updated information such as weather forecasts, traffic conditions, policy changes or periodically, enhanced material
- **Interactive level –** This level allows formal interaction between citizens and government service providers. Providing a more sophisticated level of access enabling users to directly access information based on their specific interest or needs. Users can reach specialised databases, download forms and applications or submit them from mobile devices or wireless connection; make appointments with officials.
- **Transactional level –** This level is a mature interface that provides a single entity interaction for mobile and wireless users. Regardless of department or agency, a mobile wireless request is actioned through a single governmental interface with disregard for time and place. It will provide non-critical transactions with payment.
- **Fully interactive** – This level offers a secure mobile wireless transaction for payment, ordering and billing services. Agency independent, it offers the users 24/7, anytime anywhere access from a mobile wireless device with secure identification and authorisation. It offers the ability to use critical data regardless of the device's size and susceptibility to loss or theft.

In the following sub-section (2.3.3: The prospective drivers of m-Government maturity in SA), the researcher looks at some of the existing stimuli of m-Government maturity in the province. These range from mobile device penetration, coverage of wireless telecom networks and the emergence of Internet, 3G convergence and the introduction of LTE to name a few.

The prospective drivers of m-Government maturity in SA), the researcher discussed the prospective drivers of m-Government in SA. Sub-section 2.3.2.1 of that section

see (2.3.3.1 Mobile Device Penetration) compared Internet penetration and mobile penetration in SA see (

. This statistic did not serve as the sole indicator as to whether the citizens are m-Ready to utilize m-Government services, but there is also the question of user needs discussed in section 2.2.4 see (3 Understanding user needs). These factors were analysed to determine the m-Readiness of the citizens.

However, for both government and citizen readiness, the researcher used the conceptual PMRMM as it scrutinised the m-Government indicators holistically, where it assessed the citizen, technology, and province's readiness.

In the following chapter, the researcher will discuss the research methodology to be used in conducting the study that will bring us closer to perceiving both Government and Citizen's readiness for m-Government. Before the conceptual model could be tested in the empirical setting of this study, it was necessary to select a credible research methodology to guide the data collection and analysis for this study. Below the researcher discusses the research design and methodology utilised in the study.

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Chapter 3

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

In every research, irrespective of the research field, there remain some underlying philosophical assumptions about what makes valid research and which method(s) is/are appropriate for the development of knowledge in a given study. It is extremely important for a researcher to know those assumptions prior to undertaking and evaluating a study. The chapter elaborates on the philosophical assumptions as well as the research design fundamentals that the study followed. From the fundamentals, appropriate philosophical paradigms were selected that formed the basis for the framework of the study. Additionally, the chapter discussed the research methodologies and design used in the research, including strategies, instruments, data collection and analysis methods while elaborating on the stages and processes involved.

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3.2 Research design

Research is at times mistaken for gathering information, documenting facts, and rummaging for information (Leedy & Ormrod, 2001). The main aim of a research is for one to understand a phenomenon by going through a systematic process of collecting, analysing and interpreting data. The research process is systematic in that, defining the objective, managing the data, and communicating the findings occur within established frameworks and in accordance with existing guidelines. The frameworks and guidelines provide researchers with an indication of what to include in the research, how to perform the research, and what types of inferences and probable there will be, based on the data collected (Williams, 2007). Therefore, the general research approach acts as an overall guide to conducting the research work.

As known, all research originates with at least one question about one phenomenon of interest. These questions are there to help researchers focus thoughts, manage efforts, and choose the appropriate approach or perspective from which to make sense of each phenomenon of interest.

The research question of this study reads as follows, "What is the extent of readiness of the provincial government as well as that of the underprivileged citizens of the province for the introduction of m-Government services?" The research question required that data be collected from two units of analysis, that is, the underprivileged citizens of the province and the provincial government's IT managers/specialists. Therefore, these two aforementioned stakeholders formed the research's units of analysis. Due to the form of the research question, the required data was numerical and the form of the research question dictated which research approach should be adopted.

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The three common approaches to conducting research are quantitative, qualitative and mixed methods (Williams, 2007). Because of the research question requiring numerical descriptive data formats, the researcher selected the quantitative research method. The first step was gathering of data, where primary data was gathered from the units of analysis. The primary data was gathered by deriving questionnaires from the study's proposed conceptual PMRMM reference model, which was developed by using the reviewed literature on existing models and related studies, but with guidance from the study's research questions. Secondary data was gathered through investigating the state of MWT in the province, combining it with data extracted from the primary data regarding the awareness and usage of mobile services. In arriving at the findings, the researcher employed a descriptive statistical analysis method in analysing the data, then, findings were discussed and presented to draw up conclusions and recommendations.

3.3 Research paradigm

According to Terre Blanche and Durrheim (1999), the research process has three major dimensions, namely *ontology*[7], *epistemology*[8]and *methodology*[9]. According to them, a research paradigm is an all-encompassing system of interrelated practice and thinking that defines the nature of enquiry along these three dimensions. The term paradigm originates from a Greek word paradeigma that means pattern, and was first used by Thomas Kuhn (1962) to denote a conceptual framework shared by a community of scientists that provided them with a convenient model for examining problems and finding solutions. Kuhn defines a paradigm as,

> "*an integrated cluster of substantive concepts, variables and problems attached with corresponding methodological approaches and tools…*"

According to him, the term paradigm refers to research culture with a set of beliefs, values, and assumptions that a community of researchers has in common regarding the nature and conduct of research (Kuhn, 1962). Therefore, a paradigm implies a pattern, structure and framework or system of scientific and academic ideas, values and assumptions (Olsen et al., 1992).

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3.3.1 Philosophic paradigms

According to Gonzalez and Dahanayake (2007), the research philosophy provides the ideological basis of a methodology. In addition, Guba and Lincoln (Guba & Lincoln, 1994) state that a paradigm is a set of beliefs about the nature of a social reality, that is, the nature of the "world" and the individual's place in it. As stated above, a paradigm consists of three dimensions, namely ontology, epistemology, and methodology. However, (Gonzalez & Dahanayake, 2007) also state that the

[7] The study or concern about what kinds of things exist, what entities there are in the universe (Larose & Kruse, 2005)

[8] The study of the nature of knowledge and justification (Carter & Little, 2007)

[9] A theory and analysis of how research should proceed (Carter & Little, 2007)

philosophical paradigm is typically composed of ontology and epistemology, but it may also embody ethics and axiology.

Ontological and epistemological aspects concern what is commonly referred to as a person's worldview, which has significant influence on the perceived relative importance of the aspects of reality (Williams, 2007). Two possible worldviews are objectivistic and constructivist. These different ways of seeing the world may have repercussions in most academic areas; yet, none of these views is considered superior to the other. Both may be appropriate for some purposes and insufficient or overly complex for other purposes.

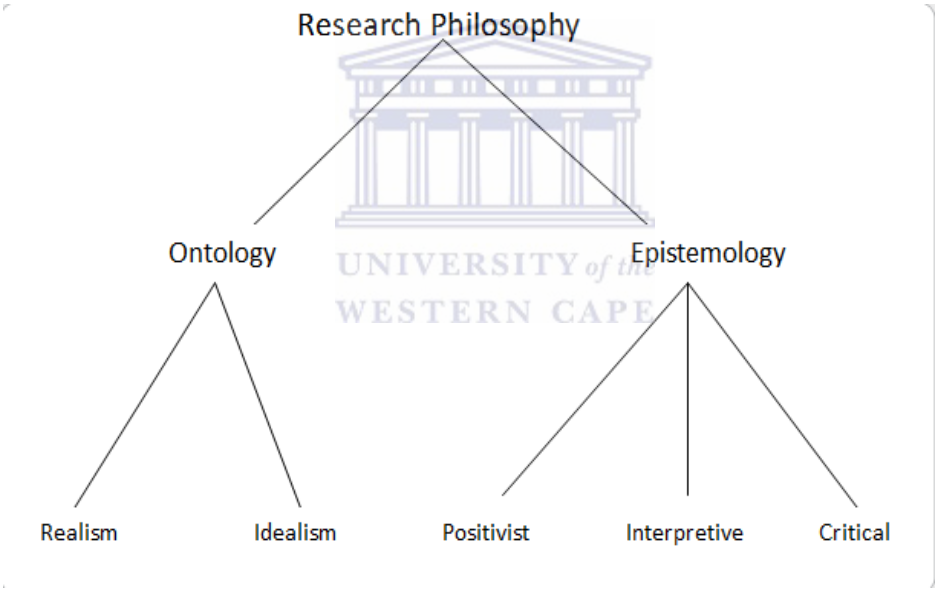

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Figure 16: Research philosophy source: (Gonzalez & Dahanayake, 2007))

However, Gonzalez and Dahanayake (2007) classified research paradigms into three philosophically distinct categories, namely positivism, Interpretivism and critical postmodernism. This three-fold classification is considered ideal for this research because these three categories can be used to conveniently place the more specific psychological and sociological theories used in the field of IT. (See figure 16

above). In addition, the aforementioned philosophical perspectives are the popular paradigms in contemporary social, organisational and management research. Below the researcher discusses the key features that are ideal from three perspectives that include the worldview, the nature of knowledge pursued and the different means by which knowledge is produced and assessed within each paradigm.

3.3.1.1 Positivistic approach

Positivism emerged as a philosophical paradigm in the 19th century with Augeste Comte's rejection of meta-physics and his assertion that only scientific knowledge can reveal the truth about reality (Kaboub, 2008). Positivism adopted David Hume's theory of the nature of reality (i.e. philosophical ontology) (Kaboub, 2008). According to Kaboub (2008), David Hume thought that philosophical and logical reasoning could lead us to "see" non-existent links between events occurring simultaneously. In addition, positivism also adopted Rene` Descartes's epistemology (i.e. theory of knowledge) (Kaboub, 2008). Descartes believed that reason is the best way to generate knowledge about reality (Kaboub, 2008). However, in ontological terms, there lies a positivistic assumption that the reality is objectively given and is measurable using properties that are independent of the researcher and his or her instruments, that is, knowledge is objectively quantifiable.

Positivistic thinkers adopt scientific methods and systematise the knowledge generation process with the help of quantification to achieve precision in the description of parameters and the relationship among them (Krauss, 2005). Positivism is concerned with uncovering truth and presenting it by empirical means (Henning et al., 2004). The positivist paradigm forms part of both the epistemological and the ontological paradigm. It seeks to understand the relationship between the researcher and what can be known. In this case, what can be known is the mobile readiness of both the PG and the citizens of the province. The positivist

paradigm will be adopted as part of the research approach used in this study, as it will take on numerical quantities.

3.3.1.2 Interpretive approach

According to (Gonzalez & Dahanayake, 2007), interpretive research is identified by the presence of participants' perspectives as primary sources of information analysed against cultural or contextual circumstances. In addition, (Johari, 2006) quoted Walsham (Walsham, 1995), stating that interpretive research methods in IS are aimed at producing and understanding of the context of the IS and the process whereby the information system influences and is influenced by the context. Unlike positivism, interpretive studies involve understanding the phenomena subjectively, whereas positivism is all about objectivity. The emergence of Interpretivism can be traced back to the 70's when Boland (1979) first drew attention to the relevance of hermeneutics and phenomenology to IS research (Johari, 2006). One of the main values of interpretive research is its ability to encourage researchers to be more interpretive and inductive rather than seeking to confirm or disconfirm hypothesis

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3.3.1.3 Critical approach

According to Carole Brooke (Brooke, 2002), Klein and Hirschheim predicted that, the future of Information Systems (IS) research would belong to methodologies that are able to combine a high level of formal rationality with a sufficient level of communicative rationality under emancipatory conditions. Despite the prediction made by Klein and Hirschheim, not so long ago it was argued that the dominant rationality in IS was still rational and positivist and that to break away from this in order to adopt different paradigms could lead to marginalisation (Brooke, 2002).

The question now is, has the argument drifted too far in the opposite direction from the one previously stated by researchers? More importantly, is critical IS research of any real value outside of a limited field of application?

Definitions within critical research are considerably broadening due to a consequence that more research paradigms tend to include/place themselves under the banner of critical inquiry. As guidance to a conclusive discussion, the researcher first answers the question of what is critical epistemology. In answering the above question, Howcroft and Trauth concentrate on the two terms, namely "critical" and "epistemology" separately as they carry different meanings, but are used in conjunction with each other.

3.3.2 Research Methodologies

Defining a research methodology is not easy, especially when trying to distinguish it from method or approach (Gonzalez & Dahanayake, 2007). One understanding is to see it as a systematic approach involving guidelines, activities, techniques and tools (Wynekoop & Russo, 1997). However, this notion is more readily associated with methods than methodology.

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According to Gonzalez and Dahanayake (2007), a methodology is a more abstract concept relating either to the study of methods or to a more general and less prescriptive approach than a method. In addition, Dubravka Cecez-Kecmanovic (2002) states that a methodology is understood here in its philosophical sense as an overall strategy of conceptualising and conducting an inquiry and constructing scientific knowledge. Methodology, therefore, refers not only to research methods or techniques (such as case study or interview), but also to the epistemological assumptions of methods and how they are linked to a particular theory (Cecez-Kecmanovic, 2002). Over and above a methodology's philosophical underpinnings, a methodology can be either qualitative or quantitative, empirical or non-empirical, design science or bevaioural science or it can be multimethodological. Figure 17 below shows the reserch methodology concept map.

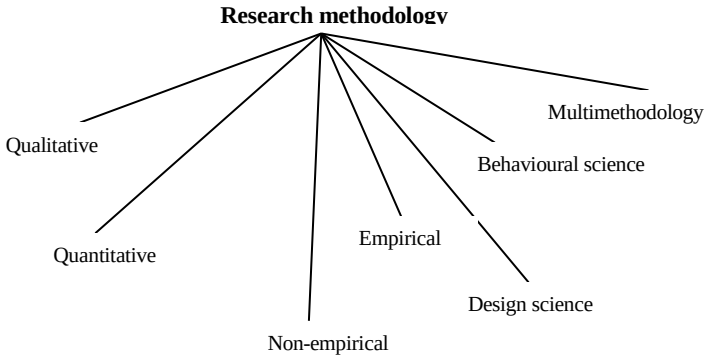

Figure 17: Research methodology concept map (source: Gonzalez & Dahanayake, 2007)

Below the researcher will briefly touch upon a few methodologies, mainly those popular within the field of IS. These methodologies are the qualitative research method, the quantitative research method and mixed methods research as a subset of Multi methodology.

3.3.2.1 Quantitative research

According to Carr (1994), quantitative research can be described by the terms "empiricism" and "positivism". The quantitative research approach is an objective, formal, systematic process in which numerical data is used to quantify or measure phenomena and produce findings (Carr, 1994). Therefore, Carr (1994) states that a quantitative methodology is there to test theory deductively from existing knowledge through the creation of hypothesised relationships and proposed outcomes for a study. According to Williams (2007), there are three broad classifications of the quantitative research method, namely descriptive, experimental and causal comparatives (Leedy and Ormrod, 2001).

1. *Descriptive*

The descriptive research approach is a basic research method that examines the situation as it exists in its current state (Williams, 2007). The descriptive approach involves the identification of attributes of a particular phenomenon based on an observational basis, or the exploration of correlation between two or more phenomena. The descriptive research employs the use of correlational, development

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design, observational studies, and survey research. These research methods may also be used in both experimental and causal comparative research.

2. *Experimental*

In the experimental research, the researcher investigates the treatment of an intervention in the study and then measures the outcomes of the treatment (Williams, 2007). As mentioned above, this research method uses the correlational, development design, observational studies, and survey research.

3. *Causal*

In the causal comparative research, the researcher examines how the independent variables are affected by the dependant variables and involves cause and effect relationships between the variables. The factorial design focuses on two or more categories with the independent variables as compared to the dependant (Williams, 2007).

The three classifications of quantitative research mentioned above form a broader classification that is followed by quantitative researchers. Quantitative research involves the collection of data so that information can be quantified and subjected to statistical treatment in order to support or refute "alternative knowledge claims" (Williams, 2007).

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Methods used to conduct Quantitative research

There are several research methods used to conduct quantitative research. These research methods fall under the three broad aforementioned classifications of quantitative research (Creswell, 2002). The first one is the descriptive method. This method uses correlation, developmental design, observational studies, and survey research (Creswell, 2002). These research methods are not only used in descriptive research, but can be used to various degrees with either experimental or causal comparative research (Ellis & Levy, 2009). Below is a brief description of each of the methods mentioned.

- **Correlational research**

Correlational is mainly concerned with association between variables (Isaac & Michael, 1997). The purpose of this research method is to give the researcher knowledge by looking at things that already exist and determines if and in what way these things are related to each other (Carr, 1994). In addition, the rationale behind correlation adoption is to allow the research to make a prediction about one variable based on what is known about another variable (Brooke, 2002). As is known, correlation takes on directions, different directions, mainly positive correlation and negative correlation. In other words, correlation can follow two patterns where in positive correlation the variables are directly proportional, that is, if there is an increase in the value of one variable, then the value of the other also increases (Gonzalez & Dahanayake, 2007). In a correlational study, the researcher is measuring conditions that already exist (Lanthier, 2002).

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- **Developmental design**

Development design encompasses the process of exploring how characteristics may change over time within a study group. Two types of development design exist, namely cross-sectional and longitudinal. In the cross-sectional study, the researcher compares two different groups within the same parameters. The longitudinal study is commonly used in child development research to better understand a phenomena of particular age groups or to study a group over a specific period of time (Leedy & Ormrod, 2001). However, van den Akker (1996) mentioned that various motives for initiating and conducting development researh can be mentioned. One of the motives that van den Akker speaks of stems from the experience of traditional research approaches (e.g. experiments, surveys, correlational analysis); with their focus on descriptive knowledge, which hardly doesn't provides prescriptions with useful solutions for variety of design and development problems in education.

- **Observational study**

In the observational study method, the researcher observes a particular aspect of human behaviour with as much objectivity as possible and records the data (Williams, 2007). There are two known observational research methods, which are, passive observational research and active observational research. In passive observational research, the researcher observes the behaviour of the units of analysis and records the behaviour using video cameras. In active observational research, it involves an observer or interviewer observing the units of analysis under natural settings, the interviewer then asks questions (in the case of humans), getting to the "why" of the observed behaviour and asking them to describe their experiences.

- **Survey methods**

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Survey research is a method used "to answer questions that have been raised, to solve problems that have been posed or observed, to assess needs and set goals, to determine whether or not specific objectives have been met, to establish baselines against which future comparisons can be made, to analyse trends across time, and generally, to describe what exists, in what amount, and what context" (Isaac & Michael, 1997). According to Glasow (Glasow, 2005), Kraemer (1991) identified three distinguishing characteristics of survey research; first, survey research is used to quantitatively describe specific aspects for a given population. These aspects often involve examining the relationship among variables. Second, the data required for survey research is collected from the people and is, therefore subjective. Finally, survey research uses a selected portion of the population from which the findings can later be generalised back to the population.

Survey research uses independent and dependant variables to define the scope of study but cannot be explicitly controlled by the researcher (Isaac & Michael, 1997). Before conducting the survey, the researcher must predicate a model that identifies the expected relationship among these variables. The survey is then constructed to test this model against observations of the phenomena. In addition, Mathiyazhagan and Nandan (2010) stated that the social scientific nature of the survey research is revealed by the nature of its variables, which can be classified as sociological facts, opinions and attitudes. Sociological facts are attributes of individuals that spring from their membership in social groups: sex, income, political and religious affiliation, socio-economic status, education, age, living expenses, and occupation, race and so on.

3.3.2.2 Qualitative research

The goal of qualitative research is understanding issues or particular situations by investigating the perspectives and behaviour of the people in these situations and the context within which they act (Kaplan & Maxwell, 2005). This can be accomplished by conducting qualitative research in natural settings with data in textual form rather than numeric. Most of the qualitative researcher's time is spent on the field, closely working with research participants in their natural surroundings. The qualitative researcher and the participant work together to document and develop interpretations of events or situations relative to a specific research question (Costa, 2005). According to Michael D. Myers, qualitative research involves the use of qualitative data such as interviews, documents, and participant observation data to understand and explain social phenomena (Myers, 1997).

Methods used to conduct qualitative research

Qualitative data is gathered primarily from observations, interviews, and documents which are analysed by various systematic techniques. This approach is useful in understanding causal processes, and in facilitating action based on the research

results (Kaplan & Maxwell, 2005). Below the researcher briefly looks at some of those methods that form part of qualitative research.

- **Case Study**

  Leedy and Ormrod (2001) require that a case study has a defined period. The case study can either be a single case or a case bounded by time and place (Williams, 2007). Case studies are employed in different disciplines of research, from a medical research studying a rare illness (event) to a political science research on a presidential campaign (activity). These examples follow a definition by Creswell (2002) who states that a case study is where a "researcher explores in depth a program, an event, an activity, a process, or one or more individuals". According to Williams, Leedy and Ormrod stated that, case studies attempt to learn more about a little known or poorly understood situation (Williams, 2007).

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- **Ethnography**

  Creswell (2002) defines ethnographies in which the researcher studies an intact cultural group in a natural setting over a prolonged period of time by collecting, primarily observational data. The focus is on everyday behaviours to identify norms, beliefs, social structures and other factors. This is the research method of anthropology with its emphasis on culture (Sidi et al., 2009). Ethnography research is undertaken by observations, interviews and examination of documents. When conducting this type of research, no prior assumption should be made and there should be no prejudice by the researcher when observing his/her collaborators.

- **Grounded Theory**

  The existence of grounded theory is attributed to the work of Glaser and Strauss (1967) as an approach to qualitative analysis while conducting an

observational field study similar to the way in which hospital staff dealt with dying patients. According to Laws and McLeod (2006), grounded theory may be best defined as "a qualitative research method that uses a systematised set of procedures to develop and inductively derive grounded theory about a phenomenon". Hence, the approach purported to be inductive rather than deductive. According to Laws, Strauss stated that the purpose of grounded theory was to organise "many ideas" from analysis of the data. However, Anselm Strauss and Corbin (1990) later extended this by saying that the purpose of grounded theory was to build a theory that was faithful to and illuminating the area under study. Thus, grounded theory was inductively derived from the researcher's studies of the phenomena it represented.

- **Phenomenological study**

  Phenomenological researchers generally agree that the researcher's concern is to return to embodied, experimental meanings aiming for a fresh, complex, rich description of a phenomenon as it is concretely lived (Finlay, 2009). There is consensus amongst researchers of a need for a phenomenological research method that is responsive to both the phenomenon and the subjective interconnection between the researcher and the researched. However, many different research methods and techniques are practised under the banner of phenomenological research. Therefore, there remains a need to distinguish the work of phenomenological research from that of other variants of qualitative research that focus on subjective meaning, in order to set boundaries and define characteristics. According to Amedeo Giorgi (Giorgi, 1989), four core characteristics hold across all variations, stating that the research is rigorously "descriptive", uses the phenomenological "reductions", explores the "intentional" relationship between persons and situations, and discloses the "essences" or structures of meaning immanent in human experiences through the use of imaginative variation.

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3.3.2.3 Mixed Methods

Scholars see a major strength of IS as that of having diversity in research methods. IS researchers have employed a plethora of different research methods that can at one level be broadly categorised into two: quantitative and qualitative (Venkatesh et al., 2012). In addition, the current praise of strength in IS research is largely attributed to methodological diversity. This is encouraging for IS research which employs a mixed methods approach that constructs on a common scientific ground, essential to promote and sustain the tradition of methodological diversity in IS research which is approaching an obsolete state.

Mixed methods research has been termed the third methodological movement (paradigm), with quantitative and qualitative representing the first and second movements (paradigms) respectively (Tashakkori & Teddlie, 2003). As is currently known, proponents of mixed methods research have suggested areas in which a mixed method approach is potentially superior to a single method design. There has been intense debate regarding whether or not it is even appropriate to combine multiple methods that are often based on radically different paradigmatic assumptions (Guba & Lincoln, 1994). Despite the several challenges associated with methodological pluralism based on the notion of the incompatibility thesis, it has been suggested that, it is in fact, feasible to conduct research that cuts across multiple methodologies and paradigms (Mingers & Taylor, 1992). In addition, scholars within the field of IS reviewed previous requests for methodological conjunction and suggested the possibility of a peaceful coexistence of multiple methodologies.

3.3.2.4 Method selection: Quantitative research method

The nature of the research and its accompanying research questions require numerical data. Therefore, it was sound for the researcher to adopt a quantitative research method to guide the process of answering the research question. As

discussed in section 3.3.2.1, several methods exist which can be used in conducting quantitative research. Therefore, greatest care had to be taken in selecting a suitable method to be followed for this study, firstly by taking into consideration the research's objectives of the study, secondly the technique to be used for data collection, thirdly the sample size to be studied, and most importantly, the research's units of analysis. Therefore, due to the form and direction of the research, ultimately, the survey research method was regarded as the best-suited quantitative method to be employed in the study. In addition, it gave proper guidance and helped the researcher realise sound results due to its characteristics and properties as well as the procedures that should be followed in undertaking the study of this nature.

3.4 Population and Sampling

In determining and selecting the population to be studied, the researcher used the research sub-questions and objectives to serve as guidance. In addition, the research's units of analysis had already been identified - these were citizens from the underdeveloped provinces and the IT managers and specialists from the PG's office. Therefore, the first research sub-question sought to understand, "*To what extent are the underprivileged citizens of the province m-Ready for m-Government services?*", and the objective the researcher sought to achieve by posing this question was to determine,, "at *which level of m-Readiness are the residents of the province for utilising m-Government services, the residents being mainly those from underprivileged communities*". The second sub-question determined, "*How m-Ready is the PG to deliver efficient and reliable m-Government services to the citizens of the province*"? Therefore, by posing this question the researcher sought: "*To determine the m-Readiness of the PG for delivering efficient and reliable m-Government services to the citizens*".

3.4.1 Citizen sampling

In determining the sample size, a 90% confidence level with 10% margin of error was used. Therefore, after the calculations, it was found that the study required a sample of 200 as a proper representation of the population under study.

Census' 2011 (Statistics SA, 2011) publication stated that, the population of the province under study was 5,823 million citizens. Therefore, this population was distributed over the various districts of the province, some more socially and economically developed than others, and having a higher standard of living than others. From the districts of the province, those that were still under-developed in terms of infrastructure and with the majority of the residents living on a low standard according to the standards defined by the government, were taken into consideration for sampling. According to Pauw (Pauw, 2005), the vast majority of the province's population reside in urban areas, which constitutes 89.6% of the province's population with the rest living in rural areas.

Therefore, in order to answer the first research question mentioned above, the target population for the study was going to be from the underdeveloped provinces situated in both urban and rural areas. However, in determining the underprivileged citizens, the Census findings were consulted and according to Census 2011 (Statistics SA, 2011), for the average annual household income per household head, Blacks and Coloureds were the least earning amongst the ethnic groups of SA namely, White, Coloured, Black, and Indian, see Figure 18.

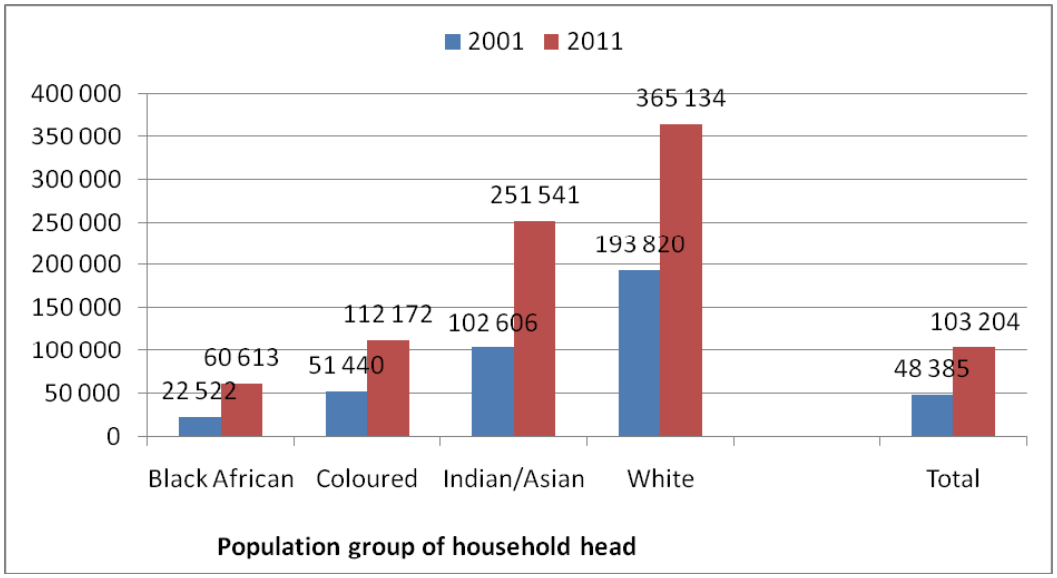

Figure 18: Average annual household income by population group of household head (Source: Statistics SA, 2011)

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In addition, concerning the issue of unemployment rates, the Black and Coloured population groups were the most unemployed population groups in SA. (See figure 19).

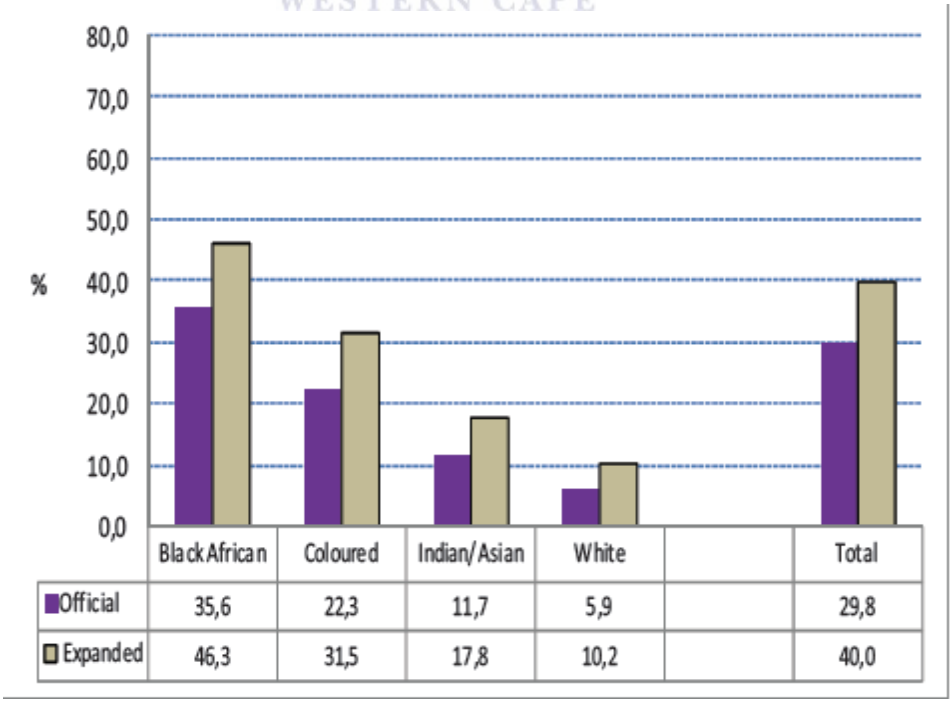

Figure 19: Unemployment rate by population group (Source: Statistics SA, 2011)

Therefore, due to those findings, it was logical to assume that the two ethnic groups lived under poor conditions and were the majority occupants, if not the main occupants, of the townships and rural areas of the province under study. According to Census 2011 (Statistics SA, 2011), Black and Coloured population groups constituted 81.8% of the province's population in 2011, with 32.9% and 48.8% respectively, see Table 8.

Table 8: Percentage distribution of the population-by-population group and province, 1996 - 2011(Source: Statistics SA, 2011)

	Black African				Coloured				Asian				White				Other
Province	1996	2001	2007	2011	1996	2001	2007	2011	1996	2001	2007	2011	1996	2001	2007	2011	2011
WC	21,6	26,7	30,1	32,9	56,0	53,9	50,2	48,8	1,1	1,0	1,3	1,0	21,4	18,4	18,4	15,7	1,6
EC	86,6	87,2	87,6	86,3	7,7	7,7	7,5	8,3	0,3	0,3	0,3	0,4	5,4	4,9	4,7	4,7	0,3
NC	44,9	46,5	39,8	50,4	43,7	42,9	50,0	40,3	0,2	0,2	0,2	0,7	11,2	10,3	10,0	7,1	1,6
FS	84,8	88,0	87,1	87,6	3,0	3,1	3,0	3,1	0,1	0,1	0,2	0,4	12,1	8,8	9,6	8,7	0,3
KZN	82,8	85,2	86,0	86,8	1,4	1,5	1,4	1,4	9,3	8,3	8,1	7,4	6,6	5,0	4,4	4,2	0,3
NW	90,1	90,0	91,2	89,8	1,6	1,8	1,7	2,0	0,4	0,3	0,4	0,6	7,9	7,8	6,7	7,3	0,3
GP	72,3	75,2	75,4	77,4	3,6	3,6	3,7	3,5	2,1	2,3	2,6	2,9	22,0	18,8	18,3	15,6	0,7
MP	91,0	93,2	92,0	90,7	0,7	0,7	0,8	0,9	0,4	0,3	0,4	0,7	7,9	5,9	6,8	7,5	0,2
LP	96,9	97,0	97,5	96,7	0,2	0,2	0,2	0,3	0,1	0,2	0,2	0,3	2,8	2,7	2,2	2,6	0,2
SA	**77,4**	**79,0**	**78,9**	**79,2**	**9,0**	**8,9**	**9,0**	**8,9**	**2,6**	**2,5**	**2,6**	**2,5**	**11,0**	**9,6**	**9,5**	**8,9**	**0,5**

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Therefore, to give an adequate representation of the whole target population under study, a stratified random sampling method was adopted in extracting a sample from the underdeveloped provinces occupied by the two ethnic groups, where one province was in an urban area and the other in a rural area.. However, the ethnicity had no direct influence in this research but is a fact of the current situation in SA and referenced due to the mere fact that, Statistics SA classified the annual earnings per household head by ethnicity.

However, not all the citizens from the two population groups are underprivileged. Therefore, in properly representing the underprivileged citizens, the researcher adopted the unemployment proportions as well as the annual earnings per household as a means of strata to be used in extracting a representative sample of both population groups from their respective population sizes and as a means of separating the underprivileged from the privileged, or those that can afford, respectively.

In determining how the questionnaires should be distributed amongst the population groups, the researcher used the unemployment rates against the selected sample size, where, Unemployed Blacks ratio = *UBr*, Unemployed Coloureds ratio = *UCr*, *N* = sample size, and *UBC* = *UBr* + *UCr*. The model used is ratio based, where the researcher looked at the ratio of the *UCr* to *UBr*.

$$UCr : UBr$$

In determining the questionnaire percentage distribution per population group, the researcher took the percentage equivalent to the ratio of each population group, where, *Pg* is the population group, that is, *UCr* or *UBr*, and *p* for the unknown percentage.

$$\frac{Pg}{UBC} = \frac{p}{100}$$

From the formula above, the researcher managed to extract adequate percentages of the respective target population groups that are unemployed in the province. Therefore, from sample *N*, the researcher knew that *p* of the questionnaires were for population group *Pg*, and the researcher worked out an approximate ratio from Census 2011 (Statistics SA, 2011) data. The ratio was found to be 5:3 (***UCr*:*UBr***) of the two ethnic group's unemployment rates.

3.4.2 PG sampling

As mentioned above, the IT managers and specialists from the PG's IT office formed part of the units of analysis for the research. The research question and objectives were already in place to guide the data collection. Therefore, the target population and sample that assisted in meeting the research objectives were from the PG's IT office, where a list of 20 IT managers and IT specialists were consulted and surveyed.

3.5 Survey instrument

The two questionnaires used for this study are presented in Appendix A. From the two instruments, one is for the sample selected from the afore mentioned townships and the other questionnaire was used in collecting data from IT managers/specialists from the PG's office. For the purpose of differentiating the two questionnaires, one for the province's residents and the other for the PG's IT managers and specialists, the researcher referred to them as the citizen readiness questionnaire and the government readiness questionnaire respectively. Below the researcher discusses the two instruments, starting with the citizen questionnaire.

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3.5.1 Citizen Readiness Measure Questionnaire

This instrument consists of various questions accompanied by matrix tables and technology related items arranged in order to address the research questions. The questionnaire items were arranged in four primary sections: Section I was information related to the participant's digital literacy. Section II was information related to the costs of using the highlighted mobile technologies and services. Section III seeks to understand the participant's awareness about mobile technologies and services such as mobile transaction services (MTS) commonly used to interact, transact and reach out to the masses, these services include but are not limited to services like Vodacom M-Pesa mobile transaction service.

This section also wanted to understand the awareness of the population under study about the existing PG Mobile Digital Services (MDS). Section IV seeks to understand the participant's willingness in using the specified mobile technologies and services to interact and transact with the government. Section V seeks to understand the citizen's perception and expectations of mobile technologies and services that m-Government can be built upon.

Research tradition emphasizes the use of previously validated instruments whenever applicable, in order to contribute to cumulative research findings (Valero, 1997). Accordingly, based upon the reviewed literature, the items have been designed towards the development of this questionnaire. This instrument consisted of eight items, which were a mixture of questions, some are self-explanatory enquiries, others are presented in matrix tables, and Likert scales as well as dichotomous questions.

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Section I of the instrument was made up of one question. This question is a Likert-scaled question. The question is about knowledge and level of understanding of mobile technologies relevant to the study. This question was presented in a matrix table, on a scale of one to five, with (a) 1-no knowledge, (b) 2-poor knowledge, (c) 3-good knowledge, (d) 4-very good knowledge, (e) 5-excellent knowledge.

Section II of the instrument contained two questions. These questions are Likert-scale questions in a matrix form. In these questions, the researcher seeks to understand the respondents' view and understanding on the usage and costs of using the mobile technologies and services listed, with (a) 1-very cheap, (b) 2-somewhat cheap, (c) 3-fair, (d) 4-exensive, (e) unaffordable. The second question of the section was, also on a scale of one to five, with the objective of seeking to know the frequency of use on the listed technologies, where (a) 1-never, (b) 2-seldom, (c) 3-average, (d) 4-frequently, (e) 5-all the time.

Section III of the instrument contained two questions. The first question of this section sought to understand the respondent's knowledge about the existence of the PG's MDS and whether they have utilised them or not. This was done through a YES or NO dichotomous question with an option of elaborating why if answered with a NO. In the second question, the researcher seeks to understand if the respondent is aware of existing (MTS) to perform transactions such as bill payments, airtime purchase etc.

Section IV of the instrument contained one question. With this question the researcher seeks to understand whether, given the necessary training, would the respondent use mobile services to interact and transact with the government. This question is a Yes or No dichotomous question where if the answer is no, then the respondent is asked to give the reason.

The last section, Section V of the instrument, is made of two questions. In the first question, the researcher seeks to understand whether respondents see m-Government as a significant tool to have or not. This question is a Likert-scale question with options of, (a) 1-insignificant, (b) 2-somewhat significant, (c) 3-significant, (d) 4-very significant, (e) 5-extremely significant. The second question of this section seeks to understand the citizen's level of trust of mobile applications. This last question is a dichotomous Yes or No type of a question with an option of elaboration given that the respondent responded with a No.

Table 9 below presents a tabular view of the questions from the citizen readiness questionnaire, and how they fit and serve the PMRMM.

Table 9: Citizen Readiness Measure questions

Citizen Readiness Measure Questions
Digital Literacy
1. Please rate your knowledge and level of understanding of the mobile technologies and services listed.
Usage & Cost (MFI)

2. Have you ever performed any transactions on your mobile phone (e.g. buy electricity, funds transfer, buy airtime etc.)?
3. How do you find the cost of using the technologies below?
Awareness about Mobile Technologies and Services and PG MDS (MFI)
4. Are you aware of the existence of the provincial government's mobile digital services, e.g. mobile websites?
5. Are you aware of mobile transactions such as mobile payments systems used to transact over mobile phone, transactions such as, buy electricity, funds transfer, movie rentals, etc.?
User Willingness
6. Given the training, would you use the mobile service e.g. USSD, SMS, Social Networks, to interact with the government?
7. Would you perform financial related transactions other than value added services on your mobile phone?
User Perceptions & expectations
8. Rate how useful and significant would it be for you to be able to interact with the government via mobile services?

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3.5.2 Provincial Readiness Measure Questionnaire

This questionnaire is made up of nine structured questions. Seven of the questions were dichotomous questions that expect a response of either Yes or No with the other three being Likert scaled questions. This instrument was structured into four sections.

Section I was made of three questions. These three questions focused on determining the technological presence of the PG. Within these three questions, two were dichotomous questions and one a Likert-scaled question. With the first question, the researcher seeks to understand whether the PG provides mobile technologies to its management or not. This question is a Yes or No dichotomous question. The second question from this section was a Likert-scaled question. This question seek to understand the PG's interest in mobile technologies and its accompanying services. This question is a Likert-scaled question starting with (a) 1-

not interested, (b) somewhat interested, (c) 3-average interest, (d) 4-very interested, (e) 5-extremely interested. The third question was a Yes or No dichotomous question. Through this question, the researcher sought knowledge about the current state of the PG's back-end system, and whether it was fully integrated and accessible from different computing devices and its level of ubiquity.

Section II of the instrument was based on the management's capacity to drive m-Government forward. This section comprised two Yes or No dichotomous questions. With the first question, the researcher seeks to understand whether the management sees significance in the PG providing them with evolving mobile technologies. With the last question, the researcher seeks to understand whether the management has an existing relationship with local companies or existing incubators that deliver mobile solutions.

Section III of this instrument looked at the innovation levels within the PG. This section comprised two questions, one Likert-scaled question and one Yes or No dichotomous question. The first question of the section determined to what level the PG promoted Research and Development (R&D). This question was rated on a scale of one to five. With the second question, the researcher sought to understand whether the PG provides or supports necessary technological training for its workforce for performance improvements. This question is a Yes or No dichotomous question.

Section IV of the instrument looked at the IT strategy of the PG. This section was made of two dichotomous YES or NO questions. The first question asked about the existence of an IT strategy. The second question was dependent on the first question of this section. With the second question, the researcher wanted to understand if the current IT strategy catered for data mobility which would create an ubiquitous system.

Table 10 below gives a tabular summary of the organisation readiness questionnaire, however organised according to the purpose of each question in relation to the PMRMM.

Table 10: Provincial readiness questionnaire questions

Provincial Readiness Measure Questions
Technology maturity and awareness
1. Does the organisation provide you with mobile technologies?
2. Rate the organisation's interest in mobile solutions based on the current mobile technologies it uses.
3. Is the organisation's back-end system fully integrated and accessible from any computing device, e.g. Smart-phones?
Management capacity
4. Does the management find any significance in the organisation providing you with evolving mobile technologies?
5. Does the management have an existing relationship with local companies or incubators that deliver mobile solutions?
Innovation levels
6. To what level does the organisation promote Research and Development (R&D)?
7. Does the organisation provide or support necessary technological training to its workforce for performance improvements?
IT Strategy presence
8. Does the organisation have an IT Strategy?
9. Does the organisation's IT Strategy allow for seamless inclusion or integration of Mobile Solutions?

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3.6 Pre-tested Questionnaire

The questionnaire pre-test proceeded in the following manner. Consultations were made during the instrument development to obtain feedback on the quality of the two instruments and to identify any needed revisions. During this stage, the researcher's research supervisor, experts in survey and qualitative research, experts

from the office of postgraduate studies and others from IS research within the University of the Western Cape, were consulted to help improve the quality of the questionnaire. Different viewpoints received were helpful in improving the quality of the instrument as a whole and clarifying the research variables. In addition, a small sample which consisted of students and community members was used to conduct a pilot study as a means of seeing whether the participants would find difficulty in answering the questions, and where clarity was needed.

3.7 Data Collection

Survey research is particularly well suited for studying attitudes, opinions, and orientations in a large population (Valero, 1997). According to Masrom (Masrom, 2007), a high response rate increases the probability that the respondents will accurately represent the sample, thereby reducing the chance of response bias. Questionnaire-type studies frequently fall victim to bias (Valero, 1997). In order to avoid the bias, which can be expected with a low questionnaire return rate, the researcher adopted a researcher administered data collection technique, where the researcher personally administered and distributed the questionnaires for the effective collection of data from the selected samples. By adopting this method, high-reinforced response rates helped reduce the biasness that questionnaire-type studies frequently fall victim to. Data was collected in two ways, by using questionnaires for citizen and organisation readiness measures and an investigation was conducted coupled with some of the data from the two questionnaires for the mobile fluency index.

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3.7.1 Primary Data

The primary data constitutes the data collected from the study's units of analysis, namely the provincial citizens as well as the provincial government.

I. Citizen Readiness

As has been mentioned above, see (3.4.1 Citizen sampling), the researcher adopted a stratified random sampling as a means of giving adequate representation of the target population. Therefore, in achieving this, the researcher used the current annual household income per population group and the current unemployment rate as strata used to determine the population as well as the target provinces within the Province respectively. In selecting the sample from the selected provinces, the researcher used the unemployment rate as the sampling strata for guiding the distribution of questionnaires adequately.

As mentioned above, Black and Coloured population groups were classified as the least earners with high unemployment rates, which lead the researcher to assume that these are the population groups that live in underdeveloped areas in townships and in the rural areas of the Province. In collecting the data, the researcher used an interviewer-administered questionnaire, where a province of mixed population groups, which are also part of the units of analysis, was visited. The researcher administered the filling of a questionnaire and gave some explanations and clarity where necessary in making sure that the participants understood the concepts and technologies that formed part of the questionnaire.

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II. Provincial Readiness

Based on the study's research question, two units of analysis were identified and the provincial government is one of them. Therefore, a questionnaire was drafted to help in answering or reaching one of the research objectives. The target population was the IT managers and specialists from a provincial government's office. Due to the nature of the study where a notion was being investigated, that is, trying to determine the perceived m-Readiness of a province (the government and citizens), observational research methods were not suitable. Face-to-face interviews would have been suitable but due to time constraints and the availability of the targeted participants, this method was not viable. The researcher realised that, since the target participants were IT managers/specialists, this meant that they have an academic

background, meaning that they are literate and would have some understanding of the concepts that formed the questionnaire.

Due to that, the researcher chose the self-administered questionnaire, where contact details and email addresses of the target participants were requested and the questionnaires were emailed to the departments to complete. However, the researcher experienced a very slow response rate due to the participants' lack of cooperation for various reasons unknown to the researcher. Due to time constraints for the submission of the research, a decision was made to perform a telephonic interviewer administered questionnaire based survey, which accelerated the response.

3.7.2 Secondary Data

The secondary data was data gathered from the investigation of the state of the technology and mobile technology presence in the province under study, the usage of mobile services and awareness of mobile services by the citizens of the province.

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Mobile Fluency

The data was collected by investigating the current infrastructure index, that is, mobile penetration rates within the province under study, the availability of Wi-Fi Hotspots in the province, and the availability of a 3G network for converged services, narrowing it to the province under study. In addition, some of the data was extracted from the primary data, that is, the usage and cost of mobile services as well as the awareness of mobile services by the citizens of the province.

The researcher randomly asked a number of citizens whether they owned or rented a mobile phone. The number of citizens asked amounted to 250. The researcher mainly targeted citizens from the youth through to senior adults, as Gerrit Beger and Akshay Sinha (Beger & Sinha, 2012) stated that, in SA users of mobile phones are from the ages of 15 – 24, though this might not hold in underprivileged provinces.

3.8 Data analysis and validation

As the study followed a descriptive research approach, by adopting the survey research method, it was then plausibly sound for the researcher to employ the use of descriptive statistics in conjunction with multivariate statistics for data analysis. The descriptive statistical analysis included the computing of means and percentages of data related to the citizen readiness measure and government readiness measure, where in citizen readiness, percentage data related to user's perceptions and expectations of m-Government, user's digital literacy levels, and their view about the cost of mobile technology usage. However, in organisation readiness, the percentage data analysed was related to the management's capacity and involvement, local incubators and innovation levels in the province, the maturity of the technology, the ubiquity of the organisation's IT systems and the standards it is built upon. Lastly, the researcher also analysed the existing IT strategy of the PG and regulatory policies thereof.

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As both the questionnaires were of a structured type but comprising different forms of questions, that is, dichotomous as well as Likert-scaled questions, different techniques of analysis were employed relative to the type of measure used in data collection. The use of a statistical program such as SPSS, helped in analysing and cleaning the data.

3.9 Ethical considerations

For ethical considerations, the researcher was granted ethical clearance by the university to conduct a survey on the province's citizens using its name. Therefore, for every questionnaire completed, a participant was first enlightened about what the study is and why it is being conducted and that he/she is participating out of free will and could therefore discontinue participation without any implications. Most importantly, the confidentiality of the response given by participants was declared. It was also made clear that no compensation of any sort would be rewarded to the participants.

3.10 Summary

In this chapter, the researcher discussed the three main traditional research methods and the paradigms that guide these methods, which are the paradigms used in academic research. In accordance with the study and the research problem, the researcher selected the quantitative research method as the method of choice, mainly taking on a descriptive statistical method to guide the development of the research. The population and sampling as well as the sampling instrument were also discussed, looking into the research variables in the survey instrument. Data collection and analysis techniques were briefly discussed. In the next chapter, the researcher gives the findings and discussion on those findings.

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Chapter 4

RESULTS: PRESENTATION AND FINDINGS

4.1 Introduction

E-Government and m-Government should be used to enhance and automate existing processes and services, therefore if the processes and services are inefficient then the two will magnify the inefficiency but if the processes and services are efficient, then the two solutions will magnify the efficiency.

This chapter presents and discusses the findings from the study. The study was conducted on the provincial government (PRI), the provincial citizens from under developed areas (CRI) and the mobile fluency status of the province (MFI). The chapter critically looks at the findings categorically from the aforementioned indicators that are extracted from the devised PMRMM model and conclusions are drawn.

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4.2 Research findings

This section presents the results from the survey conducted using two questionnaires. (See appendix A). One is for the IT managers/specialists from the provincial government's office and the other for provincial citizens, mainly from the underdeveloped provinces of the province. However, the citizen readiness questionnaire also contains questions that seek to understand the usage of mobile services and awareness of various mobile services amongst the provincial citizens, which was part of the data used in determining the mobile fluency of the province.

Unlike the European MRI scoring system of a 1 to a 7, the PMRI implements a scoring from a 1 to 5, where 1 = lowest, 2.5 = average, and 5 = highest, since those were the scales that the researcher adopted for data collection. This section presents

the results categorically as per PMRMM's Indicators, namely PRI, CRI, MFI. Each subsection starts by discussing the response rates, then, the results are presented.

4.2.1 CRI results

In determining the CRI, the nine questions in the citizen readiness questionnaire were used. However, the questionnaire also contains questions for determining the MFI. Below the researcher discusses the response rate, useable data and presents the results.

4.2.1.1 Response rates

Initially the researcher chose a sample size of 200. However, due to time constraints, the researcher successfully managed to administer a completion rate of 80%, which covered 160 questionnaires in a period of three weeks. This was considerably lower as the researcher had anticipated a 100% response rate since the data collection method was researcher administered, but due to time constraints, this was not achieved. Therefore, this gave an indication that the results from the questionnaire do correspond with the anticipated 10% margin of error at a confidence level of 90%. This implied that there can be a proper generalisation of the results as the margin of error was within the anticipated 10% level.

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4.2.1.2 Practical data

The data was examined for comprehensiveness, and the researcher discovered that 100% of the respondents responded to all the questions in the questionnaire. This was attributed to the method used, the researcher-administered questionnaire, where the researcher gave clarity on certain IT terminology and wherever required, but avoiding driving the respondents to a certain response or indirectly and unconsciously influencing their response.

4.2.1.3 Results

In this section, the researcher presents and discusses the outcomes from the citizen's readiness questionnaire. However, some of the questions were combined where

required to form homogenous groups. Each question or a group of questions had a specific goal, that is, to determine the points of each indicator from the CRI, which was later used in determining the PMRI score of the province. Below are the technologies that the researcher used within the CRI questionnaire. These technologies were selected, as they are common and standard within society and used on a daily basis as a means of communicating, transacting and socialising. For the purpose of this document, the researcher will refer to them as the Common Standard Mobile Technologies (CSMT).

- Short Message Service (SMS)
- Unstructured Supplementary Service Data (USSD)
- Multimedia Message Service (MMS)
- Mobile Internet Services (MIS)

The researcher selected these various technologies to gather information about the knowledge levels on MWTs, firstly because they are the standard commonly used technologies, with the SMS and USSD being compatible with every mobile phone. However, the use of MIS was influenced by its high acceptance in society as well as the high penetration rates of BlackBerry Smartphone's that come with the BlackBerry Internet Services (BIS); therefore, this gave unlimited access of internet usage to previously digitally excluded citizens.

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I. Digital literacy levels (Question 1)

This subsection presents the level of knowledge of the population under study on CSMTs. A summary of the results on each of the technologies in the CSMT list is presented with graphs per technology. The results magnify the respondent's knowledge of the listed technologies.

Figure 20 depicts respondent's knowledge levels of SMS technology. The knowledge levels are a bit skewed, with 0.625% having poor knowledge,

13.13% having good knowledge, 53.13% having very good knowledge and 33.13% with excellent knowledge of the technology.

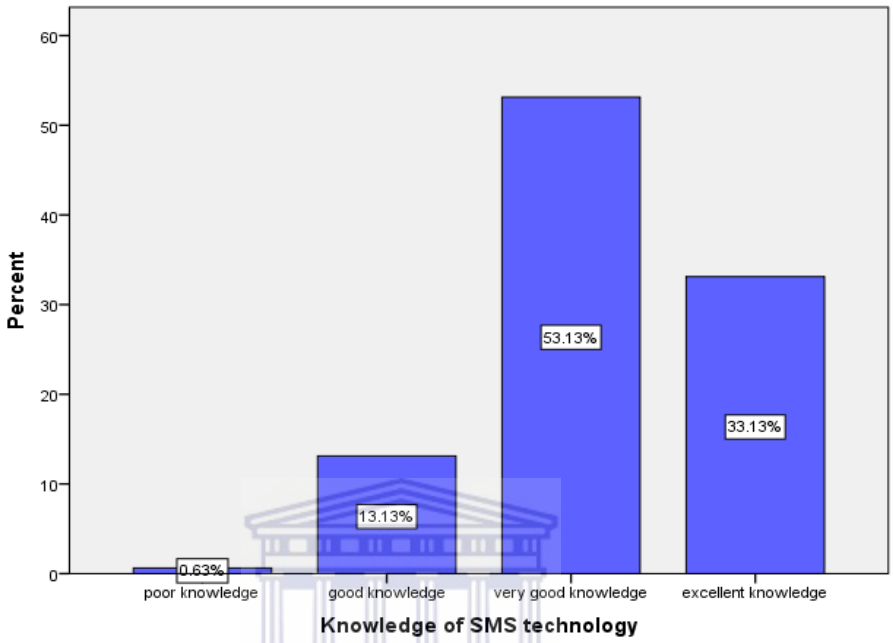

Figure 20: Knowledge level of SMS (n=160)

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However, the graph shows that 99.39% of the sample has at least a good knowledge when using the technology, which is the majority of the sample. Therefore, this indicates that on average, a citizen from the previously disadvantaged provinces has a skill level of 4.19, which corresponds to "very good knowledge", according to the researcher-defined scales.

Figure 21 presents the results of the respondent's knowledge of USSD technology. According to the results, a majority of the respondents have a good knowledge of USSD technology, with 83.1% having at least good knowledge of the technology, but with 3.75% having no knowledge at all and 13.13% with knowledge, but poor knowledge.

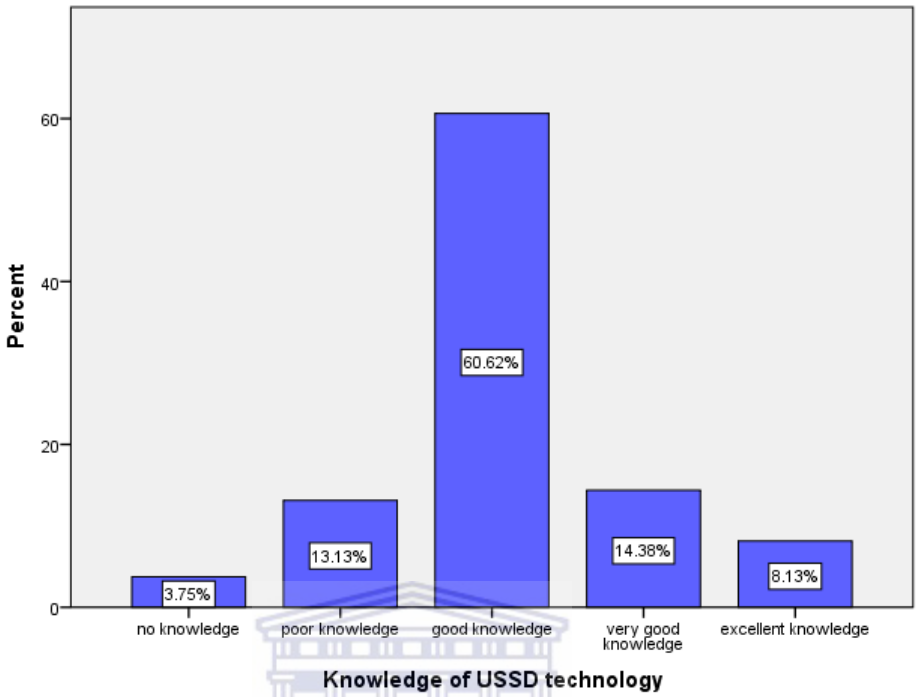

Figure 21: Knowledge level of USSD (n=160)

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As the results show, the majority of the respondents have at least a good knowledge of the USSD technology. Therefore, this deduces to an average skill level of 3.10 per citizen from the province under study. This translates to "good knowledge" according to the researcher-defined scales.

Figure 22 portrays the results on the respondent's knowledge levels of MMS. The results show that a majority of the respondents have at least good knowledge level of MMS technology and that represents 91.88% of the sample.

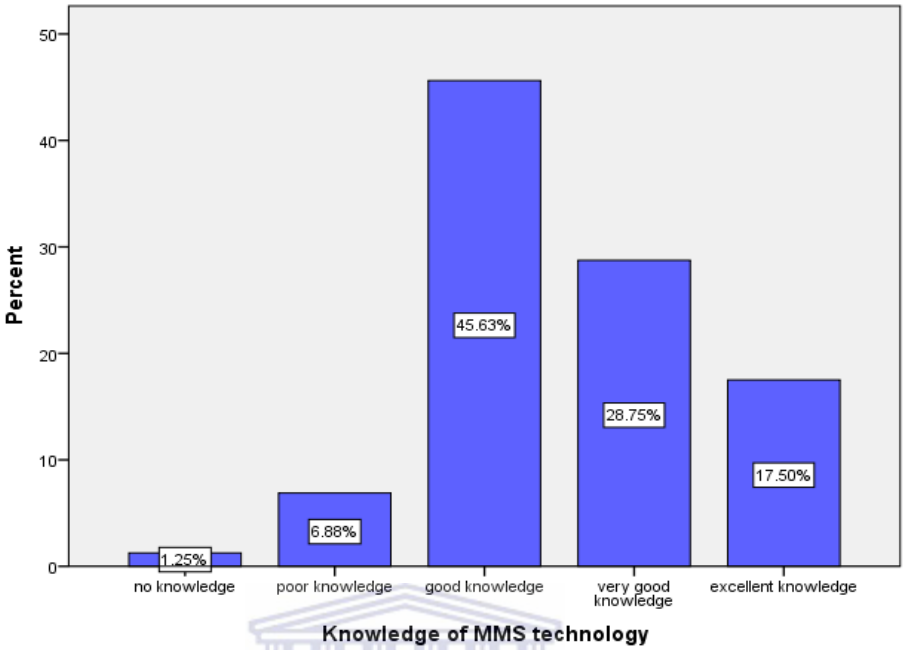

Figure 22: Knowledge level of MMS (n=160)

When generalising the results from the survey back to the population under study, it shows that on average, a citizen from the population has a MMS knowledge level of 3.54. Therefore, mapping this level to the defined scales, the knowledge level corresponds to "very good knowledge". Therefore, the results show that citizens from the provinces under study have a very good knowledge of MMS technology.

Figure 23 presents the results on the respondent's knowledge levels of mobile internet browsing. As there is a great shift towards enterprise mobility, and mobile solutions, these results give great insight into government's decision-making in delivering interactive mobile solutions to the citizens.

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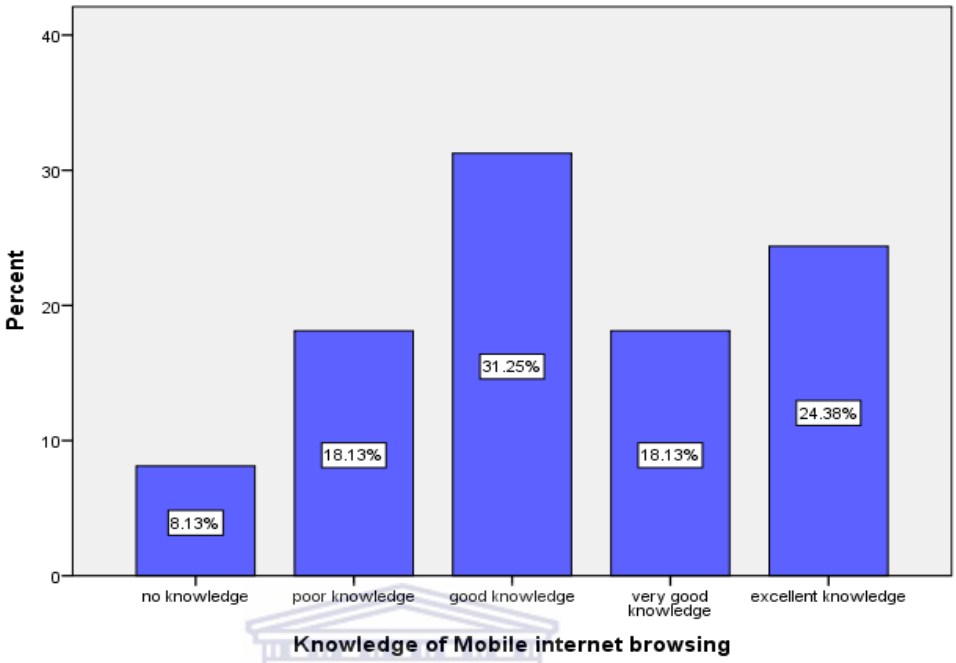

Figure 23: Knowledge level of Mobile internet (n=160)

A significant percentage of the sample that represents 73.76% of the sample declared that they have at least good knowledge of Mobile internet browsing, with 18.13% having poor knowledge and 8.13% with no knowledge at all. The percentage of those with poor and no knowledge at all is quite high, and, it will require some sort of intervention from the government.

From the results discussed, an overall knowledge of MWTs was deductively derived from the knowledge of CSMTs presented above. The results show that, on average, a citizen from the population under study has a knowledge level of 3.5. When deducing from the level, this translated to a scale of "very good knowledge". Therefore, when generalising the results back to the population under study, the results showed that, on average, a citizen from the population under study has a "very good knowledge" of the MWTs, which implies that the average citizen has a very good digital literacy level.

II. Willingness to use MWT for interacting with the PG and for personal transacting (Question 6 and 7)

This section presents the results on user willingness. The questions that fall under this indicator seek to understand the respondent's willingness to use MWTs such as CSMTs to interact and transact with the government and other private entities that provide mobile services. The indicator is made of two questions, one focused determining the respondent's willingness to interact with the government via MWTs and the other focusing on the user's willingness to perform general transactions other than VAS such as financial related transactions on mobile transacting services (MTS) platforms.

Figure 24 presents the results on the respondent's willingness to use MWTs such as CSMTs and their services to interact and transact with the government.

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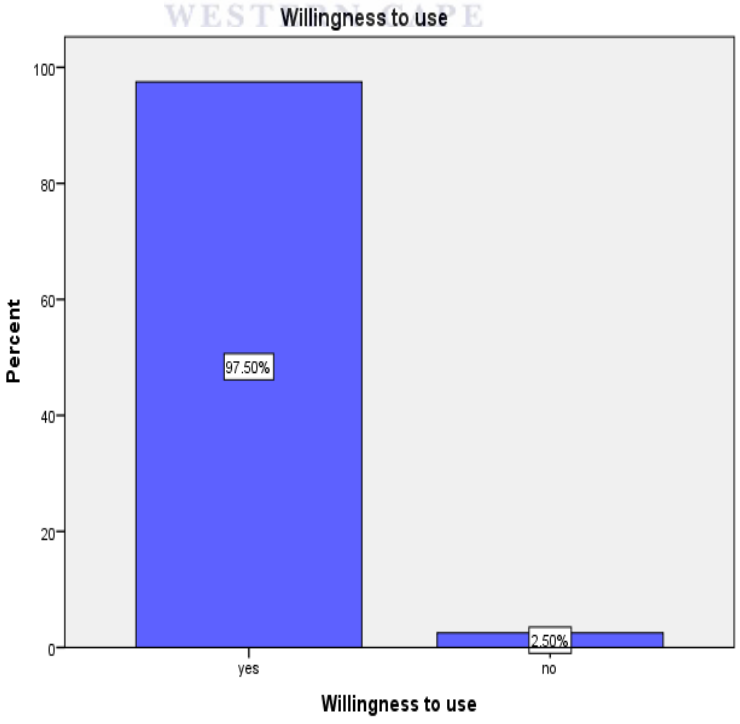

Figure 24: Willingness to use MWTs to interact with PG (n=160)

The graph shows that 97.5% of the sample is willing to use MWTs such as CSMTs and their services to interact and transact with the government. However, 2.5% of the sample is not willing to transact with the government via MWTs. Therefore, the results show that, on average, a citizen from the population under study has a willingness level of 1.04. Therefore, this means on average, a citizen from the population under study is willing to use the MWTs such as CSMTs as a means of interacting with the government.

Figure 25 shows the results of the respondent's willingness to use MTSs to transact generally with other existing private entities for services such as electricity bill payments or purchases and money transfers. The results show that 80.63% of the respondents are willing to use MTS platforms as a means of paying their bills and other VAS as well as money transfers.

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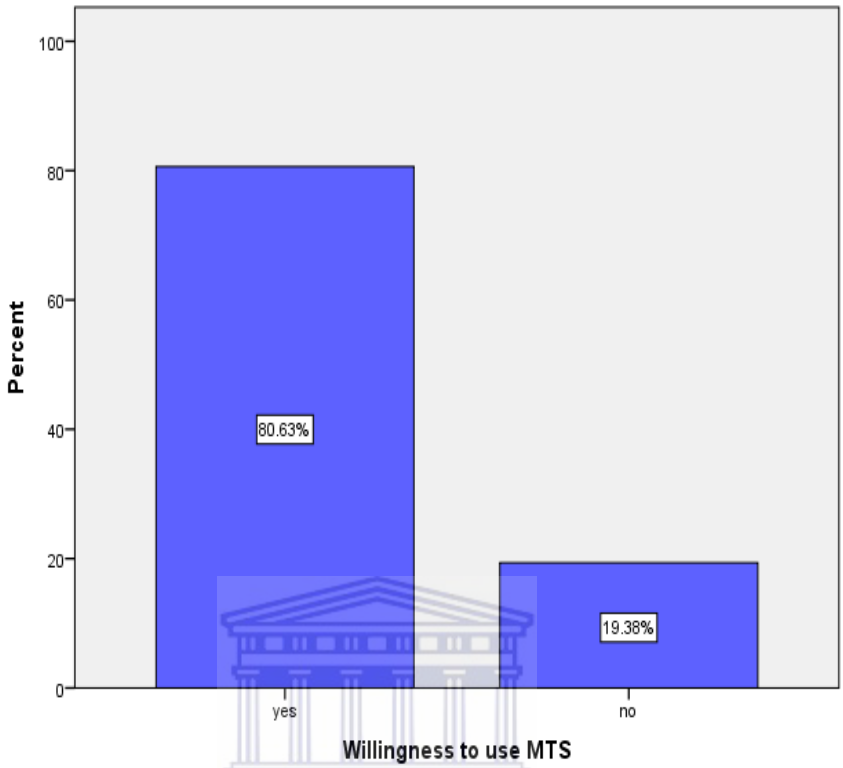

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Figure 25: Willingness to use MTS (n=160)

However, 19.38% of the respondents are not willing to use MTS systems as a means of transacting with retailers or any other service provider or trader. According to the results, this is attributed to the lack of trust in MTS platforms, on average, the respondents claimed that transacting over the internet is not safe at all. However, over and above the claims, a majority of the respondents are willing to use MTS for doing their day-to-day bill payments, but mainly money transfers.

The results presented in this section were used in deducing the willingness level of a citizen from the population under study. It therefore shows that, a citizen from the population being studied has a "willingness to use" level of 1.11. When transforming the willingness level to correspond with the scoring method, it

therefore transforms into a score of 4.6. Therefore, this level implies that, a citizen from the population under study is willing to use MWTs to interact with the PG and other private entities.

III. User perceptions (Question 8)

This section presents the results on the respondents' perceptions and expectations of the possibilities of interacting and transacting with the government via MWTs.

Figure 26 displays the results from the survey conducted against the sample from the population under study. According to the results, a significant percentage of the sample that constitutes 94.38% of the overall sample, find it at least "significant" for them to have access to mobile services for citizen to government as well as government to citizen interaction.

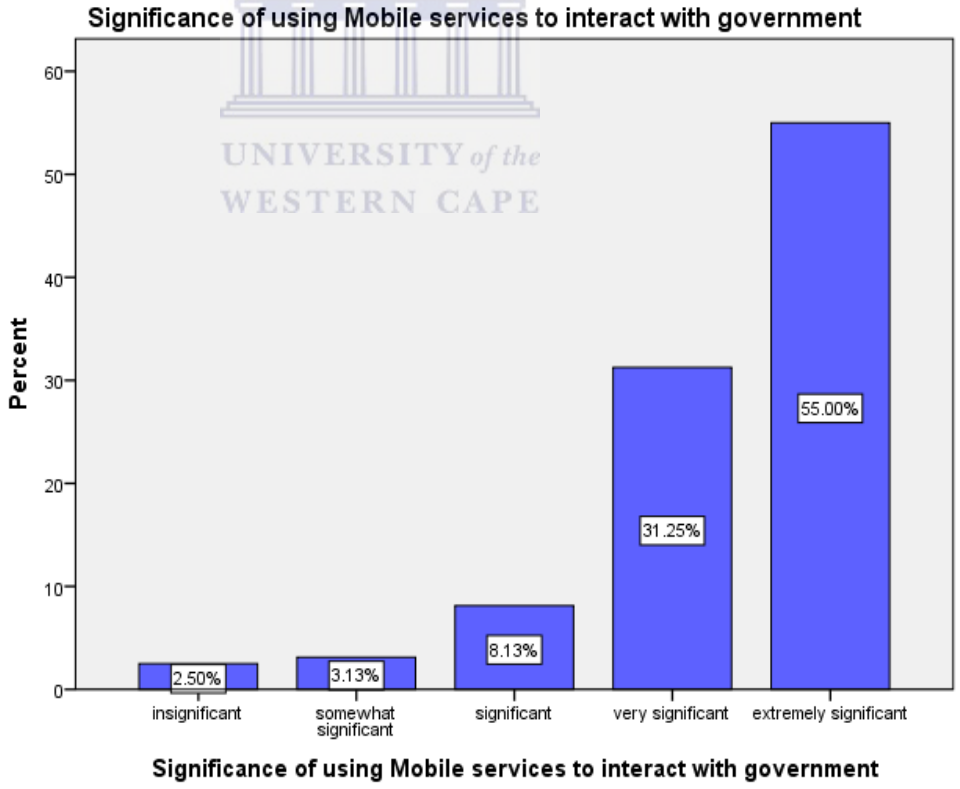

Figure 26: Significance of interacting with government via MWTs (n=160)

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However, a small percentage of 2.5% find it insignificant to interact with the government via MWTs, with a percentage of 3.13% finding it partially significant. Therefore, when the results were generalised back to the population under study, the results showed that, on average a citizen has a significance level of 4.33. Therefore, when mapping this level to the defined scales it deduces to a scale of "very significant", meaning, the average citizen found it "very significant" to be able to interact with the government via MWTs.

4.2.1.1 CRI overall score

This subsection presents the overall results of the CRI. These results were drawn from the indicators discussed above. The CRI gives the overall readiness score of the citizens from the population under study, as per the defined scores of 1 to 5.

Figure 27 below gives a graphical representation of the CRI results composing all the indicators that make up this index, that is, Digital literacy, User willingness and User perceptions.

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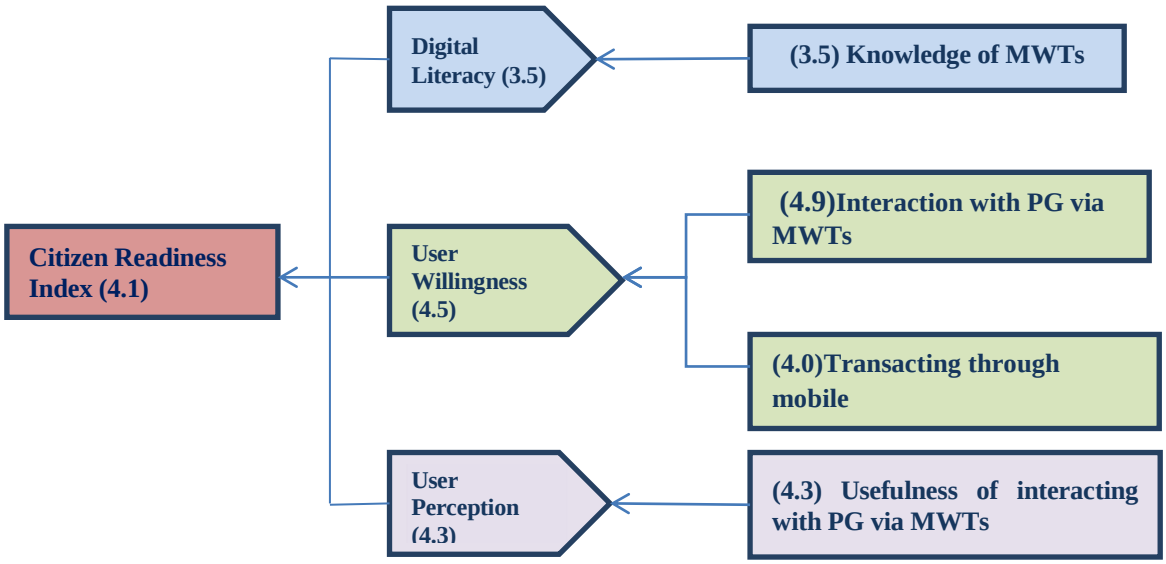

Figure 27: CRI scoring model (Based on: LLE)

The above model presents the results on the CRI level of the population under study. The model shows the score of each indicator which is derived from its own indexes. These indicators form part of the CRI that is guided by the proposed PMRMM. The results from the User willingness indexes are results derived by transforming the results from the data collected since the questions that made that indicator are dichotomous yes or no questions, therefore they required transformation in order to determine the score of their indicator according to the defined scoring method. The results showed that the CRI level is at 4.1, which is very high according to the defined levels. Therefore, according to the researcher defined scoring method, the underprivileged citizens of the province are ready for m-Government as the CRI score is above 2.5. Below the researcher presents and discusses the PRI, as well as its guiding model.

4.2.2 PRI results

The section presents the results analysed from the collected data where a nine question questionnaire was the survey instrument utilised. The purpose of the questions within the questionnaire was to determine the score of each indicator under the organisation readiness measure, which will later determine the PRI score. The researcher commences the chapter by first discussing the response rates, practical data, then, starts with the presentation of the results.

4.2.2.1 Response rate

One of the units of analysis for the study was IT managers or specialists from the office of the PG. The researcher's target was a sample of thirty participants from this office, mainly the IT department. Due to time constraints, the researcher initially employed an email based questionnaire distribution, where participants would receive a questionnaire via email, complete it, and then email it back to the researcher. However, this method proved not to be efficient as the researcher was experiencing slow response rates from the participants, which forced the researcher

to change strategy and use a phone-based survey. This resulted in the researcher settling with 20 completed questionnaires, which is just 66.7% of the target sample.

4.2.2.2 Practical data

On examining the data for completeness, the researcher took note that all nine questions within the questionnaires were 100% completed. This was attributed to the clarity of the questions and that it was a phone-based survey method so the researcher also gave clarity where needed.

4.2.2.3 Results

The section presents and discusses the results from the conducted survey with the units of analysis, which are the IT manager/specialists from the PGs office. The researcher used the nine questions questionnaire in determining the scores of the indicators that make up the PRI score. Therefore, some of the questions in the questionnaire were combined to form a homogenous group that complements an indicator from the PRI. In overall, the outcome of the results determined the PRI score. Below the results from the questionnaire are discussed according to their purpose within the PRI model.

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I. Ubiquitous systems and interest shown in MWTs (Question 1, 2 and 3)

This subsection presents and discusses the results from the survey conducted for determining the organisation's technology maturity and awareness of adopting mobile technologies to improve productivity within an organisation. This indicator is made of three questions that play different roles in determining the indicator's score.

Figure 28 presents the results on the first question under the indicator. The question seeks to determine whether the organisation provides mobile

technologies to its workforce to promote and improve data mobility and office on the go. According to the results, 90% of the sample stated that the organisation does provide them with mobile technologies with only 10% of the sample refuting this statement by stating that they are not provided with mobile technologies by the organisation.

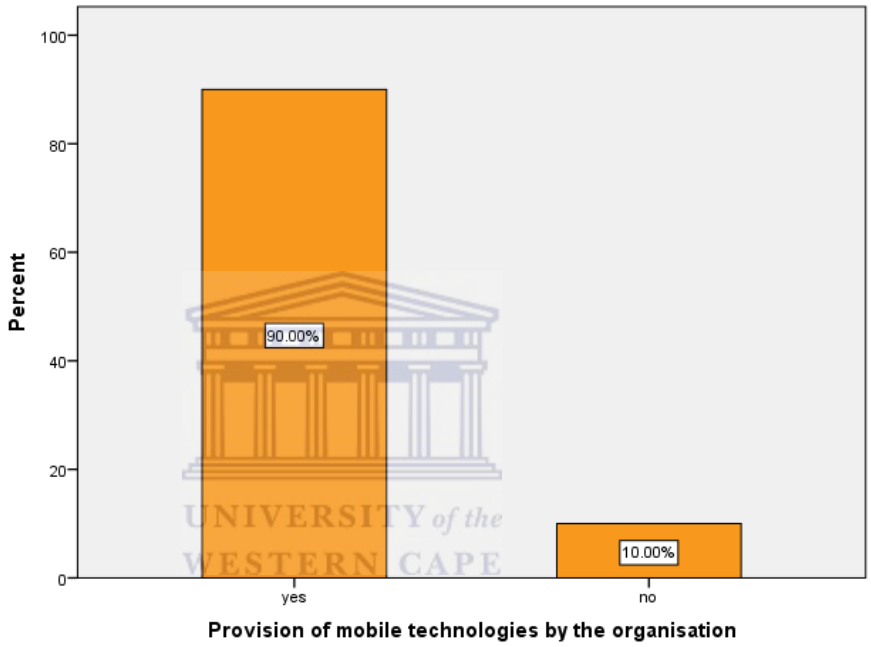

Figure 28: Provision of Mobile technologies by organisation (n=20)

It might happen that, the organisation provides these mobile technologies according to ranks or employee levels within the organisation and therefore provides these technologies to those levels that require extensive decision making and required high availability and access to organisation data 24/7. Therefore, according to the presented results, the organisation has a provision rate of 1.1. When transforming the results to the scales of 1 to 5, which are used for scores in this study, the organisation has a provision rate of 4.5, meaning it has a high provision rate.

Figure 29 presents and discusses the results on the second question under the indicator. The question seeks to determine the organisation's interest in mobile technologies based on the current technologies that it uses. The results show that, 85% of the sample found the organisation as having at least an "average interest" in mobile technologies based on the current technologies that the organisation uses. However, 15% of the sample found the organisation to be at most "somewhat interested" in mobile technologies based on the current ones in use.

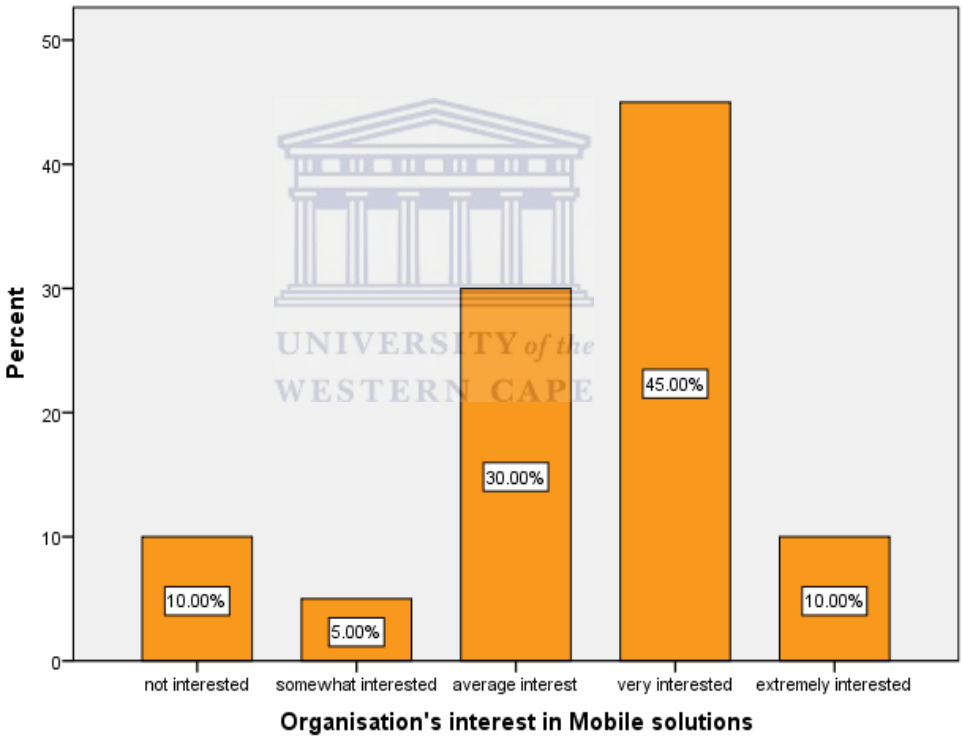

Figure 29: Organisation's interest in Mobile technologies (n=20)

According to the results, on average, the organisation has an interest level of 3.4 in mobile technologies based on the technologies in use. Therefore, this translates to the organisation having an "average interest" in mobile technologies, based on the technologies in current use.

Figure 30 presents the results on the third question under the indicator. This question seeks to determine whether the organisation's back-end system is fully integrated and provides data mobility, that is, it is accessible from any computing device such as smart phones and tablets.

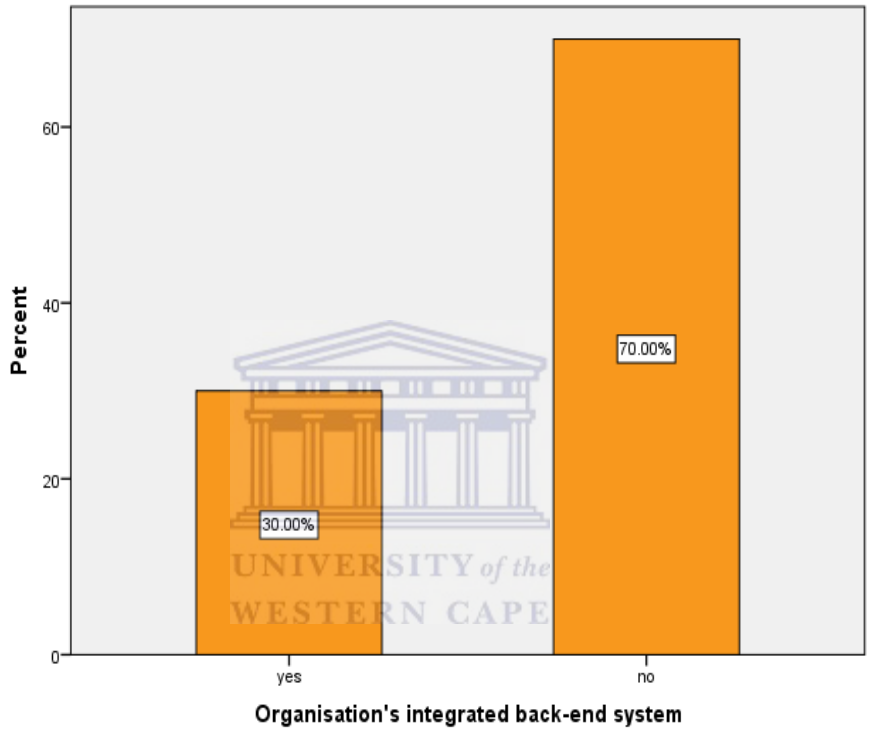

Figure 30: Organisation's integrated back-end system (n=20)

The results show that, 70% of the sample stated that the organisation's back-end system is not fully integrated and it does not cater or support data mobility, nor is it accessible from mobile computing devices such as smart phones and tablets. However, 30% of the sample stated that the organisation's back-end system is fully integrated and accessible from any computing device. Therefore, the transformed results show that this indicator scores a mere 1.5.

II. Management capacity (Question 4 and 5)

This subsection presents the results on the management's capacity levels. The indicator is made up of two questions. One question seeks to understand whether the management finds any significance in providing the workforce with evolving mobile technologies. The other question seeks to understand whether the management has forged a PPP with local IT companies and incubators that deliver and research Mobile solutions. The combination of these questions worked towards determining the management's capacity levels.

Figure 31 presents the results on whether the management finds significance in the organisation providing its workforce with evolving mobile technologies. The question formed part of this indicator since it was seen that the decision of providing mobile technologies to the workforce lay more with the management.

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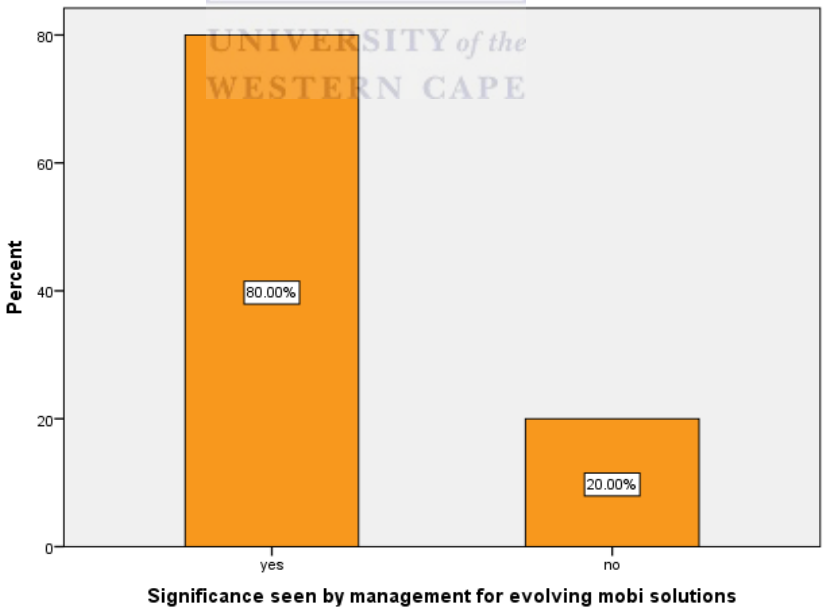

Figure 31: Significance seen by management in evolving mobile technologies (n=20)

The results present that 80% of the sample stated that the management does see significance in providing evolving mobile technologies to the workforce,

with 20% of the sample stating the opposite. Therefore, on average, the results showed that significance seen by management is at a level of 1.20. Therefore, when transforming those results to correspond with the scoring used in this study, the significance seen by management is at a level of 4, which is a very high score.

Figure 32 gives a graphical overview of the outcome on the data collected from the question of the management having an existing PPP with local IT companies and incubators.

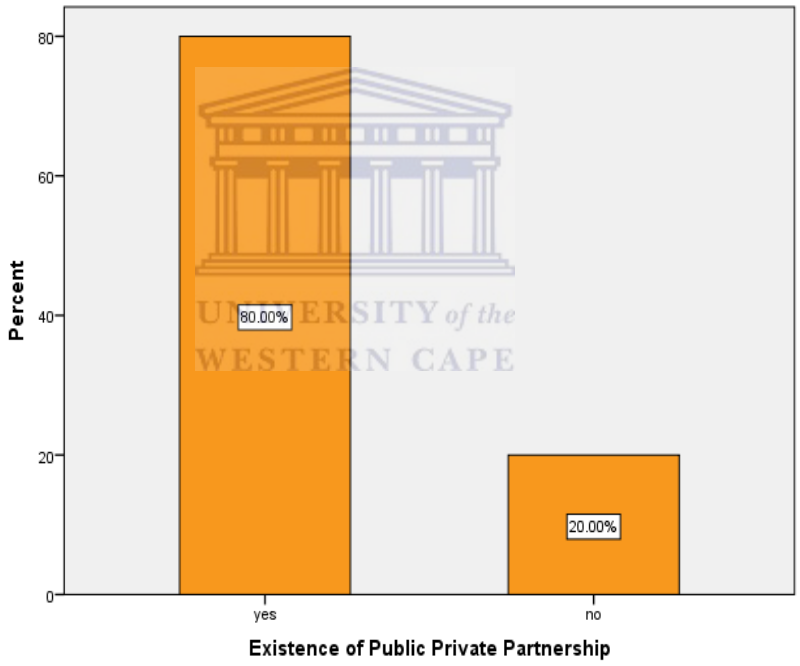

Figure 32: Existence of PPP (n=20)

According to the results, 80% of the sample stated that there is an existing PPP forged by the management. However, 20% of the sample stated otherwise. From the results presented above, when transformed, it shows that the existence of PPP score is at a four.

III. Innovation levels (Question 6 and 7)

This subsection of the document focuses on the results from the data collected to determine the organisation's innovation levels. This indicator is made up of two questions that were structured to drive the determination of the organisation's innovation levels. The first question of this subsection seeks to determine to what level the organisation promotes R&D. The second question of this indicator seeks to determine whether the organisation supports technological training of its workforce in evolving mobile technologies for performance improvement.

Figure 33 presents the results from data collected using the question that seeks to determine whether the organisation promotes R&D. The results stipulate the organisation's commitment to R&D according to its IT managers and specialists.

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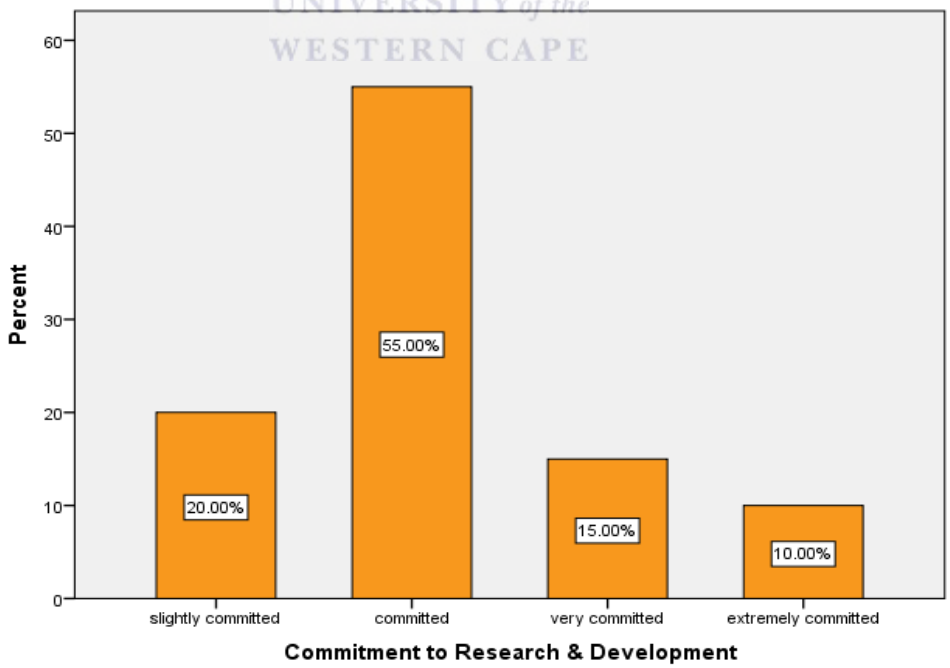

Figure 33: Organisation's commitment to R&D (n=20)

According to the results presented, 80% of the sample stated that they find the organisation at least "committed" to R&D with the other 20% finding it "slightly committed" to R&D. Therefore, on average, the sample found the organisation's commitment levels to R&D being on a 3.15. These findings imply that the organisation is "committed" to R&D.

Figure 34 depicts outcomes of data collected by use of the second question of this indicator. The question used as a data collection instrument seeks to determine the organisation's support of technological training of workforce for performance improvements.

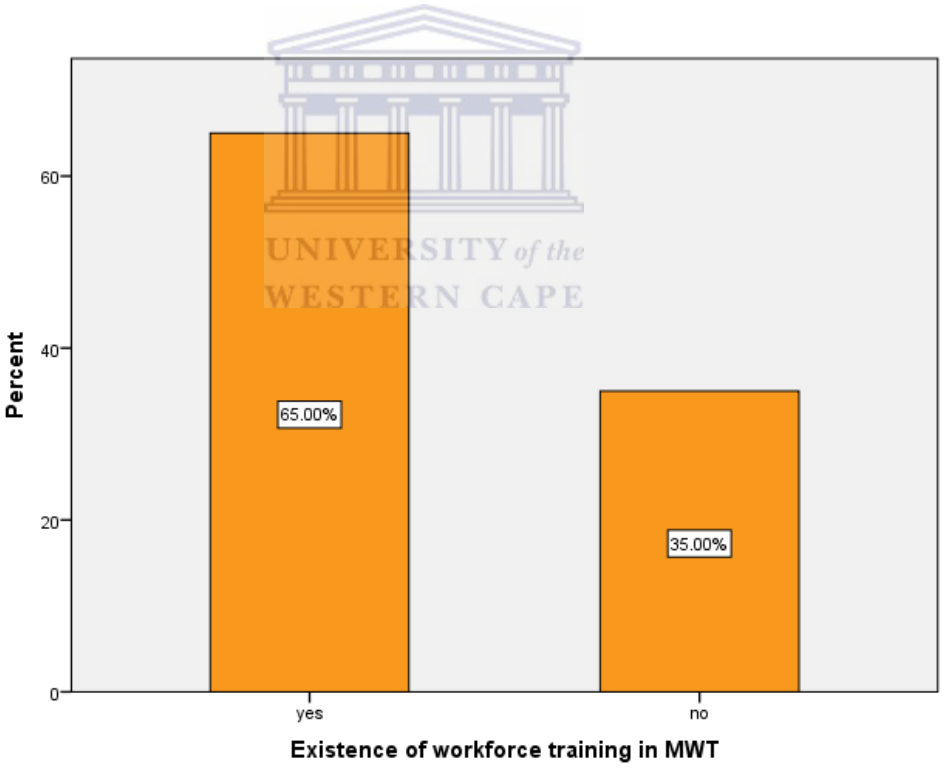

Figure 34: Existence of workforce training in MWT (n=20)

According to the results presented by the figure above, a majority of the sample, which is 65%, stated that the organisation does support training of

the workforce as a means of performance improvements where necessary. However, 35% of the sample stated otherwise. Therefore, on average, the results from the sample show that the support of workforce training in technologies by the organisation is at 1.35. Therefore, when transforming the results to correspond with the scoring used in this study, the organisation's support level is at 3.3, which is above average.

IV. IT Strategy presence (Question 8 and 9)

This subsection presents and discusses results on the organisation's IT strategy presence indicator. The indicator is made up of two questions that seek to determine the IT strategy of the organisation and whether it caters for data mobility. The first question seeks to understand if the organisation has an IT strategy. The second question seeks to understand whether the organisation IT strategy caters for data mobility.

Figure 35 shows the results from data gathered for determining whether the organisation has an IT strategy. The data was gathered from the IT manager and specialists from the PG. The gathered data was analysed to determine the organisation's level.

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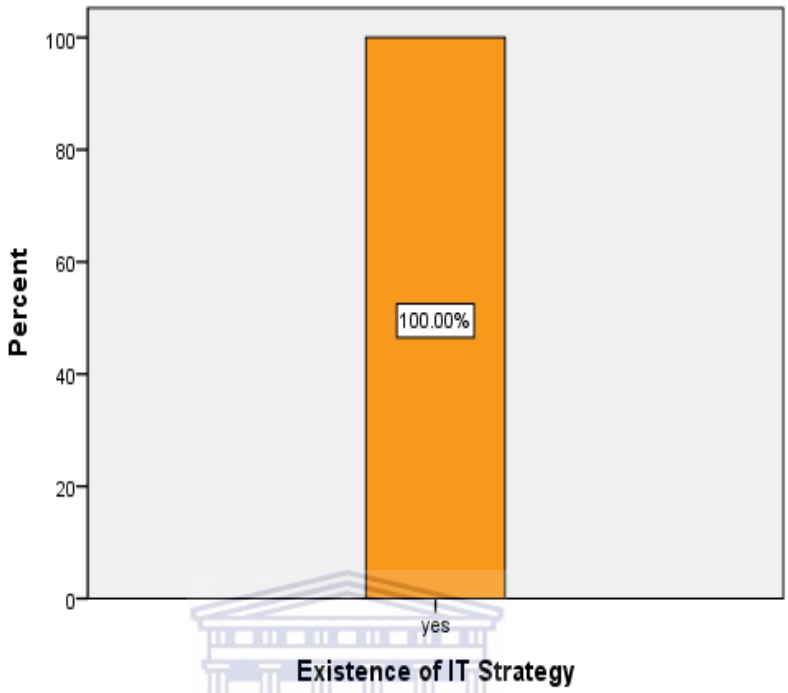

Figure 35: Existence of IT Strategy (n=20)

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According to the presented results, 100% of the sample stated that the organisation has an IT strategy present. Therefore, when transforming the average results to correspond with the study's scoring method, the results show that the organisation scores a five, which is very high.

Figure 36 presents the outcomes from the collected data in determining whether the existing IT strategy of the organisation caters for data mobility, and inclusion of MWT. According to the presented data, 65% of the sample stated that the existing IT strategy does not cater for data mobility and integration of MWTs. However, 35% of the sample stated otherwise.

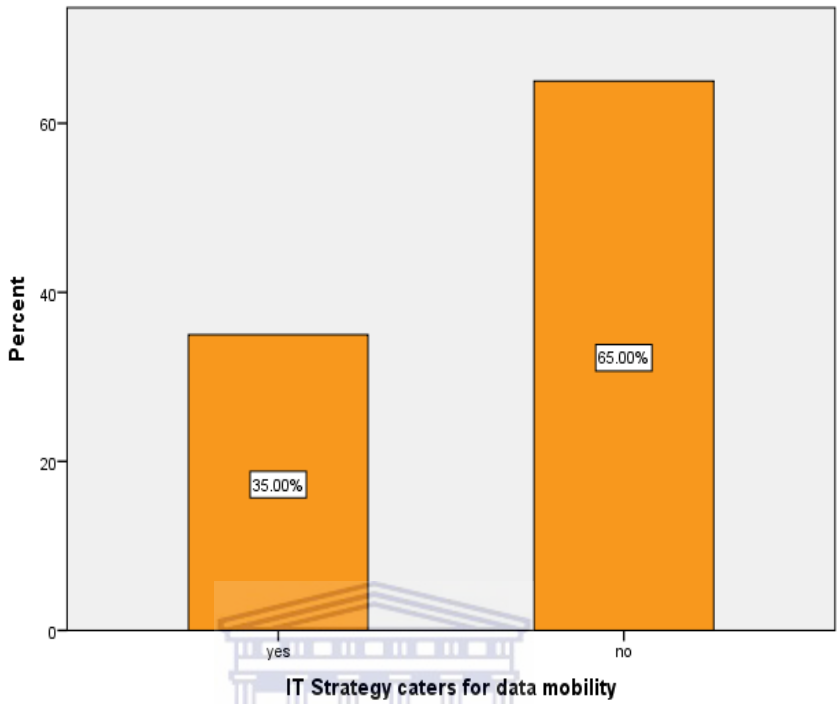

Figure 36: IT Strategy caters for data mobility (n=20)

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Therefore, according to the results from the collected data, the IT managers and specialists from the PG office on average rated the inclusion of data mobility and seamless integration of MWTs by the existing IT Strategy as being on a level of 1.65. When the average is transformed for scoring purposes, for this index, the organisation scored a 1.75, which is a poor scoring according to the scales used in this study.

4.2.2.4 PRI Overall score

This subsection presents and discusses the overall PRI score. The score was derived from the indicators that make up the organisation readiness measure, which has been discussed above under this section of the document. Figure 37 below graphically presents the PG's score on m-Readiness by using the proposed conceptual PRM model from which is derived the PRI.

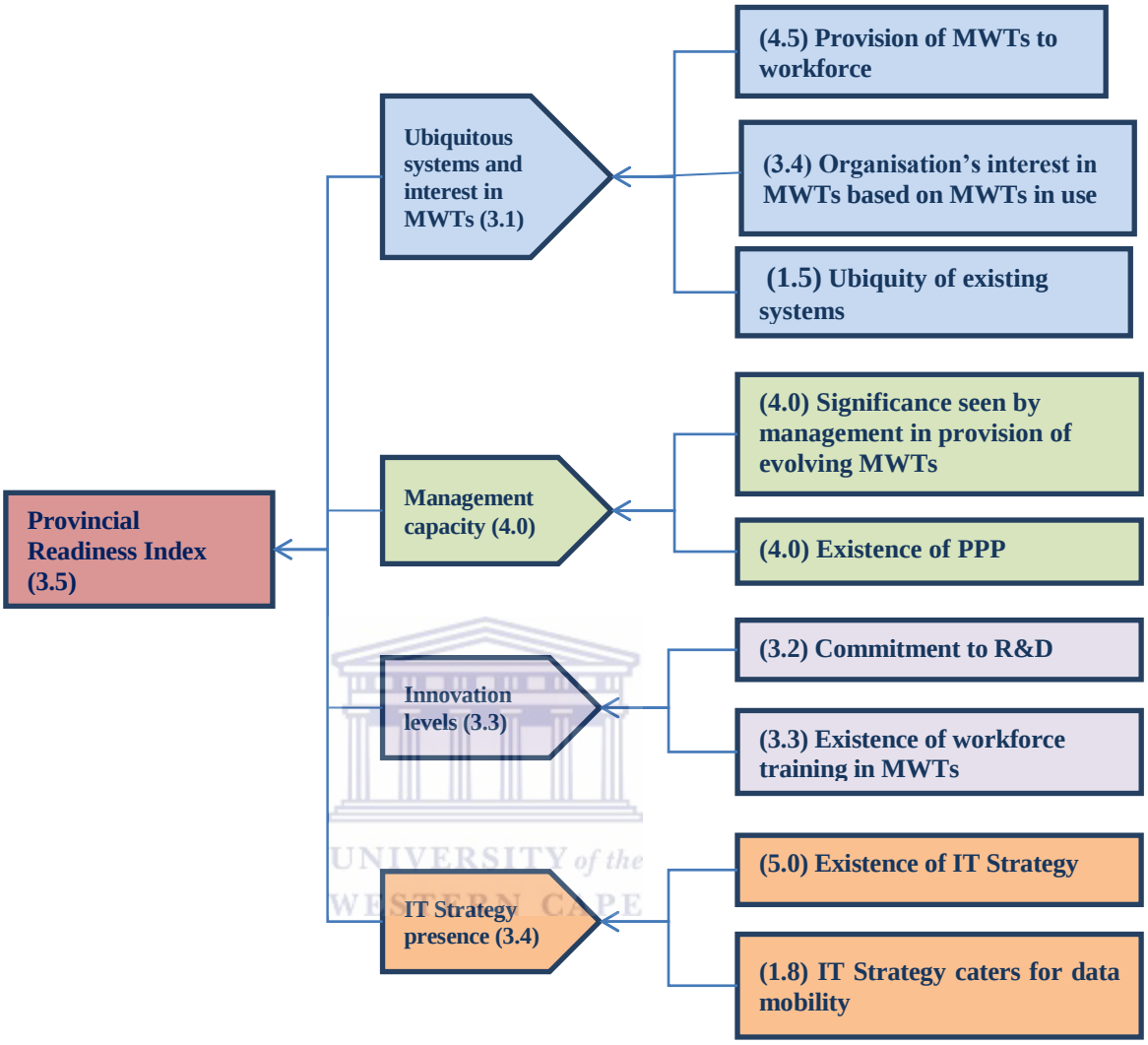

Figure 37: PRI scoring model (Based on: LLE)

Figure 37 depicts the score of each indicator that forms part of the PRI, that is, Ubiquitous systems and interest in MWTs, Management capacity, Innovation levels, and IT Strategy presence. The score of each indicator and the index that falls under that particular score was rated on a scale of 1 to 5, which was a scale used in this study. The figure shows that the PRI scored a 3.5, which is an above average score. Therefore, from the above score of the PRI, it means that the PG is ready for m-Government services.

4.2.3 MFI results

The results presented in this section were gathered from different sources using different techniques. Some of the data was gathered from the selected sample from the population under study. Since the MFI is made of three indices, it required data for all three, namely the citizen's awareness levels on MWTs, the usage levels of MWTs and the infrastructure presence. Therefore, in gathering the required information, the citizen readiness questionnaire was used in determining the awareness levels and the usage levels. Data for the infrastructure presence was gathered by means of investigating and determining on average the number of mobile phones per N number of citizens and the maturity of the mobile networks in the province.

4.2.3.1 Response rates

Concerning data gathered from the use of a questionnaire, that is, data on user's awareness of MWTs and MWTs usage levels and affordability thereof, the researcher utilised the data initially gathered for CRI. Therefore, the same response rates as the CRI were received. However, concerning the infrastructure presence, no data was collected, but an investigation was conducted in determining the maturity of the mobile network, and the number of mobile phones per N number of citizens within the province under study.

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4.2.3.2 Practical data

The data in this section is exactly the same data as in CRI due to the aforementioned reason of the data in this section being data extracted from the CRI questionnaire.

4.2.3.3 Results

In this section, the researcher presents and discusses the outcomes of the aforementioned indices that form part of the MFI, with their data extracted from the citizen's readiness questionnaire. However, some of the indices are made up of

combined questions where required to form homogenous groups. Each question or a group of questions had a specific goal, that is, to determine the level or points of each indicator from the MFI model, which were later used in determining the MFI score of the province.

I. The usage levels and affordability thereof (Question 2 and 3)

The usage of a technology can be affected by the costs associated with its usage and by how willing the prospective users of using that particular technology are. Therefore, it is critical that before delivering a solution dependant on certain technologies, one must first understand the prospective users' levels of usage of the technologies; and whether they find it affordable or not. This subsection gives insight into the sample's usage levels and affordability of CSMTs.

- **Usage level**

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This subsection presents the results on respondents' usage levels of CSMTs.

Figure 38 depicts the results on SMS usage levels. The results show that the SMS technology is a commonly used means of communication as at least 95% of the sample uses this technology on average.

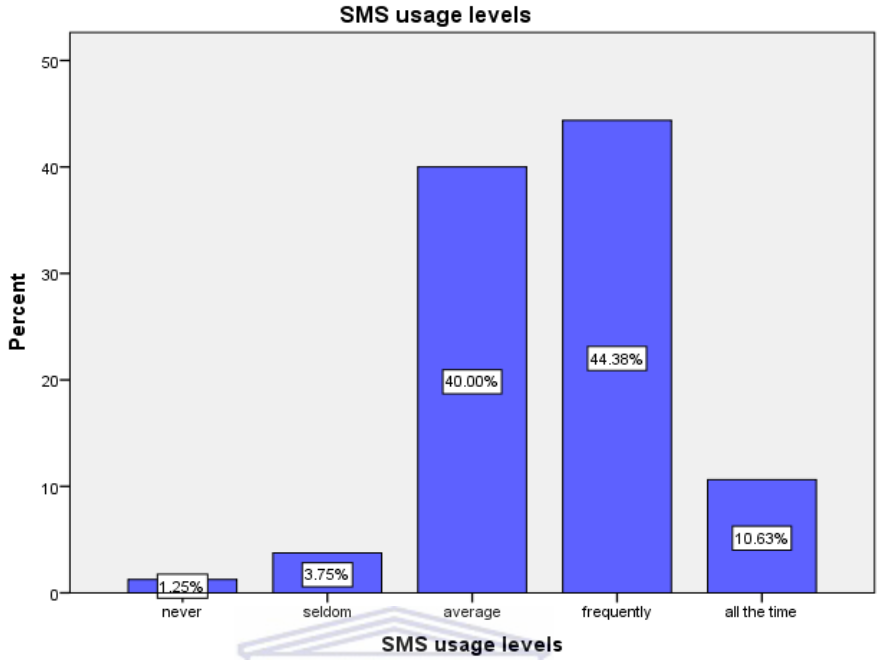

Figure 38: SMS usage level

The usage levels can be attributed to its ease of use and affordability levels. Therefore, from the results presented, generalising the results back to the population under study, on average, the usage level of SMS technology by a citizen from the population is on 3.59, rounding to a four. This scale translates to a "frequently" according to the defined usage scales.

Figure 39 presents the results on MIS usage levels. The arrival of mobile social networking saw an increase in mobile internet traffic. However, the results show that the population under study is about 68.75% of the sample who utilises the services on an average basis.

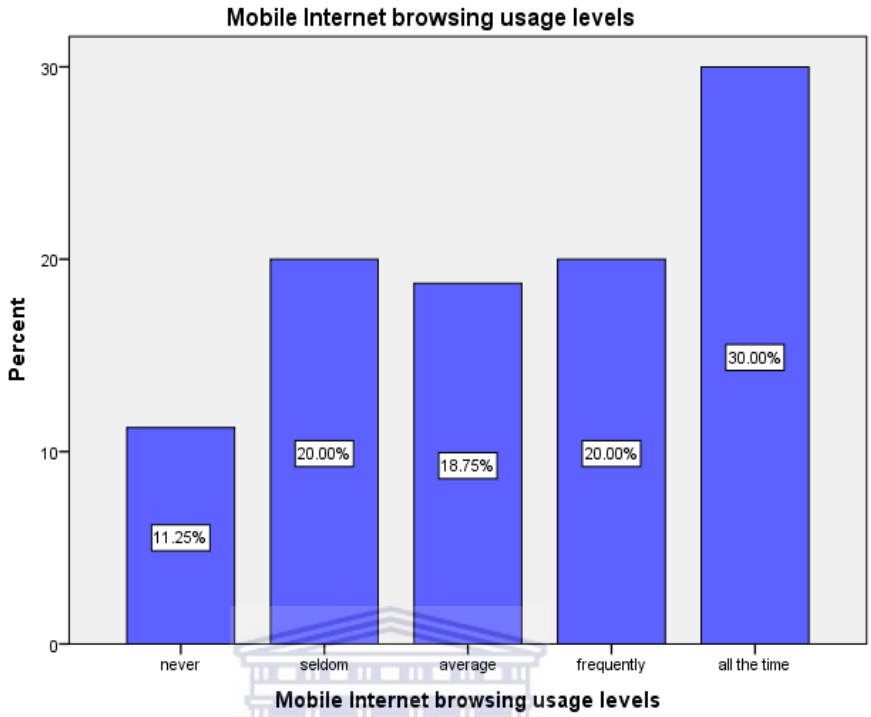

Figure 39: Mobile internet usage

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In addition, the results show that 11.25% of the population never utilise the MIS due to various reasons with 20% using occasionally. According to the results, on average, a citizen from the population under study has a usage level of 3.38, which is equivalent to "average" according to the defined scales.

Figure 40 presents the results on the USSD usage levels by citizens from the population under study. The results show that, from the selected sample, 86.88% use the technology on an average basis. However, 9.38% of the sample claims that they seldom use the technology, with 3.75% stating that they have never used it at all.

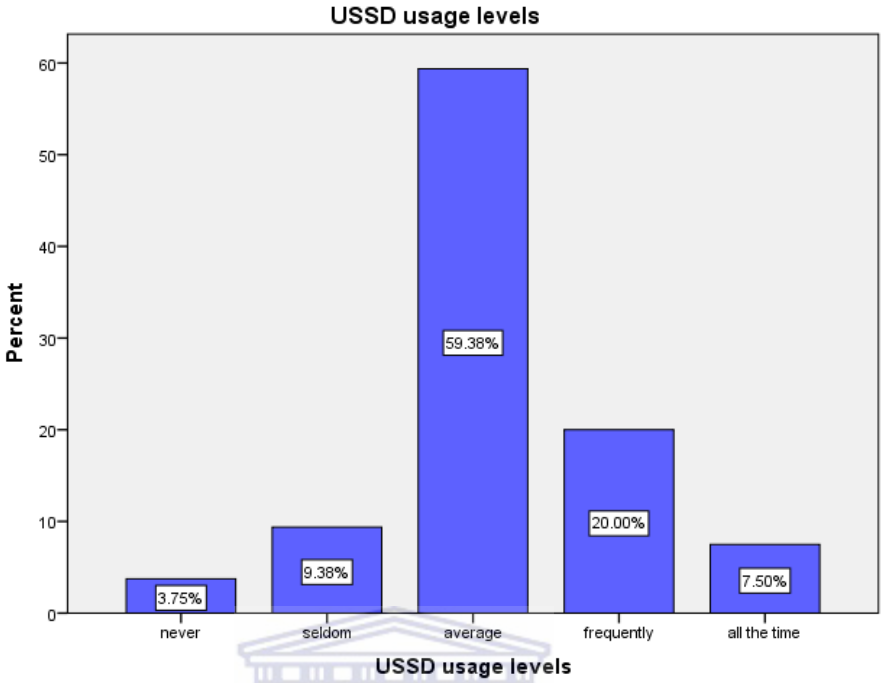

Figure 40: USSD usage levels (n=160)

Therefore, when analysing the results, it showed that on average, a citizen from the population under study has a USSD usage level of 3.18 and this corresponds to a scale of "average" according to the defined scales.

Figure 41 displays the results on the usage levels of MMS technology by the sample. The results show that there is not much usage of the MMS technology and this can be attributed to either, affordability or lack of willingness to use. This can also be attributed to compatibility issues of the mobile phone that the respondent has, as some do not support this technology.

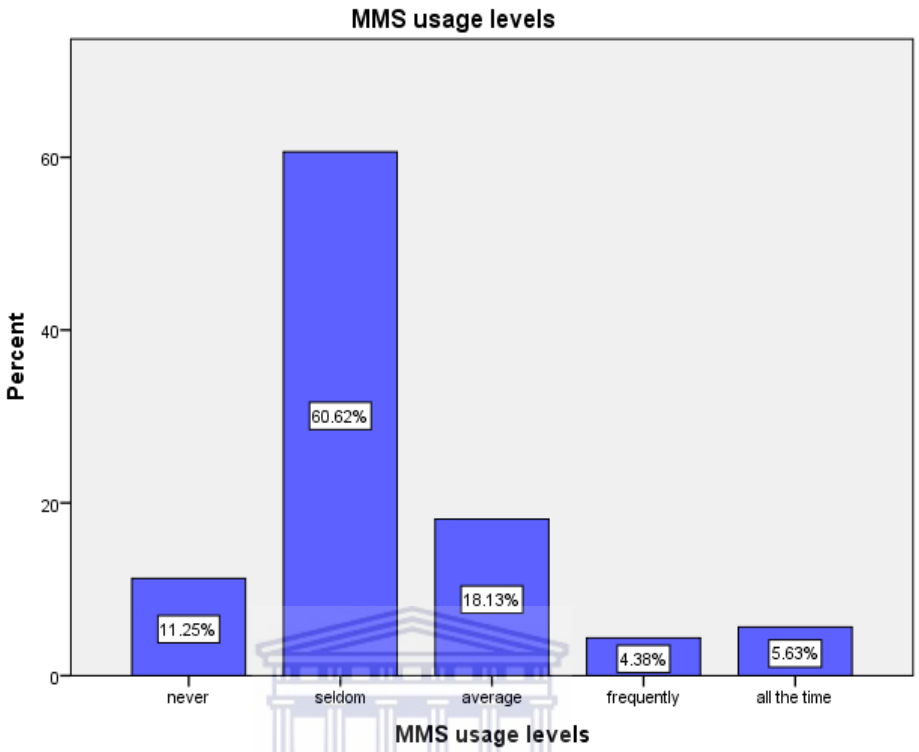

Figure 41: MMS usage levels (n=160)

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According to the results in Figure 41, a significant percentage of the sample hardly use the MMS technology with 60.62% of the sample stating that they "seldom" use the technology and 11.25% "never" use it. Therefore, 71.87% of the sample hardly or never uses the technology, where a small percentage of 28.14% at least use the technology on an "average" basis. Therefore, on average, a citizen from the population under study has a usage level of 2.33 and this is equivalent to a scale of "seldom" according to the scale used in measuring the usage levels.

Above, the researcher presented and discussed the results from the data collected on the usage levels of CSMTs by the citizens from the province under study. Therefore, on average, a citizen from the province under study has a usage level of 3.12. This average corresponds to "average".

- **Affordability levels**

This subsection presents and discusses results on the affordability of CSMTs by the sample. Below the affordability of CSMTs are discussed. The respondent's affordability scaling was done in accordance with the current tariffs and rates charged by the big three mobile telecommunications companies operating in the country, namely, MTN, Vodacom, and Cell C. Table 11 below presents the current billing structures per CSMT by the big three Telecoms.

Table 11: Network operator prices per technology (source: MTN, Vodacom, Cell C)

Operator name	SMS price	USSD price	MMS price	MIS price
MTN	R0.80c	R0.21 per 20 seconds	R0.90c	R2 per MB
Vodacom	R0.80c	R0.60c per 20 seconds	R0.80c	R2 per MB
Cell C	R0.50c	----------	R0.50c	R0.39c per MB

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Figure 42 gives a graphical overview of the responses from the sample. According to the results, 75% of the sample find the costs associated with utilising the SMS technology "cheap" with16.88% finding these costs "fair" and a mere 8.13% find the costs "expensive".

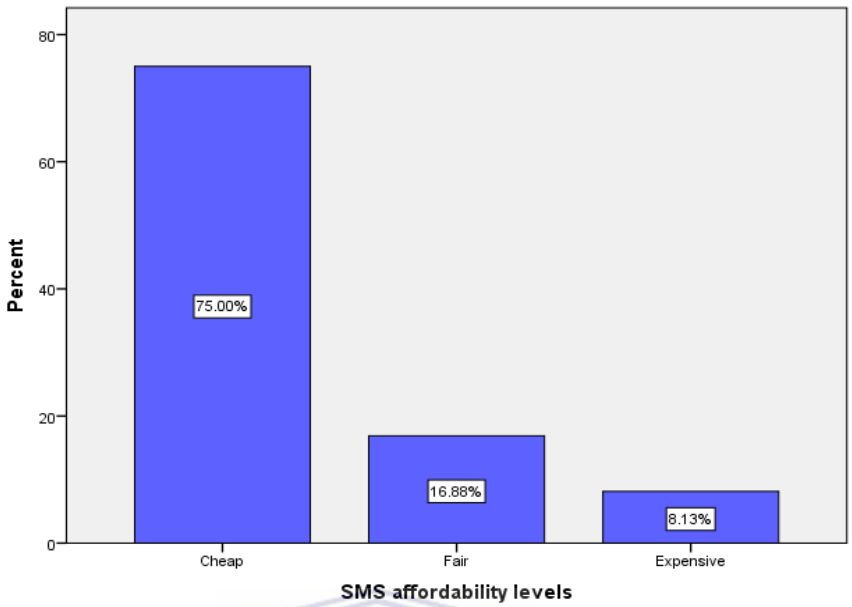

Figure 42: SMS affordability levels

Therefore, when generalising the results back to the population under study, it shows that, on average, a citizen from the population under study finds the cost levels of using the SMS technology to be on a 1.33, which translates to a scale of "cheap" according to the scales used.

Figure 43 displays the outcomes of the survey conducted against the affordability levels of the USSD technology. According to the results, 66.25% of the sample found the costs of utilising the USSD technology "cheap", with 27.5% finding the costs "fair" and a small fraction of 6.25% found it "expensive".

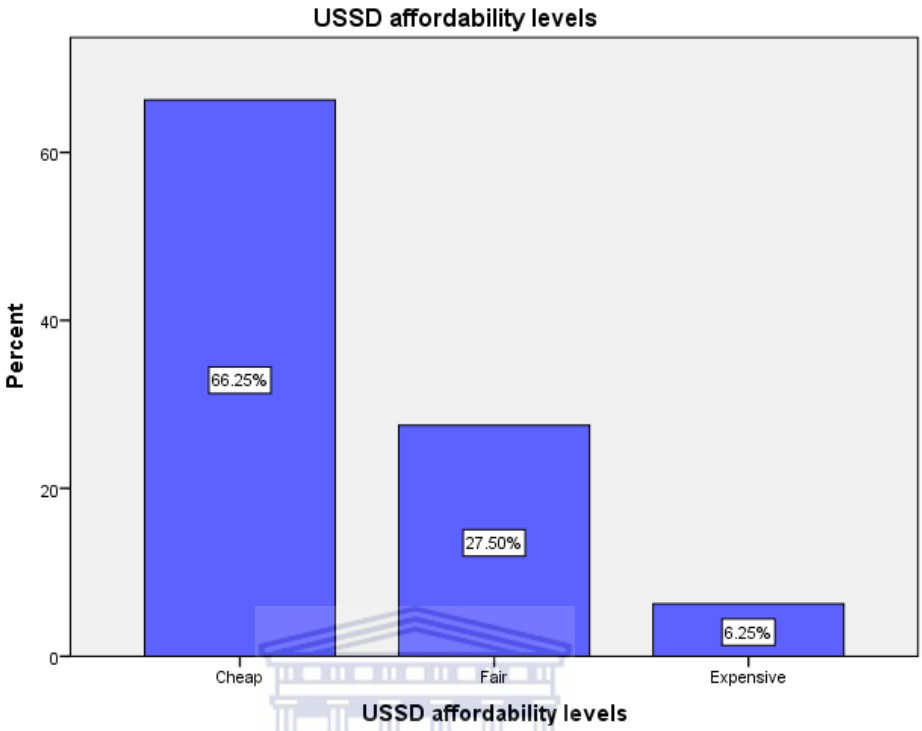

Figure 43: USSD affordability levels

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The gathered results give an indication that, on average, a citizen from the population under study has a USSD affordability scale of 1.4 and this corresponds to a level of "cheap" according to the graph. However, most of the participants were unaware that they were utilising the USSD technology on a daily basis, from loading airtime, to airtime balance checks, etc.

The results on affordability levels of MIS are presented in the figure below, which is Figure 44. From the results below, it shows that 30.63% of the participants found the MIS technology's affordability levels to be on a "cheap" level. In addition, 45% of the sample found the technology affordability levels as "fair" with 24.38% finding utilising the technology as "expensive".

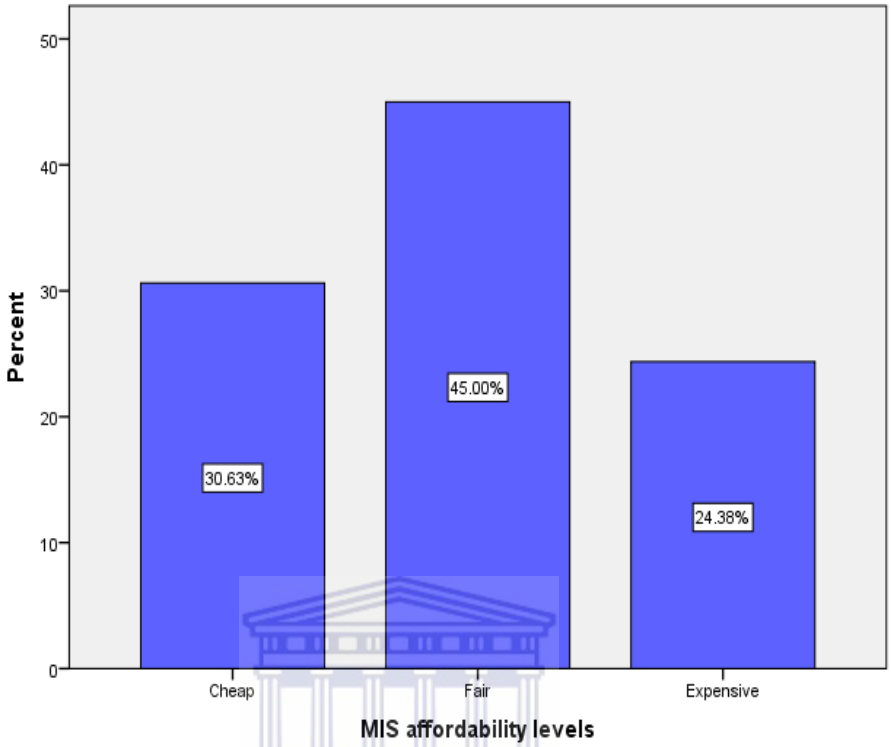

Figure 44: MIS affordability levels

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When generalising the results back to the population under study it showed that, on average, a citizen from the population under study has a MIS affordability scale of 1.94. From the defined levels, namely "cheap", "fair", and "expensive", the findings correspond to the scale of "cheap".

The figure below, Figure 45, presents the results on the affordability levels of the MMS technology. From what the results show, a majority of the sample found using the technology "expensive". This majority percentage constitutes 56.25% of the sample, while 38.75% of the sample found the affordability levels of the technology to be "fair" and 5% of the sample found it "cheap" to use the technology.

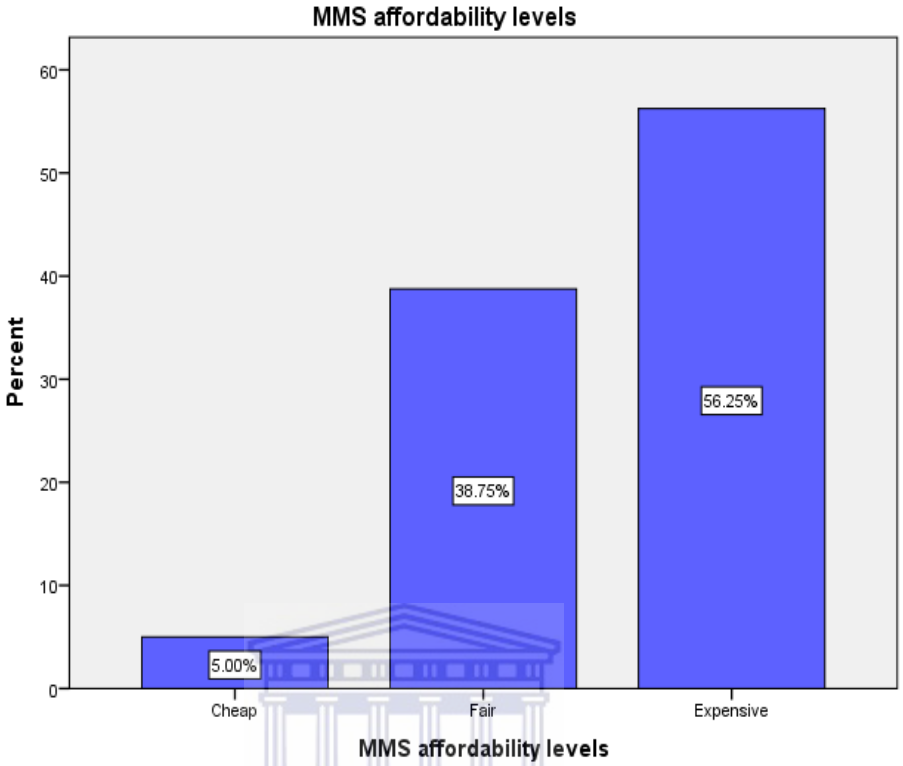

Figure 45: MMS affordability levels

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According to the results, on average, a citizen from the population under study has an affordability scale of 2.51 and by rounding this average, the scale moves to a 3. Therefore, on average, a citizen from the population under study finds it "expensive" to utilise the MMS technology. It is possible that these findings also have an influence on the usage levels of the technology coupled with mobile phone compatibility issues.

The results presented above were on the data gathered in determining the citizens' affordability levels of CSMTs. These results showed that, on average, a citizen from the population under study has an affordability level of 2.73. When rounding the level off, it shows that the citizen finds the costs associated with using the CSMTs "fair". When rating this level according to the scores used in

this research, the citizen has a slightly above average score of 2.7, which can be a 3 when rounded off.

II. Awareness of MPS and PG digital services (Question 4 and 5)

This section presents and discusses the results on the awareness levels of the population under study of the existence of MTSs and PG's mobile digital services (MDS). This indicator works towards determining the MFI of the province. This indicator is made up of two questions that were later combined to gain more insight into the awareness levels of the population under study in order to determine the MFI score. Below the results from the two questions are discussed.

- **Awareness of PG MDS**

Figure 46 presents the results on the awareness of PG digital services. The purpose of the question was to determine the sample's awareness of existing PG MDSs. The participants were expected to be either aware or not aware of the existing MDSs.

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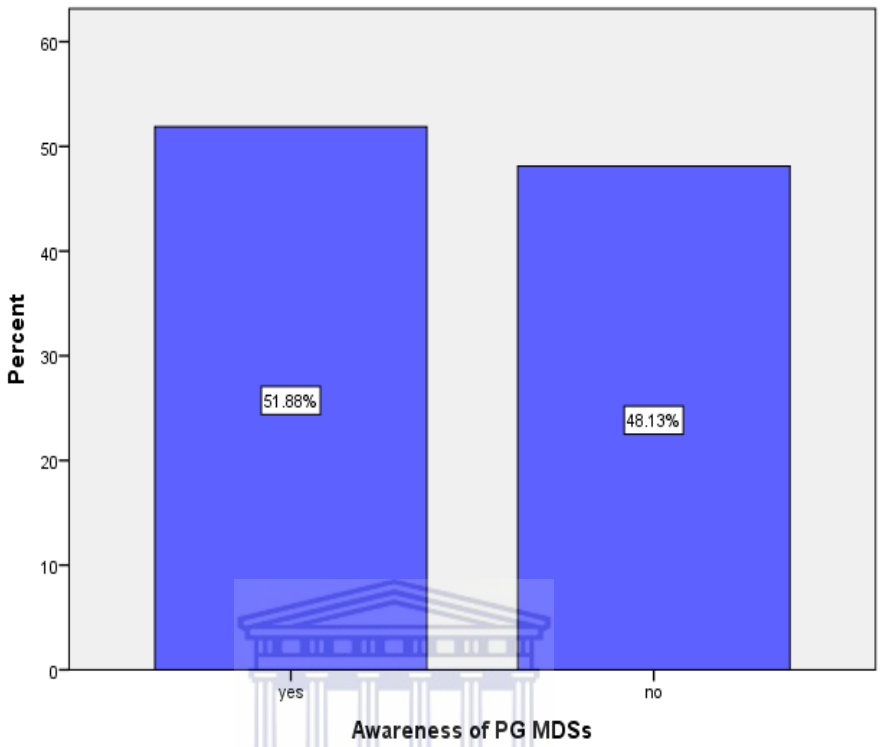

Figure 46: Awareness of PG MDS (n=160)

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The results show an almost evenly distributed awareness rates, where 51.88% of the sample said that they are aware of the existence of PG's MDS while a significant percentage of 48.13% of the sample said that they are not aware of the MDS. According to the results, the sample that is not aware of the existence of the MDS is quite large and is almost half the overall sample size. Greatest care was taken when generalising the result against the population under study. Therefore, on average, a citizen from the population under study has an average awareness level of 1.48, meaning the citizen is not 100% aware of the MDSs, but has an average level of awareness.

When transforming the average results to conform to the scoring system adopted in this study, it showed that the citizen's awareness of PG MDSs was at a level of 2.6. Therefore, this level showed that the awareness of PG

MDSs of the citizens from the province under study is on 2.6, and this is an average score.

- **Awareness of MTSs**

Figure 47 presents the results on the sample's awareness of MTS. The question mainly asked whether participants were aware of the existence of mobile transaction services such as MTS. The purpose of this question was to determine the samples awareness of existing MTSs that are accessible to them.

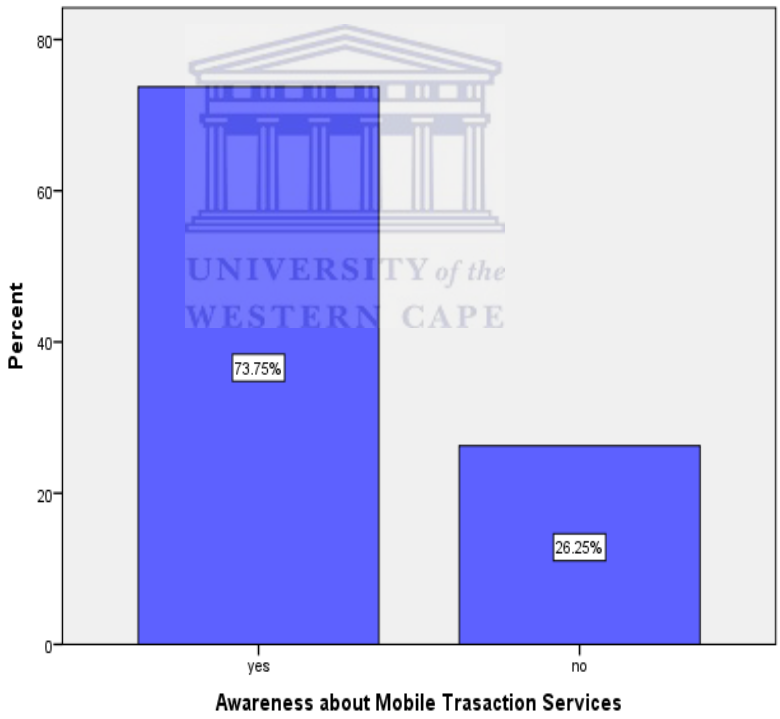

Figure 47: Awareness of Mobile Transaction Services (n=160)

According to the presented results, a huge percentage that constitutes 73.75% of the sample stated that they are aware of the existence of MTSs and 26.25% of the sample stated that they are not aware of such services available to them. Therefore, when generalising the results, it was found that,

on average, a citizen from the population under study has an awareness level of 1.26, therefore, that means, on average, citizens from the province under study are aware of MTSs.

When transforming the results from the collected data, it showed that, on average, the awareness level of a citizen from the population under study is 3.7. When rating this score according to the scores used in this study, this score was classified as high.

III. Infrastructure presence

This subsection presents and discusses results from the conducted investigation of infrastructure presence in the province under study. The investigation was mainly on "the number of mobile phone per N number of citizens" and the "maturity of the mobile networks".

- **Provincial mobile penetration rates**

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According to the African Mobile Observatory (Phillips et al., 2011) the number of citizens with access to a mobile phone, either rented or owned, has increased by 35% from 2005 to 2011 and the country is now experiencing a 117.6% penetration rate. Gathering accurate data on a number of mobile phones per N number of citizens from the province under study would have taken quite a long time. Therefore, the researcher employed some form of random estimation while he was busy with data collection from the province under study. Figure 48 presents the results of citizens who own a mobile phone in the province under study.

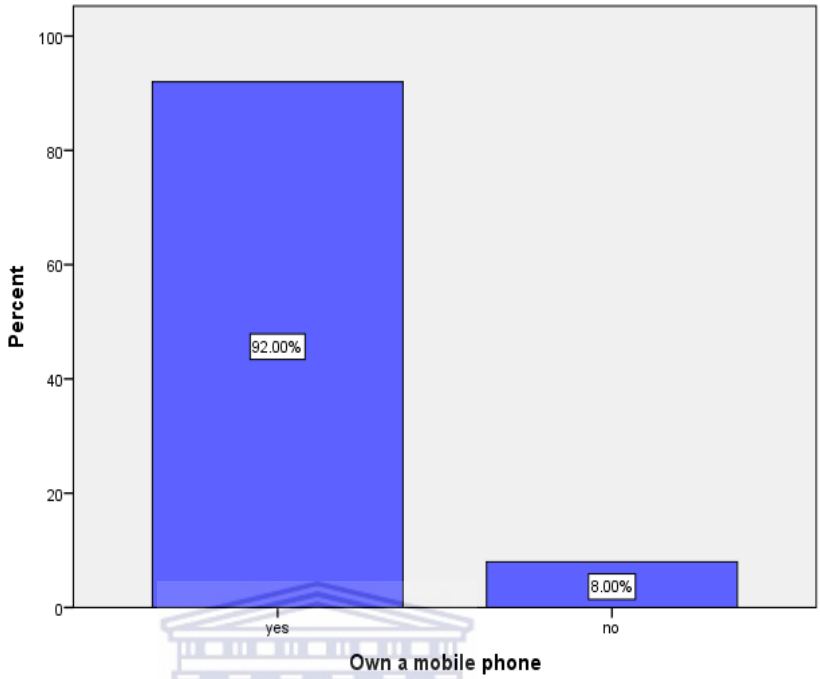

Figure 48: Provincial mobile phone presence (n=250)

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According to the results, 92% of the citizens who were asked whether they have access to a mobile phone gave a positive response i.e. that they do have one and a small fraction of 8% did not have access to one. According to the results, within the province under study, there are 230 mobile phones per 250 citizens.

Therefore, the results were transformed to determine the actual score of the penetration rates, which is the number of mobile phones per 250 citizens. The results showed that the penetration rates scored a 4.6 and this is a very high score, showing that there are high mobile penetration rates within the province under study.

- **Mobile network coverage in the province**

This subsection presents the results on the current state of mobile technology infrastructure in the province under study. The results are presented as per mobile operator, that is, the network coverage per mobile operator. Due to limited content on network coverage breakdown in SA, Table 12 below presents the overall population covered by the mobile cellular networks. These results are presented per mobile operator, that is, MTN, Vodacom and Cell C.

Table 12: Population covered by mobile networks in SA (source: mybroadband.co.za)

Operator	Number of 3G sites	Claimed population coverage
MTN	5,538	80%
Vodacom	3,534 (U2100), 317 (U900)	65%
Cell C	Unknown	72%

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In determining the score of this indicator, the researcher used the scoring that was adopted in this study and directly mapped the coverage results to the adopted scores. When transformed, the results showed that MTN scored a four, with Vodacom scoring a 3.3 and Cell C scoring a 3.6. Therefore, on average, the indicator scored a 3.6 and this is an above average score.

4.2.3.4 MFI overall results

In this section, results on awareness, usage and affordability of CSMTs, as well as data gathered from the investigation of infrastructure presence in the province under study, was presented and discussed. This data led to the deductive determination of MFI by deriving the average level of the matrixes from the three indicators, namely, the awareness, usage and affordability, and infrastructure presence. Figure 49 below depicts the results on MFI, the indicators that make up the MFI, as well as the matrixes under each indicator.

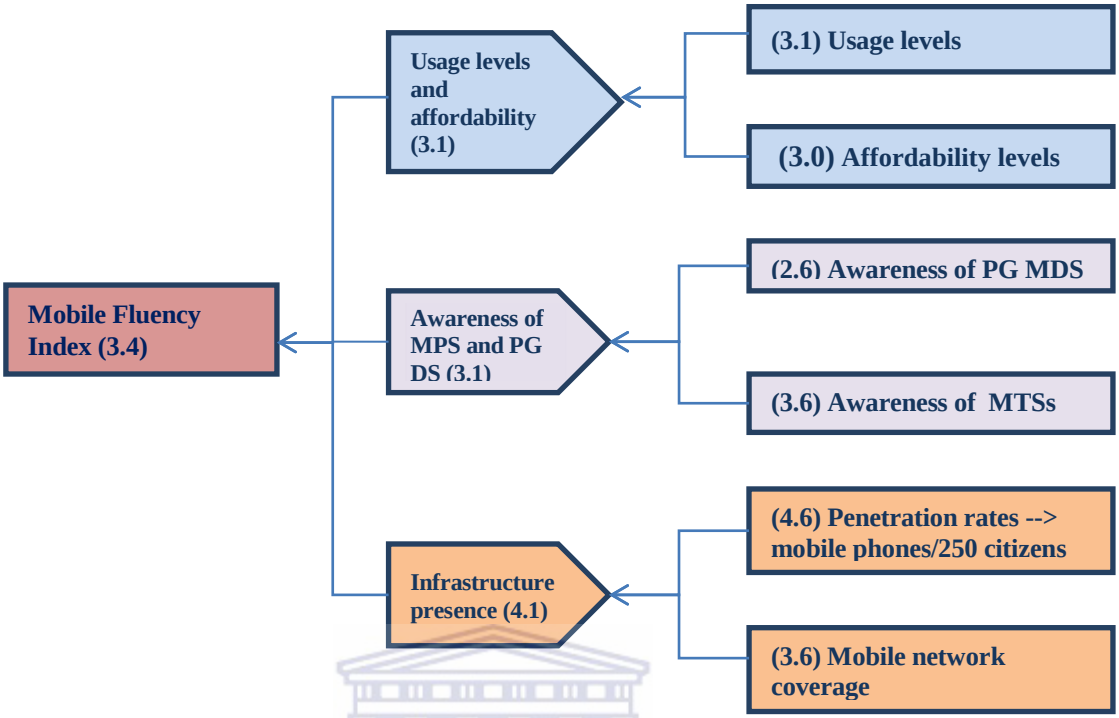

Figure 49: MFI scoring model

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The above model (see figure 49) depicts the overall score of the MFI and its indicators, namely, usage levels and affordability thereof, awareness of MPS and PG DS, and infrastructure presence. Therefore, when mapping the score of the MFI to the researcher defined scoring system, it then deduces to realisation that there is sound awareness, usage and sufficient infrastructure in the province to support m-Government.

4.2.4 PMRI overall score

This section discusses and presents the overall score of the PMRI. Table 13 below presents the overall score deductively derived from the indices that make up the overall PMRI of the province under study. These indicators include, CRI, PRI, and MFI.

Table 13: PMRI overall score

MRI Category	Provincial province
Citizen readiness	4.1 of 5
Organisation readiness	3.5 of 5
Mobile fluency	3.4 of 5
PMRI overall score	**3.7 of 5**

The three indices, namely CRI, PRI, and MFI, that were analysed and the findings presented in the above sections and subsections of the chapter, are the ones that were utilised in determining the PMRI of the province, which is the PMRI in Table 13 above. According to the presented results, the province's PMRI score landed at a 3.7. Therefore, according the scoring used in this study, the province's PMRI is far above average, meaning the Province is m-Ready for m-Government services.

4.3 Summary

This chapter was dedicated to presenting and discussing the findings on the PMRI of the province, taking into account the citizens from previously disadvantaged provinces and their respective readiness index. In determining the PMRI, the proposed PMRMM was used as a source of guidance, where scores and levels of indicators that fall under each index from the model were presented and discussed. In addition, scoring models that gave in-depth information about an index's score were presented and discussed. These models were the ones that helped in determining the PMRI of the Province, from a perspective of the PG, citizens from underprivileged provinces, and the Province's mobile fluency.

According to the presented results above, starting from the analysed data gathered for determining the readiness score of each index from the three indexes under PMRI, it showed that the underprivileged citizens are ready for m-Government with an index score of 4.1. The data showed that the PG is also ready for m-Government with an index of 3.5 and the mobile fluency had an index score of 3.4. Therefore, this translated to the Province being ready for m-Government with a score of 3.7,

from a scale of 1 to 5.In the following chapter, the researcher discusses the conclusions drawn from the data analysed from the study's units of analysis. In addition, recommendations were made where necessary and those will be presented in the following chapter.

Chapter 5

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The previous chapter presented the results of the research obtained by means of various cycles of data collection and analysis. A quantitative research approach was used to manage the research process. Therefore, research questions were addressed by means of the analysed data and findings presented. In this chapter, the researcher gives a brief summary of the study and the drawn conclusion from the findings presented in the previous chapter is discussed. This conclusion will determine whether the research objectives have been met or not. In addition, the limitations of the study are presented and recommendations made from the findings presented in the previous chapter.

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5.2 Reaching study objectives

The objective of this study was to determine the m-Readiness of a province for m-Government, taking into account, the PG, the underprivileged citizens and the mobile fluency of the province. In determining this, a research process was followed guided by its methodology in order to reach conclusions and give recommendations where necessary. Therefore, this section presents the process taken in reaching the research objectives, and the recommendations made based on the findings of the study.

5.2.1 M-Readiness reference model

Developing or devising an m-Readiness measure reference model did not form part of the objectives of this study. However, due to limited research on m-Readiness measuring tools focusing on developing countries, literature was reviewed, where key concepts related to this study's research objectives, were first discussed. The relation of the two concepts, namely e-Government and m-Government, was

magnified, and definitions from various researchers discussed to an extent where, a definition that the study followed and adopted, was highlighted.

From the reviewed literature, a m-Readiness model by LLE, namely MRI for Europe, was selected, however, the model only looked at developed countries and would overlook key important issues that needed to be taken into account when determining the readiness for m-Government in a developing country. Therefore, the MRI had to be synthesised with existing research undertaken by SA researchers that used certain techniques such as checklist of metrics and questionnaires to determine the m-Readiness of organisations from a perspective of a developing country. From the synthesised researches, the PMRMM was developed and used as a reference model for the study that helped in reaching the objectives mentioned in the beginning chapters of this research document.

5.2.2 Research process and results

For the study to meet its research objectives, a research method that would guide the research process had to be selected, and chapter three of the study presented the research design, which is how the study unfolded. In addition, the chapter presented various existing research paradigms and commonly used methodologies, and from that presented the chosen research method that guided the research process. A description of the population samples was given and the instruments that were used in collecting data were presented and described according to the reference model of the study. Ethical considerations that the researcher conformed and abided to before commencing with data collection, were briefly discussed as well.

As a means of answering the research questions that the research objectives were based on, chapter 4 analysed, presented and discussed findings from the collected data from the study's units of analysis as well as the investigation conducted, to determine the mobile fluency of the province. The results in this chapter were categorically analysed and presented according to each index from the study's

reference model, which was PMRMM. The purpose of each index from the PMRMM was meeting the research objectives, that is, determining the m-Readiness of the PG, the m-Readiness of the underprivileged citizens of the province, and determining the mobile fluency level of the province.

The study adopting a scoring technique, where indexes and indicators were scored on a scale of one to five and this was based on the LLE. Therefore, a score of each index that is, CRI (4.1), PRI (3.5) and MFI (3.5), was derived from each of its indicators, and later contributed to the score of the PMRI which was found to be 3.7. The PMRI was the index that determined the m-Readiness of the Province, taking into account, the underprivileged citizens, the PG, and the mobile fluency for m-Government, and this helped in answering the study's main research question.

5.2.3 Conclusion

Various factors tend to affect the adoption of new technologies, ranging from the readiness of the prospective users, which can also be influenced by other factors such as cost and willingness to use it, to the perceptions that the prospective users have about the technology and whether they are aware of its existence and are comfortable to use it. Therefore, m-Government is no exception as it utilises different types and forms of MWTs and their associated services. The questions in the two questionnaires were designed to answer the research questions and also to meet the research objectives. By designing the questionnaires in such a manner, a question or questions worked towards determining a certain indicator from the indexes. Therefore, from the findings presented in chapter 4, each of the three indexes that made up the PMRI, namely ORI, CRI and MFI, had above average scores.

Therefore, in accordance with the research objectives of the study, the three indexes were derived to meet those objectives. The analysed data proved that the three indexes hold an above average m-Readiness score and this was according to the

defined scores that were used in this research, therefore, this meant that the underprivileged citizens and the PG are ready for m-Government, and the province has sufficient supporting technologies and awareness for such an initiative.

However, as the numbers lead the researcher into concluding that the province is m-Ready from a PG's perspective, the underprivileged citizen's perspective as well as the province's mobile fluency perspective. The downside does unfortunately exist, and is not of a technical complication or financial constraint, but that of the rapid pace of mobile technology changes. In addition, another downside is that of skills shortage in the government for undertaking such projects, as there are great challenges associated with mobile technology implementation, with little or no ubiquity in its systems.

However, the existing PPP can play a huge role in situations where the government lacks the required capacity and skills for delivering m-Government by procuring the services of a private vendor that has adequate capacity and the required skills.

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5.3 Recommendations

5.3.1 Practical implementation of the model

This subsection of the chapter presents the recommendations made in relation to the PMRI of the province on a practical level. However, the recommendations were only directed to the PG as the driver and custodian of m-Government in the Province.

- In order for the organisation to improve its IT systems, first and foremost, the regulatory policies that govern the strategy need to be re-visited and relaxed in a manner that will allow for a broader development of a corporate strategy that includes an IT Strategy. This will in turn allow for a mobile strategy that guides business processes, which require ubiquitous systems as the main enablers.

- Extensive awareness about existing government MDS should be conducted as a means of including the citizens, which will later help to determine whether the citizens are willing to use the new technology or not.
- Partnerships should be forged with existing mobile network operators, where information distribution and advertisements of government initiatives can be conducted as a means of reaching the full population. In this way, the citizens can be more comfortable when they use their mobile phones as a means of interaction with the government.

Over and above the recommendations made, according to the analysed data, it is recommended that the PG takes into consideration commitment when delivering m-Government services.

5.3.2 Recommendations for furthered research

The PMRMM reference model used in this study was not devised to be compatible for every environment on a provincial level. Situations tend to differ in provinces due to their level of development, therefore, for further research, it is recommended that the reference model be revisited in order to cater for the conditions and situations of the Province under study.

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Secondly, as a means of expanding the reference model to cover the full value chain, that is, G2G, G2E, G2C, and G2B, more research has to be conducted in finding a way of synthesising what is thought to be critical in determining the readiness of the corporate world for m-Government, from a perspective of mid- to large industries.

5.4 Contribution of this study

The contribution of this study is twofold, firstly as a practical decision-making guide regarding the introduction of m-Government and secondly it adds to the conceptual understanding of government readiness for introducing its services via the ICT mobile platform, i.e. m-Government.

The study was conducted to help with decision making by the PG towards determining the Province's readiness in improving information access, reducing the digital divide that is currently being experienced by the underprivileged citizens and later providing electronic democracy, e-Democracy, via mobile platforms. The study can be used as a feasibility base for determining whether the province is ready for m-Government or not. Therefore, from this study educated decisions can be made to avoid failure due to lack of adoption by prospective users or maybe failure to deliver by the PG.

In addition, the study provides a conceptual tool which can be later improved where needed and utilised in determining the readiness of other Provinces for m-Government services, from a context of a full value chain, that is G2G, G2C, G2E and G2B.

5.5 Limitations of this research

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The purpose of the study is to determine the m-Readiness of the PG for delivering m-Government as well as that of the underprivileged citizens for utilising m-Government services, taking into account the mobile fluency of the province. Therefore, due to that, the study does not cover the full value chain, but looks at three segments of the value chain, that is, G2C, G2E and G2G.

In addition, the recognised and existing m-Readiness tool (that is the LLE's MRI tool as reported in the reviewed literature) was not designed for developing countries, thus it does not include certain aspects that are critical in determining whether the Province in a developing country is m-Ready or not. Therefore, more research was conducted in order to find a way of synthesising existing research and utilise their models and tools that they used in studying m-Readiness of a province within a developing country.

As this study was conducted in a certain SA Province, the results might not be generalizable for other provinces. In order to increase generalizability of the results of this study, further research in other provinces is recommended.

5.6 Summary

This chapter gave a summary of the whole study, with the main focus on the theoretical framework, giving a summary of how the study devised the used reference model. The chapter also gave a summary of the research method and how the research unfolded and the methodology that guided the research process as well as the analysis method adopted in the research. In addition, the chapter presented the conclusions drawn from the analysed data. After the conclusions were presented, the researcher made some recommendations that were seen as important for the province as well as the PG.

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Appendices

APPENDIX A: QUESTIONNAIRES

UNDERSTANDING CITIZEN M-READINESS FOR M-GOVERNMENT SERVICES

USSD – Unstructured Supplementary Service Data

SMS – Short Message Service

MMS – Multimedia Messaging Service

1. Please rate your knowledge and level of understanding of the mobile technologies and services listed below on a scale of 1-5.
   1-no knowledge, 2-poor knowledge, 3- good knowledge, 4-very good knowledge, 5-excellent knowledge

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Technology	1	2	3	4	5
SMS					
Mobile internet browsing					
USSD					
MMS					

2. How often do you use the technologies listed below?
   1-never, 2-seldom, 3-average, 4-frequently, 5-all the time

Technology	1	2	3	4	5
SMS					
Mobile internet browsing					
USSD					
MMS					

3. How do you find the costs of using the technologies below?
   1-very cheap, 2-somewhat cheap, 3-fair, 4-expensive, 5-unaffordable

Technology	1	2	3	4	5
SMS					
Mobile internet browsing					
USSD					
MMS					

4. Are you aware of the existence of the provincial government's mobile digital services, e.g. mobile websites?

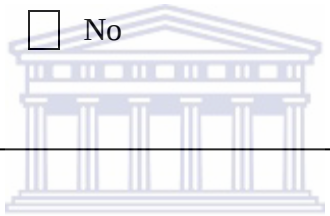
☐ Yes ☐ No

5. Are you aware of mobile transacting systems such as mobile payments systems used to transact over the mobile phone, transactions such as, buy electricity, funds transfer, movie rentals, etc.?

☐ Yes ☐ No

6. Given the training, would you use the mobile service e.g. USSD, SMS, Social Networks, to interact with the government? If no, please state why?

☐ Yes ☐ No



7. Would you perform financial related transactions other than value added services on your mobile phone e.g. movie rentals, online shopping, etc.? If no, please state why?

☐ Yes ☐ No

8. Rate how useful and significant would it be for you to be able to interact with the government via mobile services?

1-insignificant, 2-somewhat significant, 3- significant, 4-very significant, 5-extremely significant

☐ insignificant ☐ somewhat significant ☐ significant ☐ very significant ☐ extremely significant

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Organisation readiness questionnaire

1. Does the organisation provide you with mobile technologies?

   ☐ Yes ☐ No

2. Rate the organisations interest in mobile solutions based on the current mobile technologies it uses.

   ☐ Not interested ☐ somewhat interested ☐ Average interest ☐ very interested ☐ extremel intereste

3. Is the organisation's back-end system fully integrated and accessible from any computing device, e.g. Smart-phones?

   ☐ Yes ☐ No

4. Does the management find any significance in the organisation providing you with evolving mobile technologies?

   ☐ Yes ☐ No

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5. Does the management have an existing relationship with local companies or incubators that deliver mobile solutions?

   ☐ Yes ☐ No

6. To what level does the organisation promote Research and Development (R&D)?

   ☐ Not committed to R&D ☐ Slightly committed to R&D ☐ committed to R&D ☐ very committed to R&D ☐ extremely committe to R&D

7. Does the organisation provide or support necessary technological training to its workforce for performance improvements?

   ☐ Yes ☐ No

8. Does the organisation have an IT Strategy?

   ☐ Yes ☐ No

9. Does the organisation's IT Strategy allow for seamless inclusion or integration of Mobile Solutions?

APPENDIX B: ETHICS CONSENT FORM

CONSENT TO PARTICIPATE IN RESEARCH

Title:

The readiness of a province for mobile government: A case of the underprivileged citizens, the provincial government and the mobile fluency of the province

You are asked to participate in a research study conducted by Mr Shadrack Mehlomakulu, a student from the Department of Information Systems, in the Economic and Management Sciences Faculty, University of the Western Cape.

This research study is partially conducted towards the completion of the researcher's M.Com (IS) thesis at the University of the Western Cape.

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You were selected as a possible participant in this study because you are a government ICT services manager/specialist.

The researcher has obtained permission from the University of Western Cape to conduct this.

1.PURPOSE OF THE STUDY

The aim of the study is to research the perceived m-Readiness of a provincial government and that of the provincial citizens in delivering and utilizing m-Government services respectively.

2. PROCEDURES

If you volunteer to participate in this study, we would ask you to do the following:

1. You will be supplied with the questionnaire to fill in.
2. You will realize that the questionnaire is semi-structured and will enfold depending on your answers.

3.POTENTIAL RISKS AND DISCOMFORT

No potential risks are envisaged at this stage. However, if something might come up, it will be dealt with in a sensible and sensitive manner. No organization's name will be mentioned and a high level of anonymity will be adhered to.

4. POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

This study aims to help understand the perceived m-Readiness of both the province and its citizens for m-Government services, especially in the underprivileged communities. Through this, measures can be put in place to bridge the digital divide through mobile phones.

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5.PAYMENT FOR PARTICIPATION;

No payments to the participants will be made.

6.CONFIDENTIALITY

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission. Confidentiality will be maintained by means of not referring to the participants and by means of themes and categories that will be identified and used in the analysis and discussions of the findings and the outcomes, in the research report, the thesis, and in conference papers and articles that would be submitted for possible publication in academic journals.

The researcher further pledges that any information given by participants will be handled in the strictest confidence, and that the information which citizens give will not be used to reflect negatively on them in any way. The information will be stored in files that will be locked in the filing cabinet of the researcher, in his home. No participant's name or organization's name will be disclosed.

7.PARTICIPATION AND WITHDRAWAL

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you don't want to and still remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant so.

8.IDENTIFICATION OF INVESTIGATORS

If you have any questions or concerns about the research, please feel free to contact me at (021) 414-8247 (o); (cell) 078 9693 795; e-mail 2629583@uwc.ac.za/smehlomakulu@gmail.com

9. RIGHTS OF RESEARCH SUBJECTS

You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you have questions regarding your rights as a research subject, contact Dr Zoran Mitrovic, Department of Information Systems, room 4.38, Level 3, EMS building, UWC, or telephonically, (021) 959-2162; or via e-mail at zmitrovic@uwc.ac.za.

SIGNATURE OF RESEARCH SUBJECT OR LEGAL REPRESENTATIVE

The information above was described to *me, the participant,* by Mr Shadrack Mehlomakulu in *English* and *I am the participant* in command of this language. I was given the opportunity to ask questions and these questions were answered to *my* satisfaction.

I hereby consent voluntarily to participate in this study. I have been given a copy of this form.

_____

Name of Subject/Participant

_____

Name of Legal Representative (if applicable)

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_____ _____

Signature of Subject/Participant or Legal Representative Date

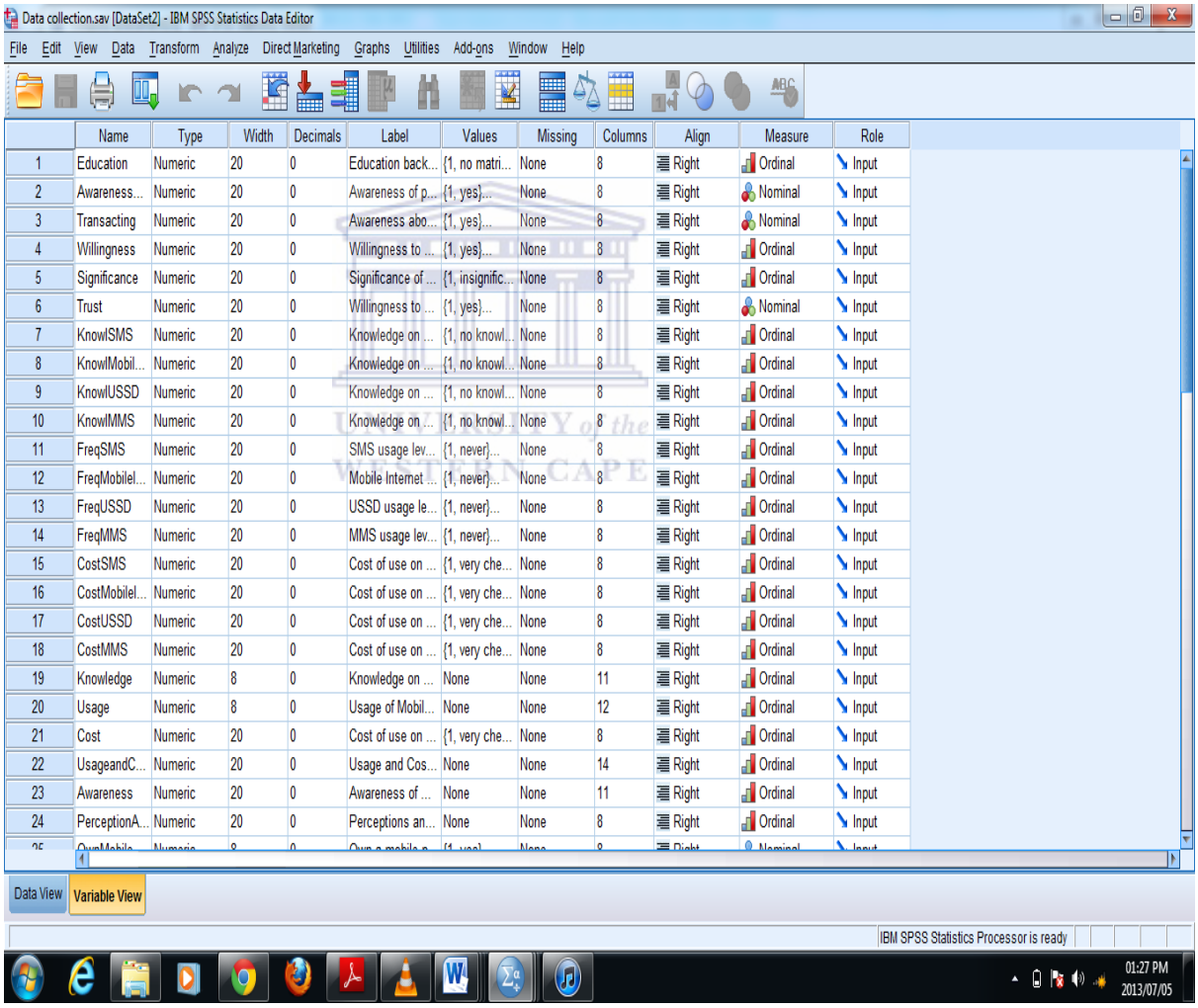
SIGNATURE OF INVESTIGATOR

I declare that I explained the information given in this document to _____ [*name of the participant].H*e/she was encouraged and given ample time to ask me any questions. This conversation was conducted in *English* and *no translator was used.*

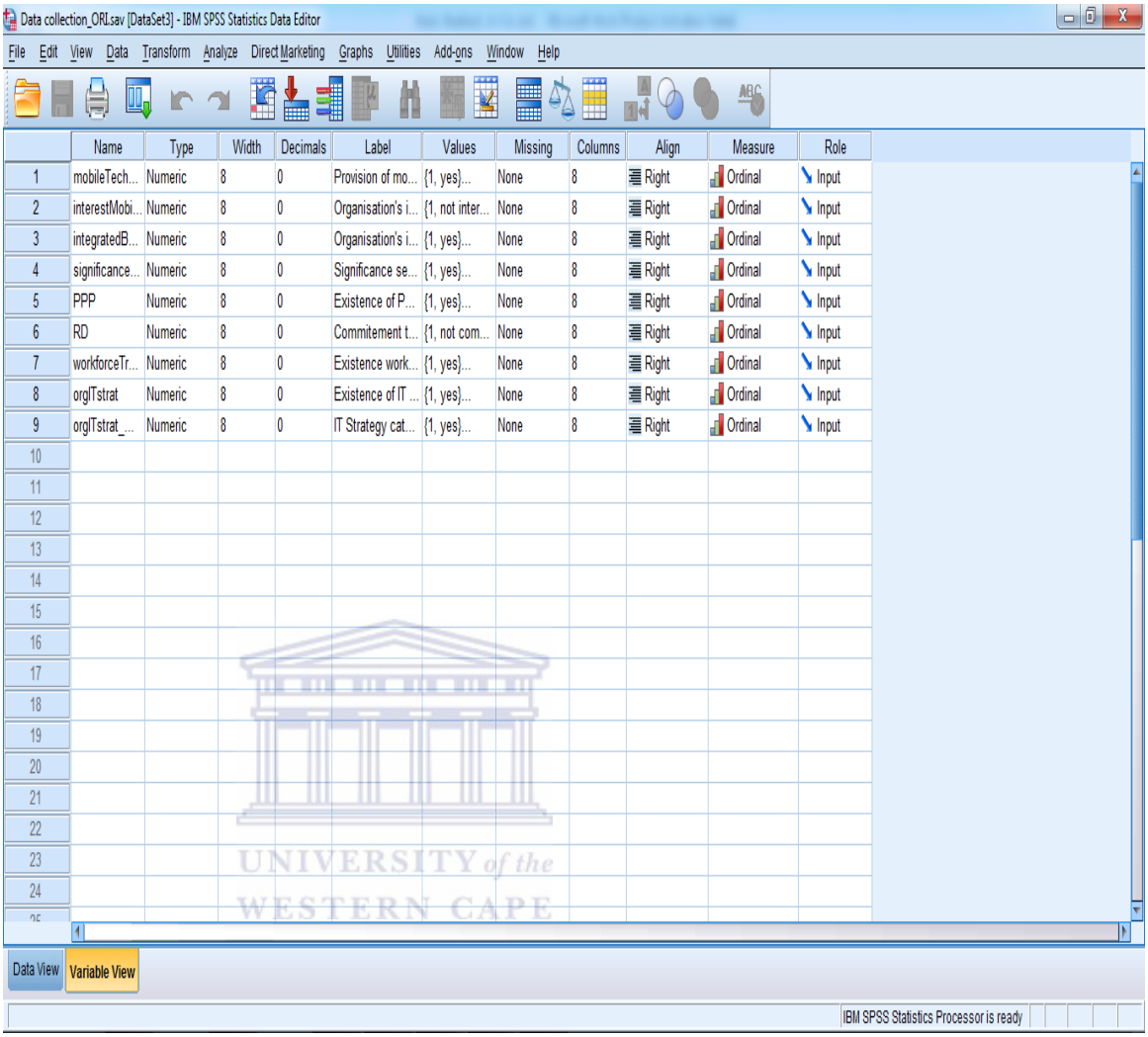
Signature of Investigator Date

APPENDIX C: SPSS SOFTWARE VARIABLE VIEW

1. Citizen's readiness data analysis



2. Organisation's readiness data analysis


Data collection_ORI.sav [DataSet3] - IBM SPSS Statistics Data Editor
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Data View
Variable View
IBM SPSS Statistics Processor is ready