

**Assessing the Diffusion and Use of Mobile Payment Solutions:**

**A case of the South African Townships**

**By**

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## **DECLARATION**

I declare that “Assessing the Diffusion and Use of Mobile Payment Solutions: A case of the South African Townships” is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

Mr KM Mhlongo

Date: 20/11/2016

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## **ABSTRACT**

With mobile phones almost being ubiquitous in most communities, the electronic payment industry has realised the potential of using mobile phones as devices that can be used to conduct electronic payments. This realisation has led to an increase in the number of mobile payment solutions, which are being deployed for use by the public. However, these mobile payment solutions have not been widely adopted, especially by the citizens who are residing in the townships. Thus, this study investigates the factors that inhibit township residents from adopting mobile payments.

The study was done at the Soshanguve township on the outskirts of Pretoria in Gauteng, South Africa. The study adopted a mixed method approach to collect data. Phase 1 relied on the interviews from a few selected individuals to collect the initial data, once this process was complete; a questionnaire (Phase 2) was developed and distributed to the general community of Soshanguve for data collection, which was qualitatively and quantitatively analysed.

The study unearthed several factors that may inhibit the diffusion and use of mobile payments in the townships. Some of the factors are as follows: mobile payments are not easy to use; lack of products to purchase using mobile payments; high costs associated with using mobile payment solutions; lack of trialability of mobile payment solutions; and lack of awareness of mobile payment providers in the townships.

The study proposes several guidelines that could help developers and operators of mobile payment solutions to design and deploy their solutions in such a way that they are suitable for consumption by the users in township communities. Proposed guidelines are as follows: (1) when a mobile payment solution is launched, effort should be made to market it to the target market; (2) potential adopters of mobile payments should be able to try it without incurring any financial penalties; (3) mobile payments should be easier to use; (4) mobile payment security features should be apparent to the potential adopters in order to alleviate their fears; (5) mobile payment solutions should be designed according to the needs of the target market as one size fits all does not work; (6) mobile payment solutions should fulfil a need which is not met by the current alternatives or it should offer more value than the existing alternatives; (7) the cost of conducting mobile payments should be affordable; and (8)

the regulator should develop legislation that stimulates innovation and competition while ensuring the security of mobile payments.

**Keywords:** Mobile Payments, Mobile Commerce, Mobile Banking, Mobile Network Operators, Mobile Wallet, Mobile Adoption, Mobile Money Transfer.

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## DEFINITION OF TERMS

<b>Township</b> – an urban residential area for blacks, coloured or Indian people which is generally on the outskirts of a town or city (Statistics South Africa, 2001).
<b>Spaza Shop</b> – an informal business operating from a residential home, usually selling convenience goods such as bread, soft drinks, milk, salt and sugar.
<b>General Dealer</b> – free standing business which is located either in a residential area or the business area of a township; selling a wide variety of goods.
<b>Mobile Wallet</b> – it is a mobile application that simulates a vault, it stores valuables which have been digitised such as bank cards and other sensitive information that enables the user to make purchases through their mobile device.
<b>Mobile Commerce</b> – the use of mobile devices to conduct commercial transactions.
<b>Mobile Payment</b> – a payment that is made through a mobile device such as mobile phone or a tablet for goods or services rendered by the seller.
<b>Mobile Money Transfer</b> – the sending of money by individuals to each other through the use of a mobile device.
<b>Remote Payment</b> – payments that are made from the mobile device of the customer to the merchant without any physical interaction between the POS terminal of the merchant and the mobile device of the customer.
<b>Proximity Payment</b> – payments that require that the mobile device of the customer interacts with the POS terminal of the merchant.
<b>Mobile Network Operator</b> – is an organisation that provides data and wireless voice services to its customers, they are also known as cellular company, mobile network carrier, wireless service provider, wireless carrier.
<b>Near Field Communication</b> – is a radio frequency technology that enables two electronic devices which are within a certain distance of each other to communicate.
<b>Point Of Sale</b> – a place in a store where customers go to pay for the goods or services rendered by the merchant.
<b>Mobile Broadband</b> – the use of mobile phone infrastructure to deliver wireless internet access to portable modems and mobile devices.

## ABBREVIATIONS

1G	1st Generation Mobile Network
2G	2nd Generation Mobile Network
3G	3rd Generation Mobile Network
3GPP	3rd Generation Partnership Project
4G	4th Generation Mobile Network
ABSA	Amalgamated Banks of South Africa
AMPS	Advanced Mobile Phone
ATM	Automated Teller Machine
B2B	Business-to-Business
B2C	Business to Consumer
B2G	Business-to-Government
BRT	Bus Rapid Transport System
C2C	Consumer-to-Consumer
CBD	Central Business District
CDMA	Code Division Multiple Access
DAN	Device Account Number
EDGE	Enhanced Data for Global Evolution
EFT	Electronic Funds Transfer
EVT	Expectancy Value Theory
FDD	Frequency Division Duplex
FDMA	Frequency Division Multiple Access
FM	Frequency Modulation
FNB	First National Bank
GBPS	Giga Bits Per Second
GDP	Gross Domestic Product
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile Communications
IDT	Innovation Diffusion Theory
IMT	International Mobile Telecommunications
IP	Internet Protocol

ITU	International Telecommunication Union
KMO	Kaiser-Meyer-Olkin
LBS	Location Based Services
LTE	Long-Term Evolution
MBPS	Mega Bits Per Second
MMS	Multimedia Messaging Service
MNO	Mobile Network Operator
MO	Mobile Originated
MPS	Mobile Payment Solution
MSISDN	Mobile Station International Subscriber Directory Number
MT	Mobile Terminated
MTN	Mobile Telephone Networks
NFC	Near Field Communication
PCA	Principal Component Analysis
POS	Point of Sale
PRSMS	Premium Rate SMS
QR	Quick Response
RFID	Radio-Frequency Identification
SANRAL	South African Roads Agency Limited
SARB	South Africa Reserve Bank
SIM	Subscriber Information Module
SMS	Short Message Service
SPSS	Statistical Package for the Social Science
TAM	Technology Acceptance Model
TDD	Time Division Duplex
TDMA	Time Division Multiple Access
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
TUT	Tshwane University of Technology
UNCTAD	United Nations Conference on Trade and Development
UNICEF	United Nations International Children's Emergency Fund
UPS	United Parcel Services

USSD	Unstructured Supplementary Service Data
UTAUT	Unified Theory of Acceptance and Use of Technology
WAP	Wireless Application Protocol
Wi-Fi	Wireless Fidelity
Wi-Max	Worldwide Interoperability for Microwave Access
WWAN	Wireless Wide Area Network



# Chapter 1: Introduction

## 1.1. Background

South Africa is the second biggest economy in Africa after Nigeria in terms of Gross Domestic Product (GDP) (BusinessTech, 2014) with a population of 54 million people (Statistics South Africa, 2014a), divided mainly into four population groups. 80.3% are black Africans, 8.6% are white Africans, 8.7% are Coloureds and 2.4% are Indian/Asian (Statistics South Africa, 2014a). Income distribution among the population groups reflects the legacy of apartheid with the Africans being the poorest, followed by the Coloureds and the Indian/Asian population groups (Statistics South Africa, 2014b). Africans, Coloureds and Indians primarily reside in the townships (Bond, 2008).

The retail business in the townships has been dominated mostly by small and often informal businesses up until the last century (Ligthelm, 2010). Township residents have migrated from the lower income group into middle-income group, which has resulted in an increase in their spending power (Ligthelm, 2010). Mainstream retailers have realised this emerging and untapped market and have recently moved into the townships where new shopping centres are being built (Ligthelm, 2010).

Mobile Network Operators (MNOs) are entities that provides wireless communications and data services to their subscribers (Technopedia, 2015). South Africa has five MNOs: Vodacom, Mobile Telephone Networks (MTN), Cell C, Virgin Mobile and Telkom Mobile (UNICEF New York *et al.*, 2012) and a mobile penetration of 128%, with 66.1 million active sim cards and 40.7 million unique subscribers (Deloitte Digital SA, 2013). It is possible that some users might have multiple mobile phones whilst others might not have any access at all. A single mobile phone might also be shared by family and friends (Skuse and Cousins, 2008).

There are usually two types of packages, which are offered by MNOs; contract and prepaid. Of the mobile subscribers, 83% are on prepaid while the rest are on contract packages (Deloitte Digital SA, 2013). South Africa has a smart phone penetration rate

of 54% (FinScope, 2014). Due to the low level of income amongst township residents, they are generally on the prepaid packages and the mobile phones are generally used to receive rather than to make calls (Wasserman, 2011).

Mobile banking refers to the use of mobile devices to access banking and financial services (Chandran, 2014). According to FinScope (2014), 90% of South Africans use mobile phones with only 32% of them using mobile banking. The survey that was conducted by ikapadata (2012) indicates that 46% of township residents are using their mobile phones to browse the Internet, however the use of mobile phones for banking or mobile payments in the townships is still very limited.

Currently, there is no commonly accepted definition for the term “mobile payment”. However, according to Mallat (2007) “Mobile payments are defined as the use of a mobile device to conduct a payment transaction in which money or funds are transferred from a payer to a receiver via an intermediary or directly without an intermediary”. In this study, the technology that is used to conduct a mobile payment will be referred to as a mobile payment solution (MPS) or mobile payments.

The structure of this chapter is as follows: Section 1.2 details the problem statement that formed the basis of this research. The purpose of the study, including related research objectives and questions are discussed in Section 1.3 – Section 1.6. Section 1.7 - Section 1.10 discuss the significance of the study, scope of study, limitations of the study and the ethical considerations. The research methodology that was used in the study is described in Section 1.11. The dissertation layout in Section 1.12 shows how the whole study is structured.

## **1.2. Problem Statement**

The number of adult South Africans that are banked is estimated to be around 27.4 million, which is 75% of the adult population. Only 5% of the non-banked have access to other non-bank financial institutions, while 6% are served by informal means and 14% have no access to financial institutions at all (FinScope, 2014). FinScope<sup>1</sup> (2014)

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<sup>1</sup> <http://www.finmark.org.za/finscope/>

defines an adult as a person who is at least 16 year of age or older. R12 billion in cash is estimated to be stored by South Africans in their homes (Meyer and Andam, 2012).

The survey, which was conducted by ikapadata<sup>2</sup> (2012) in the townships around Johannesburg, Cape Town and Durban, indicates that only 25% of the township population are accessing their bank accounts through their mobile phones or send money to other recipients through a mobile phone.

The survey also indicates that only 8% of the township population has ever sent money via an MPS (ikapadata, 2012). Furthermore, the uptake of mobile payment solutions by the township population is still very low (ikapadata, 2012). According to Dahlberg *et al.* (2008), consumers play a very important role in determining the success or failure of an MPS and for an MPS to be successful there has to be a critical mass that must be attained.

South African mobile payment solutions in their current form have struggled to be adopted by the township communities, with only 25% of the township residents using mobile payment solutions (ikapadata, 2012). Since the ikapadata study was conducted, there has not been an update of the usage by township residents nor a separate study that establishes the usage of mobile payments by the township residents that the researcher is aware of.

Thus, this study investigated the diffusion and use of mobile payment solutions in the South African townships. The study further examined the issues that affect the diffusion and use of MPSs in the townships.

### **1.3. Purpose of the Study**

The purpose of this study was to assess how mobile payment solutions are currently being used in the townships in order to identify the factors that affect the diffusion and use of mobile payment solutions in the townships.

### **1.4. Main Research Question**

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<sup>2</sup> <http://ikapadata.com/>

What are the factors that are inhibiting the diffusion and use of mobile payment solutions in the townships?

### **1.5. Secondary Research Questions**

- SQ1: What are the goods and services that may be consumed via mobile devices and can be paid for using mobile payment solutions?
- SQ2: What is the current landscape of mobile payment solutions in South Africa?
- SQ3: What technology adoption or diffusion models are relevant for understanding the diffusion and use of mobile payment solutions by the township residents?
- SQ4: How do township residents understand the concept of mobile payment solutions?
- SQ5: What types of mobile devices are used by the township residents and are they suitable for conducting mobile payments?
- SQ6: What are the accessibility issues, which township residents encounter when they use mobile payment solutions?
- SQ7: What are the usability issues, which township residents encounter when they use mobile payment solutions?

### **1.6. Research Objectives**

- O1: To identify the products and services, which are suitable for consumption via mobile devices and can be paid for using mobile payment solutions.
- O2: To determine the landscape of mobile payment solutions in South Africa.
- O3: To investigate the technology adoption or diffusion models that are relevant for understanding the diffusion and use of mobile payment solutions.
- O4: To assess the level of awareness in the townships regarding the existence of mobile payment solutions.
- O5: To determine whether mobile devices used by township residents are suitable for conducting mobile payments.
- O6: To assess how the rate of diffusion is affected by the accessibility issues, which are encountered by township residents when using mobile payment solutions.

- O7: To assess how the rate of diffusion is affected by the usability issues which are encountered by township residents when using mobile payment solutions.

### **1.7. Significance of the Study**

The usage of mobile payment solutions is very low in the townships as indicated by ikapadata (2012). This research provides some insights on how to increase MPS usage in the townships. This research also provides the financial institutions, MNOs and independent MPSs operators with guidelines that could help them develop MPSs that are suitable for the township market.

### **1.8. Scope of Study**

The scope of this study is limited to identifying those factors that enhance or inhibit the adoption of MPSs in the South African townships; and only functionality that is directly related to MPSs will be studied.

### **1.9. Limitations of the Study**

The study is restricted to the township of Soshanguve on the outskirts of Pretoria, South Africa. The study does not assess which particular MPS has an overall better performance or recommend the use of one MPS over another. The study also does not assess any factors that inhibit or enhance the adoption of mobile phones in the townships.

### **1.10. Ethical Considerations**

Ethics refers to a set of values or moral principles (Crommelin and Pline, 2007). According to Polonsky and Waller (2004), some of the ethical issues that should be considered in any research are the following:

- **Voluntary participation** - participants should choose whether they want to participate in the study or not; they should not be forced or deceived into participating (Polonsky and Waller, 2004). The researcher ensured that no participant was forced into participating in the research. Participants were given the opportunity to withdraw from the study at any point when they wish to withdraw.

- **Confidentiality and anonymity** – anonymity refers to the researcher not knowing who the participants are, while confidentiality refers to the researcher being aware of the identity of the participants but does not reveal their identity in the results of the study (Polonsky and Waller, 2004). While the researcher was aware of whom the participants are, their identity is not revealed in any form in this report of the study.

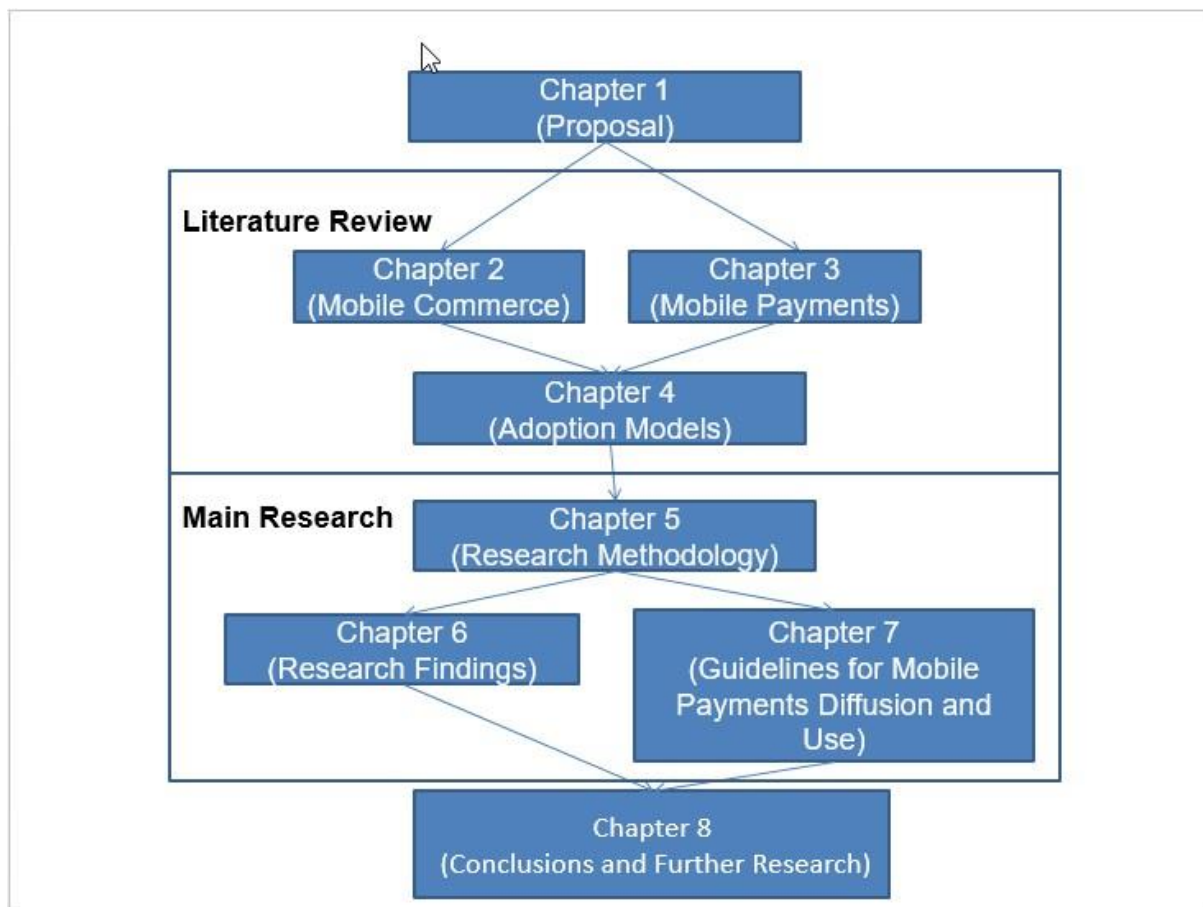
Before the study could commence, the researcher applied for an ethical clearance from UNISA, the clearance was subsequently granted. The copy of the ethical clearance can be found in Appendix D.

### **1.11. Research Methodology**

The methodology adopted for this study is a mixed method approach; which combines both the quantitative and qualitative approaches. The study began with the qualitative approach whereby open-ended interviews were conducted with the participants who were chosen by means of purposive sampling from the township of Soshanguve on the outskirts of Pretoria. The interviews were recorded and stored in an electronic format. The aim of the qualitative phase was to identify issues, which participants experienced when using an MPS.

Once the interviews were concluded, they were analysed using summative content analysis as it allowed the researcher to explore the usage of words by the respondents (Zhang and Wildemuth, 2009). The outcome of the interview analysis was used to develop a questionnaire; which was used during the quantitative phase of the study. The questionnaire was distributed to the general population of Soshanguve. The aim of the quantitative phase was to identify trends within the Soshanguve community. An extensive research methodology section can be found in Chapter Five (5).

## 1.12. Dissertation Layout



**Figure 1.1: Dissertation layout**

**Chapter 1** – Introduction: introduces the research topic and discusses why the research is necessary and how it would contribute to the research knowledge in the field of information systems.

**Chapter 2** – Mobile Commerce: starts by defining m-commerce, various sectors that uses m-commerce are identified, followed by the discussion of various products and features of m-commerce.

**Chapter 3** – Mobile Payments: this chapter gives an overview of the mobile technology and how it has evolved overtime. It describes the current landscape of mobile payment solutions in South Africa, the various business models and products as implemented by entities such as banks, MNOs and others.

**Chapter 4** – Technology Adoption Models: discusses technology adoption theories such as expectancy value theory (EVT), theory of reasoned action (TRA), theory of planned behaviour (TPB), technology acceptance model (TAM), unified theory of

acceptance and use of technology (UTAUT) and innovation diffusion theory (IDT) which are used to explain the adoption of new innovation in communities .

**Chapter 5** – Research Design and Methodology: this chapter discusses the methodology and methods which were undertaken in this study.

**Chapter 6** – Research Findings: the results from the interviews and surveys are analysed and presented, including the extraction of the factors that may influence the diffusion and use of mobile payments in the townships.

**Chapter 7** – Guidelines for Mobile Payments Diffusion and Use: discusses the results of the study in detail and link them to similar research studies. This chapter concludes by presenting the guidelines that could be followed to improve the diffusion and use of mobile payments solutions for the township residents.

**Chapter 8** – Conclusion and Further Research: this chapter concludes the study by mapping the research conducted with the research questions posed in Chapter 1. Lastly, the chapter briefly highlights some of the essential mobile payment research areas that require further investigation.

### **1.13. Summary**

The purpose of this chapter was to introduce the research conducted in this study by identifying the research questions and briefly describing the status of the mobile industry in South Africa as well as briefly describing how the South African township population uses MPSs. The next chapter is the literature review covering electronic e-commerce and m-commerce.



# Chapter 2: Mobile Commerce

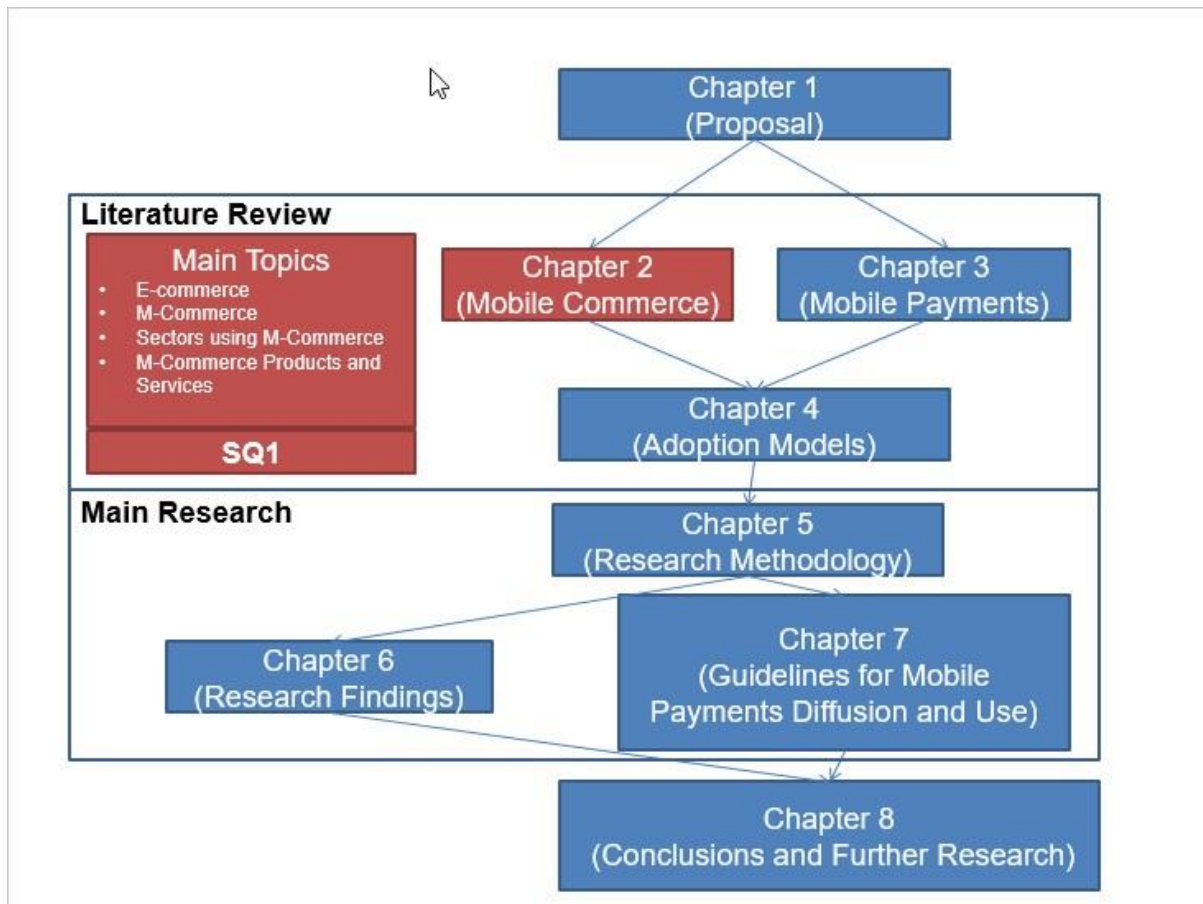


Figure 2.1: Chapter 2 Navigation map

## 2.1. Introduction

The objective of this chapter is to identify from literature the products and services, which are suitable for consumption via mobile devices and could be paid for using mobile payment solutions. This chapter seeks to address SQ1 (Subject-Question 1) as stated in Chapter 1 (Section 1.5). These products and services are discussed in the context of mobile commerce, shortly referred to as m-commerce.

Section 2.2 - Section 2.3 briefly describes electronic commerce, followed by Section 2.4, which explains in detail the features of mobile commerce. The major sectors that make use of mobile commerce are delved into in Section 2.5. This chapter ends with Section 2.6 that describes products and services that are available through m-commerce.

According to Juniper Research (2013), the total amount of mobile commerce transactions around the world in 2013 was estimated to be around R20 trillion, and is projected to reach R42.74 trillion in the year 2017. Only 2% of the consumer retail goods in South Africa are purchased online (Takealot, 2015), with the number of South African companies that enable their customers to make online purchases amounting to around 35% (WiGroup, 2015).

## **2.2. Electronic Commerce**

When the internet started to experience some exponential growth companies, started taking advantage of it in order to make their business more efficient and reach new markets. There are two different schools of thought when it comes to the definition of e-commerce. The first school of thought requires that the entire transaction be completed electronically and has some monetary value, for example the World Trade Organization (WTO) defines it as “the sale or purchase of goods or services conducted over computer networks by methods specifically designed for the purpose of receiving or placing of orders” (World Trade Organization, 2013).

The second school of thought emphasises that the transaction might not be of monetary value or that the transaction can be completed partially by electronic means. The Organisation for Economic Co-operation and Development (OECD) defines e-commerce as “the sale or purchase of goods or services, whether between businesses, households, individuals, governments and other public or private organizations, conducted over computer-mediated networks. The goods and services are ordered over networks, but the payment and the ultimate delivery of the goods or services may be conducted on or offline (include: orders received or placed on any online application used in automated transactions such as Internet applications, electronic data interchange (EDI), Minitel or interactive telephone systems)” (Organisation for Economic Co-operation and Development, 2005).

E-Commerce can be broadly divided into five categories (Koponen, 2009):

- **Business to Consumer (B2C)** - it refers to e-commerce that is conducted between businesses and consumers. It is characterised by customers

searching and acquiring information; the purchasing of items such as physical books, e-books, music, software and other material that are downloadable.

- **Business-to-Business (B2B)** – e-commerce that happens between businesses, that is, the transactions can involve some of the following types of businesses: manufacturers, distributors and dealers.
- **Consumer-to-Consumer (C2C)** – e-commerce that involves private individuals.
- **Business-to-Government (B2G)** – e-commerce that involves the government and private companies.
- **Mobile commerce (m-commerce)** – refers to the use of wireless devices such as mobile phones and Personal Digital Assistants (PDAs) to buy or sell goods and services.

As the purpose of this study is to investigate the factors that inhibit the adoption of mobile payments in the townships, mobile commerce is one of the important concepts to understand.

### **2.3. Understanding Mobile Commerce**

The definition of m-commerce is also a contentious topic, with different definitions emphasising different aspects of m-commerce. Zhang *et al.*, (2004) simply state that m-commerce is just an extension of e-commerce that makes use of a mobile terminal and a wireless network. Mobile terminal refers to all devices that are portable and can be carried around with ease; also included are devices that are secured into vehicles with the capability of accessing wireless networks (Veijalainen *et al.*, 2003), this is the branch of m-commerce which is referred to as telematics. IHS (2011) defines telematics as the “wireless connectivity established between passenger vehicles and infrastructure whether it is machine-to-machine, machine-to-human or direct to the cloud”.

Müller-Veerse (2002) defines m-commerce as any transaction that is done via a mobile telecommunication network that has a monetary value. UNCTAD (2002) defines m-commerce as the selling and purchasing of services and goods from a hand-held device.

From these definitions it is clear that what constitutes m-commerce depends on the definition that is adopted. As such, for the purpose of this study, the definition that is adopted is from Rajnish *et al.* (2006); it states that m-commerce is “any transaction, involving the transfer of ownership or rights to use goods and services, which is initiated and/or completed by using mobile access to computer-mediated networks with the help of an electronic device”. This definition was chosen as it includes transactions which are of monetary value and are completely or partially completed through mobile devices.

## 2.4. Features of Mobile Commerce

M-commerce has some unique features that enable it to have an edge over other forms of commerce. The unique features are listed below (Golden and Regi, 2013).

- **Ubiquity** – the user is able to transact from any area where there is network coverage. There are several uses for this feature; for example it can be used by traders to sell or buy stock immediately when they are informed of market movement regardless of their location provided that the location has network coverage.
- **Accessibility** – the user can be contacted regardless of time and location provided that the location is covered by the MNO. However, the user is able to restrict the times that are acceptable as well as the persons that are able to contact them.
- **Convenience** – mobile devices can be carried around with ease, they are able to store data and retrieve information.
- **Localisation** – the emergence of Global Positioning System (GPS) and related technologies has enabled the development of applications that are location-aware. These applications are able to deliver services, which are relevant to the location of the user provided that the area is covered by the MNO.
- **Instant connectivity** - the introduction of General Packet Radio Service (GPRS), Enhanced Data Rates for Global System for Mobile Evolution (EDGE) and other technologies such as two and half Generation (2.5G) which was later followed by third Generation (3G) and fourth Generation (4G) has enabled mobile devices to connect to the Internet in a simpler and faster way.

- **Personalisation** - the services that are offered can be customised in such a way that they suit the preferences of the user.
- **Time sensitivity** – refers to services, which are time critical; in the trading environment such as in the buying and selling of financial instruments; the stock price has to be updated in real time, any slight delay can mean a difference between a profit and loss.

## 2.5. Major Sectors that use M-Commerce

Some of the sectors in the commerce industry that use m-commerce are the following: finance, services and retail and information sectors (Golden and Regi, 2013). This section gives a brief overview of how each sector uses m-commerce. Some subsections might not meet the definition of m-commerce but they help in understanding the various implementations of mobile applications.

### 2.5.1. Financial sector

Retail banks, investment banks and other financial institutions such as brokerage firms, stock markets, and stock brokers are making use of mobile devices in order to enhance their productivity (Golden and Regi, 2013).

- **Investment banking** – applications (i.e. mobile apps) have been developed in house by banks, such as JPMorgan and Co<sup>3</sup> and other independent software houses to enable traders to capture financial instruments, such as equities, forwards, swaps, options and forex from their mobile devices (Aitken, 2011). From these apps, traders are able to use trading strategies, such as technical analysis to react to the market appropriately, manage their portfolios and view the latest news in real time (Aitken, 2011).
- **Retail banking** – customers are able to access some of the banking services, which are offered by the banks such as ABSA<sup>4</sup> through their websites or mobile applications, which have been custom developed for mobile devices (ABSA, 2012). Services such as balance enquiry, money transfer, purchase of airtime,

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<sup>3</sup> JPMorgan is a retail and investment bank based in the united states (<http://www.jpmorgan.com>)

<sup>4</sup> ABSA is one of the big four banks in South Africa (<http://www.absa.co.za>)

sending money to a mobile number are generally offered by both the mobi sites and the custom applications (ABSA, 2012).

- **Stock markets** – customers are able to access current stock prices, market trends, tips and the latest news, which have been published by the stock markets from their mobile device (Golden and Regi, 2013).

### 2.5.2. Services and retail sector

Customers are able to purchase items, which they are interested in by using a mobile device (Golden and Regi, 2013). Mobile devices can be used to buy products or services from e-retailers such as Amazon<sup>5</sup>. Traditional retail giants, such as Woolworths<sup>6</sup> have also set up online shops that can be accessed using mobile devices. The payment of the transaction might be completed through a mobile device or might be made through other traditional means (e.g. Electronic Funds Transfer (EFT)).

Government institutions such as municipalities enable their customers to pay for services such as rates, taxes and prepaid electricity through electronic channels. Tshwane municipality<sup>7</sup> has such capabilities: customers are able to log into the municipality website to effect the payment of these services through the use of a mobile device if they opt to (TSHWANE MUNICIPALITY, 2015). The South African Revenue Service<sup>8</sup> (SARS) has an app that enable their clients to file tax returns (SOUTH AFRICAN REVENUE SERVICE, 2015).

MNOs such as Vodacom (Vodacom, 2015) and MTN (MTN, 2015) have sim based and smartphone based apps that enable their clients to manage their accounts. The clients can buy prepaid electricity, prepaid airtime, data bundles, SMS bundles and other related products and services from the app. Pay per view TV conglomerate Multichoice<sup>9</sup> enable their subscribers to make payments through their mobile app.

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<sup>5</sup> <http://www.amazon.com/>

<sup>6</sup> <http://www.woolworths.co.za/store/>

<sup>7</sup> <https://www.e-tshwane.co.za/eTshwane/>

<sup>8</sup> <http://www.sars.gov.za/>

<sup>9</sup> <http://www.multichoice.co.za/>

Online retailers such as Takealot<sup>10</sup> and Netflorist<sup>11</sup> have mobile apps that enable their clients to make purchases through their mobile apps.

### **2.5.3. Information sector**

Media houses and other information service providers are able to deliver financial news, sport results, market prices, upcoming sales and discounts, traffic updates in real time into the mobile devices of the customers (Golden and Regi, 2013).

## **2.6. M-Commerce Products and Services**

The aim of this section is to briefly highlight several products and services that can be purchased through mobile devices.

### **2.6.1. Mobile ticketing**

Tickets are sent to the mobile devices of the customers using various technologies, such as Short Message Services (SMS). The customers would then present the message to the appropriate authorities in order to access the service or product which they paid for. For such services, any network-enabled mobile device can be used.

Customers can download an application and install it into their mobile device. The application will then enable them to book or cancel tickets as the need arises. The customers can also access the Wireless Application Protocol (WAP) portals of the service providers in order to book or cancel a ticket. In this case, only capable mobile devices, such as smart phones could be used.

### **2.6.2. Mobile vouchers, coupons and loyalty cards**

Virtual tokens that represent vouchers, coupons or loyalty cards are distributed to the mobile devices of the customers. They are distributed through an SMS or the use of location based services to deliver the items to the mobile devices of the clients (Owen and Shank, 2011). The customers would then present the virtual token at the Point of

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<sup>10</sup> <http://www.takealot.com/>

<sup>11</sup> <http://www.netflorist.co.za/>

Sale (POS) to complete a financial transaction, such as getting a discount or supplementing a payment for acquired good or services.

### **2.6.3. Content purchase and delivery**

The ability of recently manufactured mobile phones to act as fully fledged mobile media players has led to a substantially increase in the sale of digital content, such as wallpapers, ringtones, games, music tracks and full length movies. In addition, the recent advances in technology, such as 4G enable mobile devices to download content at a faster rate (Niranjanamurthy and Kavyashree, 2013). Users are able to use airtime or credit cards as a means of payment.

### **2.6.4. Location based services**

To provide the appropriate services to customers, in some industries it becomes very important for the service providers to have the ability to locate their customers' whereabouts. Location Based Services (LBS) are services that use the location of the mobile device with other information in order to deliver an enriched service (Schiller and Voisard, 2004). Some of the categories of LBS are shown below (Buczowski, 2012).

- **Marketing** – targeted at people according to their geographical location.
- **Information services** – gets delivered to the recipients based on their location, behaviour and time specificity. Users are able to locate places of interest, such as restaurants, petrol stations, tourist attractions, hospitals based on their location.
- **Navigation** – enables the user to navigate to a desired location by using a mobile device that has the necessary software installed, such as Google Maps, Yahoo Maps or Bing Maps.
- **Location-based social media** – enables users who are members of the social network to broadcast their location using the GPS of the mobile device. Users are able to post comments that are specific to their current geographic location, such as the restaurants and hotels they will be visiting in that area, the quality of service which they received in a particular restaurant or hotel.



- **Mobile location based gaming** – games that are played on mobile devices that use the geographical location of the player as an input in the gaming process.

**Geotagging** – refers to the additional geographical information that is added in the form of metadata to various forms of digital media, such as video and photographs. Geotagging enables users to filter content which they are interested in by location.

### **2.6.5. Information services**

Several information services that can be delivered into the customers' desktops can also be delivered into their mobile phones. Examples of such services include the following (Tiwari and Buse, 2007):

- News
- Stock quotes
- Sports scores
- Financial records
- Traffic reporting

### **2.6.6. Mobile banking (m-Banking)**

Mobile banking refers to the services that are offered by banks and other financial institutions that enable their clients to view their account details and conduct various transactions on a network-enabled mobile device (Njenga, 2009).

### **2.6.7. Mobile storefront (mStores)**

Mobile storefronts are virtual online shops that have been tailor made for mobile devices. Depending on how the store is setup, it might be comprised of the following functionality: billing and online payment system and inventory management (Techopedia, 2015).

### **2.6.8. Mobile brokerage**

Mobile brokerage can be defined as “transaction based, mobile financial services of non-informational nature that revolve around a securities account” (Georgi and Pinkl,

2005). Users are able to monitor their investments, trade stocks, check balances and get quotes (Canadian Imperial Bank of Commerce, 2015).

### 2.6.9. Mobile marketing and advertising

Mobile marketing is defined as “any marketing activity conducted through a ubiquitous network to which consumers are constantly connected using a personal mobile device” (Kaplan, 2012). Mobile marketing and advertising can be classified using the following two variables: Consumer knowledge and Trigger of communication (Kaplan, 2012):

- **Consumer knowledge** - refers to whether the initiator of the communication has any knowledge of the recipient.
- **Trigger of communication** - the communication can either be initiated by the company or by the consumer.

Using these two variables, Kaplan (2012) developed four categories that mobile marketing applications fall under; they are represented in Table 2.1.

**Table 2.1: Trigger of communication**

		Trigger of communication	
		Push	Pull
Degree of consumer knowledge	High	<p><b>Victims</b></p> <p>AT&amp;T sent SMS text messages to 75 million customers suggesting they watch <i>American Idol</i> and vote for candidates using their AT&amp;T phone</p>	<p><b>Patrons</b></p> <p>Pop icon Britney Spears enabled fans to receive—for \$2.99 per month—<i>Britney’s Diary</i>: a weekly text message about her life during a concert tour</p>
	Low	<p><b>Strangers</b></p> <p>Toyota teamed up with Fox Broadcasting to insert 10-second commercials into 26 short mobile movies, so-called ‘mobisodes,’ for the TV show <i>Prison Break</i></p>	<p><b>Groupies</b></p> <p>Calvin Klein used Quick Response codes on billboards in New York to allow users to pull up an exclusive 40-second commercial</p>

Source: (Kaplan, 2012)

- **Push / High** – marketers have knowledge of the recipients and they just send them marketing material without having to ask for permission.
- **Push / Low** – marketers send marketing material to recipients whom they have no knowledge of.

- **Pull / High** – recipients knowingly give permission and their personal information to the marketers so that they can receive marketing material.
- **Pull / Low** - the recipients of the marketing material opt to receive the marketing material from the marketer but the marketer does not have any knowledge of the recipients.

## 2.7. Summary

This chapter highlighted certain products and services which are currently being used in certain industries for m-commerce. As the purpose of this study is to investigate the adoption of mobile payments in the townships, the financial, retail and services sectors are important industries that determine if m-commerce is adopted by the general public as their solutions are targeted towards individuals.

Mobile commerce is growing at a rapid pace as a result some of the areas of mobile commerce have been left out as the researcher was of the view that they were not applicable to the objectives of the paper. The aim of this section was to highlight various areas where mobile applications has been deployed, some of the areas might not meet the definition of m-commerce but they were included as they assist in understanding various implementations of mobile commerce.

This study focuses on the m-commerce services that are offered by the financial, retail, telecommunication and services sectors. The rationale being that in those countries where mobile payments have been successful those sectors had a significant impact in the adoption rate. The functionality that the study investigated includes mobile banking, apps that enable the individual to pay for or buy a product or service from their mobile device.

# Chapter 3: Mobile Payments

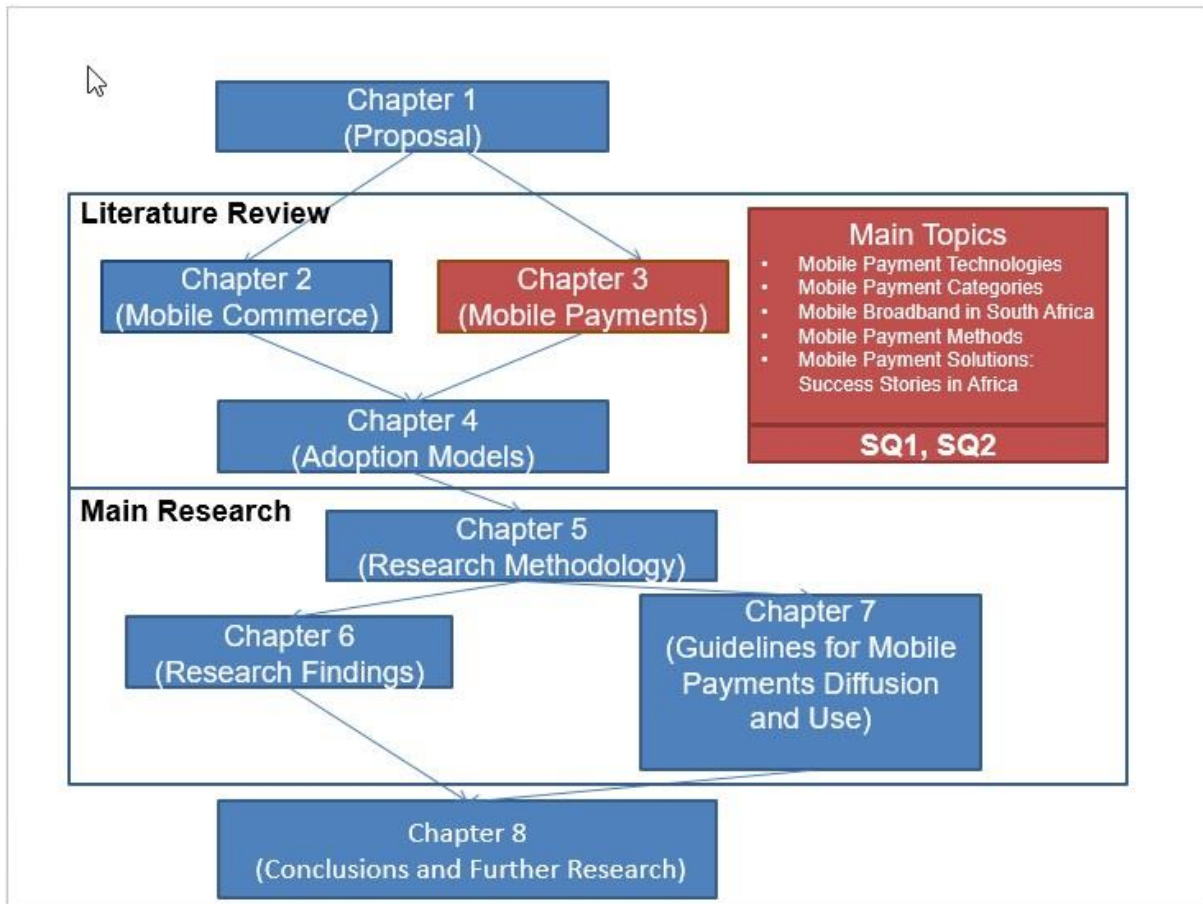


Figure 3.1: Chapter 3 Navigation map

## 3.1. Introduction

The structure of this chapter is depicted in Figure 3.1. For background purposes, the chapter starts by describing how mobile technologies have evolved overtime in Section 3.2, beginning from first generation (1G) to fourth generation (4G) and long-term evolution (LTE). The understanding of each technology generation is important as it enables the researcher to understand how the various implementations of mobile payments are supported and enabled. Section 3.3 discusses the evolution of mobile broadband in South Africa, especially in relation to mobile payment solutions. Mobile payment solution categories are briefly highlighted in Section 3.4. Section 3.5 discusses the common methods which are used to implement mobile payments and also explores the role played by all the stakeholders who are involved in the processing of mobile payments.

Section 3.6 - Section 3.7 discusses the value chain and business models of mobile payments. Section 3.8 discusses the success story of mobile payment solutions in

Africa. The sections further discuss how the various South African companies have implemented their mobile payment solutions. This chapter is relevant to the study, particularly in partially addressing the secondary questions SQ1 and SQ2 as it discusses the current landscape of mobile payments in South Africa thereby identifying relevant items that can be purchased through the use of mobile devices. The literature review in this chapter also assisted in the formulation of the interview schedule and questionnaire.

## **3.2. Mobile Payments Enabling Technologies**

This section discusses the enabling technologies for mobile payment solutions.

### **3.2.1. Generations of mobile communication**

The telecommunication industry has experienced some substantial growth in the last few decades with the wireless mobile communication sector being the major contributor of the growth (Farooq *et al.*, 2013). Mobile telephony was birthed at AT & T's Bell labs in the 1970's (Farooq *et al.*, 2013), since its inception it has advanced in technology. The term that is used to refer to the technology of a particular time is "Generation". This section will describe the Generations of mobile communication technologies.

#### **3.2.2. 1G (First Generation)**

It was the first wireless telephony system to be used and it used analogue signals that used circuit-switched technology, the core of this technology was known as Advance Mobile Phone (AMPS) (Chen and Yang, 2007), it was developed by Bell Labs (AT and T, 2011). This system was primarily designed for voice based on the frequency modulation (FM) radio technology that uses frequency division multiple access (FDMA); the channel that it used had a capacity of 30KHz with a frequency band of 824-894 (Chen and Yang, 2007). The specification for 1G can be summarised by Table 3.1:

**Table 3.1: 1G specification**

<b>Generation</b>	<b>Starts from</b>	<b>Data capacity</b>	<b>Technology</b>	<b>Service</b>	<b>Frequency</b>
1G	1970-84	2 Kilobit per second (kbps)	Analogue Wireless	Voice only	800 – 900 MHz

**Source:(Chen and Yang, 2007)**

### **3.2.3. 2G (Second Generation)**

The second generation wireless telephony system uses digital signals instead of analogue, which was used in the first generation. It supports both data and voice services and it was launched in 1991 in Finland (Farooq *et al.*, 2013) using the GSM standard. It is the most dominant and used in over 212 countries across the globe (Churi *et al.*, 2012). 2G networks use modulation schemes, such as code division multiple access (CDMA) and time division multiple access (TDMA) (Li *et al.*, 2009). The benefits of 2G networks as compared to 1G network are the following (Churi *et al.*, 2012):

- Different mobile networks could provide services such as Multimedia Messaging Service (MMS).
- 2G networks have a higher penetration rate.
- 2G networks are far more efficient.
- Uses a digital signal rather than an analogue signal with a speed of up to 64 kbps.

2G networks are more secured for both the sender and the receiver; the messages which are exchanged between the sender and the receiver are digitally encrypted.

2G networks have the following limitations (Kasera and Narang, 2004):

- **Low transfer rates** - The data transfer speed is very low as 2G networks were primarily designed for voice.

- **Low efficiency for packet-switched services** - 2G networks are not very efficient in accessing wireless internet.
- **Multiple standards:** 2G networks have very limited roaming capabilities.

In order to eliminate some of the limitations of 2G, improvements were made into 2G, which resulted in a transition from 2G to 2.5G and then to 2.75G (Farooq *et al.*, 2013).

- **2.5G (Second and half Generation)** – refers to 2G networks that are also using packet switched domain as well as circuit switched domain (Churi *et al.*, 2012). Packet switching refers to a channel that is established between two points with the purpose of transferring data; the data is then broken down into smaller units called packets and then transmitted through a medium. The packets may arrive at the destination address in a non-sequential order. At the destination address the packets are reassembled to an order in which they were sent.

**2.75G (Enhanced data rates for global evolution) (EDGE)** – As GPRS networks became saturated with data and voice traffic due to high demand; it became clear that the data rate should be improved. In order to achieve a better data rate, a new encoding technique called 8PSK (Churi *et al.*, 2012) was developed, which made it possible to achieve a better data rate of up until 236 kbit/s; meaning that it was able to handle 4 times the traffic that a GPRS network could handle (Shukla *et al.*, 2013). The specification for this generation is summarised in

**Table 3.2.**



**Table 3.2: 2G specification**

Generation	Starts from	Data capacity	Technology	Service	Frequency
2G	1990	10 kbps	Digital wireless	Voice data	850-1900 MHz (GSM) 825-849 MHz (CDMA)
2.5G	2000	200 kbps	GPRS	MMS Internet	850-1900 MHz
2.75G	2003	473 kbps	EDGE		850-1900 MHz

**Source: (Chen and Yang, 2007)**

### **3.2.4. 3G (Third Generation)**

Most of the 2G systems were voice centric, the GSM standard supported the transmission of SMS with a limit of 160 characters (Pereira and Sousa, 2004). Other 2G systems also support the transmission of data, but at very low speeds of around 9.6 Kb/s or 14.4 Kb/s. As mobile phones became prevalent in society, it was apparent that the demand for wireless internet access will also increase. Thus the governing bodies started to work on the specification that will satisfy the appetite for the mobile wireless internet (Pereira and Sousa, 2004).

The specifications for 3G were developed by the International Telecommunication Union (ITU). These specifications are officially referred to as International Mobile Telecommunications (IMT)-2000. The aim of the specifications was to enable static and mobile phone users to access the world's telecommunication infrastructure using both land and satellite systems (Pereira and Sousa, 2004). Some of the 3G requirements that should be adhered to are the following (Pereira and Sousa, 2004).

- If the user is in motion, such as being inside a moving train or a car, the system should be able to handle 144 Kb/s; if the user is a pedestrian who is just walking, the system should be able to handle 384 Kb/s and for static users the system should be able to handle up to 2 Mb/s.
- The system should be able to allow users to roam across the globe without being disconnected; the specification for 3G is shown in Table 3.3.

**Table 3.3: 3G specification**

Generation	Starts from	Data capacity	Technology	Service	Frequency
3G	2001	384Kbps	Broad band /Internet Protocol (IP) Frequency Division Duplex (FDD) Time Division Duplex (TDD)	High speed voice/data/video	1.6-2.5 Gigahertz (GHz)
3.5G	2003	2Mbps	GSM/ 3rd Generation Partnership Project (3GPP)	High speed voice/ data/ video	1.6-2.5 Gigahertz (GHz)
3.75G	2003	30Mbps		High speed internet/multi media	1.6-2.5 Gigahertz (GHz)

Source:(Chen and Yang, 2007)

### 3.2.4.1. 4G (Fourth Generation)

The 4G specification is meant to unify all mobile technologies that are in existence such as GSM, GPRS, IMT – 2000, Wireless Fidelity (Wi-Fi) and Bluetooth (Pereira and Sousa, 2004). 4G is capable of transmitting at a speed of up to 20Mbps; faster than 3G and downloading at a speed of up to 100Mbps (Shukla *et al.*, 2013). The 4G networks were developed to achieve the following:

- **Ubiquity** - mobile network ubiquity requires that the network should always be available to subscribers whenever they want to use it from wherever they want to use it. The ubiquitous access to the network is not only restricted to humans, but to every device that has to make a connection; i.e. tracking devices.
- **Multi-service platform** – 4G networks should be able to handle different types of traffic i.e. voice and data; more and more data services are becoming more prevalent and becoming more profitable to MNO's as compared to voice.

- **Low bit cost** – it is important that the cost of data is affordable in environments where the data volume is high. Some applications, which require a considerable amount of data transmission, such as video can stifle the demand of such applications if the costs become very expensive. 4G networks should be flexible to offer high mobility users speeds of up to 50 – 100Mbps while offering low mobility users speeds of up to 1Gbps.

Some of the applications that are available on the 4G networks are the shown in Table 3.4.

**Table 3.4: Applications available on 4G**

Video on demand	Content producers are able to send their customers video clips
Video conferencing	Friends or colleagues are able to see and have a conversation with each other over the mobile device
Tele medicine	Health professionals are able to provide advice to patients who are found in far flung areas
Location-based services	There are applications that enable subscribers to locate areas of interest in their current vicinity such as restaurants.

**Source: (Churi et al., 2012)**

Table 3.5 describes the specification of 4G networks.

**Table 3.5: 4G specification**

Generation	Starts from	Data capacity	Technology	Service	Frequency
4G	2010	200 Megabits per second (Mbps)-to-1 Giga bits per second (Gbps)	Long Term Evolution (LTE) Worldwide Interoperability for Microwave Access (Wi MAX)	Internet	2-8GHz

**Source:(Chen and Yang, 2007)**

### **3.3. Mobile Broadband in South Africa**

Mobile broadband, which is also known as Wireless Wide Area Network (WWAN), refers to high speed internet access from mobile devices such as a mobile phone, mobile networks from 2G and up are able to offer mobile broadband (Pinola, 2015). Bold and Davidson (2012) define mobile broadband as “any mobile (or cellular) technology that delivers minimum data rates in the hundreds of kilobits per second (kb/s) to end users and peak rates in the Megabits per second (Mb/s)”. According to the Broadband Commission (2013), the country with the highest mobile broadband penetration in Africa is Ghana with a mobile broadband penetration of 33.3 % while South Africa is in the 5th position with a penetration of 26%.

All the South African MNOs offer mobile broadband and the service differs from MNO to MNO as to which technology to use. The coverage maps from MTN (MTN, 2015), Vodacom (Vodacom, 2015), Cell C (Cell C, 2015) and Telkom mobile (8ta) (Telkom Mobile, 2015) indicate that rural areas and poorer urban townships receive poorer service as compared to more affluent areas where MNOs are more likely to generate enormous amounts of revenue by rolling out their latest infrastructure first then subsequently in the poor areas if the budget allows.

GPRS, 2G and EDGE are available from all the four MNOs; namely MTN, Vodacom, Cell C and Telkom Mobile as indicated in their coverage maps. LTE and 3G are available from all the MNOs, but only in certain parts of the country as indicated in their coverage maps. Vodacom has just started an initiative to upgrade most of the infrastructure in the townships around Gauteng such as Soweto, Orange Farm, Alexandra, Tembisa, Mamelodi, Atteridgeville and Soshanguve. The aim of the upgrade is to add more base stations which are 3G, 4G and LTE compatible (Wilson, 2014).

Initiatives from organisations, such as project Isizwe together with governmental entities such as the Tshwane municipality to offer free Wi-Fi to the local residents could help in increasing the number of people with access to the internet (City of Tshwane, 2013). The collaboration between these two entities has rolled out Wi-Fi with a

capacity of 25 000 users in areas such as Church Square, Mamelodi, Hatfield, Soshanguve, and the Pretoria CBD (City of Tshwane, 2013).

### **3.4. Mobile Payments Categories**

Mobile payments are generally categorized using the following attributes: the size of the payment and the location of the mobile device. Thus, they can be classified into either remote payments or proximity payments (Smart Card Alliance, 2011).

#### **3.4.1. Remote payments**

The customer's mobile phone does not directly interact with the merchant's POS hardware. The customer usually uses a mobile application, which is installed on the mobile device to purchase goods or services. Remote payments are often implemented using SMS, mobile application or mobile browser (Smart Card Alliance, 2011).

#### **3.4.2. Proximity payments**

The customer's mobile phone has to interact with the merchant's POS system. Proximity payments are often implemented using fobs, contactless stickers, tags, or NFC-enabled mobile phones (Smart Card Alliance, 2011). The transactions are generally initiated by either placing the mobile device next to the merchant's POS terminal or scanning the QR code, which is embedded within the mobile device.

#### **3.4.3. Transaction size**

Transactions are divided into two categories: micro payments and macro payments (Smart Card Alliance, 2011).

- **Micro payments** – are payments which amount to less than a certain value. There is no consensus as to what the value should be as it differs from country to country and company to company. Smart Card Alliance (2011) indicates that micro payments are payments, which amount to less than R87. Micro payments are generally used to purchase music, ring tones, parking, transit, items such as coffee in convenience stores (Smart Card Alliance, 2011).

- **Macro payments** – similarly to micro payments, there is no consensus as to what are macro payments, it differs from country to country and company to company. Smart Card Alliance defines macro payments as payments which amount to more than R87. Remote payments are typically used for bill payment, remittances, charitable, web-site purchases, person-to-person domestic and international and retail POS (Smart Card Alliance, 2011).

#### 3.4.4. Economic purpose

The economic and financial activity of mobile payments can be classified into two types (Flood *et al.*, 2013).

- **Purchases** – funds are paid to the seller in order for the buyer to receive goods or services, which are offered by the seller.
- **Transfers/Remittances** – payments which do not create or extinguish an obligation between the parties involved. These are generally made up of domestic and cross border remittances, which are common in Third World economies.

#### 3.4.5. The funding source

There are generally three sources of funds, which are used in mobile payments (Flood *et al.*, 2013).

- **Credit account from a financial institution** – credit accounts, which are offered by financial institutions such as banks, which enable the holder to buy goods or services on credit from participating merchants around the world. Before the credit account is issued, a risk assessment is performed on the applicant to ensure that they do not exceed a certain limit (Westpac, 2015).
- **Deposit account from a financial institution** – an account with a financial institution such as bank which enables the holder to withdraw or deposit money into the account. The withdrawals are limited to the funds that are available in the account (Business Dictionary, 2015).

- **Funds stored by another entity** – online entities such as PayPal<sup>12</sup> and PayU<sup>13</sup> that enable individuals to open an account with them and the funds are sourced from this account when an online payment is made.

### **3.5. Mobile Payments Methods**

There are several techniques that are used in implementing mobile payments, some of them are described below.

#### **3.5.1. Direct mobile billing**

This scheme is usually operated by MNOs and is an alternative to debit or credit cards payments. It allows mobile storefronts to be integrated with the billing systems of the MNOs. Thus, goods and services, which are purchased from the mobile storefront will be billed directly to the customer account, which is held by the MNO (Howard, 2010).

A customer would visit or launch the mobile storefront from their mobile device, select all the products which they wish to purchase and navigate to the checkout screen. They will be given a choice to indicate their preferred method of payment. If they select direct mobile billing, then their MNO account has to have enough funds to cover the costs before they proceed to complete the checkout process.

#### **3.5.2. PRSMS (premium rate SMS)**

Customers purchase a product or service, which is offered by merchants by sending an SMS that is charged at a premium rate to a specific number; the MNO and the merchant then share the revenue, which is generated from this setup. The mode of payment can either be Mobile Terminated (MT) or Mobile Originated (MO) (Howard, 2010). MT billing refers to a design where the recipient of the message carries the cost of the message while MO billing refers to a design where the user is charged as soon as they send a message to a short code (Howard, 2010).

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<sup>12</sup> <https://www.paypal.com/home>

<sup>13</sup> <https://www.payu.co.za/>

PRSMS have generally been targeted at digital goods, such as games, ringtones and wall papers. The MNO usually manages the payment, and for prepaid customers the amount will be debited from their prepaid airtime while for customers who are on contracts the amount will be included in their monthly invoices. PRSMS has other uses, such as in the entertainment industry where viewers send a PRSMS to a number to vote for their favourite contestant in a television show, such as Big Brother or Idols (Howard, 2010).

### **3.5.3. SMS**

SMS forms the basis of the messaging technology and is used to exchange data between the entities which are involved in the transaction, thus transactions are initiated and concluded by the exchange of SMSs between the networks and the mobile device (Howard, 2010).

A store of value, such as a registered account or mobile wallet is used as a source of funds. It could be credit or debit based or it might use another form of a store value account (SVA), such as PayPal. All mobile payments, which fall under the PRSMS category are excluded from this category (Howard, 2010).

### **3.5.4. Smartphone applications**

These are applications that are designed for the smart phone market. Most organisations have developed their own applications, which their clients can download and install into their smartphones. Most of these applications can either be downloaded from the websites of the vendors or from iStore<sup>14</sup>, Google Play<sup>15</sup> or Blackberry<sup>16</sup> world depending on the operating system of the mobile device.

Most of these applications will let the customer pay for the goods, which they have purchased by means of a credit or debit card. For example: the Debonairs app enables customers to browse a range of pizzas and other products which are available from Debonairs within the app, they can either pay by credit card when they conclude the

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<sup>14</sup> <https://itunes.apple.com/en/genre/ios/id36?mt=8>

<sup>15</sup> <https://play.google.com/store?hl=en>

<sup>16</sup> <https://appworld.blackberry.com/webstore/?countrycode=ZA&lang=en>



transaction on the app or by cash when the pizza is delivered to their place of residence (Debonairs Pizza, 2015). In-app billing refers to the billing method where the OS handles the payment process.

The three major mobile operating systems (OS): Android (Google, 2015), IOS (Apple, 2015) and BlackBerry (BlackBerry, 2015) have this method embedded in their OS. In order to use this functionality users have to register for the service and provide the required credit card details that will be used when a purchase is made.

In-app billing is used only for the purchasing of digital content (Google, 2015). When the app makes use of an in-app billing method for purchases, the OS vendor takes a certain percentage of the total price of the product that has been bought for facilitating the payment.

### **3.5.5. Contactless**

Contactless payments are payments that require no physical connection between the mobile device and the POS terminal, mobile subscribers are able to make payments by waving or tapping their mobile device in front of a reader (Smart Card Alliance, 2011). Some of the technologies, which are used in the implementation of contactless payments are described in section 3.5.5.1 and 3.5.5.2.

#### **3.5.5.1. Near field communication (NFC)**

It is a radio-frequency identification (RFID) technology that is capable of transmitting small amounts of data. It allows two NFC compatible electronic devices, which are few centimetres apart to communicate safely with each other (Bayings, 2005).

Amalgamated Banks of South Africa (ABSA) using the MasterCard's PayPass technology has launched the Potentiate account. Customers who open the account are issued with the MasterCard Titanium card that is equipped with Tap and Go capabilities. The card enables the card holders to tap the card to a reader when making purchases for items that are less than R200 (Fisher-French, 2013).

The MyCiti bus rapid transport system (BRT) in Cape Town in partnership with ABSA have launched a smart card that enables commuters to tap the card into the readers

that are installed on the buses for payment (Fisher-French, 2013). The Rea Vaya BRT system in Johannesburg also issues smart cards to commuters in partnership with ABSA, commuters are able to reload their smart cards from any ABSA ATM (ReaVaya, 2015).

The First National Bank (FNB) mobile banking app has capabilities that enable users of the app who have NFC enabled mobile phones to conduct financial transactions with each other when they are within a certain short distance of each other regardless of whether they have an account with FNB (FNB, 2015).

The adoption of NFC payments in South Africa has been very poor, some of the reasons for the failure can be attributed to the stakeholders not willing to invest huge sums of money into building the necessary infrastructure until the potential number of customers with NFC enabled mobile devices warrants the investment (Ngubeni, 2014).

### **3.5.5.2. Quick response codes (QR code)**

QR codes are two-dimensional bar codes that are capable of storing huge amounts of data and can be read at high speed (Jin Soon, 2008). Figure 3.2 below indicates an image of a QR code.



**Figure 3.2: QR code**

Several mobile payment apps that use QR codes, such as SnapScan, Zapper and FlickPay have recently been introduced to the South African market (Vermeulen,

2014). Merchants and Individuals register with the entity that developed the app and they are issued with a QR code. The QR code serves as unique identifier that is linked to the merchant / individual (Vermeulen, 2014).

Whenever the customer wishes to purchase an item from a merchant, depending on the implementation of the app, the customer uses their mobile phone to scan the QR code of the merchant in order to identify the merchant and then type in the amount that is due on the app to conclude the transaction. Alternatively, the customer can use the app to generate the QR code, which has all the transaction details that the merchant can scan using their point of sale (POS) in order to conclude the transaction (Vermeulen, 2014). The use of QR codes is still in its infancy in South Africa (Bouwer, 2014).

### **3.5.6. Mobile web and wireless application protocol (WAP) billing**

The consumer generally visits a mobile website (mobisite) or installs a mobile storefront that is WAP enabled in order to purchase goods or services (Roebuck, 2012). By visiting the mobisite, the customer establishes a WAP session that enables the vendor to pick up the Mobile Station International Subscriber Directory Number (MSISDN) (Lu, 2006). MSISDN is a unique number that is assigned to a mobile phone sim card (Beal, 2015).

The vendor uses the MSISDN to bill the subscriber's account that is held by the MNO (Lu, 2006). Some other implementations of WAP billing have options that enable the customer to use their debit/credit card for payment, or to use online wallets, such as PayPal, which requires the user to pre-register with such solutions (Roebuck, 2012). Customers are able to purchase rich content such as music, gaming, wall papers and video from WAP-enabled sites.

### **3.5.7. Digital wallets**

Refers to a virtual wallet that has the capability of storing sensitive information such as credit cards and debit cards, the data is stored in a remote server that is secured (Crowe and Tavilla, 2012). Storing data in a remote server is also referred to as storing data in cloud. The mobile phone of the customer has to be equipped with an

application that references the data that is stored in the cloud for payments (Yarbrough and Taylor, 2012).

Digital wallets are implemented in such a way that they are used by merchants or individuals or both. An example of a digital wallet that can be used by both individuals and merchants is Square<sup>17</sup>. If used by merchants as a POS terminal as shown in Figure 3.3 and Figure 3.4, it is primarily made of the following:

- The reader that gets attached to the mobile device that has the necessary software installed to enable it to simulate a POS terminal.
- Customers can use their bank cards for purchases by swiping on the reader that is attached to the mobile device.



**Figure 3.3: Square reader**  
**Source: (Kaiser, 2015)**

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<sup>17</sup> <https://squareup.com>



**Figure 3.4: Tablet with square POS software**  
**Source: (Gorman, 2012)**

Digital wallets can be used as a source of funding when purchasing items from online retailers. The online retailer will source the credit card details from the cloud. Users are also able to send another individual some money by using their cell phone number or other valid form of identification. Digital wallets can also be used by making in-store purchases through NFC-enabled mobile devices.

### **3.5.8. Mobile wallets**

A mobile wallet is an application that is installed on a mobile device for the purpose of managing payments. The sensitive information is stored on the actual mobile device in a secured area of the device known as the element (Crowe and Tavilla, 2012). The primary difference between a mobile wallet and a digital wallet is the way in which sensitive information is stored. Digital wallet stores sensitive information in a cloud, while mobile wallet stores sensitive information in a secured area of the phone (Crowe and Tavilla, 2012).

Mobile wallets are primarily implemented with the NFC technology (Crowe and Tavilla, 2012). The mobile device is equipped with a secured storage called the secured element where the payment credentials are stored. The secured element has very limited interaction with the mobile device thus increasing security (Guess, 2014).

When the mobile device is presented to an NFC-enabled POS reader, the NFC chip will simulate the physical card that has been given to the consumer by the issuer; then the simulated card will be transmitted from the mobile device to the reader for processing (Cox and Sanchez, 2013).

### **3.5.9. Hybrid wallets**

Hybrid wallets are a combination of features that are found in the cloud and mobile wallets (Crowe and Tavilla, 2012). Instead of payment credentials being stored on the mobile device, they are stored on the cloud. When the mobile device is presented to an NFC enabled POS reader, the payments are transmitted from the cloud into the mobile device, which in turn will transmit the payment credentials to the POS through NFC (Cox and Sanchez, 2013). An example of a hybrid wallet is the Google wallet as described below.

**Google Wallet** – the customer has to download the application into their smartphone, then setup the necessary information such as credit cards, debit cards, gift cards, loyalty cards that will be used as source of payment. The payment credentials were stored on the secured area of the mobile device up until 2014 when Google decided to move the payment credential from the secured element of the mobile device to the cloud (Guess, 2014). If the customer has to use the tap and go features, their mobile phone should be NFC enabled.

Once the setup is complete the customers can start transacting by waving or tapping the phone next to a POS terminal that is compatible with Google wallet. The customer will be asked to confirm the payment by entering a pin number, once the pin number has been confirmed the transaction goes through (Chandler, 2012).

**MasterCard MasterPass** – developed by MasterCard, it enables banks and merchants to either use the MasterCard mobile wallet or customize the application to use a wallet of their choice (Clark, 2013). It supports QR codes, NFC, tags and mobile devices used at POS stations. Thus shoppers can swipe their NFC-enabled device or have their mobile device display a QR code that can be scanned by a reader in order to conclude a payment (Clark, 2013).

**Apple Pay** – Apple neither stores the payment credentials on the cloud nor secured element of the mobile device, but it uses the tokenization system. The customer sets up the cards, which they want to register by either capturing the photograph of the cards or manually inputting the card numbers into the application that is installed on the mobile device (Guess, 2014).

Apple then encrypts the data and sends into the payment networks and the card issuer. The payment network then generates a Device Account Number (DAN) which is a unique identifier that is assigned to the mobile device that initiated the setup. The payment network also issues a key that is used to generate a unique token each time a transaction is processed for that specific mobile device (Guess, 2014).

The customer initiates a payment by placing the mobile device next to a POS terminal, the customer will be asked to authenticate the transaction by means of TouchID, a finger print recognition system from Apple. Once authentication has been completed, the DAN and the token that has been generated using a key from the payment network are transmitted from the mobile device to the POS for processing (Guess, 2014).

The adoption of mobile wallets and digital wallets in general has been very poor, this is caused by several factors (Hockenson, 2013, Nathan, 2014):

- Lack of awareness as to where mobile payments are accepted.
- Lack of cooperation between industry players, each player trying to advance its own interests.
- Users are still sceptical about the security of mobile payments.

Figure 3.5 summarises how mobile payments are implemented using the various methods which have been described above.

		SMS	Browser, Apps	Contactless, NFC, Bar Code
<b>Payment size</b>	<b>Macro</b>	Peer-to-Peer remittance Donations Mobile top-up	M-commerce Bill payment	Retail POS
	<b>Micro</b>	Digital content		Coffee shops C-stores Vending Ticketing Parking Transit
		<b>Remote</b>		<b>Proximity</b>
<b>Payment Location</b>				

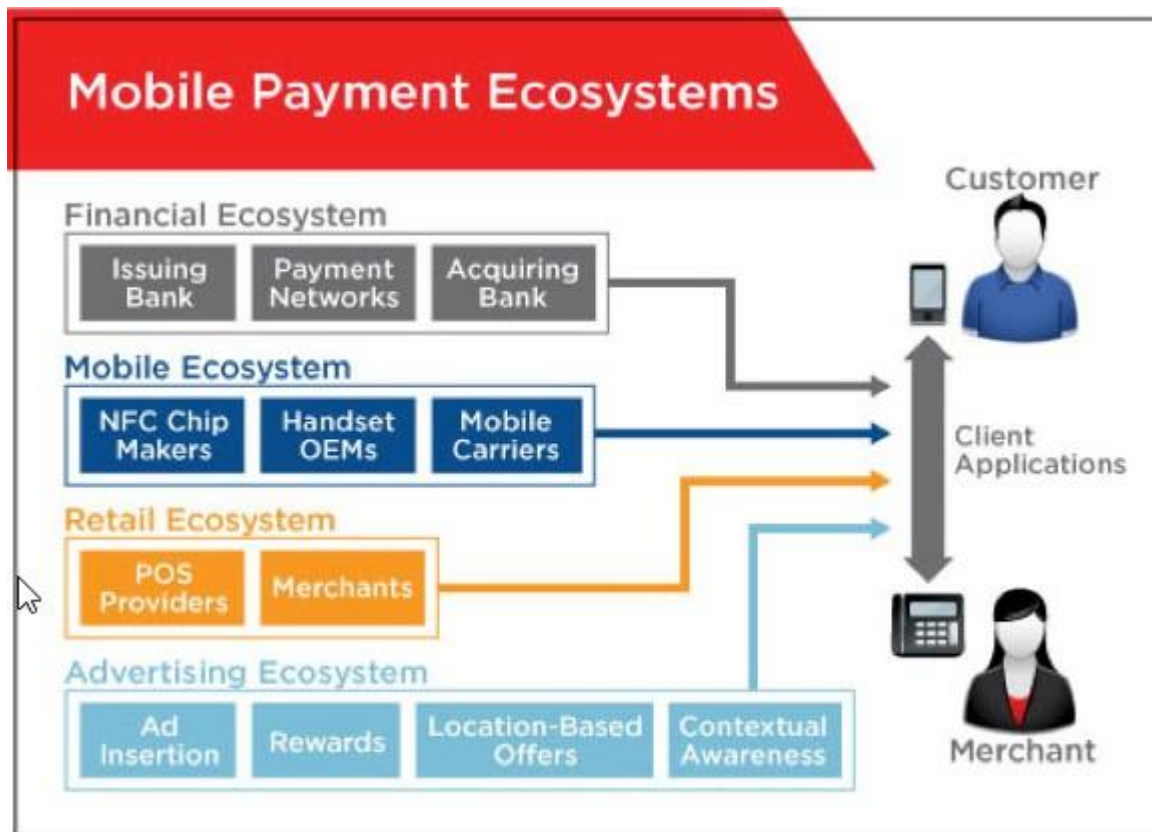
**Figure 3.5: Summary of payment methods**  
**Source: (Smart Card Alliance, 2011)**

### 3.6. Mobile Payments Value Chain

It is important to identify all the major players who are involved in the processing of a mobile payment transaction when a purchase is made. By identifying all the players and the function they perform, it becomes possible to identify areas that need improvement in order to enhance the entire mobile payment ecosystem. Improvement in the ecosystem may relieve the challenges which individuals are currently experiencing when they attempt to make a mobile payment.

For the purposes of this study, the definition of value chain will be adopted from Kaplinsky and Morris (2001). They define it as “the description of the full range of activities which are required to bring a product or service from conception through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use.” To better understand the value chain of the mobile payment ecosystem, the list of the mobile payment ecosystems is shown in Figure 3.6.





**Figure 3.6: Mobile payment ecosystems**

Source: (Cushing, 2015)

The financial ecosystem is composed of the following:

- **Issuing bank** – refers to financial institutions, such as banks that issue credit or debit cards to clients (First Data, 2010). In an effort to generate new revenue streams and to become more efficient, a number of banks have released mobile apps that enable their clients to do banking while on the go. The benefits that banks experience from mobile payments are the following (BearingPoint, 2012):
  - Mobile payments help banks to reduce their operating costs and to streamline their operations.
  - Transactions that involve cash are far more costly for the banks as compared to electronic transactions; as such mobile payments would help the banks to reduce costs that are associated with handling cash.
  - Mobile payments afford the banks an opportunity to offer banking services to those communities which do not have or have very limited access to banking services (e.g. township residents).

- **Payment networks** – refers to institutions such as Visa, American Express and MasterCard that regulate and facilitate card payments (First Data, 2010). Payment networks are very fearful that mobile payments initiatives such as “Google Wallet” and Softcard will drive them out of business; thus as a precautionary measure to defend themselves against loss of business they have chosen to invest in mobile payments by using their expertise, which they have acquired over the years (BearingPoint, 2012). MasterCard has the MasterCard PayPass while Visa has the Visa Checkout as products that enable their clients to make payments from a mobile device.
- **Acquiring bank** – refers to financial institutions that handle the processing of card payments on behalf of merchants. They accept debit or credit card payments on behalf of the merchant (First Data, 2010).

The mobile ecosystem is composed of the following:

- **Near Field Communication (NFC) chip makers** – hardware manufacturers such as Samsung, Texas Instruments and NXP Semiconductors that manufacture the NFC chips.
- **Handset Original Equipment Manufacturers (OEM)** – handset manufacturers such as Sony, Huawei, Samsung and Apple that distribute their mobile devices to MNOs.
- **Mobile Network Operators (MNOs)** – they distribute the mobile devices to the public (BearingPoint, 2012).

Retail ecosystem is composed of the following:

- **POS Providers** - they supply the POS terminals that enable the merchants to conduct mobile/card payments.
- **Merchants** - merchants are always interested in increasing their revenue from other channels which they can tap into. Remote payments may provide a cost effective way of generating additional revenue if their usage becomes very popular as they are less costly to run compared to other channels (BearingPoint, 2012).

Advertising ecosystem is composed of the following:

- **Ad Insertion** – mobile advertising uses techniques such as banners, text links, text messaging, multimedia messaging, mobile video and TV and in-app advertising (Mobile marketing association, 2011).
- **Rewards** – some advertisers are rewarding their target audience with coupons, tickets or gift cards for engaging with their advertisement on the mobile apps (Heine, 2013).
- **Location-based offers** – refers to advertising that is targeted at the audience based on their location (Reardon, 2013).
- **Contextual awareness** – mobile systems that are able to adapt their operations based on their surroundings (Ait-Ali-Slimane *et al.*, 2011).

The current mobile payment ecosystem as depicted in Figure 3.6 misses the importance of aggregators. Aggregators are entities that process payments on behalf of online merchants, aggregators enable the online merchants to receive bank and credit card transfers without being forced to register with a card association or a bank. PayPal is one of the most well-known aggregators (BearingPoint, 2012).

### 3.7. Mobile Payments Business Models

Different business environments require different business strategies. Over the years since the inception of mobile payments there have been several mobile payments business models that have been developed. Some of them are the following:

- Operator centric model
- Bank centric model
- Collaboration model
- Peer-to-peer model

The service providers have to choose the business model according to their client base and their business objectives. If the aim of the service provider is to provide financial services to the poor and the unbanked then it is no use to offer a sophisticated

app that requires the use of a smart phone as most poor people generally do not have access to smart phones and may struggle with the use of an app.

If the service provider targets the middle to high income group, then the service that they develop is not only restricted to feature phones, but it can be enhanced to be feature rich by developing an app that will run on smart phones. The service which is being offered also dictates the business model that is followed; certain features of the service can only be offered by specific entities .e.g. banking services.

Each model has its strengths and weaknesses, the section that follows gives a brief overview of each model followed by its value chain and the stakeholders that are involved that each model.

### 3.7.1. Operator-centric model

The MNO acts independently by providing the hardware and software that is required to process mobile payments (Yakub et al., 2013). The billing mechanism works in two ways: the bill can either be debited from the customer’s pre-paid account or they can be integrated into the customer’s post-paid account (Capgemini Consulting, 2011), which they generally receive on a monthly basis, Table 3.6 indicates how operator centric model works.

**Table 3.6: Operator-centric model value chain**

<b>Deploy Mobile Payment Application</b>	<b>Order Product</b>	<b>Perform Payment</b>	<b>Manage Account</b>	<b>Manage Marketing</b>
Mobile operator develops and deploys applications	Customer may order operator-managed content	Contactless payment option or peer to peer option	Operators bills customers as part of wireless bill or customer prepays	Operator may collaborate with retailers to develop mobile marketing applications

Applications tied to device			Operator pays merchant through existing A/P process	(e.g., smart posters, coupons, loyalty programs)
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**Source: (Smart Card Alliance, 2008)**

According to Chaix and Torre (2012), this model is suitable for environments where the financial infrastructure is underdeveloped. M-Pesa in Kenya is an example of an operator centric model. Its success is attributed to the dominant position that is held by the MNO Safaricom, a subsidiary of Vodafone. Another factor that enabled M-Pesa to succeed is the lack of the banking infrastructure in Kenya (British Broadcasting Corporation, 2012).

Prior to February 2015, the South African Reserve Bank (SARB) did not allow money transfer operators (MTOs) to take deposits without a banking license (Birch, 2015), as a result there were no operator-centric models in South Africa. MNOs were forced to collaborate with banks if they wanted to take deposits, this requirement led to Vodacom partnering with Nedbank in 2010 to launch M-Pesa. This partnership came to an end in 2014, and Nedbank was replaced with Bidvest bank (Goldstuck, 2014).

As from March 2015, SARB has introduced a new type of licence known as the category three license that enables MTOs to operate without having to partner with a bank (Birch, 2015).

### **3.7.2. Bank-centric model**

The bank supplies m-payments software or hardware to customers as well as equipping the merchants with the necessary POS terminals to process the payments. The role of the MNO in this model is simply that of a carrier (Capgemini Consulting, 2011). Table 3.7 indicates how the Bank-centric model operates.

**Table 3.7: Bank-centric model**

<b>Deploy Mobile Payment Application</b>	<b>Order Product</b>	<b>Perform Payment</b>	<b>Manage Account</b>	<b>Manage Marketing</b>
Bank deploys mobile payment applications to consumers  Bank payment processor ensures that POS terminals have contactless capability	Bank can potentially offer value-added content (e.g., phone top-ups)	Contactless proximity payment using POS  Bank payment processor manages payments	Status quo  Payments are reflected in the consumers and merchants existing accounts.	Bank may collaborate with retailers to develop mobile marketing applications (e.g., smart posters, coupons, loyalty)

**Source: (Smart Card Alliance, 2008)**

All the five big South African banks have mobile applications that their customers can download and install into their mobile devices. Another option which users have is to access the banks' mobile sites, which are optimised for mobile devices. According to Arde (2013), the usage of mobile banking apps across all the five big banks in South Africa is still very small. Table 3.8 below summarises the functionality, which is offered by the five South African banks.

**Table 3.8: Mobile-banking functions**

	<b>ABSA</b>	<b>FNB</b>	<b>Nedbank</b>	<b>Standard Bank</b>	<b>Capitec</b>
Prepaid airtime	Yes	Yes	Yes	Yes	Yes
Balance enquiry	Yes	Yes	Yes	Yes	Yes
Mobile money transfer	Yes	Yes	Yes	Yes	No

	<b>ABSA</b>	<b>FNB</b>	<b>Nedbank</b>	<b>Standard Bank</b>	<b>Capitec</b>
Traffic fines	Yes	Yes	Yes	Yes	No
Electricity	Yes	Yes	Yes	Yes	Yes
Bill payment	Yes	Yes	Yes	Yes	Yes
Beneficiary Payment	Yes	Yes	Yes	Yes	Yes
Notification by SMS	Yes	Yes	Yes	Yes	Yes
Share Trading	No	No	Yes	No	No
Forex Trading	No	No	Yes	No	No
Geo Payments	No	Yes	No	No	No
Has mobile device that accepts payments	Yes	No	Yes	No	No
Cross border mobile money transfer	Yes	Yes	No	No	No

### **3.7.3. Collaboration model**

Several stakeholders such as banks, MNOs and other interested parties can collaborate on how to best deliver m-payments to customers (Capgemini Consulting, 2011). Table 3.9 Indicates how the collaboration model operates.

**Table 3.9: Collaboration model**

<b>Deploy Mobile Payment Application</b>	<b>Order Product</b>	<b>Perform Payment</b>	<b>Manage Account</b>	<b>Manage Marketing</b>
Likely deployed by independent third party trusted service manager.  Maybe deployed by operators	Service provider to purchase products (eBay)	Contactless or peer-to-peer option	Customers and merchants continue to manage their credit/accounts at their respective financial institutions.	Bank and mobile operators collaborate with retailers to develop marketing applications.

**Source: (Smart Card Alliance, 2008)**

The subsections below describe some of the practical examples of the collaboration model in South Africa.

### **3.7.3.1. Vodacom M-Pesa in partnership with Nedbank**

Vodacom M-Pesa enables individuals to send and receive money via a mobile phone. The sender has to have a Vodacom sim card that is registered for M-Pesa before they can start sending money to the recipients. The recipient of the money was initially not required to have an account with Nedbank or Vodacom (Nedbank, 2015). They could withdraw the money at any Nedbank branch, Nedbank ATM or Vodacom M-Pesa outlets (Nedbank, 2015). This partnership has since come to an end and Vodacom has now partnered with BidVest Bank (McLeod, 2015).

Vodacom South Africa and Nedbank were using the collaboration model when they launched the M-Pesa service for the first time in 2010 as a carbon copy of the service



in Kenya (Goldstuck, 2014). The conditions that enabled M-Pesa in Kenya to sign around 13 million users and made it so successful was: a dominant MNO and Kenya's poor financial infrastructure. In South Africa this was not the case and thus the uptake of M-Pesa has been very disappointing, only 1 million users signed for the service (Goldstuck, 2014).

### **3.7.3.2. Vodacom M-PESA in partnership with Bidvest Bank and Visa**

M-Pesa in South Africa was revamped in 2014 as it initially failed to capture the market. Nedbank has been replaced with Bidvest bank as the banking partner (McLeod, 2015). Vodacom has negotiated with 8000 agents in order to increase their footprint in both urban and rural areas. Their partnership with both Visa and Bidvest bank enables them to issue out a debit card that will give their clients access to 27000 ATMs and 240 000 merchants (McLeod, 2014).

### **3.7.3.3. WIZZIT in partnership with the Bank of Athens**

WIZZIT is a branchless bank that is targeted at the lower end of the market. It was launched in 2004 as a division of the South African Bank of Athens (WIZZIT, 2012). Transactions are mainly conducted by means of a mobile phone or a maestro debit card that is issued when the customer is registered. The following mobile functionalities are available from WIZZIT: prepaid airtime, bill payment, balance enquiry, and money transfer (WIZZIT, 2012).

The maestro card works like any other debit card which is issued by a bank. It can be used for payments at POS terminals (WIZZIT, 2012). WIZZIT has also partnered with ABSA and the South African Post Office (SAPO) (Changemakers, 2005) to enable clients to deposit money at their branches and to use their ATMs to withdraw funds. The marketing for WIZZIT is done by agents who are called WizzKids. They are unemployed youth who are found in the poor communities where WIZZIT intends to capture the market. They are responsible for recruiting and training the community on how to use WIZZIT (WIZZIT, 2012).

### **3.7.3.4. Standard Bank in partnership with MTN**

MTN and Standard Bank were in a partnership, which was called MTN Banking that offered a product called MTN MobileMoney. The partnership came to an end in 2011 and the whole MTN Banking entity was acquired by Standard Bank (Standard Bank,

2015). MTN MobileMoney is a sim-based application that enables customers to perform the following actions on the account: person-to-person cash transfer, balance enquiry, money transfer, purchase airtime, bill payment, and deposit cash into the account from participating merchants.

The mobile phone number acts as the account number, the customers are issued with a debit card that is linked to their cell phone number (Standard Bank, 2015). The debit card enables them to withdraw money from an ATM and transact with the card at POS terminals (Standard Bank, 2015).

### **3.7.3.5. Standard Bank in partnership with merchants**

Instant Money is a person-to-person money transfer platform, which was developed by Standard Bank. Users are able to buy vouchers from participating merchants or through the Standard Bank internet banking website or the instant money website (Instant Money, 2015). When the user has bought the voucher, they are able to upload it into the recipient's mobile phone number with a secret pin number of their choice. Using the pin number that was chosen by the sender the recipient is able to cash out the funds from participating merchants (Instant Money, 2015), such as Spar Retail stores.

### **3.7.3.6. FNB in partnership with Mxit**

Mxit was an instant messaging application that was developed by a Stellenbosch-based company called Mxit Lifestyle (Pty) Ltd. It was once the largest social network on the African continent with over 27 million users (Keegan, 2011), it ceased to exist in October 2015 due to competition from WhatsApp and Facebook (MyBroadBand, 2015). Mxit had an online currency called Mxit Moola that enabled Mxit users to transact on the Mxit platform (Gadget, 2012), One South African Rand was equivalent to one Moola (Setzer, 2014).

Mxit users were able to purchase products, such as wallpapers, games, music, skins as well as joining chat zones using Moola. FNB integrated its eWallet into the Mxit platform, thus enabling eWallet users to buy Mxit Moola at a discounted rate of 35% (Gadget, 2012).

### **3.7.3.7. Standard Bank in partnership with Mxit**

Standard Bank has also partnered with Mxit. Standard Bank instant money functionality has been integrated into the Mxit platform, thus enabling Mxit users to send money to any recipient with a mobile phone (Standard Bank, 2015). Mxit users are able to deposit cash, withdraw cash, purchase electricity, purchase airtime by moving money between their Mxit Moola account and Instant Money account (Standard Bank, 2015).

### **3.7.3.8. MTN in partnership with Pick n Pay, Boxer, South African Bank of Athens and Visa**

The partnership was launched in June 2014 between Pick n Pay, its subsidiary Boxer, MTN, Visa and the South African bank of Athens (MTN, 2014a). Customers are able to send money, receive money, purchase goods and services at Pick n Pay and Boxer stores nationwide (MTN, 2014a). Using the Mobile Money Visa card they are able to make purchases at any POS terminal that accepts the Visa card or withdraw money from an ATM. The partnership works in the following way (MTN, 2014a):

- Users are required to open an account at any of Pick n Pay or Boxer stores; they are also required to purchase the Mobile Money Visa card.
- When the registration process is complete, customers create a password which gives them access to their virtual wallet.
- Every time when they want to deposit money into their virtual accounts, they generate a unique code from the application that they have to give to the cashier together with the cash at the till to complete the reloading of the account; they can also use EFT to reload their account.
- For payment processing, they also have to generate a unique code from the application that they have to give to the cashier, once the code has been confirmed funds are deducted from their accounts.

### **3.7.4. Peer-to-Peer model**

There is a general disagreement as to what constitutes a peer-to-peer payment (Windh, 2011). For the purposes of this research study; peer-to-peer payment is defined as a payment that is made by an individual to another individual who is usually

a friend or family member, or to a small enterprise (Bradford and Keeton, 2012). In this model, the mobile payment service provider does not collaborate with either the MNOs or financial institutions (Yakub *et al.*, 2013). Table 3.10 indicates how the peer-to-peer model operates.

**Table 3.10: Peer-to-peer model**

<b>Deploy Mobile Payment Application</b>	<b>Order Product</b>	<b>Perform Payment</b>	<b>Manage Account</b>	<b>Manage Marketing</b>
Peer-to-peer service provider deploys mobile payment applications to consumers and POS terminals to merchant.	Peer-to-peer service provider portal may provide capability to purchase products	Contactless or peer-to-peer  Customer sends secure payment request to peer-to-peer provider  Payment transferred to merchant's account.	Consumers and merchants must set up accounts with peer-to-peer provider.  Funds transferred to merchant bank account	Peer-to-peer service provider may collaborate with retailers to develop service discovery marketing applications.

**Source : (Smart Card Alliance, 2008)**

Some of the relevant examples of this model are PayPal, Google Wallet, Facebook, Snapcash, Square Cash and Venmo. The attributes of each service are shown in Figure 3.7.

Company	Fees	Delivery	Limits	Key Facts
Facebook	None	Transfer occurs immediately and money is credited to your bank account in 1-3 business days	Service available for Visa and Mastercard debit cards only; can only transfer money to Facebook friends; must have a Facebook account	745 million active daily mobile users
Google Wallet	No fees for transfers from bank accounts, debit cards or Google Wallet account; 2.9% transfer fee from credit cards	Money is received almost instantly when users send from Google Wallet balance or from a debit card; sending from a bank account can take up to several days	Must have a Google Wallet or a Gmail account to send and receive money; \$10,000 limit per transaction and \$50,000 limit over a 5 day period	Can send money as an attachment through Gmail or through the Google Wallet app.
Paypal	2.9% fee + 30 cents for sending from a credit or debit card	Transfers to Paypal accounts happen immediately; transferring money to a bank account can take up to several days	\$10,000 limit per transaction	Ability to send mobile transfers internationally; owns Venmo, \$180bn global dollars process by Paypal in 2013
Snapcash	None	Delivers to recipient's bank account in 1 business day	Same limits that apply to Square Cash	Operated by Squarecash; 50% of users under the age of 18
Square Cash	None	Delivers to recipient's bank account in 1 business day	Does not currently process payments with credit cards; only serves Visa and Mastercard debit cards; payments limited to \$250 per week until user verifies identity, limit is \$2,500 per week thereafter	No separate account required; also operates Snapcash
Venmo	No fees for transfers from bank accounts, debit cards or Venmo account; 3 transfer fee from credit cards and non-major debit cards	Transfers to Venmo accounts are instant, transfers to bank accounts take 1 business day	Transfers deposited to Venmo account, then have to be withdrawn; transfers limited to \$300 per week until user verifies identity	Owned by Paypal; includes social feed

**Figure 3.7: Peer-to-Peer payments**

Source: (Webber, 2015)

### **3.8. Mobile Payment Solutions: Success Story in Africa**

This section describes a MPS that has been successful on the African continent.

#### **3.8.1. M-Pesa (Kenya)**

M-Pesa is a money transfer and micro financing service that is based on the SMS technology; M stands for mobile and Pesa stands for money. It was developed by Vodafone for its Kenyan subsidiary Safaricom and officially launched into the Kenyan market in March 2007 (Ignacio *et al.*, 2010). At the beginning of 2010, M-Pesa had 9 million registered customers and 16900 outlets, processed transactions worth around US \$650 million per month and generated revenue of US \$7 million (Mas *et al.*, 2010).

Customers are required to register for the service before they can use it. There are several M-Pesa outlets which are spread throughout Kenya where customers can register (Ignacio *et al.*, 2010). When a customer is registered, they are assigned an account that is linked to their cellphone number. Once the account has been opened, customers can start transacting by visiting the M-Pesa outlets for deposits and withdrawals.

The outlets are also responsible for maintaining customer relationships. When accounts of the customers have positive balances, they can use their mobile phones for money transfers, purchase airtime and paying bills (Ignacio *et al.*, 2010). Some of its achievement as of January 2010 (Ignacio *et al.*, 2010):

- Half of its outlets were located outside urban areas.
- Deposits and withdrawals reached US\$650 million.
- 27 companies were using it to distribute payments to their stakeholders.
- 75 companies were using it to collect payments from their clients.
- Family Bank and Kenya Commercial Bank customers were using it to deposit and withdraw funds from their bank accounts.

### **3.9. Summary**

The chapter started by describing how mobile telephony has evolved over time since its inception, from 1G to 4G. Various methods which are used to implement mobile payments, such as PRSMS, SMS, smartphone applications, NFC, QR Codes, WAP and mobile wallets were also discussed.

The business models which are adopted by different organisations that are implementing mobile payments were examined in order to have a comprehensive understanding of the current landscape of mobile payments in South Africa. Lastly mobile payments which have been successful on the African continent were examined. The next chapter delves into the theories of how communities adopt or reject a new technology when it is introduced for the first time.

# Chapter 4: Technology Adoption Models

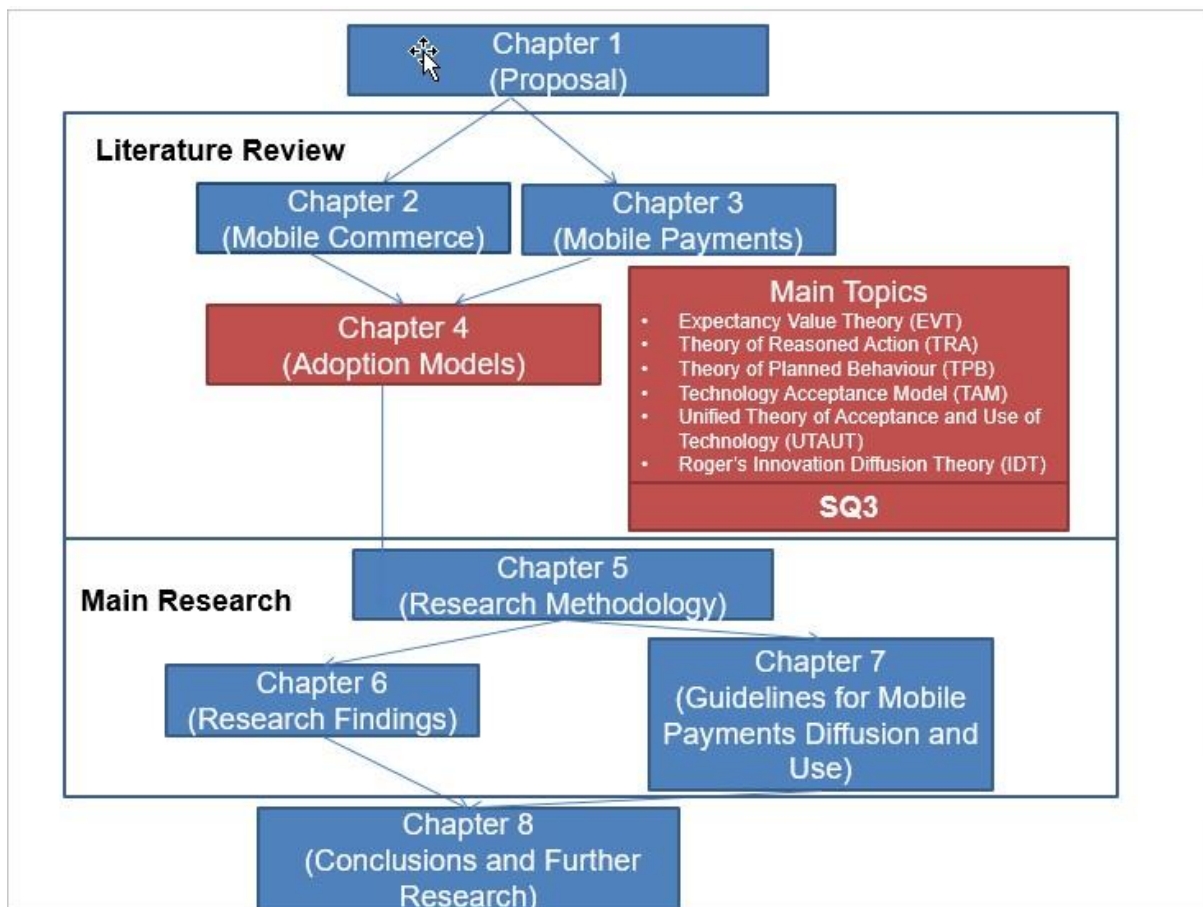


Figure 4.1: Chapter 4 Navigation map

## 4.1. Introduction

The aim of this chapter is to discuss theories and models that are widely used to describe how users adopt and use new technology. These theories and models are meant to explain the adoption of new technologies by the potential users as introduced for the first time. There are a number of factors that might lead the users to either accept or reject the new technology, thus it is essential in this study to also understand various theories and models that could explain the diffusion and use of mobile payment solutions, especially by the township residents.

The chapter is structured as indicated by Figure 4.1: Section 4.2 introduces the six (6) theories or models that are used to explain the adoption of a new idea or innovation by communities. Section 4.3 – 4.8 describe each theory in detail. In concluding this



chapter, an adoption model found to be relevant for understanding the diffusion and use of mobile payment solutions is chosen.

## **4.2. Technology Adoption Theories**

There are several models and theories which have been developed in order to predict technology adoption by the user populations such as expectancy value theory (EVT), theory of reasoned action (TRA) (Ajzen and Fishbein, 1980a), theory of planned behavior (TPB) (Ajzen, 1985), technology acceptance model (TAM) (Davis, 1989), Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh *et al.*, 2003), and innovation diffusion theory (IDT) (Rogers, 2003).

## **4.3. Expectancy Value Theory (EVT)**

EVT was suggested by Martin Fishbein in the 1970's (Mazis *et al.*, 1975). The aim of the expectancy value theory is to establish the factors that motivate individuals to behave in a certain way (Bradley, 2009). If we can establish those factors that motivate the behavior then we can predict with confidence how an individual will behave in the future based on those factors (Bradley, 2009).

Expectancy is defined as “the measurement of the likelihood that positive or negative outcomes will be associated with or follow from a particular act” (Mazis *et al.*, 1975). The strength of the will to act is determined by the value that is assigned to the outcome and the strength of the expectancy (Mazis *et al.*, 1975).

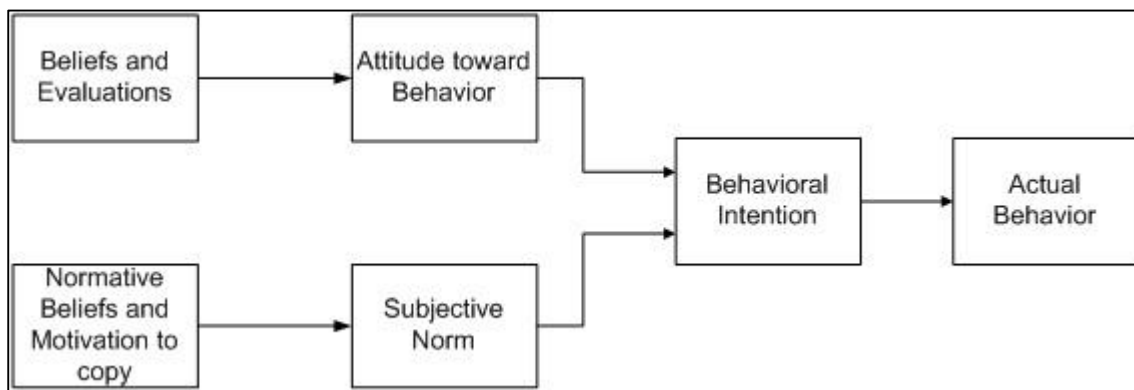
The weakness of EVT is that it is very difficult to relate the outcome of a particular task to the effort that was used to achieve that outcome (Ferris *et al.*, 1978). Individuals have different abilities as a result two individuals who have the same level of motivation might achieve different results. As a result of this weakness, this theory is not adopted for this study.

## **4.4. Theory of Reasoned Action (TRA)**

TRA improves on EVT (Bradley, 2009), TRA states that the behaviour that is undertaken by an individual is a result of the individual's behavioral intention (BI) to undertake the behaviour (Davis *et al.*, 1989). TRA argues that the attitude (A) of the

individual towards a behaviour is determined by their evaluations and beliefs. The attitude then determines the behavioral intentions. Attitude refers to the positive or negative assessment of the behaviour that is being investigated (Doll and Ajzen, 1992).

Subjective norm refers to the influence, which other individuals will have on the acceptance decision. Beliefs refer to the view that is undertaken by the individual that undertaking a certain behavior will lead to consequences (Davis *et al.*, 1989). Figure 4.2 indicates the process that is undertaken by an individual before undertaking certain behaviour.



**Figure 4.2: Theory of reasoned action**

TRA has the following limitations:

- It is suitable for predicting behaviours that are under volitional control (Montano and Kapspryk, 2002, Ajzen, 1991).
- The theory is suitable for assessing individuals who are considered “rational actors” (Fishbein and Ajzen, 1975).
- Is not suitable for cross sectional studies (Ajzen and Fishbein, 1980b, Montano and Kapspryk, 2002).
- Poorly selected participants of focus groups may result in bias (Montano and Kapspryk, 2002).

As a result of these limitations, TRA is not adopted for this study.

## 4.5. Theory of Planned Behaviour (TPB)

TPB was developed as an extension to TRA in order to address some of the limitations of TRA (Ajzen, 1991). TPB states that the most important and proximate predictor of a specific behaviour is the person's intentions; which refers to a person's motivation to undertake a certain task (Ajzen, 2002).

According to Ajzen (2002), there are three factors that determine the person's intention; namely attitudes, perceived behavioural control (PBC) and subjective norms. Ajzen (2002) further states that the above mentioned factors are preceded by other salient factors; namely salient normative belief, salient behavioral belief and salient control belief. Salient beliefs also known as accessible beliefs, are beliefs which individuals think about first when open-ended questions are posed to them (Higgins, 1996, Ajzen and Fishbein, 2000).

PBC was added to TRA to address those behaviours, which were not under volitional control. It refers to how people evaluate their own ability to undertake a certain behavior (Sheeran *et al.*, 2001, Ajzen, 2002). The TPB model proposes the following:

- When the individuals subjective norms and attitudes are positive and continue to be positive, then the intention to undertake a certain behaviour increases (Ajzen, 2002).
- A behaviour is most probable to be executed with a greater PBC by an individual when the intention remains the same (Armitage and Christian, 2003).

TPB is represented by the Figure 4.3 which is a modified diagram of TRA.

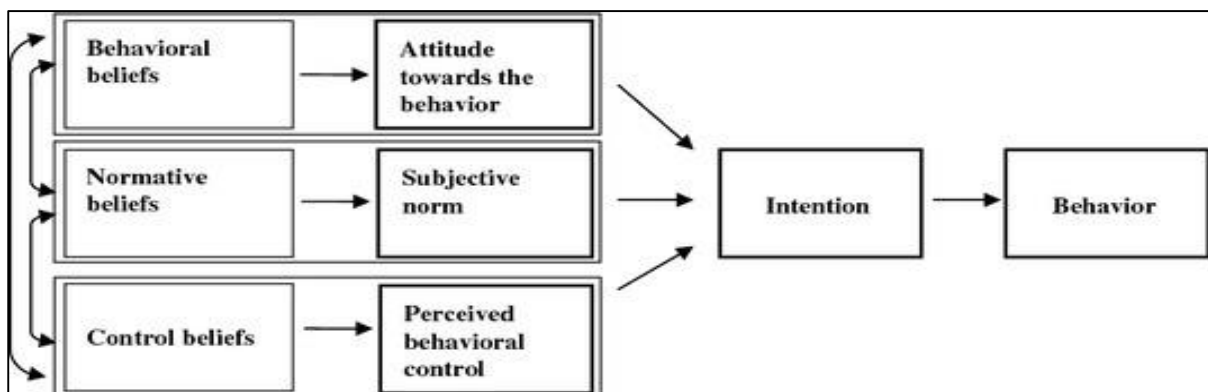


Figure 4.3: Theory of planned behaviour

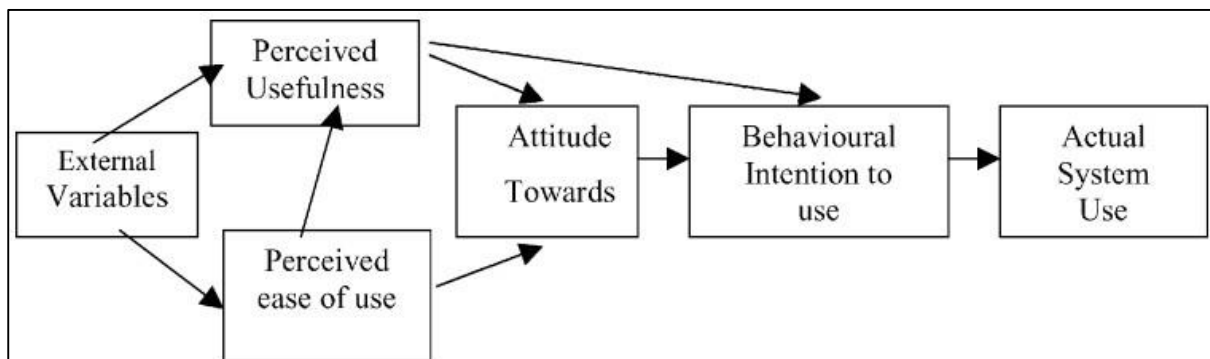
Limitations of TPB are as follows (Boston University School of Public Health, 2013):

- Personality attributes and demographics are not considered in the model.
- It is very difficult to measure PCB.
- Unconscious motives are ignored by the model.
- If the timespan between the behavioural intent and behaviour becomes too long, the less likely that the behaviour will occur.

As a result of these limitations, TRB is not adopted for this study.

#### 4.6. Technology Acceptance Model (TAM)

TAM was developed by Davis in 1986 (Davis Jr, 1986) using TRA as the basis of the model in order to predict if users will accept or reject an information system. According to Davis (1989) and (Davis *et al.*, 1989), the user's decision to accept or reject an information system is influenced by the following variables: perceived usefulness, perceived ease of use, behavioral intentions, attitude and other external variables as illustrated in Figure 4.4.



**Figure 4.4: Technology acceptance model**

The limitations of TAM (Legris *et al.*, 2003) are as follows:

- Studies that were done to validate TAM involved students in a non-business environment.
- Studies were done on non-business applications, which do not reflect the true business environment where the information system would be deployed.

- Instead of the researcher measuring usage of the new information system, the users themselves reported usage, thus the true usage of the new information system is not captured.
- The organisational dynamics that the new information is deployed on influences the adoption of the system.

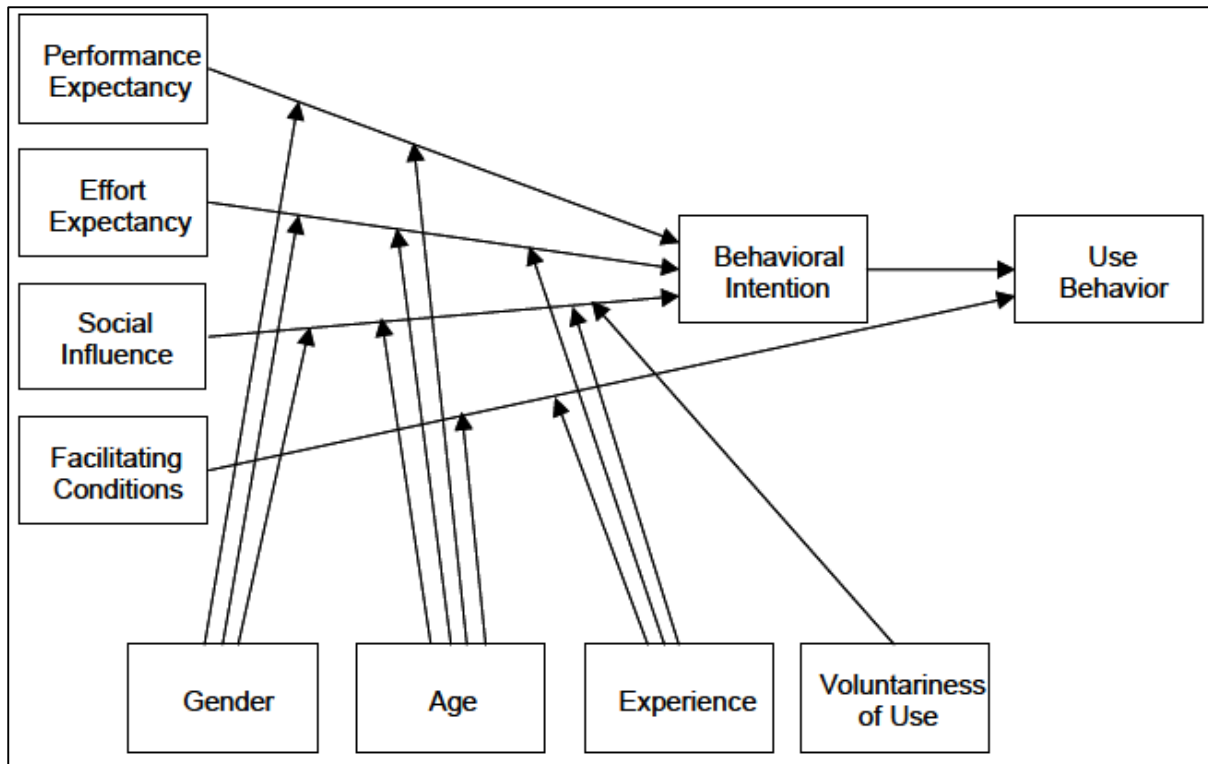
As a result of these limitations, TAM is not adopted for this study.

#### **4.7. Unified Theory of Acceptance and Use of Technology (UTAUT)**

UTAUT is a model that was developed by Venkatesh *et al.*, (2003) and its aim is to describe how technology is accepted when it is introduced into an environment. It is based on theories such as TRA, ID, TRB, TAM, the Motivational Model (MM), Socio-Cognitive Theory (SCT), the model of Personal Computer Utilization (MPCU) (Venkatesh *et al.*, 2003). UTAUT was developed to consolidate the various fragmented technology acceptance models (Venkatesh *et al.*, 2003). It emphasises Behavioural Intention (BI) as an important construct to predict the adoption and use of technology. UTAUT is composed of four constructs as shown in Figure 4.5 (Venkatesh *et al.*, 2003), and these are described as follows:

- **Performance expectancy** – The extent to which individuals believe that the use of technology will result in improved performance.
- **Effort expectancy** – how easy it is to use the technology.
- **Social factors** – refers to the degree that individuals' view that important stakeholders believe that they should use the technology.
- **Facilitating conditions** – refers to the individual's view that the technical and organisational infrastructure that enables the individual to use the new technology is present within the organisation.

The model has four other moderating variables namely: gender, age, education and voluntariness of use (Venkatesh *et al.*, 2003).



**Figure 4.5: UTAUT model**

According to the UTAUT model; performance expectancy, effort expectancy and social factors influence BI which together with facilitating conditions influence the use of technology (Venkatesh *et al.*, 2003). The arrows from the moderating variables shows how those four variables interact with the four constructs to influence BI and use behavior (Venkatesh *et al.*, 2003).

The limitations of the UTAUT model (Al-Gahtani *et al.*, 2007) are summarised follows:

- It does not take into consideration the culture of the community where it is being applied, as a result of this limitation; UTAUT is not adopted for this study.

#### **4.8. Roger’s Innovation Diffusion Theory (IDT)**

Diffusion is defined by Rogers (2003) as “the process by which an innovation is communicated through certain channels over time among members of a social system”. Innovation in this case refers to a new concept or artefact that is introduced to individuals. In this study; the use of mobile payments is regarded as an innovation. A channel refers to the medium, which is used to transmit information from one individual to the next (Rogers, 2003). Social system refers to the relationships that

exist between individuals, their characteristics, roles and status within communities (Rogers, 2003).

#### **4.8.1. Innovation decision process**

The innovation decision process is defined by Roger (2003) as the steps which an individual, community or an organization follow in order to decide if it is worthwhile to adopt an innovation. The aim of the innovation decision process is to identify the reasons behind the adoption, rejection or abandonment of innovations. In this study, the focus is on the decision process taken by an individual or group of individuals in the townships when deciding to adopt or reject a mobile payment solution. There are six (6) stages in the diffusion of innovation (Dearing *et al.*, 1996). These are listed below and their relevance to the study is explained:

- **Knowledge** – refers to whether the organization, communities or individuals are aware of the existence of the innovation (Dearing *et al.*, 1996).
- **Persuasion** – at this stage the individual, communities or organization are fully aware of the innovation; they seek out relevant information in order to decide whether to adopt or not (Dearing *et al.*, 1996).
- **Decision** – a decision is made on whether to adopt the innovation based on the information which has been gathered such as cost and benefits (Dearing *et al.*, 1996).
- **Implementation** – the innovation is absorbed and used on a regular basis by the individual, community or organization. The performance of the innovation is also measured to check if it meets the desired results (Dearing *et al.*, 1996).
- **Confirmation** – a final decision is made on whether to adopt the innovation or not (Dearing *et al.*, 1996).
- **Discontinuance** – the use of the innovation comes to an end; this might be caused by several reasons such as obsolescence (Dearing *et al.*, 1996).

#### **4.8.2. General adoption factors**

According to Rogers (2003), there are five factors that determine if the innovation will be adopted. These are as follows:

- **Relative advantage** – refers to the benefits that the innovation will introduce as compared to the current practices (Rogers, 2003). Townships are hotspots for petty crime; if township residents travel with less money in their wallets then their exposure to huge losses is reduced. According to Mallat (2007), cost is also a major factor that determines if individuals will adopt mobile banking, thus for township residents to adopt mobile payments, the cost of conducting those transactions should be affordable.

The speed at which those transactions are processed should at least match or exceed the time which customers are used to when paying by means of physical cash i.e. a Spaza shop that uses a card reader that is plugged into the head phones jack of mobile phone should at least match or exceed the POS terminal that accepts cash otherwise customers will be frustrated with the long waiting period. Some Spaza shops do not even use a POS terminal; the cashier relies on a calculator to process the transaction.

- **Compatibility** - refers to the extent to which an innovation is in line with the belief system of the individual (Rogers, 2003). With township residents being mostly familiar with paying by bank cards and cash, mobile payments are viewed as a new phenomenon. There have been scams that have made headline news (Kharif, 2012), and this has caused some fear in most people who are not familiar with how the whole payment ecosystem works. Township residents are no exception, and they view mobile payments with caution.
- **Complexity** – refers to the level of difficulty, which is experienced by individuals when attempting to understand and use the innovation (Rogers, 2003).
- **Trialability** – refers to the extent that an innovation can be tested without adopting it (Rogers, 2003). Township residents should be able to experiment with mobile payment without any negative consequences if they choose not to adopt it. The functionality to reverse or cancel a transaction should be made available at any point during the process of transacting.
- **Observability** – refers to the degree of visibility of the use of the innovation to the surroundings (Rogers, 2003). The more the township residents observe their fellow residents using mobile payment, the more likely they are to adopt it themselves. WIZZIT (2012) adopted a similar approach where they employ a



team of local unemployed youth to act as agents to market the product to the locals as well as handling queries and supporting the product. With this approach, the local agents are able to demonstrate how the product works to the locals.

The following are some of the limitations of IDT (Kole, 2002):

- It classifies new technology as “progress”, while ignoring alternatives.
- It does not take into consideration that new technology could just be a bad idea.
- It ignores the social structures by focusing on the individual adopter.

Despite these limitations, this study adopts IDT as the theory that is used to understand and explain the diffusion and use of mobile payments in the townships. The rationale being that it is one of the most popular theories and it has been used in a wide range of disciplines, such as public health, political science, economics, communications, technology, education and history (Dooley, 1999, Stuart, 2000).

#### **4.9. Summary**

This chapter highlighted several theories and models, such as EVT, TRA, TPB, TAM, IDT and UTAUT, which are used to evaluate the diffusion of new technology into a community. IDT is adopted to understand the diffusion and use of mobile payment solutions in the townships. The following chapter details the research approach followed to understand this diffusion and use of mobile payment solutions by township residents.

# Chapter 5: Research Design and Methodology

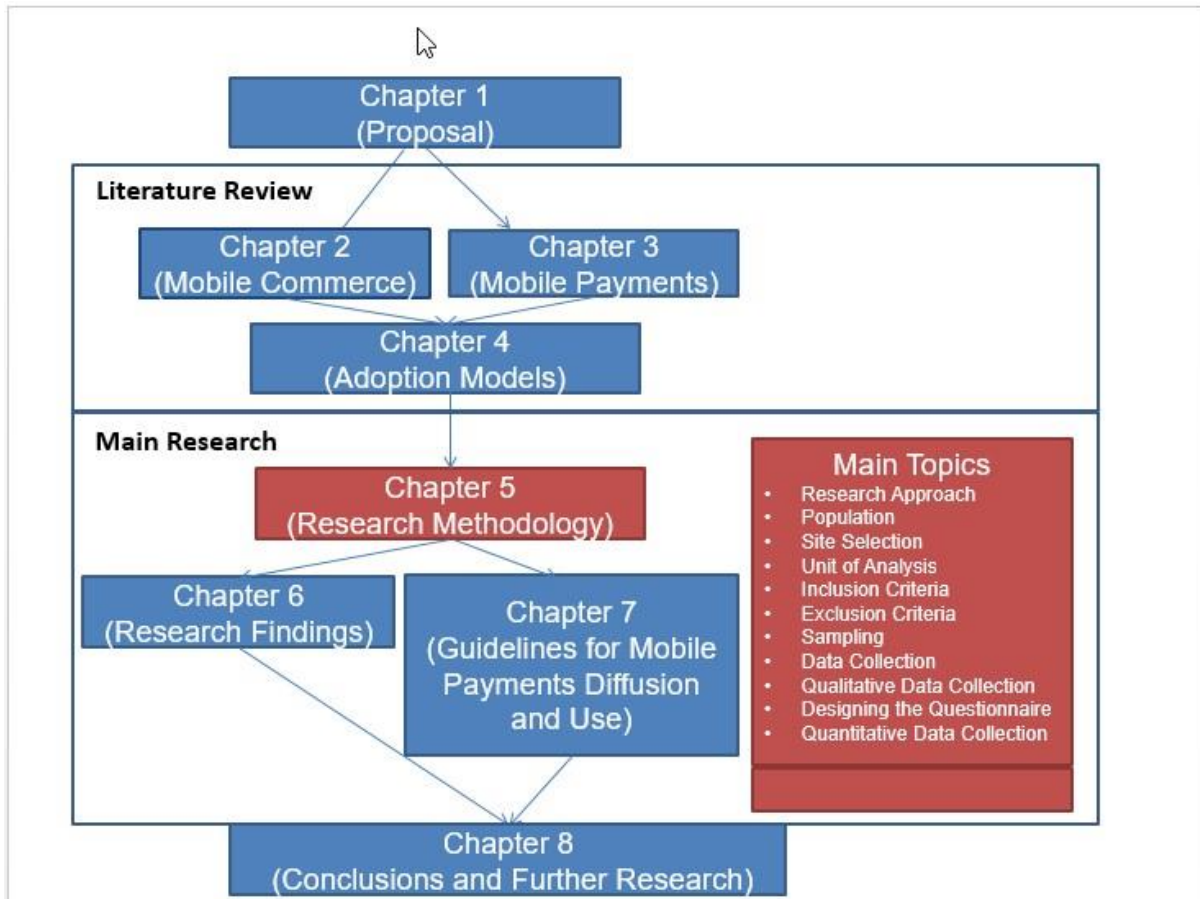


Figure 5.1: Chapter 5 Navigation map

## 5.1. Introduction

This Chapter describes the research design and methodology that was adopted in order to answer the research questions raised in Chapter One (1). According to Barbour (2008), it is important that the chosen methodology be the most appropriate for the study that is being conducted in order to ensure that the objectives of the research questions are achieved.

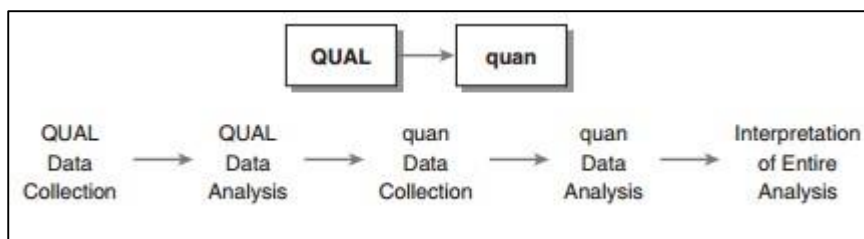
The chapter is structured as depicted in Figure 5.1: Section 5.2 describes in detail the research methods that was undertaken to conduct the study. Section 5.3 to Section 5.8 describe the various items that have to be taken into consideration when selecting

participants. Section 5.10 to Section 5.12 describe the procedures which were undertaken to collect the data.

## 5.2. Research Approach

This study adopted both the qualitative and quantitative methodologies. The use of these two methodologies in a single study is referred to as the mixed method approach (Creswell, 2014). According to Creswell (2014), the strength of a mixed method approach is that it offsets the limitations of both qualitative and quantitative approaches.

According to Creswell (2014), there are four (4) major types of mixed method designs: triangulation design, embedded design, explanatory design and exploratory design. This study adopted the exploratory design, which begins with qualitative design followed by quantitative design (Creswell, 2014). Figure 5.2 shows the layout of an exploratory design approach and its sequence is as follows: qualitative data collection, qualitative data analysis, quantitative data collection, quantitative data analysis and interpretation of the entire analysis.



**Figure 5.2: Exploratory design approach**

The rationale for this choice was that this design is most appropriate for studies where there is an absence of theory or a framework that can be applied (Creswell *et al.*, 2003). The purpose of the qualitative phase was to identify variables that were used to construct the questionnaire for data collection during the quantitative phase (i.e. 2<sup>nd</sup> phase).

### **5.3. Population**

Polit *et al.* (2001), defines a population or target population as the total number of elements that meet a set criterion. The target population for this study was individuals who reside in Soshanguve township with access to a mobile phone. Soshanguve was chosen because the researcher is familiar with the area, it has a population of around 400 000 persons (Frith, 2011).

### **5.4. Site Selection**

Soshanguve is a sizeable township on the outskirts of Pretoria. It was selected because the researcher is familiar with the area and the community, and thus provides a convenient site. High density areas of Soshanguve were selected as it would enable the researcher to generate a number of responses within a very short period of time. Soshanguve is also one of the developing townships in the Tshwane Metropolitan area, especially in terms of infrastructure. For example: Tshwane Free Wi-Fi has also been deployed in some parts of the township, which is a potential enabler for use of mobile payment solutions. The areas selected for data collection were Soshanguve High Schools, Soshanguve TUT campus, Soshanguve crossing (shopping center) and a certain section named GG of Soshanguve.

### **5.5. Unit of Analysis**

The unit of analysis “indicates what or who should provide the data and at what level of aggregation” (Zikmund *et al.*, 2009). In this study the unit of analysis was a Soshanguve resident who had access to a mobile device.

### **5.6. Inclusion Criteria**

Burns and Grove (2001) refer to the inclusion criteria as the characteristics which subjects must possess for them to be included in the study. Subjects who were included in this study were Soshanguve residents who had access to a mobile phone. Subjects who were chosen during the qualitative phase of the study were at least required to have used some form of MPS. During the quantitative phase of the study subjects were required to at least have used a mobile phone.

## **5.7. Exclusion Criteria**

Burns and Grove (2001) refer to the exclusion criteria as the characteristics which the subjects do not have that eliminate them from being included in the study. Subjects who were excluded in this study were Soshanguve residents who have never used a mobile phone.

## **5.8. Sampling**

According to Polit *et al.* (2001), a sample represents the subset of the entire population that has been selected to participate in the study. For the qualitative study (Phase 1) the sample was chosen by using purposive and convenience sampling. Purposive sampling refers to the deliberate selection of subjects by the researcher because they will be more beneficial to the study (Castillo, 2009).

The rationale behind this choice was that the researcher wanted to locate subjects who have used or attempted to use mobile payment solutions. Ten (10) subjects were chosen for the qualitative study using purposive and convenience sampling; the researcher sourced assistance locating the subjects, some of the subjects recommended other subjects for interviews.

For the quantitative study, the samples were chosen by convenience sampling. Convenience sampling refers to the selection of subjects who are easily accessible (Castillo, 2009). The researcher distributed the questionnaire in Soshanguve High School, the Soshanguve campus of Tshwane University of Technology (TUT) and the local shopping centre, which was opened in May 2014 (Moolman group, 2014).

The researcher also distributed the questionnaires to a certain section called GG since he was familiar with the community. The rationale behind this choice was the limited time, which the researcher had and to minimise costs.

## **5.9. Data Collection**

Burns and Grove (2003) define data collection as “the precise, systematic gathering of information relevant to the research purpose or specific objectives, questions or

hypothesis of the study”. In this study both qualitative and quantitative data collection methods were used due to the mixed method approach adopted.

### **5.10. Qualitative Data Collection**

The qualitative data collection phase of the study adopted the use of unstructured interviews as a means of data collection. Unstructured interviews were chosen because they enabled the interviewer to elicit information from the interviewees with regard to “observed behaviors, interactions, artefacts and rituals, with questions emerging over time as the investigator learns about the setting” (DiCicco-Bloom and Crabtree, 2006).

De Vos (2002) further states that the aim of the unstructured interview is “to actively enter the world of people and to render those worlds understandable from the standpoint of a theory that is grounded in behaviours, languages, definitions, attitudes and feelings of those studied”. Unstructured interviews are appropriate for studies where there is very little knowledge about the topic that is being investigated (Easwaramoorthy and Zarinpoush, 2006); hence this technique was chosen to reveal the relevant issues that affect the community of Soshanguve.

Unstructured interviews requires the interviewer to have no predetermined set of guidelines or questions that they start with rather they engage the interviewee with a few broad questions to break the ice (Easwaramoorthy and Zarinpoush, 2006). The interview is allowed to evolve as the interviewee answers questions, thus the interviewer is able to probe the areas that are of interest to them whilst giving freedom to the interviewee to dictate the direction of the interview. The interviewer went into the community of Soshanguve without any assumptions or set of questions that might have influenced the interviewees to respond in a particular way.

The researcher conducted and audio recorded the unstructured interviews at the homes of the respondents. The respondents were introduced to the researcher by the principal agent; some of the respondents were introduced to the researcher by subjects who had already been interviewed by the researcher, they pointed out that they might be beneficial to the study as they currently use MPS.

When the researcher realised that no new information was being obtained by interviewing more respondents, the interviewing process came to an end with ten (10) respondents having taken part in the study. The interviews were done on different days depending on the availability of the interviewees. Some interviews were conducted in English while others were conducted in both English and the native language of the interviewees.

Bogdan and Biklen (1982) define qualitative data analysis as “working with data, organizing it, breaking it into manageable units, synthesizing it, searching for patterns, discovering what is to be learned, and deciding what you will tell others”. According to Rubin and Rubin (1995), qualitative data analysis runs concurrently with the data collection process. The transcribing of the audio recordings and qualitative analysis started as early as the first interview was finished.

The recordings were manually transcribed word for word without any attempt to correct grammatical errors. There were cases where the respondents were using the native language, the researcher then translated from the native language to English and put the translation in brackets next to the original native text. In cases where the researcher was not familiar with the native language, he asked for help from those who are familiar with the language. Figure 5.3 indicates an example of a transcribed interview verbatim.

Participant: Every month me I use my cell phone, I've got two kids, you know two different women, well, launghs.. so having kids and all this and that its guaranteed, every month end I have to pay my beneficiaries and then I have registered them all in my cell phone banking so every time if it's month end, before the end of the day if its pay day, I do my transactions its either, it's up to me. To choose how to use that application, have you ever seen that application actually? This is ABSA, this is Standard Bank (shows the apps).

Interviewer: ok.

Participant: You just register and start banking and then you put in your pin and all that.

Interviewer: ja

Participant: So I use that application to pay for maintenance to my kids to make sure that every month end my kids have got access to money and then I transfer the money to their mother's bank accounts. It's easy man it's like it's beautiful, it's beautiful.

Interviewer: ok

Participant: I use that application, I use that application to, and most of the stuff is done by debit well like car and some other transactions like accounts and this and that, they go through via debit but the beauty about it, still the mobile is gonna give you the notification to say o.k, the money has gone through, the money has gone where, the money has gone where, so you can do your whole internal banking on your account in your living room, it makes life easy. For me its maintenance and then family, you know how family is? Your little brother is going say O.K I need an allowance and then you just push it using your mobile.

### Figure 5.3: Sample of Interview Transcript

Before the researcher could start with the coding process, the researcher developed the coding manual with all the rules and examples of how to code the data as suggested by (Weber, 1990). The aim of the coding manual was to ensure that there is consistency during the coding process. The structure of the coding manual is shown by Figure 5.4 as well as in Appendix C.



1	<b>Coding Rules</b>			
2				
3	Each theme/concept/idea will be assigned a code			
4	The code should be composed of four letters which are unique			
5	The unique code will be entered into the code column			
6	The source column represents all the locations from the scripts where the idea, theme or concept was identified.			
7	The source will be composed of at most 5 alphanumeric characters e.g P1L10			
8	The first two alphanumeric characters represent the participant: P1 means participant number1			
9	The last three alphanumeric characters represent the line number that expresses an idea/theme/concept			
10	L10 means line number 10			
11	P1L10 means that an idea/concept/theme was expressed by participant number 1 at line number 10			
12	Source column can have multiple values assigned to it, e.g. P1L54, P2L56, P4L42 meaning that the idea, theme or concept was mentioned by three different participants			
13	Notes are just comments which the researcher should take into consideration during analysis			
14				
15	<b>Idea/Theme/Concept</b>	<b>Code</b>	<b>Source</b>	<b>Notes</b>
16				
17	Experienced Technical Issues When Transacting	ETIT	P7L26	
18	Don't like airtime charges	DLAC	P1L54, P2L56, P4L42	

**Figure 5.4: Coding Manual**

As soon as an interview was transcribed verbatim, a copy of it was made in order to enable the researcher to code from the copies rather than the originals. Line numbers were inserted into the copies as shown in Figure 5.5 in order to make it easy to work with the scripts. The scripts were also numbered from P1 to P10, with P1 referring to the first participant and P10 referring to participant number 10.

The researcher started coding immediately after the first set of interviews were transcribed as suggested by Wildemuth (2009). The rationale of starting the coding process before the rest of the interviews were finished was to add to the coding manual ideas, themes and concepts that emerge from the data as early as possible during the coding phase. If new ideas, themes and concepts emerged later on from the rest of the scripts they are also added to the coding manual, thus the coding manual evolves up until the coding process is finished.

The researcher read through each script several times using the constant comparative method (Glaser and Strauss, 1967) in order to grasp concepts, ideas, beliefs, incidents and themes embedded in the scripts. The rationale in using the constant comparative method was because it “combines systematic data collection, coding, and analysis with theoretical sampling in order to generate theory that is integrated, close to the data, and expressed in a form clear enough for further testing” (Conrad *et al.*, 1993).

The researcher read through each script assigning codes to text that is linked to themes, ideas, or concepts. Each new theme, idea or concept was added to the coding manual if it did not exist before. Figure 5.5 indicates a passage taken from the script that has line numbers and coded text, the code is composed of four letters in parentheses.

23. Interviewer: what kind of functionality that you are aware of that exists on the mobile, basically what I am asking is what can you do with mobile banking?  
 24. Participant: can transfer funds from home (TFFF), like when I am seating at home I can transfer funds from my account to your account(TFFF), if you can phone and tell me that I am stuck I need ash quick quick. It makes our life easier.

**Figure 5.5: Line numbers and coded text**

Once the coding process was complete, the researcher created the categories document as shown by Figure 5.6, which represented the ideas, themes and concepts that emerged from the coding process, the frequency column identifies the sources of the theme i.e. P7L26 means participant number 7 line number 26.

Category	Code	Frequency
Experienced Technical Issues When Transacting	ETIT	P7L26
Don't like airtime charges	DLAC	P1L54, P2L56, P4L42
Don't like bank charges	DLBC	P3L14, P7L12
Experienced usability and accessibility issues	EUAM	P2L34
lack of funds	LAOF	P2L56, P6L28
mobile payments awareness	MPAW	P2L58, P3L32, P4L42, P8L30
don't have credit card	DHCC	P10L40
traditional way of shopping/transacting	TWST	
not sure if I will use mobile payments in the future	NSMF	
will use mobile payments in the future	UMPF	P1L34, P2L64, P5L30
will not use mobile payments in the future	NMPF	
will use but not on a regular basis	YBMP	P1L34
will use in case of emergency	EYMP	P1L36, P2L66
not used to using mobile payments	NUMP	P1L40
user training on how to use mobile payments	THMP	P1L62, P3L34, P4L40, P5L26, P8L32
don't know why not using mobile payments	DKMP	P2L66, P10L22
Don't see a need to use mobile payments	DSNM	
Concerns about transactional limits	CMTL	P4L40
Concerns about delays in transfers between different banks	CADB	P4L06
Transfer funds to other accounts	TFFF	P3L23, P7L08, P7L34, P9L50
Check balance	CBMB	

**Figure 5.6 : The categories document**

## 5.11. Questionnaire Design

Taylor-Powell and Hermann (2000) define a survey as a way of collecting data from the population in a standardized and systematic way. The questionnaire is a form of a survey which is composed of a series of questions that the participants have to answer. There are usually two kinds of questionnaires: paper-based and web-based questionnaires. The paper-based questionnaire was deemed appropriate for this study as the target population might not have access to the web and web surveys are prone to low response rates.

Some of the advantages of questionnaires are the following as compared to face-to-face interviews (Seal, 2012):

- They are less costly to administer.
- They can cover a large geographical area as compared to face-to-face interviews.
- The absence of the interviewer reduces bias.
- The identity of the respondents remains anonymous as the respondents are free to complete the questionnaires as compared to face-to-face interviews.

Some of the disadvantages of the questionnaires are the following (Seal, 2012):

- They should be short and simple in order to avoid misunderstandings, thus some information from the participants might be missed.
- Prone to cheating as it is very difficult to control who actually completes the questionnaire; e.g. students may complete a questionnaire on behalf of their parents.
- Respondents with low levels of education are more likely not to complete the questionnaire, thus being excluded from the study.
- Most often the rate of response tends to be low, although paper-based can be more effective when having field agents.

The categories document together with results from other similar studies (Mallat, 2007, Shrivastava, 2010, Makore, 2011), were used to design the questionnaire using the

procedure that was developed by DeVellis (1991). The Likert scale was deemed suitable to be used in the questionnaire as it allows the respondents to express their opinions by indicating how strongly they agree or disagree with the statements that are posed to them.

### **5.11.1. Questionnaire pre-testing**

Pre-testing is defined as a pilot study that is conducted to improve an instrument in order to reduce response errors (Converse and Presser, 1986). Pre-testing affords an opportunity to the researcher to identify potential difficulties, which the target population might experience. Once the potential difficulties have been identified they can be corrected before the questionnaire is distributed to the target population.

The questionnaire was pre-tested with a sample of 15 individuals of the target population. The 15 individuals were asked to use the following criteria to evaluate the questionnaire:

- Understanding of the statements.
- Understanding of the scales.
- The length of the statements.
- The general layout and flow of the questionnaire.

During the pre-testing phase, the researcher realised that the respondents were confused with the use of the Likert scale. Results of a previous study by Shrivastava (2010) found that the Likert scale became “lost in translation” when used in the questionnaires meant for a low-income population.

The researcher noted this difficulty and other difficulties, which were mentioned by the sample respondents and the Likert scale was modified to use “Yes”, “No” and “Maybe” as per Shrivastava’s (2010) recommendations. Other corrections were made to the questionnaire and sent to another 15 respondents who were not part of the first group.

The responses from the second group were judged to see if there were any errors which were made by the respondents. The researcher was satisfied with the

responses from the second group and thus the questionnaire was declared final and made ready for distribution to the target population.

## **5.12. Quantitative Data Collection**

The researcher appointed a principal agent in the township who was responsible for the entire distribution of the questionnaire. The researcher made sure that the principal agent understood each and every statement, which was in the questionnaire; thus the principal agent was required to be able to translate the statements into either Sotho, Tswana, Shangaan, Zulu or Venda if needs be. An informed consent letter (*cf.* Appendix A) was to be issued to all the potential respondents to sign before completing the questionnaire as per Research Ethics requirements by the university (UNISA).

The principal agent appointed other agents in consultation with the main researcher from the community who were to assist him in the distribution of the questionnaire. These agents were residents who were familiar to the principal agent; the researcher met the new agents to see if they were the right candidates before the researcher could allow them to carry out the necessary tasks. These agents were also required to familiarise themselves with the questionnaire and be fluent in Sotho, Tswana, Shangaan, Zulu or Venda.

The researcher specifically asked the agents to distribute the questionnaire around shopping centres, educational institutions and other areas where the local community gathers when there are events such as at community halls and civic centres. It becomes easier for the agent to assist the respondents where necessary and collect the questionnaires from the participants once they are done to minimise the instances where the respondents take the questionnaires home and return them later. It took the researcher a period of 8 months to collect the data.

As soon as the first batch of questionnaires was returned, the researcher followed a technique that was developed by Leahy (2004) to record the responses from the questionnaire into an excel spreadsheet, the technique is composed of five steps as follows (Leahy, 2004):

- Create an excel database.
- Code your data
- Enter your data
- Clean your data
- Analyse your data

The researcher created an excel spreadsheet as a data repository for all the questionnaires that were returned. Each questionnaire that was returned was given a unique numeric ID composed of three digits; the IDs were in sequential order e.g. 001, 002, 003, 004 up until the very last questionnaire.

As illustrated in Figure 5.7, each row represents a questionnaire that was returned, while the columns represent all the questions, which were in the questionnaire. Some questions have more than one possible answer, for such cases each possible answer was assigned its own column as shown in Figure 5.7 (e.g. Q9.a, Q9.b). This setup makes it easy to analyse the data using the tools which are built into Excel.

	H	I	J	K	L	M	N	O
1	Q7	Q8	Q9.a	Q9.b	Q9.c	Q9.d	Q9.e	Q9.f
2	1.00	3.00		1.00				1.00
3	1.00	1.00						1.00
4	1.00	1.00	1.00	1.00				
5	1.00	3.00	1.00					
6	1.00	1.00	1.00	1.00	1.00	1.00		1.00
7	1.00	1.00	1.00					
8	1.00	3.00	1.00	1.00				
9	1.00	3.00	1.00	1.00	1.00	1.00	1.00	1.00
10	1.00	3.00	1.00					1.00
11	1.00	3.00	1.00	1.00		1.00	1.00	1.00

**Figure 5.7: Rows of questionnaires in an excel spreadsheet**

The data was copied as is from the questionnaire into the excel spreadsheet, and where the user made errors i.e. selecting multiple answers to a question that requires a single answer then that specific response was treated as invalid and the cell was left blank. The same applies to questions where the respondents did not respond to the question, the corresponding cell in the spreadsheet was left blank.

### **5.13. Summary**

This chapter highlighted the research design and methodology that were adopted to collect research data from the community of Soshanguve. In phase 1, a total of ten (10) qualitative interviews were conducted. The themes which emerged from the interviews were used to design the questionnaire, which was distributed to the community. A total of 223 questionnaires were distributed but only 173 were returned. Of the 173 questionnaires that were returned, none of them were discarded. The questionnaire that was distributed to the community of Soshanguve can be found in Appendix B.

# Chapter 6: Research Findings

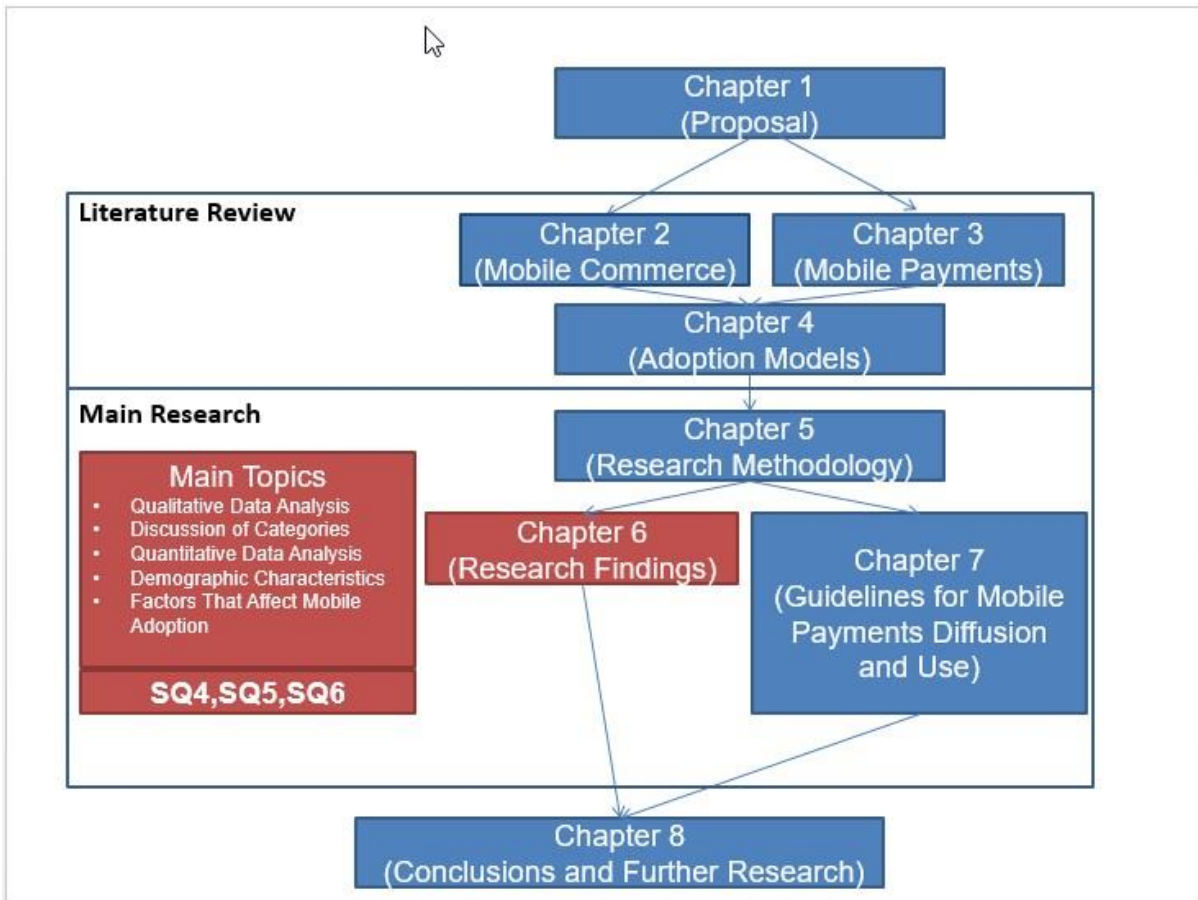


Figure 6.1: Chapter 6 Navigation map

## 6.1. Introduction

This chapter presents the research findings based on the data collected from the field. The research questions, as stated in Chapter 1 (Section 1.5), that are being addressed are SQ4 – SQ6, which ultimately answer the main research question, that is, what are the factors that are inhibiting the diffusion and use of mobile payment solutions in the townships?

Microsoft Excel was used for qualitative data analysis while both Microsoft Excel and Statistical Package for the Social Science (SPSS) were used for quantitative data analysis. As such, several graphs and statistics are also used to indicate which factors affect township residents when they attempt to use mobile payments.



This chapter is structured as illustrated in Figure 6.1 Section 6.2 – 6.2.2 discusses the categories found in the categories document. The end goal of these sections is to extract a list of factors that may influence the diffusion and use of mobile payments in the townships. Section 6.3 – 6.4 discuss the process followed to validate, capture and analyse the completed questionnaires. Methods such as the Principal Component Analysis (PCA), Bartlett’s Test of Sphericity and Kaiser-Meyer-Olkin (KMO) were used to systematically analyse and test the reliability and validity of the survey data.

## 6.2. Qualitative Data Findings

The researcher read the categories document several times in order to analyze, synthesize and group related themes and categories together in order to create a consolidated list of categories that affect individuals in the adoption of mobile payments. The list of categories that emerged from the analysis process is described in detail in the sub-sections below.

### 6.2.1. Categories

- **Charges** – costs which are related to conducting a mobile payment, i.e. data charges and transactional charges.
- **Security** – how secure are transactions (i.e. mobile payments), which are conducted through mobile devices.
- **Training** – training that should be done by users before attempting to transact through mobile devices.
- **Technical challenges** – network challenges, such as lack of network coverage, availability of 2G/GPRS/EDGE/3G/LTE in certain areas, compatibility of mobile devices to conduct mobile payments.
- **Ease of use** – how easy it is for individuals to conduct mobile payments.
- **Lack of funds** – disposable income that individuals can use to transact with on their mobile devices.
- **Mobile payments awareness** – the level of awareness about the existence of mobile payments.

- **Accustomed to existing methods** – the current methods of payments which individuals are accustomed to use.

## 6.2.2. Discussion of Categories

This section discusses the categories which have been identified from the interviews with the participants.

### 6.2.2.1. Charges

Participants indicated that they do not prefer charges when conducting a mobile payment. Some of the comments from the participants are as follows:

*“Well you must have data, if you are broke and you don’t have data you are in trouble”*

*“If it’s during the day you know is too much charges, at least during the night and after midnight around 11 cents I think but during the day is 65 cents. So that’s why I stopped it, it’s one of the reasons”*

*“I don’t like charges because they finish my airtime very fast, I might as well do it the usual way”*

*“You will find in a month I did a lot of transfers, so it will charge me more, unaware that the bank is charging me ja something like that. I think if they can reduce their charges”*

*“Basically I can’t find a reason why they should charge us for doing internet transfers”*

The comments above indicate that the respondents are concerned about two types of costs, which are involved when conducting a mobile payment. Data costs which are charged by the network operators and costs which are charged by third parties such as banks for offering a service that enable a mobile payment to take place.

The respondents’ perception of the cost factor might not necessarily be true as some services do not incur any transactional/data costs e.g. purchase of airtime, data bundles from the vendor (MTN, 2014b).

No data charges are billed to the customer, they only pay for the services that are rendered. Services which are developed by third parties may also be configured in such a way that the MNO bills the third party's account when the customer conducts a transaction, this is known as reverse billing (MTN, 2014b).

### **6.2.2.2. Security**

Participants indicated that they were very suspicious of mobile transactions. They felt as if it was very easy for "hackers" to steal their money if they conduct mobile transactions. Some of the comments from the participants are cited below:

*"Because there is this I don't know if it's a myth or if it's true, that you know if you doing those stuff on a cell phone then it's easy for people to rob you"*

*"There is something which makes me to doubt cell phone banking, is the security, I am not sure how safe it is to use cell phone banking because you have to punch in your details there, I am not sure how secure it is"*

*"Security wise it was o.k, but the thing is you really have to be careful with that, because there is a lot of guys who actually do hacking and stuff to accounts"*

*"But there is rumours that, you can never know, because this people will hack you"*

*"You see and you also hear people crying about how their money got lost through cell phone banking blah blah blah blah, so it just becomes hard for you also to fall into it".*

The respondents have a view that hackers are capable of infiltrating their mobile phones or bank accounts, as a result of that their accounts will be compromised and money will disappear from their accounts.

### **6.2.2.3. Training**

Participants indicated that it would be beneficial to the township community to receive training on how to use mobile payments; and some of the comments are listed below:

*“I think the banks must train the people, their customers”*

*“that’s why I believe maybe this institution or whatever or maybe mobile companies they need to have sort of like a training, it’s not easy for an ordinary person…….The only problem is like no one is teaching anyone anything. They just tell you that there is an application that can do this.”*

*“So for older people [ay] I think they might need some training on how to transfer funds.”*

*“So if they can like come up with a way to educate people more on how to operate them and how to secure their information online, like maybe of using internet banking over your phone”.*

Some of the respondents have tools (e.g. smart phones and apps) in their hands which they do not know how to fully use. There are those who know what mobile payments are but do not know how to use them. They have heard and seen the adverts which have been aired on the major radio stations and TV by the banks, MNOs and third parties. Their problem is they do not know how to start using the capabilities of their mobile phones, and what they need is to be shown how to use the capabilities that are available in the palm of their hands.

The training concern is closely related to the ease of use concern, which is discussed below. Some of the applications require users to remember a series of short codes e.g. to reload airtime from the MNOs, users are required to enter short codes in the right order and right format which can be a problem for the elderly.

#### **6.2.2.4. Technical challenges**

Participants indicated that they experienced some technical issues when using mobile payments. Some of the comments are listed below:

*“So why does the phone not allow me to do transfers while I am also paying the charges, [a ke re], you pay a certain amount, maybe you pay R0.50 or R1.50 just to do transfers or just to check your bank balance, so sometimes like the*

*phone does not wanna, it does not wanna like go, do you understand, you can't check, you can't do anything, it just freezes."*

*"Besides the line being down there is nothing else, resources you know"*

*"Unless if it was a time where by there was a lack of coverage of network"*

*"Sometimes it has problems due to network, sometimes if the network is down, you cannot actually do the transaction, sometimes it might be my network or their network, the network might be fully congested, then it will take longer to actually process"*

As some of the respondents have indicated, they have experienced some network issues; either the network will drop in a middle of a call or transaction; or the network was just unavailable. If the network drops in the middle of a transaction it might lead to frustration as users would not know the status of the transaction. They would view mobile payments as unreliable, which can result in them not adopting them.

Another concern which was mentioned is the issue of the application freezing in the middle of the transaction. This can lead to users becoming frustrated because they cannot go back, go forward or exit the application. In some instances, they have to reboot the phone. Depending on how the application is implemented, the reboot sometimes loses the state of the previous transaction.

#### **6.2.2.5. Ease of use**

Respondents indicated that it would be useful if the mobile payments functionality could be easier to use. Some of the comments supporting this notion are indicated below:

*"Maybe they should make it easy for everyone"*

*"OK, [ya] I think if maybe it can be more simpler, in a way"*

Most applications that use the Unstructured Supplementary Service Data (USSD) technology rely on the use of short codes. If the user wants to use the application, they have to enter a series of short codes with special characters in-between to access the service. That is, if users want to know the balance on their account on the MTN network they dial \*141#, and if they want to recharge their account they dial \*141\*pin#.

Thus if there are 20 different services, which the users want to access they have to remember 20 different short codes. That is not scalable as the number of services grows users will have to remember more short codes. If they forget one character or digit on the short code then they will get an error message, which might not be descriptive enough for the user to figure out what the source of the problem might be.

#### **6.2.2.6. Lack of funds**

According to the participants, it is very difficult for them to use mobile payments whilst they do not even have access to funds. Some of their comments are listed below:

*“The other reason is I think is because of not always that I have money in my bank account that’s why”*

*“I don’t have that flow of cash like as often as I would like to so for me I don’t see a reason why I should have mobile banking”*

Respondents felt that they were limited to using mobile payments by their lack of funds.

#### **6.2.2.7. Used to buying in-store**

According to some of the participants, they are so used to buying from the shops, they hardly see a need to conduct a mobile payment, and some of the comments are as follows:

*“I am not used to mobile payments, I can use it but not on a regular basis, because I am so used to buying from a shop.....I think I can only use it in case of emergency”*

*“I am used to going to the shop and buying those units and ja, it’s just that you are used to up until you try it”*

Habits are hard to change, respondents are used to buying from the Spaza shops and general dealers. The community might need to be educated on the benefits of using mobile payments.

### 6.2.2.8. Mobile payments awareness

Participants indicated that they thought that most people were not aware of the existence of mobile payments, some of the words of participants are indicated below:

*“If more people can know about it”*

*“Probably I am not aware of them, [ja] I think I am not aware of them, as soon as I am aware of them, I think [ja], then I will use them. But at the moment I am not aware of the some other applications.”*

*“We do have such resources but no one is telling people about them, people are sitting with a whole lot of powerful tools in their phones and then they know nothing about them”*

*“What can I say, usually I think must be like a sort of, how can I put it, maybe let people know more about this internet banking”*

The respondents might not be aware of the existence of mobile applications that facilitate mobile payments.

**Table 6.1: Mobile payment awareness of the respondents**

<b>Airtime recharge</b>	<b>Electricity recharge</b>	<b>Accounts Payments</b>	<b>Mobile Shopping</b>	<b>Check Balance</b>	<b>Money Transfer</b>
6	2	3	1	3	7

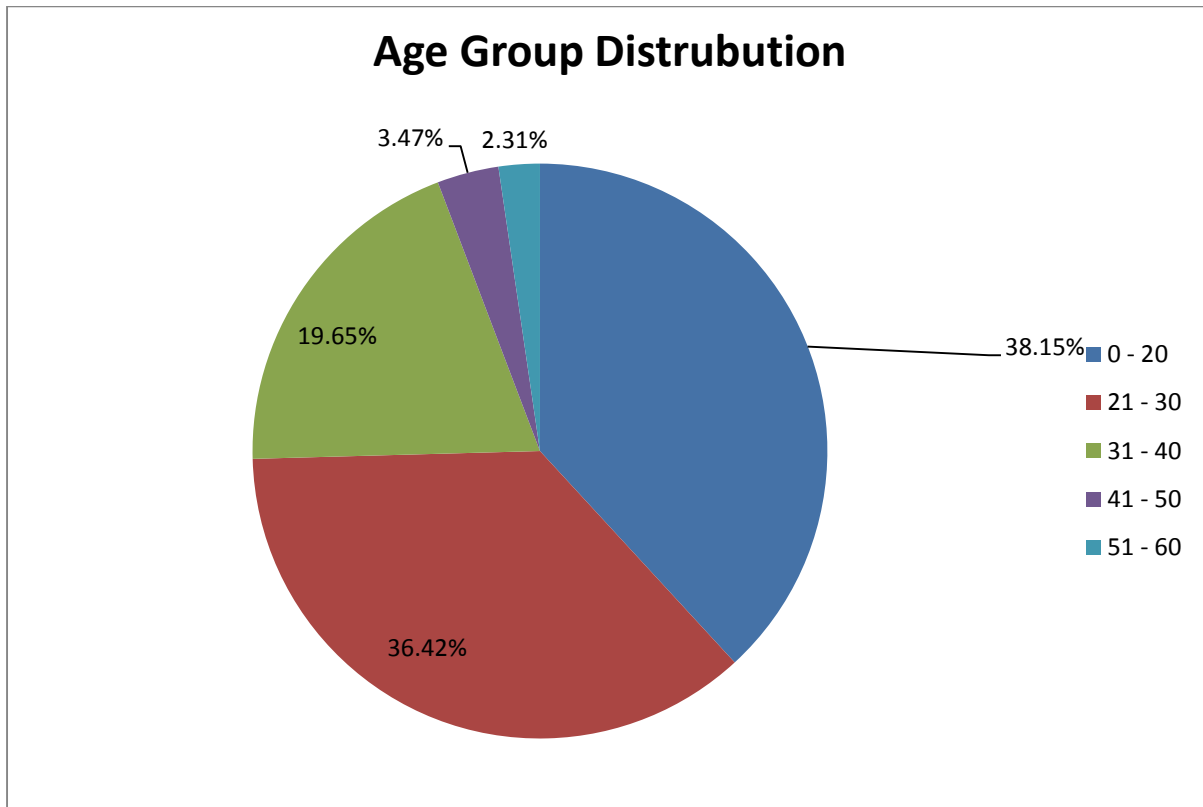
Table 6.1 indicates the types of mobile payments which the respondents are aware of. Awareness of mobile money transfer and the purchase of airtime is high with most of the respondents.

### 6.3. Quantitative Data Findings

The purpose of this section is to analyse the data that was gathered from the questionnaires and make sense of it.

### 6.3.1. Demographic Characteristics

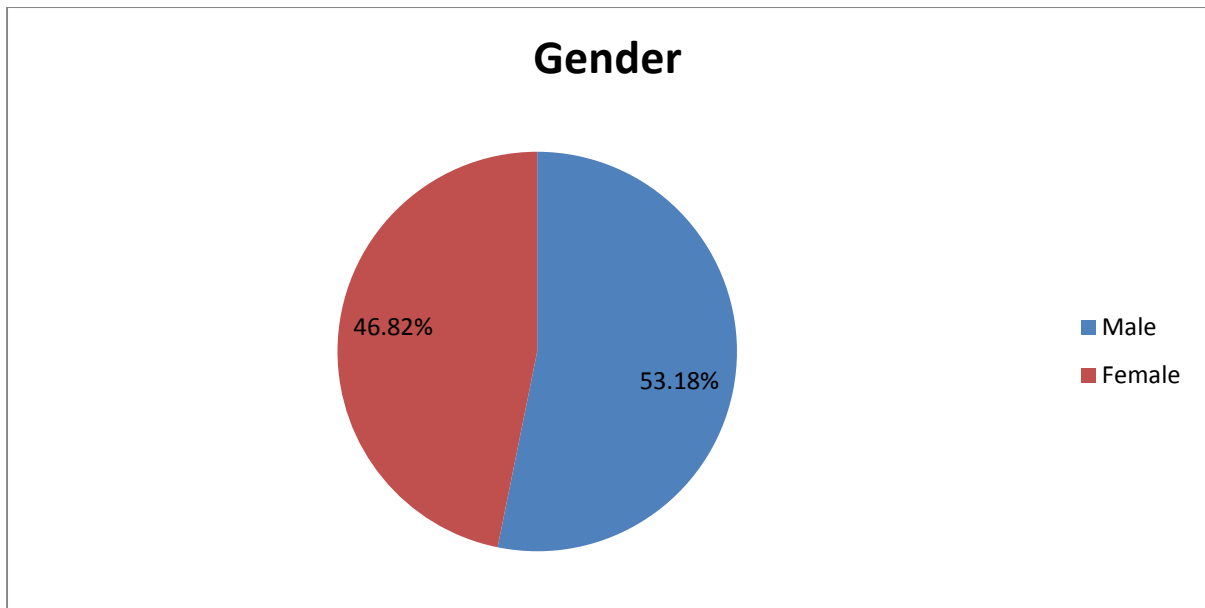
This sub-section gives a brief overview of the demographic characteristics of the respondents; variables such as age, occupation, level of education, mobile phone and bank account ownership are considered.



**Figure 6.2: Age group distribution**

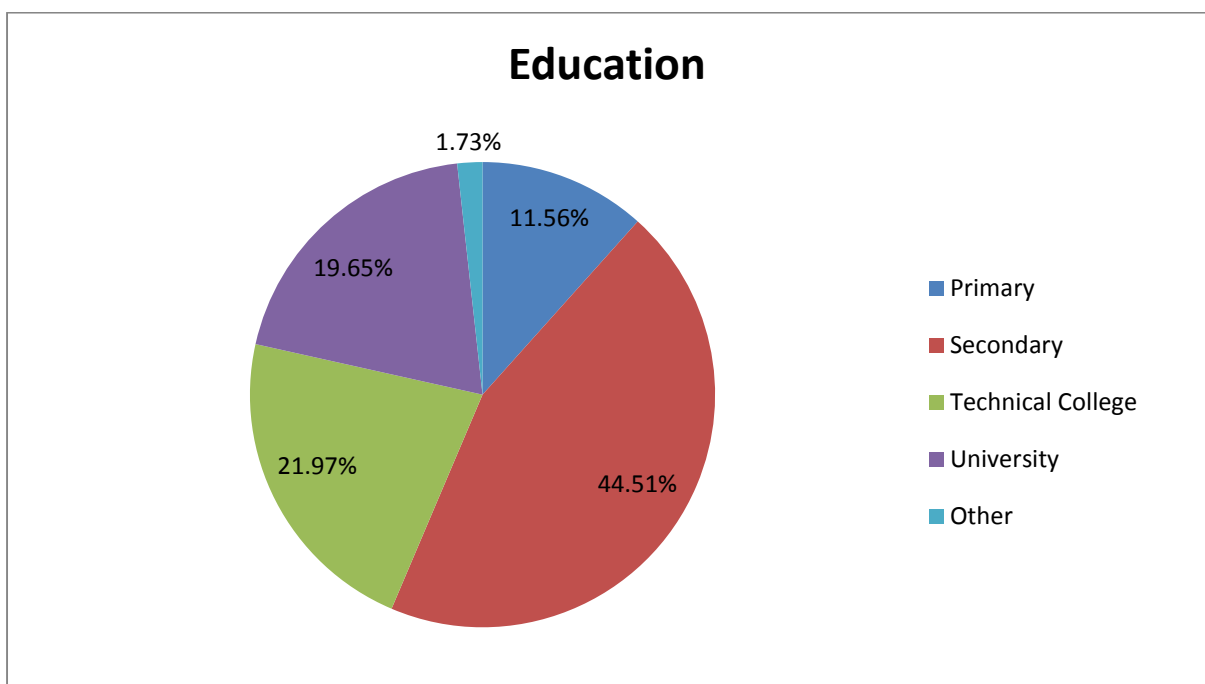
The age group of the respondents is shown in Figure 6.2 above. It can be seen that most of the respondents were between the age of 16 and 20 (38.15%), followed by the age group that is between 21 and 30 (36.42%), followed by the age group that is between 31 and 40 (19.65%), followed by the age group that is between 41 and 50 (3.47%) and the last group was for those who were above 61 (2.31%). When combining the groups who are between 0 - 20 and 21–30 into a single group, they represent 74.57% of the respondents, thus 3/4 of the respondents are aged 30 years or younger.





**Figure 6.3: Gender**

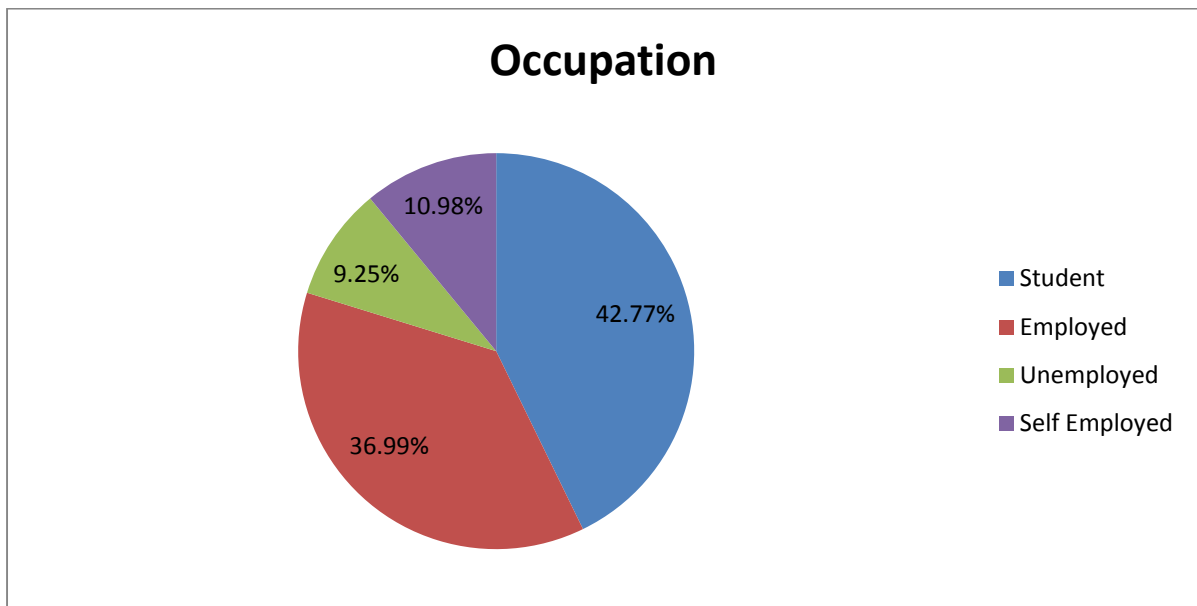
The gender of the respondents was evenly distributed between the males (53.18%) and females (46.82%) as indicated by Figure 6.3.



**Figure 6.4: Education level**

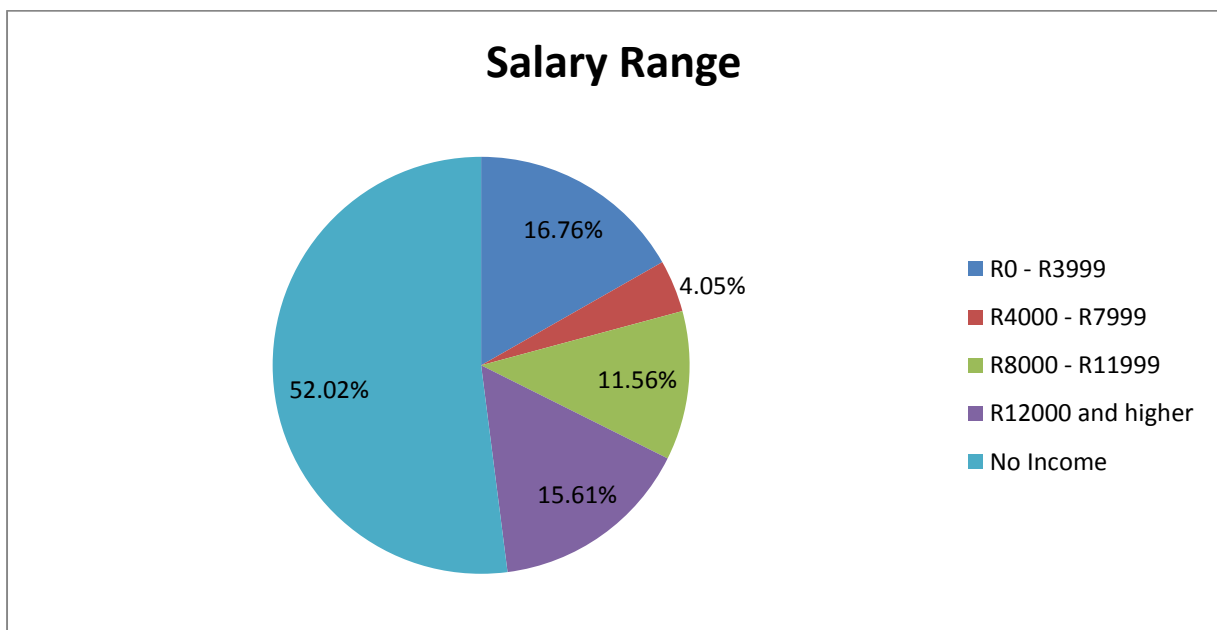
As shown in Figure 6.4, the highest number of respondents had completed high school (44.51%), followed by those who had completed a technical college qualification (21.97%), then followed by those who had completed a university qualification

(19.65%) some respondents did not mention their educational level or their qualification was classified as other in the questionnaire.



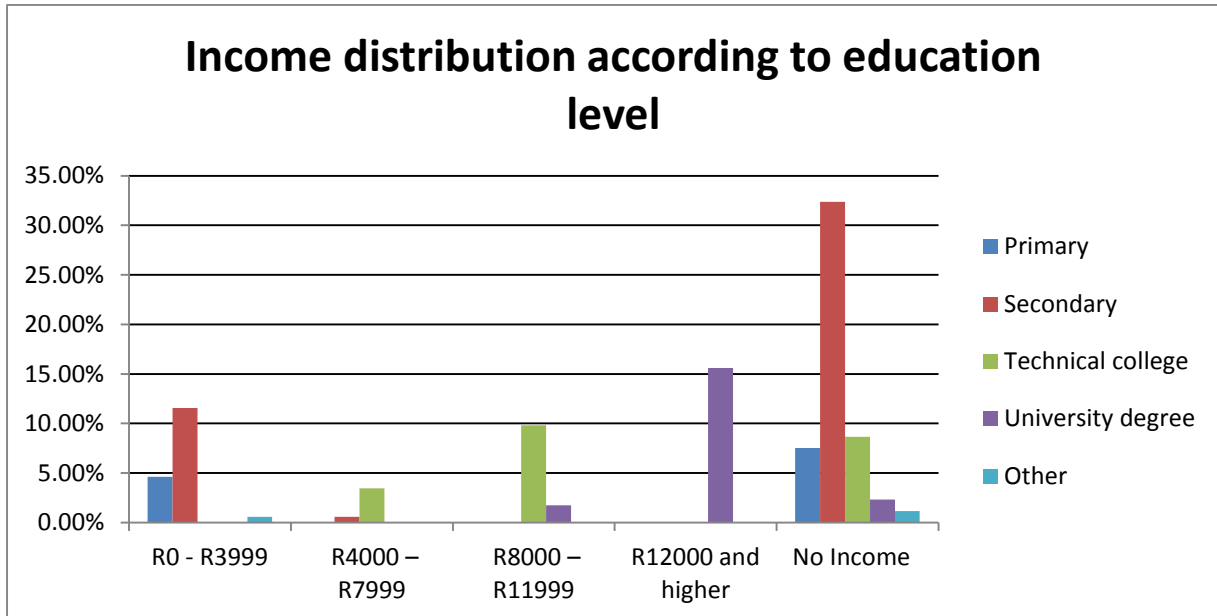
**Figure 6.5: Occupation**

The majority of the respondents were students (42.77%), followed by those who were employed (36.99%), then followed by those who were self-employed (10.98%), then followed by those who were unemployed at (9.25%) as shown in Figure 6.5.



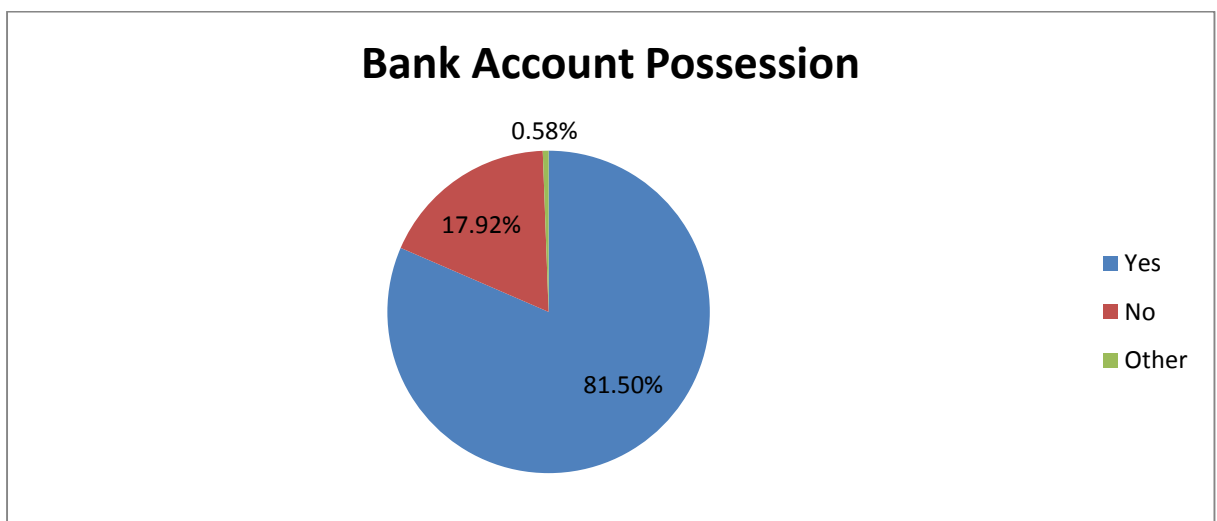
**Figure 6.6: Salary range**

The majority of the respondents had no income (52.02%). This might be due to that the majority of the respondents were students as shown in Figure 6.6. The second biggest group was for those who were earning between R0 – R3999.



**Figure 6.7: Income distribution according to education level.**

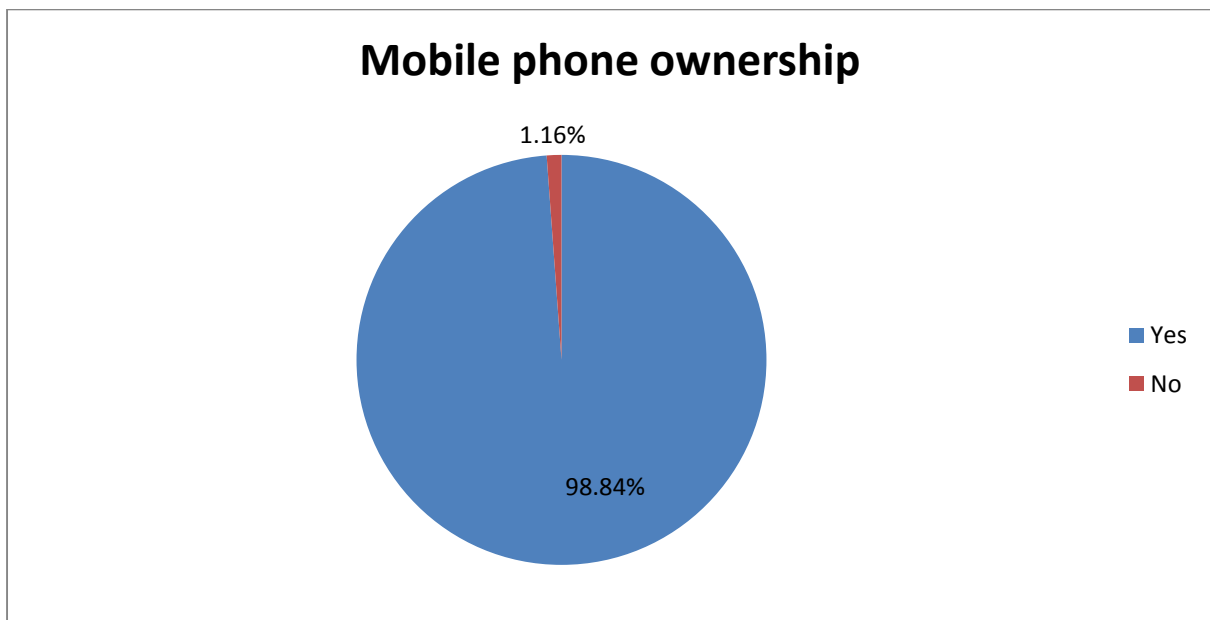
The income distribution of the respondents is reflected in Figure 6.7, as can be seen respondents with higher qualifications usually have higher salaries as compared to those with lower qualifications. Students formed a large number of those who indicated that they have no income, some respondents did not mention their level of education thus they were classified as other.



**Figure 6.8: Respondents with a bank account**

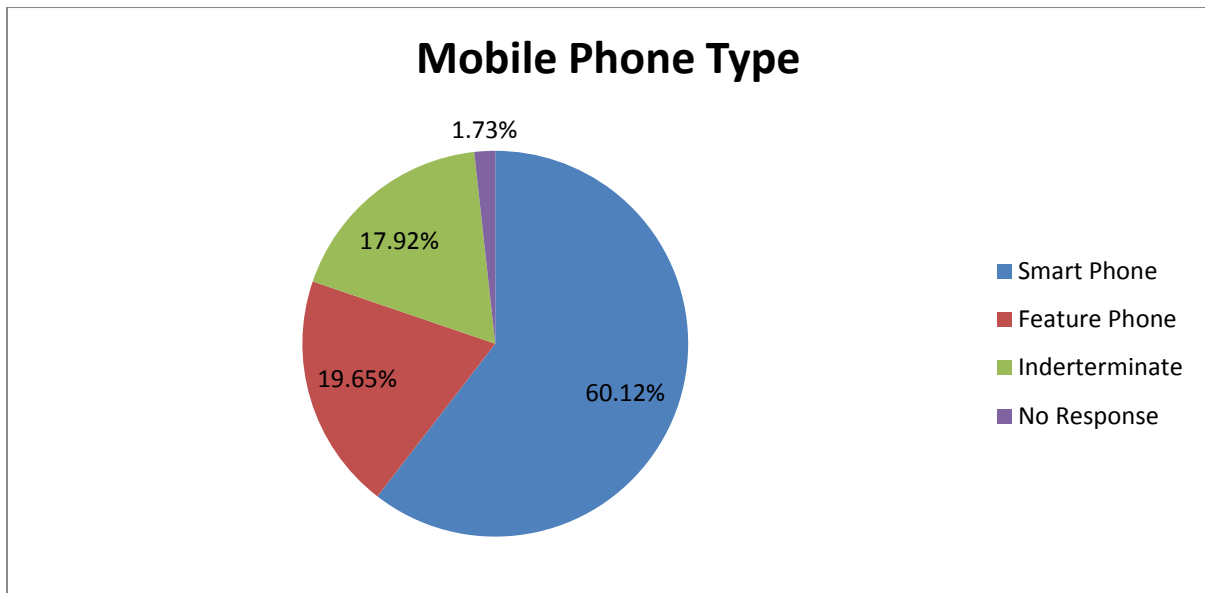
The majority of the respondents had a bank account (81.50%) as shown in Figure 6.8, only 18% did not have a bank account. According to Finscope (2014), 75% of the adult population in South Africa is banked, thus the Soshanguve figure of 81.50% is slightly higher than the national average that might be due to the fact that majority of the respondents (82.67 %) were either students or working people.

Employees are required by their employers to have bank accounts so that their monthly salaries may be deposited into the account. Students who are residing in campus residences would more than likely have bank accounts as to enable their parents to send them their monthly allowances.



**Figure 6.9: Mobile phone ownership**

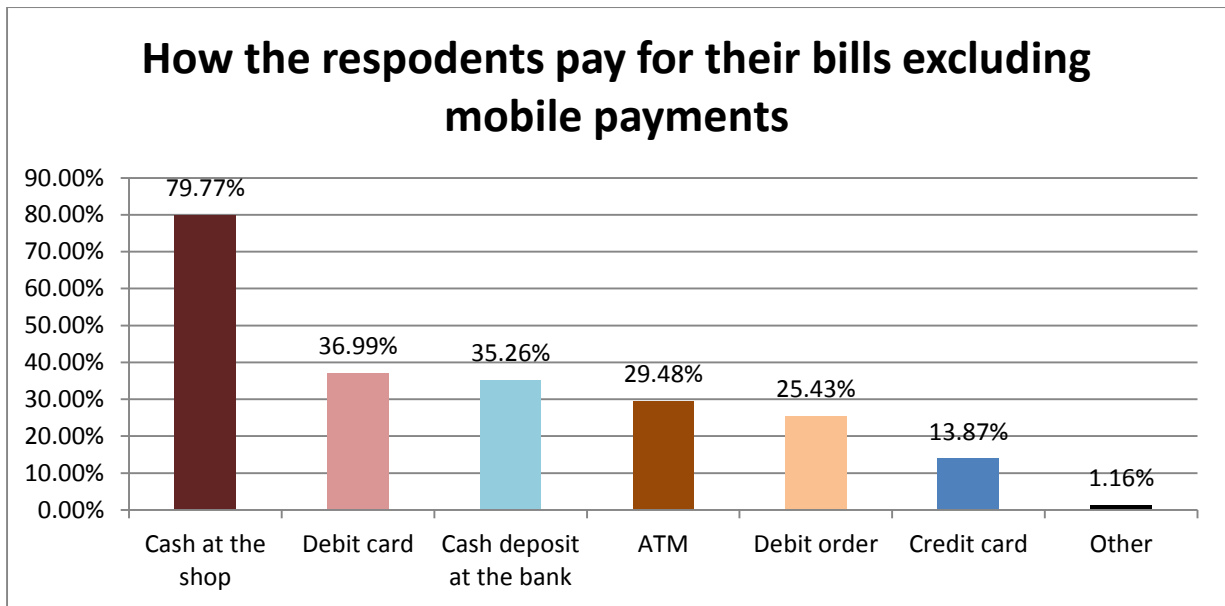
Ninety-nine percent of all the respondents had a mobile phone as shown in Figure 6.9. Thus more people have mobile phones as compared to having a bank account.



**Figure 6.10: Types of mobile phones used in the townships**

Almost 60% of the respondents had smart phones. Mylonas *et al.*, (2014) defines a smartphone as “a cell phone with advanced capabilities, which executes an identifiable operating system allowing users to extend its functionality with third party applications that are available from an application repository”.

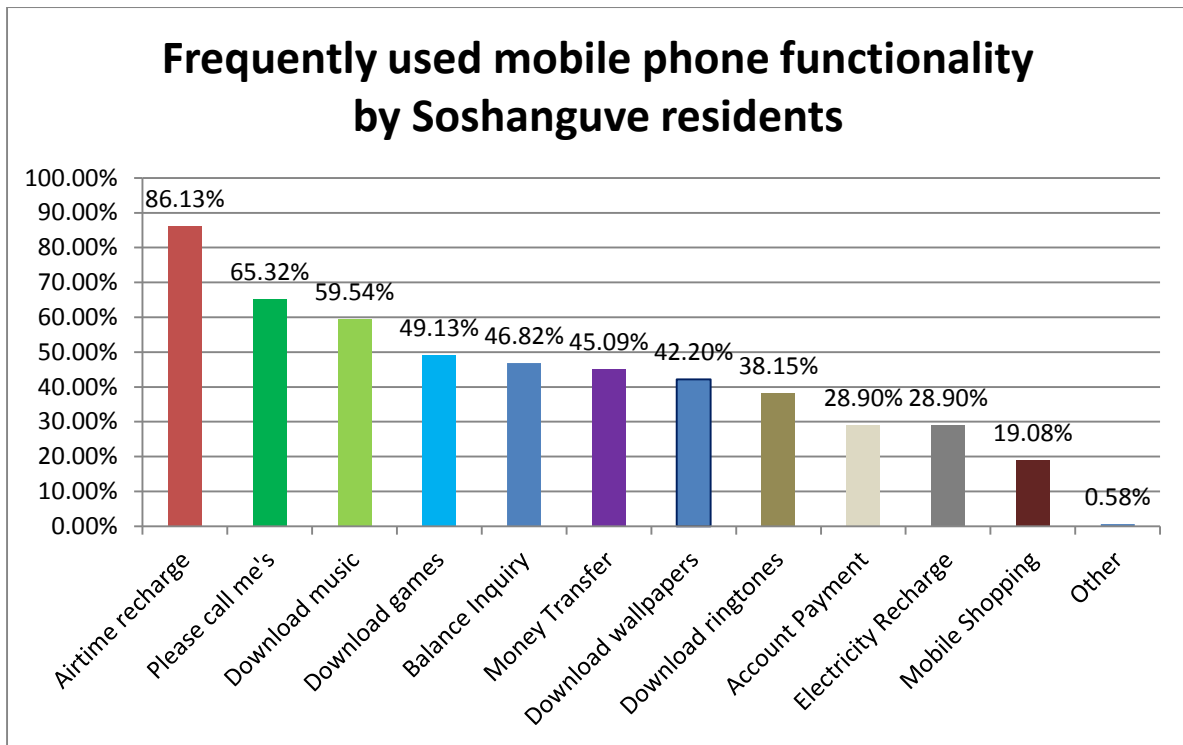
Respondents with feature phones amounted to 19.65%. Feature phones refer to mobile phones which lack the capabilities of a smart phone, such as the ability to install third party applications. They also have limited network and computing capability (Mylonas *et al.*, 2014). There were respondents whose phones could not be classified as smart phone or feature phone due to missing information that was provided by the respondents as shown in Figure 6.10, these phones accounted for 17.92%.



**Figure 6.11: How respondents pay for their bills excluding mobile payments.**

To understand how respondents pay for their bills besides the use of mobile payments they were asked to indicate if they pay their bills using the methods which are shown in Figure 6.11. It can be seen that cash is the widely used method with 79% of the respondents confirming to use this method.

It is then followed by debit card (36.99%), depositing money at the bank (35.26%), ATM payments (29.48%), debit order (25.43%) and credit card (13.87%). There were respondents who did not indicate how they are currently paying for their bills thus they were classified as other.



**Figure 6.12: Frequently used mobile phone services.**

To understand how familiar the respondents are with mobile payments, they were asked to confirm if they use the mobile services that are listed in Figure 6.12. It needs to be noted that some of the functionalities shown in Figure 6.12 do not meet the definition of mobile payments, but are useful in understanding how the respondents use their mobile phones. Some respondents did not give any indication of which functionality they use, thus the “other” option in Figure 6.12.

From the graph (*cf.* Figure 6.12), it can be seen that the five most used mobile services were the following:

- airtime recharge (86.13%),
- sending please call me (65.32%),
- downloading of music (59.54%),
- balance enquiry (46.82%) and
- mobile money transfer (45.09%).

## **6.4. Mobile Payments Adoption Factors**

The items (i.e. research questions) that were used in the questionnaire were developed to capture the respondents' views in relation to perceived training, perceived security, perceived awareness, perceived cost, perceived trust, perceived usefulness, perceived ease of use, and the trialability of mobile payment solutions which were derived from Phase 1. It was essential that the validity and reliability of these items in the questionnaire are tested.

### **6.4.1. Construct validity**

Exploratory factor analysis (EFA) was chosen to assess the construct validity of the items in the questionnaire. According to DeCoster (1998), EFA should be used when the researcher's goal is to identify a number of factors that can be explained by variables that can be grouped together.

### **6.4.2. Assessing the data for EFA and extracting the factors**

Before EFA can be conducted, the following conditions should be applicable:

- There should be evidence of correlation coefficients greater than 0.3 in the correlation matrix (Tabachnick and Fidell, 2007). Correlation coefficient measures the strength of a linear relationship between two variables, its values ranges from -1 to 1, each range is described below (Ratner, 2015).
  - Values from 0 to 0.3 indicate a weak relationship.
  - Values between 0.3 and 0.7 indicate a moderate relationship.
  - Values between 0.7 and 1 indicate a strong relationship.
- The Bartlett's test of sphericity has to be significant at  $p < .05$  (Bartlett, 1950). The purpose of the Bartlett's test is to indicate if factor analysis can be applied to a correlation matrix by testing if the correlation matrix is an identity matrix. If a matrix is not an identity matrix then it is suitable for factor analysis (Munro, 2005).
- The Kaiser-Meyer-Olkin (KMO)(Kaiser, 1974) measure of sampling adequacy should at least be 0.6. KMO is based on the idea that variables that have common factors should have small partial correlations between the



corresponding variables when the effects of the rest of the variables are controlled (Munro, 2005).

### **6.4.3. Bartlett's test of sphericity and KMO**

The researcher generated the correlation matrix using the SPSS software package<sup>18</sup>, the extract of the correlation matrix is represented by **Error! Reference source not found.** Once the matrix was generated the researcher scanned through the correlation matrix in order to check for the presence of coefficients, which were at least greater than 0.3 as recommended by Tabachnick and Fidell (2007). The correlation matrix had coefficients which were greater than 0.3, they are highlighted in yellow as shown in Figure 6.13, as a result the researcher could continue with calculating the KMO and the Bartlett's test of sphericity using the SPSS software.

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<sup>18</sup> IBM SPSS Statistics Version 19

		Correlations					
		Q13.5	Q13.6	Q13.7	Q13.8	Q13.9	Q13.10
Q12.13	Pearson Correlation	-.040	.023	.025	.307**	.094	-.029
	Sig. (2-tailed)	.606	.769	.745	.000	.224	.706
	N	168	170	168	171	169	170
Q12.14	Pearson Correlation	.257**	.070	.074	.050	.135	-.055
	Sig. (2-tailed)	.001	.362	.338	.512	.078	.475
	N	169	171	169	172	170	171
Q13.1	Pearson Correlation	.050	.208**	.341**	.142	.230**	.172*
	Sig. (2-tailed)	.523	.007	.000	.064	.003	.025
	N	168	170	168	171	169	170
Q13.2	Pearson Correlation	.005	.316**	.234**	.157*	.194*	.080
	Sig. (2-tailed)	.954	.000	.002	.041	.012	.303
	N	168	170	168	171	169	170
Q13.3	Pearson Correlation	-.074	.147	.094	.035	.106	.012
	Sig. (2-tailed)	.347	.058	.232	.656	.176	.877
	N	165	167	165	168	166	167
Q13.4	Pearson Correlation	-.016	.027	.095	-.179*	.037	.053
	Sig. (2-tailed)	.834	.727	.223	.020	.637	.497
	N	167	168	166	169	167	168
Q13.5	Pearson Correlation	1	.036	.013	-.049	-.024	-.032
	Sig. (2-tailed)		.645	.867	.527	.756	.679
	N	169	168	166	169	167	168
Q13.6	Pearson Correlation	.036	1	.247**	.018	.477**	.171*
	Sig. (2-tailed)	.645		.001	.813	.000	.026
	N	168	171	168	171	169	170
Q13.7	Pearson Correlation	.013	.247**	1	.152*	.173*	.143
	Sig. (2-tailed)	.867	.001		.048	.025	.064
	N	166	168	169	169	167	168
Q13.8	Pearson Correlation	-.049	.018	.152*	1	.183*	.075
	Sig. (2-tailed)	.527	.813	.048		.017	.327
	N	169	171	169	172	170	171
Q13.9	Pearson Correlation	-.024	.477**	.173*	.183*	1	.051
	Sig. (2-tailed)	.756	.000	.025	.017		.508
	N	167	169	167	170	170	169
Q13.10	Pearson Correlation	-.032	.171*	.143	.075	.051	1
	Sig. (2-tailed)	.679	.026	.064	.327	.508	
	N	168	170	168	171	169	171

**Figure 6.13: Correlation Matrix (extract)**

The SPSS software produced the following output:

- Bartlett's test of sphericity = .000,
- KMO = 0.614
- The matrix showed a presence of values which were greater than 0.3

The required conditions for factor analysis to be conducted hold, thus the researcher proceeded to conduct factor analysis.

#### 6.4.4. Extracting factors using SPSS

EFA was conducted using SPSS with principal component analysis and varimax rotation as the approach for extracting the variables. The reason this approach was chosen is because it is popular and similar studies have used the same approach. The other reason is that the results from this approach are much easier to interpret as compared to the other approaches, such as Common Factor Analysis (CFA) (de Winter and Dodou, 2014).

SPSS was configured to retain factors which had an eigenvalue of  $\geq 1$  (one or more) as recommended by Kaiser (1960). Figure 6.14 shows the screen plot that was generated by SPSS, as can be seen only 8 factors that have an eigenvalue of at least one (1), and these were the factors that were chosen for further analysis. The 8 factors are 8 categories that affects the respondents in adopting mobile payment solutions. It can be seen from Table 6.2 that items (questions) that test a related concept/theme are grouped together to form a component (Category).

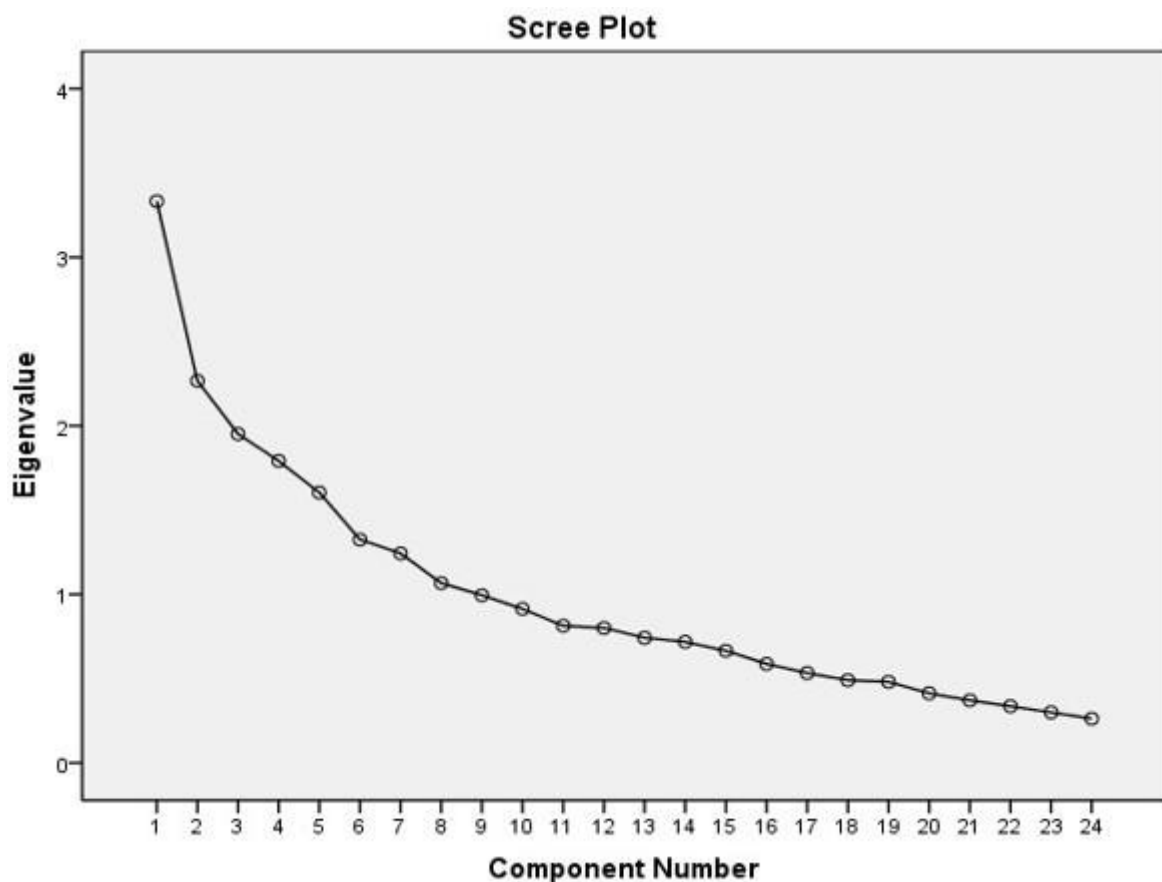


Figure 6.14: Screeplot for the factors

The rotated component matrix is a table that is generated by SPSS that indicates which items (questions in the questionnaire) are loading in a particular factor (category). The suggested minimum factor loading value if an item has to be considered to be contributing to a factor is 0.4 (Stevens, 1996). SPSS was configured by the researcher to show only the factor loadings of items whose value was at least 0.4 as shown in Table 6.2.

**Table 6.2: Rotated component matrix**

	Component (Category)							
	1	2	3	4	5	6	7	8
Q12.1							.615	
Q12.2				.777				
Q12.3								.561
Q12.5					.759			
Q12.6							.625	
Q12.8		.670						
Q12.9						.840		
Q12.10			.817					
Q12.11				.562				
Q12.12		.696						
Q12.13					.702			
Q12.14						.636		
Q13.1	.832							
Q13.2	.741							
Q13.3							.728	
Q13.4				.837				
Q13.5						.768		
Q13.6								.708
Q13.7	.570							
Q13.8					.753			
Q13.9								.746
Q13.10			.821					
Q13.12		.812						
Q13.14			.517					

### 6.4.5. Reliability of the instrument

To test the reliability of the questionnaire, the Cronbach's alpha was calculated as shown in Table 6.3. The minimum recommended value for Cronbach's alpha is 0.6 (Hair *et al.*, 2006), thus all the factors meet this criteria. Another criteria that is used to measure the reliability of an instrument is the average inter-item correlation, which should at least be 0.3 or more (Hair *et al.*, 2006), as indicated in Table 6.3. All the items that were grouped together per factor had an average inter-item of at least 0.3 or higher.

**Table 6.3: Reliability of the questionnaire**

Factor Number	Factor Name	Items	Cronbach's Alpha	Average inter-item correlation
1	Cost	13.1, 13.2, 13.7	0.629	0.372
2	Awareness	12.8, 13.12, 12.12	0.624	0.353
3	Trialability	12.10,13.10, 13.14	0.655	0.382
4	Training	12.2, 13.4,12.11	0.622	0.380
5	Usefulness	12.5, 13.8 ,12.13	0.649	0.383
6	Ease of use	12.9, 13.5, 12.14	0.643	0.373
7	Security	12.1, 12.6, 13.3	0.613	0.346
8	Trust	12.3, 13.6, 13.9	0.612	0.343

### 6.5. Discussion of Survey Results

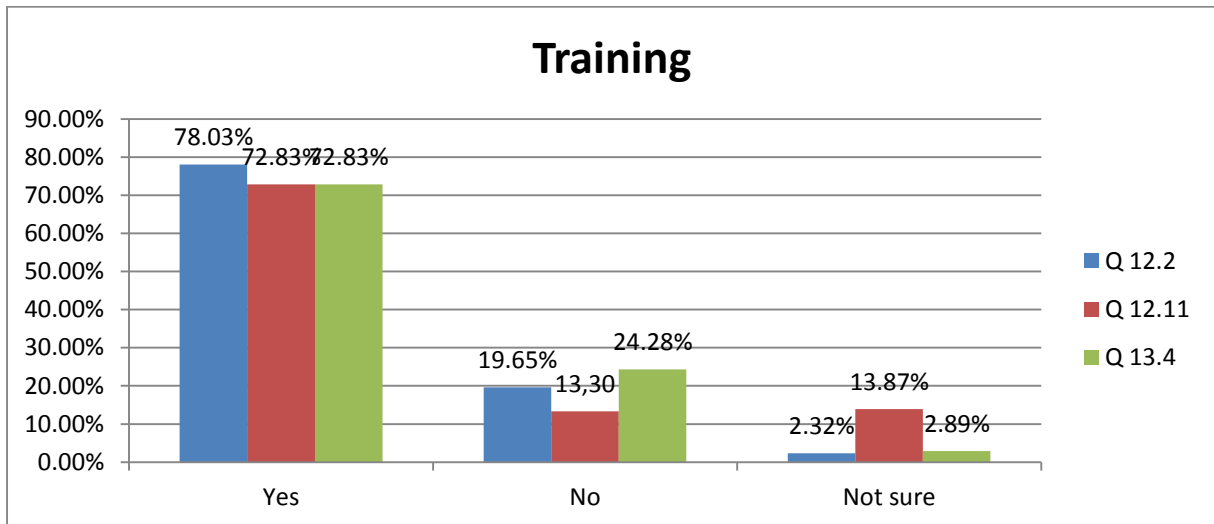
This section discusses the results of the questionnaire. The questions are grouped per construct as shown in Table 6.3.

**Training** – this category is comprised of three questions on the questionnaire:

- 12.2 “A person needs training on how to make mobile payments”.
- 12.11 “Road shows should be done to assist those who are not very familiar with mobile payments”.

- 13.4 “Need training on how to use mobile payments”.

The respondents who agreed that training is needed in order to encourage them to adopt an MPS were above 70% as indicated by Figure 6.15. This suggests that training is factor that determines if the respondents would adopt MPSs.



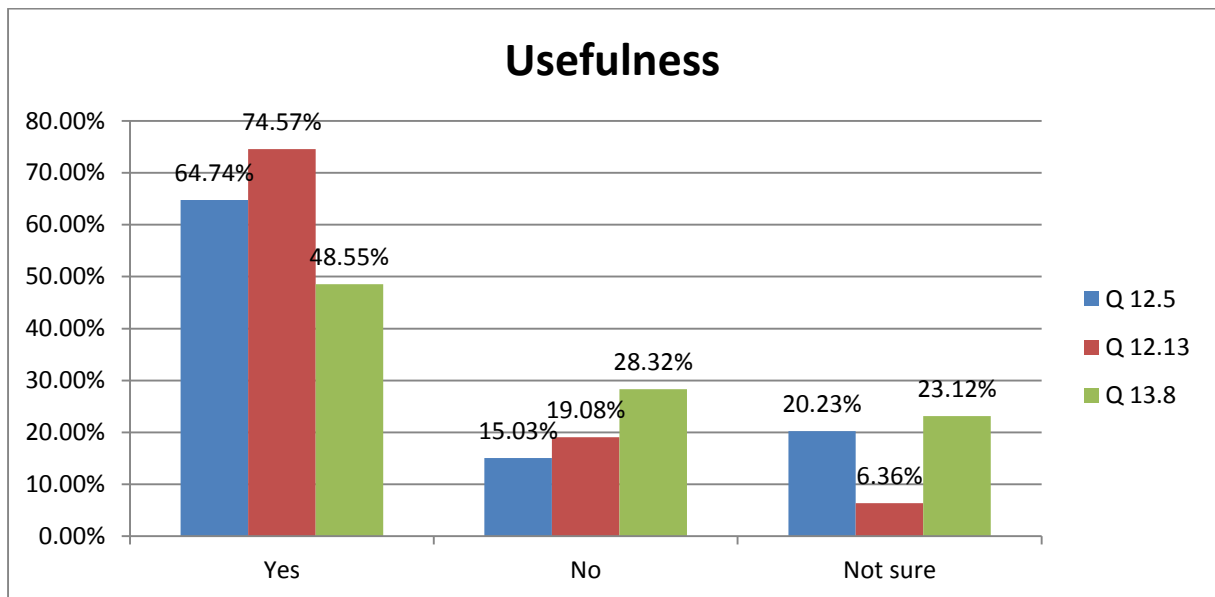
**Figure 6.15: Training**

**Usefulness** – this category is comprised of three questions on the questionnaire:

- 12.5 “Using mobile payments enables me to pay my accounts or transfer money more quickly and efficiently”.
- 12.13 “Mobile payments saves me time as I don’t have to stand in long queues”.
- 13.8 “If I could use my mobile phone to buy from general dealers and Spaza shops in the Townships”.

The respondents who agreed with question 12.5 were 64%, indicating that mobile payments are beneficial to their lives as it enables them to be more efficient. Around 74% of the respondents agreed that mobile payments saves them time as indicated by question 12.13. 52% of the respondents disagreed with question 13.8, thus they would not be encouraged to use mobile payments even if Spaza shops and general dealers started to accept them as a form of payment.

If mobile payments are to be adopted, functionality that would be of great benefit to the respondents has to be investigated.

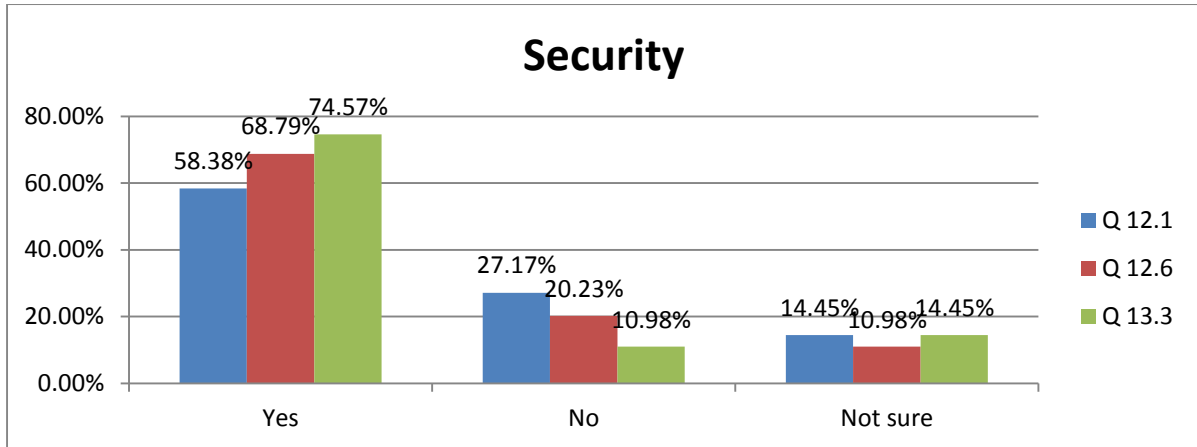


**Figure 6.16: Usefulness**

**Security** – this category had three questions on the questionnaire:

- 12.1 I am worried about the security of mobile payments.
- 12.6 I fear that when my phone gets stolen, they will use it to make purchases on my name.
- 13.3 Security from fraud

The respondents agreed that security is a factor that determines their willingness to adopt MPS. Question 12.1 had the least amount of respondents who agreed with it at 58.38% while question 12.6 and question 13.3 were above 68% as shown in Figure 6.17

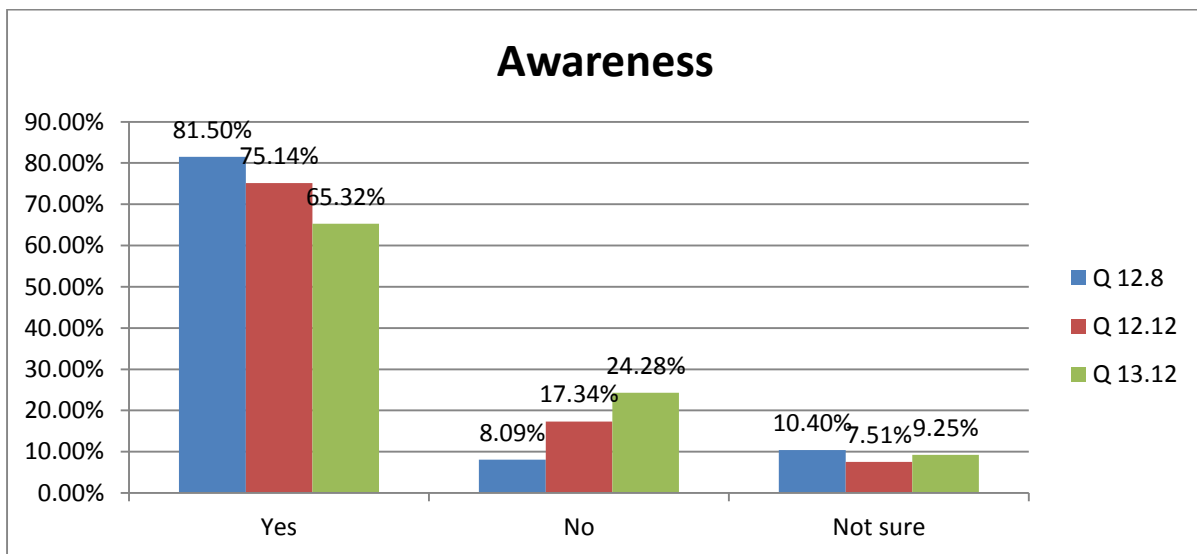


**Figure 6.17: Security**

**Awareness** – this category is comprised of three questions:

- 12.8 The public should be made more aware of mobile payments.
- 12.12 Advertising should be done to raise awareness amongst those who are not aware of the existence of mobile payments.
- 13.12 I will use mobile payments if I see my friends using it.

The respondents strongly agreed with this construct that they need to be made aware of MPSs. Question 13.12 had the lowest affirmation by respondents at 65.32%. Question 12.8 and Question 12.12 were above 75.14% as shown in Figure 6.18. The average of the three questions is 74%, indicating that there is need to advertise the capabilities of MPSs amongst the respondents.



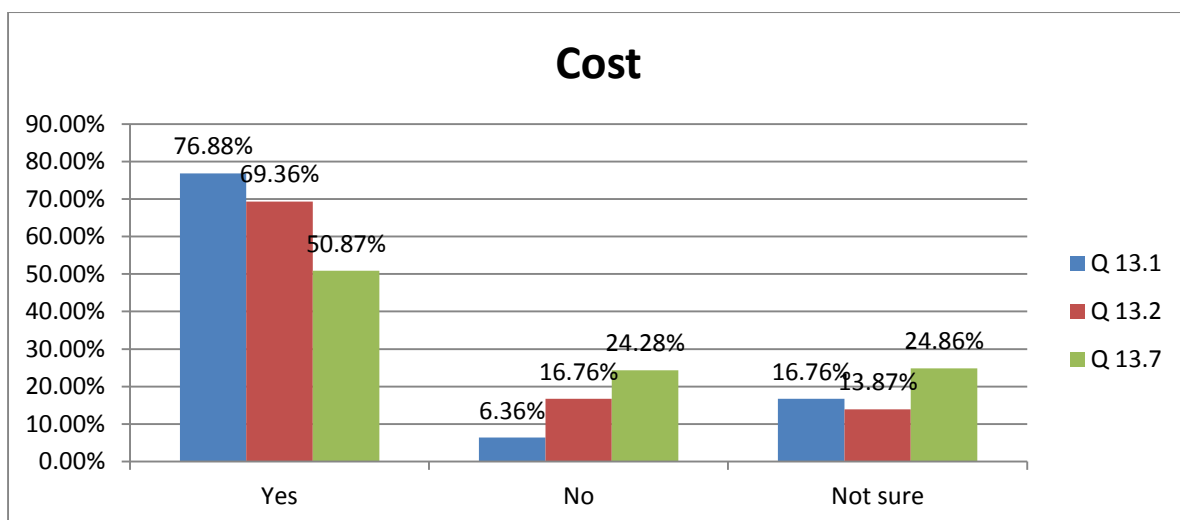
**Figure 6.18: Awareness**



**Cost** – questions that are related to the cost category are as follows:

- 13.1 Lower transaction charges
- 13.2 Lower airtime charges
- 13.7 When I have more money

Question 13.1 and question 13.2, both are related to MPS cost, were at almost above 70%, while question 13.7 was affirmed by 50.87% of the respondents as shown in Figure 6.19.

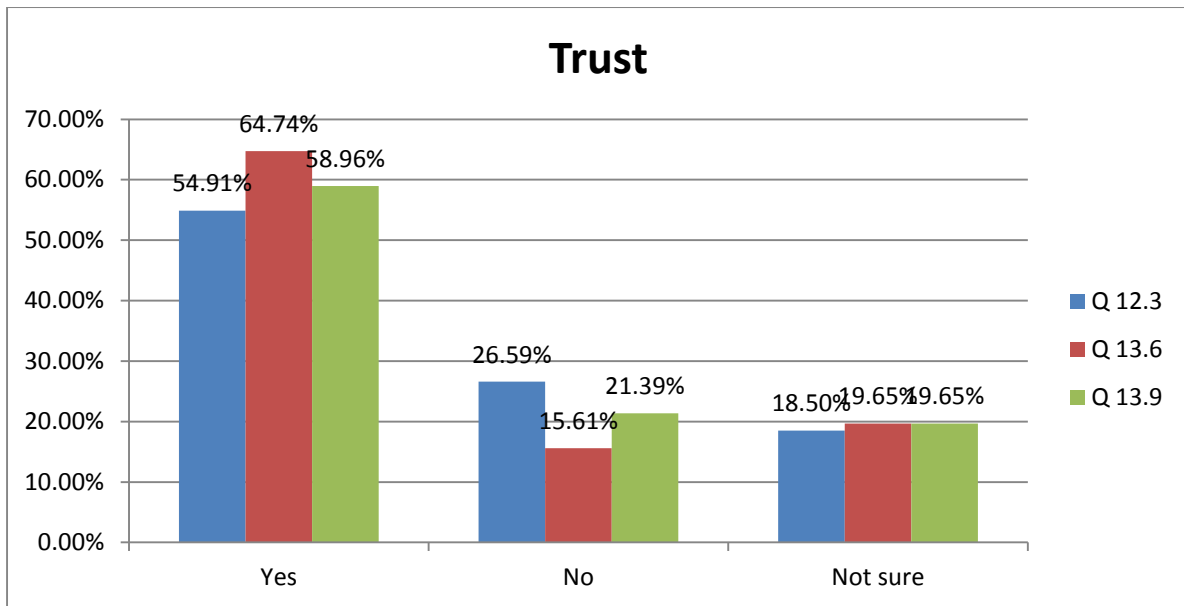


**Figure 6.19: Cost**

**Trust** – questions that are related to trust are as follows:

- 12.3 I fear that while making a mobile payment, the network connection will go down.
- 13.6 Better network coverage
- 13.9 Phone battery being able to last longer

Respondents agreed that trust was a factor that influenced them in adopting a MPS. For all the three questions the percentage of agreement ranged from 54% to 64% as shown in Figure 6.20.

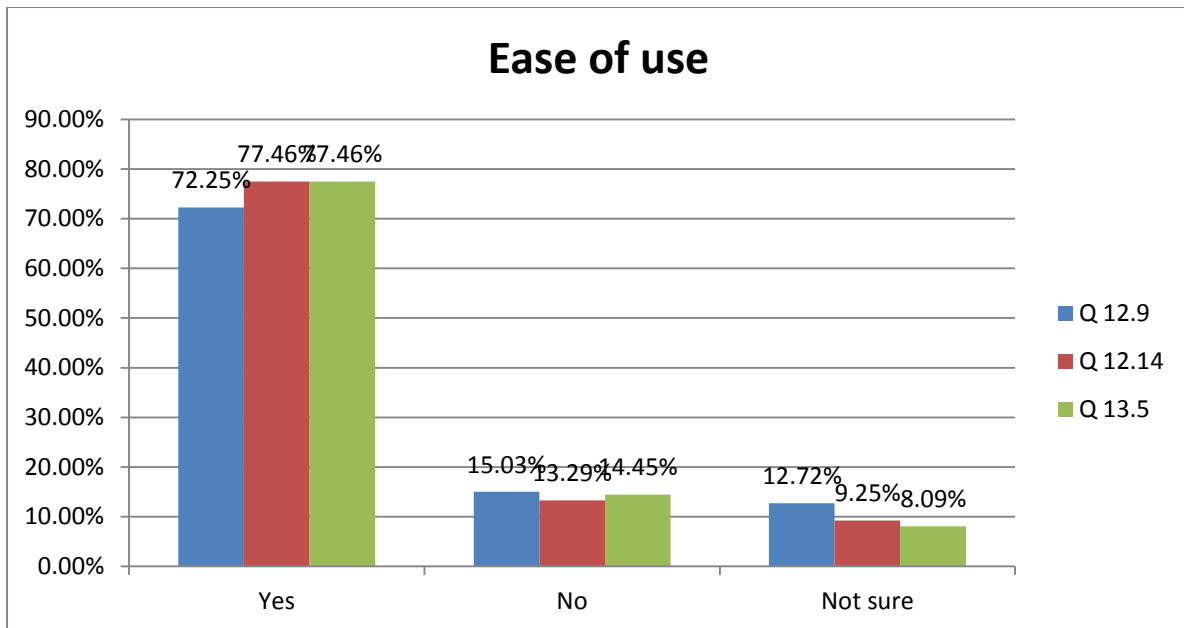


**Figure 6.20: Trust**

**Ease of use** – questions that are related to ease of use are as follows:

- 12.9 Stores should have mobile terminals in store that enable potential users to test how mobile payments work.
- 12.14 Mobile payments is easy to use
- 13.5 Mobile payments should be easy to use

There was a strong agreement from the respondents that MPS should be easier to use. All the questions that were related to this construct were above 70% as shown in Figure 6.21.

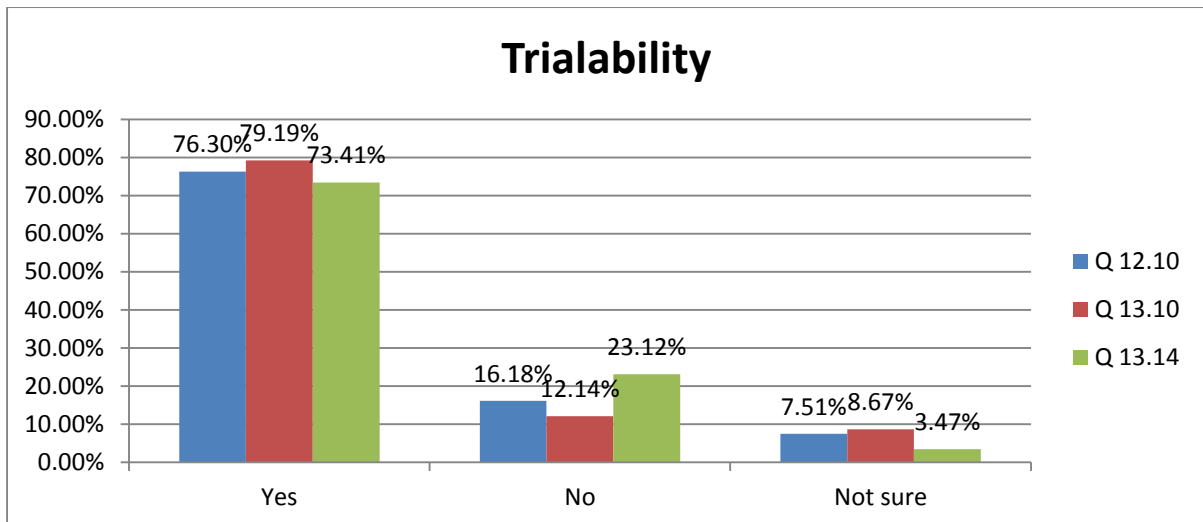


**Figure 6.21: Ease of use**

**Trialability** – questions that are related to trialability are as follows.

- 12.10 Stores should have mobile terminals in store that enable potential users to test how mobile payments work.
- 13.10 I will use mobile payments if I could test it first.
- 13.14 Promotion that enables me to use mobile payments for a certain period of time without incurring any costs.

Respondents agreed strongly with the construct of trialability, all the questions were above 70% in agreement as shown in Figure 6.21



**Figure 6.22: Trialability**

## 6.6. Summary

This chapter presented the results of the interviews and surveys. From the results, it seems as if the only form of mobile payments that is used constantly by the respondents (township residents) is the recharge of airtime, and very few people are using their mobile phones to pay for their accounts, recharge their electricity and shopping on the Web. The distribution of those who are employed plus self-employed was 47.97% while those who were students plus unemployed were 52.02%.

The very low usage of mobile payment solutions could be attributed to consumers being used to paying by cash, debit order and ATMs. The availability of services or goods that satisfy the needs of the consumers is also a factor. Airtime recharge is the most used form of mobile payment solutions as most users in South Africa are on prepaid packages thus the need to buy airtime. A total of 45% of the respondents also indicated that they have used the money transfer functionality, indicating that they either transfer funds in between their accounts or there is a niche market for remittances that can be exploited.

As the majority of the respondents were youth and most of them were still in high school or had completed high school, it was expected that their mobile phones usage will be centred on downloading music, gaming, and sending please call me's. The majority of the mobile phones that were used by the respondents were smart phones,

thus they are compatible with the latest mobile apps released by the major banks and mobile payment solutions operators.

The income distribution reflected the educational level of the respondents; those with higher qualifications were earning more as compared to those without qualifications, whilst most of the students and those without work had no source of income. In total, 52% of the respondents had no source on income, thus making it difficult to conduct any form of transaction when there is no income to use.

The Bartlett's test of Sphericity and KMO was calculated to ensure that the data is suitable for confirmatory factor analysis. The data was found to be suitable and confirmatory factor analysis was performed on the data to extract the eight factors that may influence the diffusion and use of mobile payment solutions in the townships.

Cronbach's alpha and the average inter-tem correlation were used to measure the reliability of the instrument (questionnaire), and it was confirmed that indeed the instrument is reliable. The constructs that were derived as potential effectors for the diffusion and use of mobile payment solutions are the following: training, cost, awareness, security, trust, usefulness, ease of use and trialability. These factors are analysed and corroborated using related studies in the following chapter in order to derive the guidelines that could assist mobile payment solution providers and operators in deploying mobile payment solutions in the townships.

# Chapter 7: Guidelines for Mobile Payments Diffusion and Use

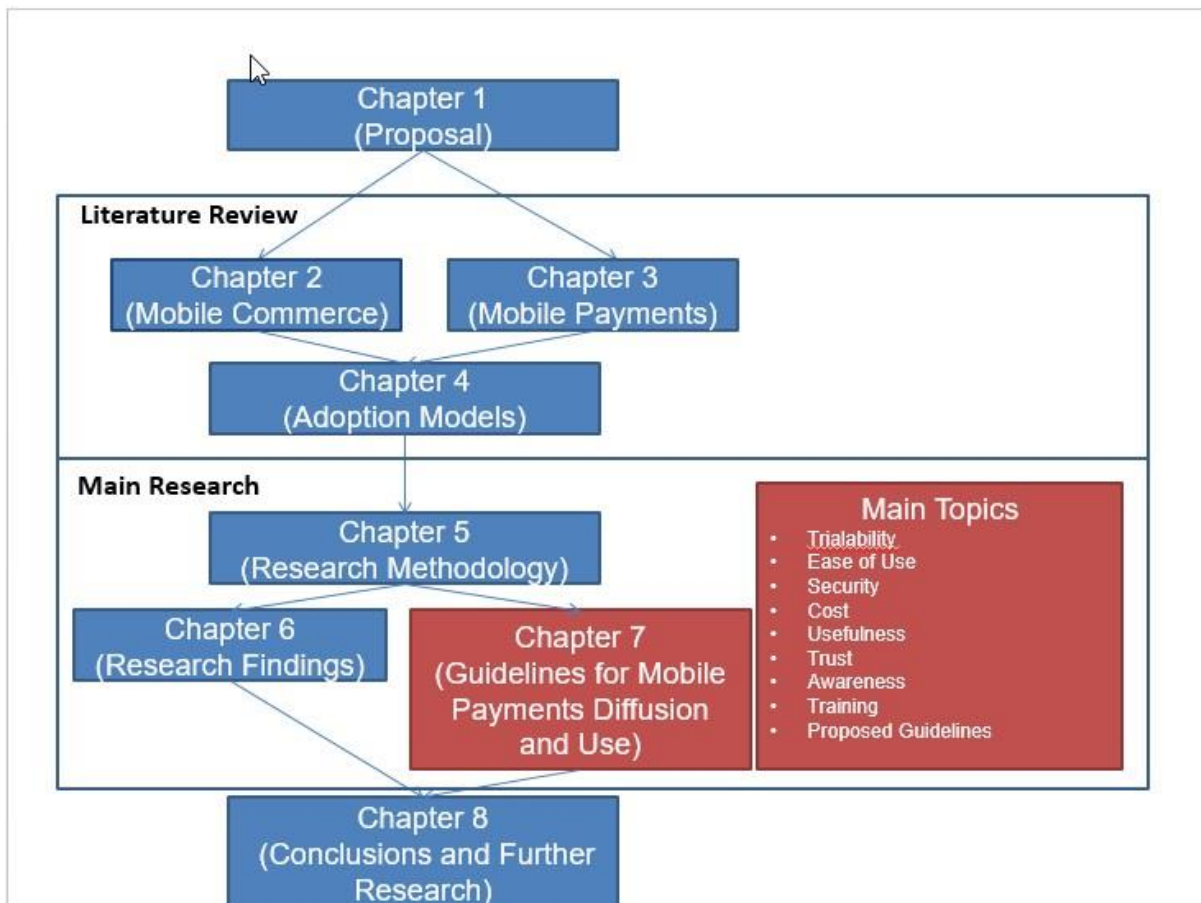


Figure 7.1: Chapter 7 Navigation map

## 7.1. Introduction

The aim of this chapter is to corroborate the factors identified in Chapter 6 with other related studies, and propose the guidelines that could be applied when deploying mobile payments for the township residents.

The structure of this chapter is depicted in Figure 7.1. This chapter starts by discussing the eight (8) factors that have been identified as affecting the diffusion and use of mobile payments in the townships in Section 7.2 - 7.9, and then the results are compared with similar studies.

Comparing the results with previous studies and the in-depth discussion of the eight (8) factors should enable the researcher to extract the guidelines that are applicable

to the township environment. Section 7.10 lists all the guidelines that are proposed in this study.

## **7.2. Trialability**

From the results in the previous chapter, it is clear that the majority of the respondents support the notion of trying out mobile payments before adoption. These findings are in agreement with other studies which have been done by Machena (2010) in South Africa that trialability influences the adoption rate of mobile payments. Potential adopters should be able to try out MPSs without incurring costs.

Agarwal and Prasad (1998) also indicated that consumers will feel comfortable with new technology as they experiment with it. Tan and Teo (2000) also came to the same conclusion that experimentation with new technology increases the chances of adoption. In addition, the Innovation of Diffusion Theory (IDT) (Rogers, 2003) states that the trialability of a new innovation influences its adoption and use.

## **7.3. Ease of Use**

The outcome of the questionnaire regarding this construct indicates that mobile payments should be simplified. Similar studies done by Machena (2010) and Masinge (2010) in South Africa investigating the adoption of mobile banking by low income communities in the townships also came to the conclusion that ease of use encourages MPS adoption.

A study conducted in Tanzania by Ishengoma (2011), concluded that people with a certain level of education found mobile banking easy to use while illiterate people found it difficult to use. According to the IDT theory, the complexity of the new innovation influences the adoption rate, the less complex the new innovation, the greater the probabilities of it being adopted. Thus, less sophisticated products and ease of use is important for use of mobile payment solutions by the low-income groups.

## **7.4. Security**

The findings indicate that users are concerned about the security of mobile payments. A study conducted by Wambari (2009) to investigate the adoption of mobile banking

in Kenya listed security as one of the concerns which potential adopters have about mobile payments.

They is also a concern about the security of the passwords and the loss of handsets (Wambari, 2009). During the qualitative phase of the study, respondents issued similar sentiments that they were afraid as to what would happen to their money in case they lost their mobile phones.

A survey conducted by Accenture South Africa in 2014 indicated that the respondents were worried about the security of mobile payments (Accenture, 2014). According to Duncan (2014), South Africans are still concerned about the security of mobile payments. If the user of the mobile payment solution is of the view that the operator of the mobile solution lacks the necessary capabilities to secure the payments, they would not adopt the MPS solution.

## **7.5. Cost**

Respondents were of the view that they would prefer that the cost of conducting mobile payments was lower. More than half of the participants had no source of income. It is therefore assumed that cost will have a significant impact on the diffusion and use of mobile payments in the townships. According to the IDT theory, relative advantage accelerates the adoption of a new innovation, if the cost of conducting mobile payments reduces the advantage; the community might be discouraged in adopting it.

Smart communications, a mobile network operator that is based in Philippines, an emerging economy in the Asian Pacific region (tradingeconomics, 2015), reduced the price of the airtime bundles that consumers could buy through their mobile device (KPMG, 2007), in order to encourage its customers to adopt its mobile payments offerings.

The reduction in prices encouraged the consumers to start buying the airtime using their mobile devices (KPMG, 2007). The surge in volume of mobile payments after the prices were dropped confirms that people from low income neighbourhoods are price sensitive as suggested by Karnani (2007).



Estimates from Sustainable Livelihoods Foundation indicates that there are around 100 000 Spaza shops in South Africa with a combined turnover of R7 billion (Odendaal, 2014). Blue Label Telecoms and MasterCard have recognised that Spaza shops and informal traders lack point of sale terminals which led to them to embark on a project that aims to distribute around 22 000 point of sale terminals to Spaza shops and informal traders who have an income of up to R25 000.

The initiative by Blue Label Telecoms and MasterCard confirms that the underserved areas in South Africa are still reliant on cash. As indicated in Section 3.5, there are solutions that enable a mobile device to become a POS terminal. Mobile devices are cheaper when they are used as POS terminals as compared to traditional POS terminals (Clifford, 2013, Speckman, 2015). The reduction in the cost of mobile POS terminals can potentially lead to Spaza shops and Informal traders adopting mobile payments. The success of M-Pesa in Kenya is also alluded to it being cheaper compared to existing alternatives (Ignacio and Dan, 2010).

## **7.6. Usefulness**

Current product offerings, which are available from mobile payment vendors, are not considered useful to the users. The main offerings are banking products from the traditional banks and mobile network operators such as the purchase of airtime and data bundles. Some banks enable their customers to register accounts, which they have with other entities such as retail stores as beneficiaries; this setup enables the mobile users to pay those accounts from their banking apps.

The limited products make it very difficult for the respondents to engage in mobile payments even if they wished to. Retail payments in South Africa are composed of the following: 30% - 35% electronic and 60% - 65% cash (Matambo and Schaefer, 2013). This is also confirmed by the results in this study that cash is still their main form of payment for good and services.

Consumers will not simply abandon their current payment methods and adopt mobile payments without getting any value from them. There have to be benefits that they are

currently not getting from their existing payment methods. Convenience is one of the benefits that can be leveraged to encourage consumers to adopt mobile payments.

A mobile device is able to carry many virtual cards compared to a physical wallet, which has a very limited capacity. Bank cards, retail cards and loyalty cards can all be stored in mobile wallets enabling the user to carry fewer items as they move about in their daily lives. The benefit of carrying fewer items can encourage potential users to adopt and use mobile payments.

Mobile devices that simulate POS terminals come with many benefits; the Informal trader or Spaza shop owner will be able to have access to great functionality such as inventory management and sales forecasting which currently they have to do by hand. A study that was conducted by Mutalemwa and Anthony (2007) in Tanzania investigating the factors that affect the adoption of mobile payments in that country confirmed that usefulness affects the adoption of mobile payments. Lastly, the IDT theory states that people will adopt new innovations if it gives them a relative advantage.

## **7.7. Trust**

The qualitative data in Section 6.2.2.2 indicates that there is a perception that it is easier for hackers to steal information when the transaction is conducted from a mobile phone. Most of these fears are unduly emphasised, thus the need to educate consumers on how secure mobile payments are. It has been proven that mobile wallets are more secured than plastic cards (Busby, 2015). Consumers need to trust mobile payments solutions before they adopt them. To trust mobile payments they have to try it or see someone whom they trust using it. This supports the IDT variable of observability.

Mobile payment solutions that are associated with existing brands that are viewed as reliable i.e. banks and MNOs, stand a better chance of being adopted. Most methods of mobile payments described in Section 3.5 require that the purchaser confirms the payment by either using a pin number or by a fingerprint. The chances of theft happening are minimal if the users can adhere to keeping their pin numbers secret.

A study that compares M-Pesa in South Africa and Kenya indicated a lack of trust as one of the factors that influences mobile payments adoption (Budree and Williams, 2013). Issuing the buyer with a virtual slip or confirmation SMS with the transaction details after each transaction can help to alleviate some of the fears.

## **7.8. Awareness**

The success of M-Pesa in Kenya could be attributed to the ubiquity of its outlets nationwide. Safaricom has more than 40000 agents distributed throughout the country (Safaricom, 2015). The outlet of each agent has proper signage with Safaricom colours indicating to the public that they can conduct M-Pesa transactions (Ignacio *et al.*, 2010).

In the case of South Africa, some of the outlets that do cashing in or cashing out for Vodacom M-Pesa and Standard Bank have not been branded enough to stand out. Thus, it becomes more difficult for customers to locate the nearest outlet where they can cash in or out. As indicated in Section 3.5, Vodacom re-launched the M-Pesa service in 2014 to address some of issues that inhibited it from being successful.

One of the issues that was indicated by Vodacom for the failure of M-Pesa was the poor footprint of outlets that processes their transactions (Goldstuck, 2014). To address this issue they have increased their outlets to at least more than 8000 which is inclusive of both informal traders such as Spaza shops and retail stores (Goldstuck, 2014).

WIZZIT in South Africa realised the power of marketing from the onset and have their “Whizzkids” who come from the local community who market the service to the locals (CGAP, 2006). In a study which was conducted by Medhi *et al.*, (2009) in several different countries such as South Africa, Philippines and India where the respondents were semi-literate and from poor backgrounds, almost half of them were not aware of the existence of mobile payments.

In another study which was conducted by Budree and Williams (2013) to compare M-Pesa in Kenya and M-Pesa in South Africa, lack of awareness was one of the factors

that was found to contribute to the lack of adoption of mobile payments in South Africa (Budree and Williams, 2013). According to the IDT theory, the observability of the new innovation is important as it helps the community to be aware of its existence.

## **7.9. Training**

During the analysis of the qualitative interviews in Section 6.2.2.3, several interviewees indicated that users must be trained on how to use mobile payments. M-Pesa outlets in Kenya help the users with their queries and on how to use the system; their ubiquity creates some comfort level for the users that they will get assistance when they need it.

In South Africa, the outlets that service mobile payments such as retail banks and mobile network operator's access points are not ubiquitous and they are mainly found in the shopping centres. To access the shopping centres township residents would have to take a mini bus taxi, which would be an inconvenience to them and would require a taxi fare.

One of the reasons that have been attributed to the failure of M-Pesa in South Africa is the lack of agents who could support it (Budree and Williams, 2013). The lack of support results in users who are unwilling to try the service as it will be difficult for them to get support. Vodacom has realised this problem and have since increased the number of outlets that supports the service to more than 8000 as of 2014 when M-Pesa was revamped (Goldstuck, 2014).

The success of M-Pesa in Kenya is attributed to their vast network of agents who cash in, cash out and support the service (Budree and Williams, 2013). WIZZIT in South Africa have their Whizzkids who support and train the locals on how to use their solution as indicated in section 3.7.3.3.

## **7.10. Proposed Guidelines**

The guidelines were developed by taking each factor as discussed in Section 7.2 to Section 7.9, then investigating solutions to those factors. The solutions were arrived at by applying several techniques such as investigating similar cases in similar

environments such as M-Pesa in Kenya and Tanzania, GCash<sup>19</sup> in the Philippines, bKash<sup>20</sup> in Bangladesh.

The IDT theory was also applied to the factors in order to suggest solutions. One additional factor (enabling environment) was added by the researcher as it was deemed to affect the diffusion and use of mobile payments. Regulatory bodies such as the South African Reserve Bank (SARB) and Government develops regulations that can either encourage or discourage the development of MPSs.

The first column in **Table 7.1** represents the factor, while the underlined text in the second column represents the proposed guidelines of the factor; the text which is not underlined explains the guideline.

**Table 7.1: Proposed guidelines per factor**

Factor	Proposed guideline
Awareness	<ul style="list-style-type: none"> <li>• <u>When a new MPS is launched, effort should be put into advertising to ensure that the target market is aware of the existence of the MPS. Radio, print media, TV, billboard advertising and road shows should be made to appeal to the target market.</u></li> <li>• The effectiveness of the advertising campaigns should be measured using industry standard metrics and modified if required.</li> <li>• Outlets that process mobile payments should have visible signage stating that they process mobile payments. As per IDT theory, organisations should look into employing local champions to market mobile payments in their communities.</li> </ul>
Training	<ul style="list-style-type: none"> <li>• <u>Semi-literate and low-income communities should be trained on how to use an MPS.</u></li> <li>• Road shows and outlets should be able to offer training to individuals who want to learn how to conduct mobile payments.</li> </ul>

<sup>19</sup> <http://www.globe.com.ph/gcash>

<sup>20</sup> <http://www.bkash.com/>

Factor	Proposed guideline
	<ul style="list-style-type: none"> <li>• The outlets and/or agents that liaise with the clients should receive the necessary training and support.</li> </ul>
Cost	<ul style="list-style-type: none"> <li>• <u>The total cost of conducting a mobile payment should be cheaper as compared to existing alternatives.</u></li> <li>• The traditional POS terminal is expensive as compared to a mobile POS terminal. A small merchant who purchases a mobile POS terminal over a traditional POS terminal saves money which can result in the merchant selling goods at lower prices due to decreased input costs. When purchasing items such as electricity and digital content such as music and games, the consumer saves transportation money as they do not have to travel to the nearest outlet to make the purchase.</li> <li>• Consumers could be encouraged to use mobile payment solutions by offering them a discount if they purchase a product / service using a mobile phone.</li> </ul>
Usefulness	<ul style="list-style-type: none"> <li>• <u>MPS should fulfil a need which is not met by the current alternatives or it should offer more value than the existing alternatives.</u></li> <li>• Currently, the informal traders and Spaza shop owners maintain their books manually. Mobile POS terminals will add benefits such as inventory management and accounting.</li> <li>• The MPS should be designed according to the needs of the target market as one-size-fits-all does not work.</li> </ul>
Ease of use	<ul style="list-style-type: none"> <li>• <u>MPS should be easier to use, simpler user interfaces where minimum input is required from the user.</u></li> </ul>
Triability	<ul style="list-style-type: none"> <li>• <u>Potential adopters of an MPS should be able to try it without incurring any financial penalties.</u></li> <li>• Outlets such as retail stores, bank branches and Spaza shops should have the capacity to demonstrate to potential adopters how to conduct mobile payments; the demonstration process should enable the user to understand without committing to a purchase. For example, a customer might walk into a bank</li> </ul>

Factor	Proposed guideline
	branch, asks customer services how they would pay a beneficiary from their mobile device; the banks' employee then walks through the whole process as to how to achieve that.
Trust	<ul style="list-style-type: none"> <li>• <u>Mobile payment security features should be apparent to the potential adopters in order to alleviate their fears.</u></li> <li>• Educating the consumers regarding the security measures that are in place can alleviate some of the fears.</li> </ul>
Security	<ul style="list-style-type: none"> <li>• <u>Industry security measures should be adhered to or exceeded to prevent any unauthorised access to financial information and fraud.</u></li> </ul>
An enabling environment	<ul style="list-style-type: none"> <li>• <u>The government in consultation with the financial regulator which is the SARB and mobile payment solutions operators should develop legislation that stimulates innovation and competition whilst safeguarding the funds and transactions, which are processed through the mobile payment solutions.</u></li> <li>• Up until 2015 only banks were allowed to take deposits, thus MNOs could not be innovative by themselves.</li> </ul>

### 7.11. Summary

This chapter highlighted all the factors that affect the diffusion and use of mobile payments in the townships. One of the key findings is the lack of trust. Several interviewees as well as the responses from the questionnaire indicated that mobile payment solutions users are afraid of losing their money if something goes wrong during the transaction. If the distribution channels can be ubiquitous, coupled with an increase in awareness campaigns and product offerings that are targeted towards low income communities, the mobile adoption rate might increase.

# Chapter 8: Conclusion and Further Research

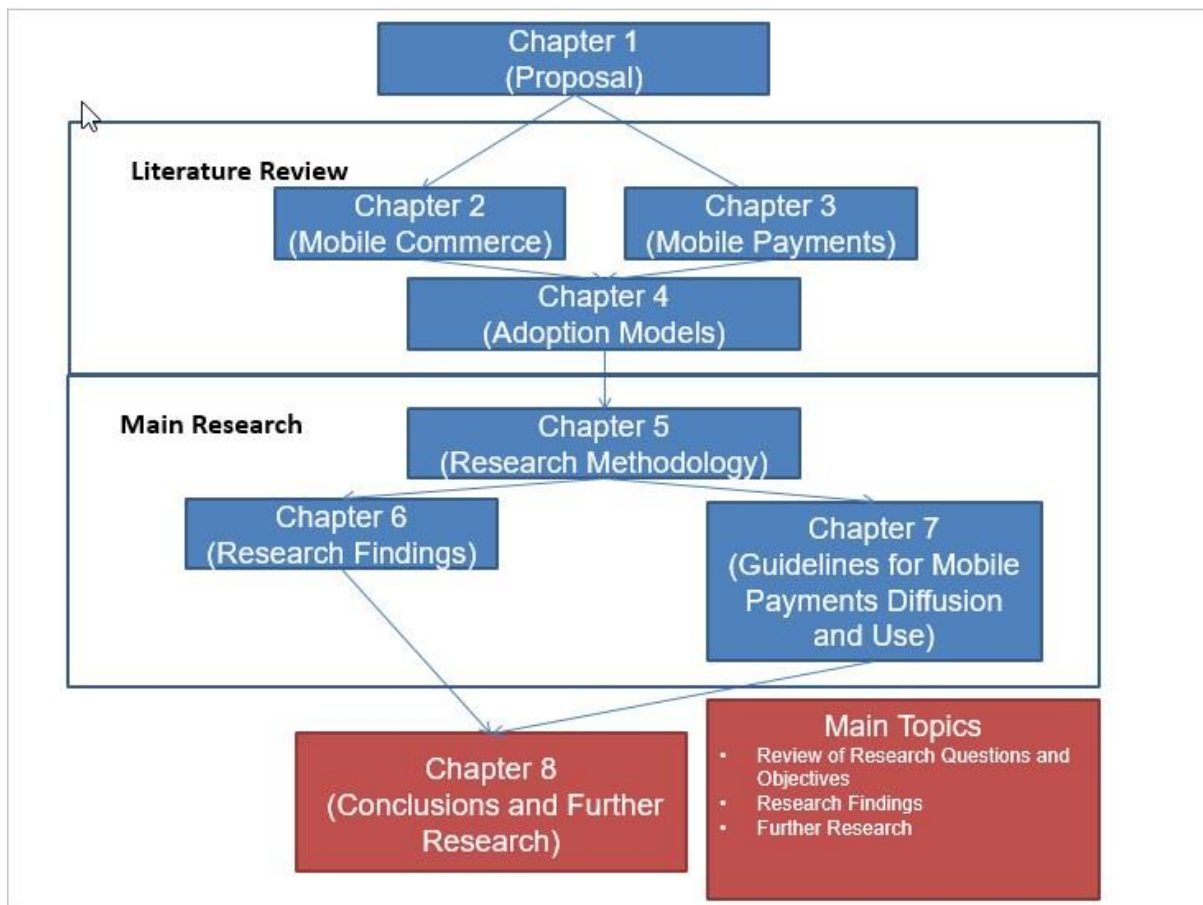


Figure 8.1: Chapter 8 Navigation map

## 8.1. Introduction

The previous chapters presented the current state of mobile commerce, the products and services which are available through mobile commerce, the business models that are used when deploying mobile payments, the history of mobile telephony, the technology acceptance theories and models that are used to analyse the diffusion of technology into communities followed by the research methodology and research findings.

The structure of this chapter is depicted by Figure 8.1. The chapter reviews the objectives of the research and then summarises the findings in relation to the research questions and objectives posed in Chapter 1. Finally, mobile payments research areas that could be further investigated in the future are suggested.



## 8.2. Review of Research Questions and Objectives

The aim of the study was to investigate the factors that affect the diffusion and use of mobile payments in the townships. The township of Soshanguve in the outskirts of Pretoria, South Africa was used as a case study. The study asked the following five secondary questions listed below in order to extract the factors that prevent township residents from adopting and using mobile payments.

- SQ1: What are the goods and services that may be consumed via mobile devices and can be paid for using mobile payment solutions?
- SQ2: What is the current landscape of mobile payment solutions in South Africa?
- SQ3: What technology adoption or diffusion models are relevant for understanding the diffusion and use of mobile payment solutions by the township residents?
- SQ4: How do township residents understand the concept of mobile payment solutions?
- SQ5: What types of mobile devices are used by the township residents and are they suitable for conducting mobile payments?
- SQ6: What are the accessibility issues, which township residents encounter when they use mobile payment solutions?
- SQ7: What are the usability issues, which township residents encounter when they use mobile payment solutions?

The research objectives were as listed below.

- O1: To identify the products and services, which are suitable for consumption via mobile devices and can be paid for using mobile payment solutions.
- O2: To determine the landscape of mobile payment solutions in South Africa.
- O3: To investigate the technology adoption or diffusion models that are relevant for understanding the diffusion and use of mobile payment solutions.
- O4: To assess the level of awareness in the townships regarding the existence of mobile payment solutions.

- O5: To determine whether mobile devices used by township residents are suitable for conducting mobile payments.
- O6: To assess how the rate of diffusion is affected by the accessibility issues, which are encountered by township residents when using mobile payment solutions.
- O7: To assess how the rate of diffusion is affected by the usability issues which are encountered by township residents when using mobile payment solutions.

The answers (As) to the research questions (SQs) above are summarised below

- A1: Digital contents such as airtime seems to be the primary goods that are bought by the residents in the townships using mobile devices.
- A2: The banking sector is the driver of mobile payments and when the respondents refer to mobile payments, they associate it with mobile banking. Mobile banking apps enable the customers to pay their bills such as traffic fines, electricity, municipal rates and electricity.
- A3: Various technology adoption models that could have been used are TRA, TPB, EVT, TAM, UTAUT and IDT. IDT was adopted for this research as it has been used widely in other similar studies.
- A4: The respondents are very aware of the existence of mobile payment solutions. However, respondents perceive mobile banking and mobile payments as the same thing.
- A5: Mobile phones that are owned by the respondents are more than capable of conducting mobile payments, more than 60% of the respondents had smartphones.
- A6: The issue of security and trust are the main inhibitors to the adoption of mobile payment solutions in the township studied. The general conclusion is that users fear that their mobile phones will be hacked when conducting financial transactions.
- A7: Since network infrastructure and connectivity is also a challenge in various areas, respondents also noted that at times their digital transactions are never completed due to network issues. These issues have an impact on the adoption of mobile payment solutions in the townships.

### **8.3. Summary of Research Findings**

The research results indicated the following:

- To a certain extent the research was able to identify goods and services that can be paid for using MPSs, with electronic goods such as the purchase of airtime taking the lead.
- Township residents have to be trained on how to use mobile payment solutions.
- Security is a primary concern. There is a general fear that money will disappear from accounts if the mobile phone is stolen or something goes wrong during the transaction.
- Township residents associate mobile payment solutions with mobile banking, they seem not to be aware of other mobile payment solutions that are not offered by banks or MNOs.
- Mobile payment solutions are perceived as consuming much airtime, thus costing much money in airtime purchases.
- Trust is associated with an element of security, which has been mentioned above. There is a general form of distrust as a view exists that hackers will make money disappear when using mobile payment solutions.
- There are very limited opportunities in the townships where the residents can make use of mobile payment solutions; traders in the townships do not offer the option of paying via mobile payment solutions.
- Township residents would prefer mobile payment solutions to be easier to use.
- Being able to experiment with mobile payment solutions without incurring additional costs could help township residents to be familiar with it thus increasing the chances that they would adopt this method.

### **8.4. Further Research**

Based on the research results of this study, the majority of the respondents were either high school, college or university graduates. This might not reflect the educational level of Soshanguve residents, thus a comprehensive study might be needed. The sample of the study should be purposeful selected according to criteria that will distinguish the number of people with certain characteristics such as education, age, and other variables that might be deemed to affect the adoption of mobile payment solutions.

An investigation as to how the township residents spend their income is necessary in order to establish the products that are suitable to their needs and can be purchased through mobile devices. Once the needs have been established then an appropriate product line that is tailor made for township residents can be developed.

There have been various strategies which have been used by the financial institutions, MNOs and other players in the mobile payment industry to market their mobile payment solutions offerings. Despite their efforts, awareness remains low in the townships. An appropriate marketing strategy that is tailor made for communities with low income and little education should be investigated and developed in order to increase awareness in the township. Safaricom in Kenya had a simple phrase “send money home” (Ignacio *et al.*, 2010) that became synonymous with its M-Pesa service.

## **8.5. Conclusion**

Mobile payments are on the rise year on year. They were estimated to be around R6243 billion at the end of 2014 (Growth, 2015). Mobile payments in South Africa have not been as successful as compared to other African countries such as Kenya (Goldstuck, 2014). This study aimed to establish those factors that are inhibiting the diffusion and use of mobile payments in South African townships and then offer guidelines as to how to eliminate those factors.

The guidelines were established and they will enable mobile payments solutions operators such as banks, independent mobile payments solutions operators and mobile network operators to design their solutions in such a way that they are able to be used by township residents.

## Appendices

### Appendix A: Letter that was given to prospective Respondents



Dear Prospective participant

This letter is an invitation to consider participating in a survey which I am conducting as part of my Master's degree in the School of Computing, College of Science, Engineering and Technology at the University of South Africa (UNISA) under the supervision of Dr J Mtsweni. I would like to provide you with more information about this project and what your involvement would entail if you decide to take part.

The purpose of this survey is about determining the factors that inhibit the diffusion and use of mobile payments in the South African townships. The study will investigate if township residents use their mobile phones to pay for goods and services and the problems which they experience. The study will further investigate the difficulties which township merchants experience when attempting to deploy mobile solutions in their shops.

Participation in this survey is voluntary. It will involve filling out a questionnaire of three pages for approximately 20 minutes. You may decline to answer any of the questionnaire questions if you so wish. Further, you may decide to withdraw from this survey at any time without any negative consequences by advising the researcher. All information you provide is considered completely confidential. Data collected during this study will be retained for a period of five (5) years. There are no known or anticipated risks to you as a participant in this study.

If you have any questions regarding this study, or would like additional information to assist you in reaching a decision about participation, please contact me at +2783 559 9233 or by email at [kulanim@gmail.com](mailto:kulanim@gmail.com). You can also contact my supervisor, Dr J Mtsweni at +27 12 429-6610 or email [mtswejs@unisa.ac.za](mailto:mtswejs@unisa.ac.za).

With full knowledge of all foregoing, I agree, of my own free will, to participate in this study.

YES  NO

Yours Sincerely

Kulani Mhlongo

## Appendix B: Questionnaire

### GENERAL QUESTIONS

Q1. How old are you?

- a. 0 – 20
- b. 21 – 30
- c. 31 – 40
- d. 41 – 50
- e. 51 – 60
- f. 61+

Q2. Gender?

- a. Male
- b. Female

Q3. What is the highest level of education you have completed?

- a. Primary
- b. Secondary
- c. Technical College
- d. University Degree
- e. Other (Please Specify)

Q4. What is your Occupation?

- a. Student
- b. Employed
- c. Unemployed
- d. Self Employed
- e. Other (Please Specify)

Q5. How much do you earn per month?

- a. R0 – R3999
- b. R4000 – R7999
- c. R8000 – R11999
- d. R12000 and higher
- e. No Income

Q6. Do you have a bank account?

- a. Yes
- b. No

Q7. Do you own a cell phone?

- a. Yes
- b. No

Q8. Please name the brand and model of your cell phone?

Q9. How do you typically pay your bills? (You can choose more than one answer)

- a. Cash at the shop
- b. Cash deposit at the bank teller
- c. ATM
- d. Debit Card
- e. Credit Card
- f. Debit Order
- g. Other (Please Specify)

Q10. Please mark with an X where appropriate to indicate if you use your mobile phone for the services which have been indicated below.

		Yes	No
1	Airtime recharge		
2	Money Transfer		
3	Balance inquiry / Mini-statement		
4	Account Payment		
5	Mobile Shopping		
6	Electricity recharge		
7	Send please call me's		
8	Download music		
9	Download games		
10	Download ringtones		
11	Download wallpapers		
12	Other (Please specify)		

### **MOBILE PAYMENT PERCEPTION**

Q11. Have you heard about mobile payments services?

- a. Yes
- b. No



Q12. Please mark with an X where appropriate to rate your view on the use of the mobile payment services below.

		Yes	No	Not Sure
1	I am worried about the security of mobile payments			
2	A person needs training on how to make mobile payments			
3	I fear that while making a mobile payment, the network connection will go down.			
4	Using mobile payments should be an affordable service.			
5	Using mobile payments enables me to pay my accounts or transfer money more quickly and efficiently.			
6	I fear that when my phone gets stolen, they will use it to make purchases on my name.			
7	Mobile Payments consumes lots of airtime			
8	The public should be made more aware of mobile payments			
9	Mobile payments should require less mental effort to use.			
10	Stores should have mobile terminals in store that enable potential users to test how mobile payments work.			
11	Road shows should be done to assist those who are not very familiar with mobile payments.			
12	Advertising should be done to raise awareness amongst those who are not aware of the existence of mobile payments			
13	Mobile payments saves me time as I don't have to stand in long queues			
14	Mobile payments is easy to use			

### MOBILE PAYMENTS ADOPTION

Q13. Please mark with an X where appropriate to rate how important the following reasons are for you to consider using mobile payments services.

		Yes	No	Not Sure
1	Lower transaction charges			
2	Lower airtime charges			

3	Security from fraud			
4	Need training on how to use mobile payments			
5	Mobile payments should be easy to use			
6	Better network coverage			
7	When I have more money			
8	If I could use my mobile phone to buy from general dealers and spaza shops in the Townships.			
9	Phone battery being able to last longer			
10	I will use mobile payments if I could test it first.			
11	Do you know anyone who uses mobile payments.			
12	I will use mobile payments if I see my friends using it			
13	If mobile payments can be made to be more secured.			
14	Promotion that enables me to use mobile payments for a certain period of time without incurring any costs.			

Q14. Please mark with an X where appropriate to indicate how interested you are to use mobile payment services in the future?

	Yes	No	Not Sure
Interested to use mobile payments in the future			

## Appendix C: Coding Manual

1	<b>Coding Rules</b>			
2				
3	Each theme/concept/idea will be assigned a code			
4	The code should be composed of four letters which are unique			
5	The unique code will be entered into the code column			
6	The source column represents all the locations from the scripts where the idea, theme or concept was identified.			
7	The source will be composed of at most 5 alphanumeric characters e.g P1L10			
8	The first two alphanumeric characters represent the participant: P1 means participant number 1			
9	The last three alphanumeric characters represent the line number that expresses an idea/theme/concept			
10	L10 means line number 10			
11	P1L10 means that an idea/concept/theme was expressed by participant number 1 at line number 10			
12	Source column can have multiple values assigned to it, e.g. P1L54, P2L56, P4L42 meaning that the idea, theme or concept was mentioned by three different participants			
13	Notes are just comments which the researcher should take into consideration during analysis			
14				
15	<b>Idea/Theme/Concept</b>	<b>Code</b>	<b>Source</b>	<b>Notes</b>
16				
17	Experienced Technical Issues When Transacting	ETIT	P7L26	
18	Don't like airtime charges	DLAC	P1L54, P2L56, P4L42	

## Appendix D: Ethical Clearance



Kulani Mhlongo (41495470)  
School of Computing  
UNISA  
Johannesburg

2014-02-10

### Permission to conduct research project

Ref: 111/KMM/2014

The request for ethical approval for your MSc in Computing research project entitled "Assessing the diffusion and use of mobile payment solutions: A case of South African Townships" 2<sup>nd</sup> Phase refers.

The College of Science, Engineering and Technology's (CSET) Research and Ethics Committee (CREC) has considered the relevant parts of the studies relating to the abovementioned research project and research methodology and is pleased to inform you that ethical clearance is granted for your study as set out in your proposal and application for ethical clearance.

Therefore, involved parties may also consider ethics approval as granted. However, the permission granted must not be misconstrued as constituting an instruction from the CSET Executive or the CSET CREC that sampled interviewees (if applicable) are compelled to take part in the research project. All interviewees retain their individual right to decide whether to participate or not.

We trust that the research will be undertaken in a manner that is respectful of the rights and integrity of those who volunteer to participate, as stipulated in the UNISA Research Ethics policy. The policy can be found at the following URL:

[http://cm.unisa.ac.za/contents/departments/res\\_policies/docs/ResearchEthicsPolicy\\_apprvCounc\\_21Sept07.pdf](http://cm.unisa.ac.za/contents/departments/res_policies/docs/ResearchEthicsPolicy_apprvCounc_21Sept07.pdf)

Please note that if you subsequently do a follow-up study that requires the use of a different research instrument, you will have to submit an addendum to this application, explaining the purpose of the follow-up study and attach the new instrument along with a comprehensive information document and consent form.

Yours sincerely

A handwritten signature in black ink, appearing to be "Kulani Mhlongo", is written over a horizontal line.

Chair: School of Computing Ethics Sub-Committee

University of South Africa  
College of Science, Engineering and Technology  
The Science Campus  
C/o Christiaan de Wet Road and Pioneer Avenue,  
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