SELECTED ANTECEDENTS TOWARDS THE ACCEPTANCE OF M-PAYMENT SERVICES AND THE RELATIONSHIP WITH ATTITUDE AND FUTURE INTENTIONS

by

ISAAC MAKOKOE

Student number: 20138237

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SUPERVISOR: Dr. N. Dlodlo

CO-SUPERVISOR: Dr P. Van Schalkwyk

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DECLARATION

This work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

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The dissertation is the result of my own independent work/ investigation, except otherwise stated. Other sources are acknowledged by giving explicit references. A bibliography is appended.

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Ms Clarina Vorster
English language editing
SATI membership number: 1003172
E-mail: cvlanguage.editing@gmail.com

To whom it may concern

This is to confirm that I, the undersigned, have language edited the completed research of Isaac Makokoe for the MTech Dissertation entitled: *Selected antecedents towards the acceptance of m-payment services and the relationship with attitude and future intentions.*

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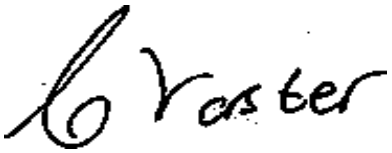

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ABSTRACT

Keywords: Mobile payments, usefulness, ease of use, security, attitude, future intentions.

An increased reliance on mobile phones by consumers for making retail purchases has been witnessed over the years. Given the pervasive use of m-payments and the incessant diffusion of innovations in South Africa, it is important for marketers to have knowledge of the right set of factors that enhance consumers' intent towards favouring m-payments in future encounters. This study draws from the undertones of Davis's (1989) Technology acceptance Model (TAM). Whereas the theory alludes to the influences of both usefulness and ease of use on consumer attitudes and behaviour, this study further amplifies the salience of cosumer perceptions of security as a salient drive towards m-payment acceptance. This is because m-payments involve money-based transactions and therefore it is important for consumers to have assurance that they operate along a secure platform. The TAM was nominated as the underlying theory in this research owing to its effectiveness when applied during the initial phases of an innovation, to avoid costly mistakes of implementing innovation attributes that do not offer the requiredset of elements for persuading consumers.

The purpose of this study was to test an integrative research model of the antecedents of m-payment acceptance using a South African sample of consumers. A quantitative study comprising a non-probability snowball sample of 474 consumers aged between 18 and 50 years was conducted in 2016, in and around the five major towns of Southern Gauteng province in South Africa. The structured questionnaire requested respondents to indicate their perceptions regarding the usefulness, ease of use and security of m-payment platforms they have utilised. In addition, the questionnaire relates to consumers' attitude evaluations of m-payments in general, as well as their intentions to both use and recommending m-payments to others in the future.

Initially, descriptive statistics were performed on the data set, including correlation analysis and multicolinearity testing. Subsequently, structural equation modelling was applied by first, assessing the measurement model using fit indices, confirmatory factor analysis and statistical accuracy tests of reliability and validity. Specification of the measurement model led to the conclusion that the future intentions model was a five-factor structure comprising usefulness, ease of use, security, attitude and future intentions. Thereafter, the results of the structural model (Structural model A) supported the existence of a direct influence between usefulness and security with attitude, while the latter was found to have a direct influence on future intentions. Nevertheless, the relationships between ease of use and attitude was not significant and therefore, alternative hypothesis H_a3 could not be supported in this study leading to the need to specify a

subsequent competing model. Under Structural model B, perceived usefulness is used as both a dependent and an independent variable since it is predicted by perceived ease of use and in turn predicts attitude towards using and behavioural intention to use simultaneously. The results of Structural model B led to the decision to accept the competing model as the ultimate model for this research since the model presents complete evidence of path weights that are greater than 0.20, interpreted as evidence for significant path outcomes.

Insights gained from this study could assist both marketing academics and practitioners to understand the perceptions of consumers towards m-payments. In this regard, if a determination is made that conducting m-payment transactions in secure and effort-free environments could enhance the effectiveness of consumers in their jobs and lives in general, then marketers could be in a better position to deliver a worthwhile innovation solution for South African consumers.

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INTRODUCTION AND BACKGROUND TO THE STUDY

1.1 INTRODUCTION

The rapid advancement in mobile technology and related devices has contributed towards the phenomenal expansion of the global financial systems (Geetha & Malarvizhi 2008:1). In addition, the emergence of novel retail channels creates requirements for new payment instruments that enable feasible and convenient transactions (Ondrus & Pigneur 2006:246; Mallat 2007:413). With the expansion of faster and more secure services, the financial sector including retail banks, has started using mobile systems to facilitate and complement the traditional service channels such as automated teller machines (ATMs) (Chandio *et al.,* 2013:3). Another recent innovation added to the retail sector has been the introduction of mobile payment (Hereinafter referred to as m-payment) services.

While the comprehensive adoption of m-payments globally is still in the early phase, some markets are already making progress towards attaining the right mix of market forces towards consumer acceptance. The findings of the MasterCard Report (2012:3) utilised a m-payments readiness index (MPRI) score to measure the preparedness and receptivity of different countries towards m-payments. On a scale of zero (no readiness) to 100 (complete readiness), South Africa (MPRI=29.1) is in fourth place among the top African states with regard to readiness to adopt m-payment services.

1.2 BACKROUND TO THE STUDY

Liêbana-Cabanillas, Sânchez-Fernândez and Muňoz-Leiva (2014:221) define m-payment as any type of individual or business activity involving an electronic device with a connection to a mobile network, enabling the successful completion of an economic transaction. On the other hand, Jeong and Yoon (2013:31) define m-payment, as any "point of sale (POS) payment made through the mobile phone". As such, m-payments can be viewed as a special form of handling payments through mobile devices (Schierz, Schilke & Wirtz 2010:210). Affirmation from Varshney (2002:121) specifies that m-payments are a form of electronic payments, made by a consumer to a business using electronic fund transfers at POS, smart cards and credit card payments over the Internet, e-cash and others. Therefore, m-payments refer to all monetary payments that are made through a mobile device.

M-payments are used to pay not only for digital merchandise, but also for transactions in the physical world. Through m-payments, users can make a purchase directly using a wireless device (Zmijewska, Lawrence & Steele 2004:270). The user initiates a request by dialling a number that activates the required service. The business or service provider then contacts a wireless service provider, financial institution, or trusted third party to verify and authorise the purchase, which is charged to the user's wireless device bill or credit card account (Varshney 2002:120). As such, m-payment is a novel payment system that enables financial transactions to be made securely from one organisation or individual to another over existing mobile networks. Therefore, through this service, mobile users might have the flexibility to make purchases and obtain credit quickly and easily almost anywhere in the world using mobile devices (Viehland & Leong 2010:40).

1.3 PROBLEM STATEMENT

M-payment services are used increasingly in some countries although they have not been widely adopted in South Africa despite their potential in streamlining the conventional payment systems (Crowe, Rysman & Stavins 2010:1). Nonetheless, m-payment services appear to offer significance to consumers because of their convenience and ubiquity as an alternative to making hard cash transactions (Liêbana-Cabanillas *et al.* 2014:221). Nevertheless, evident shortcomings have been cited in the media as the major cause of non-adoption. A research report by Accenture Market Research Company (Kolbe 2014:5) indicated that South Africans are concerned about security, privacy and the ease associated with utilising m-payment services. In addition, Grubb (2012:1) has attributed the low uptake of m-payment services to a lack of partnerships between mobile network operators and banking institutions.

Previous m-payment studies have focused on user adoption factors and market analyses in general (Dahlberg *et al.,* 2008:2). However, less consideration has been given to issues surrounding the development of context-based theoretical frameworks on m-payment services (Song, Koo & Kim 2008:21). This suggests that there is a need for replicable studies that could lead to a discovery of the several antecedents that could possibly augment the future intent to conduct m-payment. It appears then, that it is noteworthy to examine the structural relationships between perceived usefulness, perceived ease of use, perceived security, attitude and future intentions of m-payment consumers in South Africa.

Research has indicated that a number of studies have been conducted on m-payment services in Europe (Ondrus & Pigneur, 2006:246-257; Mallat, 2007:413-432; Stalfors & Nykvist, 2011:1-31), Asia (Kim, Mirusmonov & Lee 2010:310-322), Australia (Viehland & Leong 2010:35-46) and North America (Hillman *et al.,* 2014:1-10). Seemingly, limited m-payment research has been

directed at developing countries. For example, in the African continent, Hinman and Matovu (2010:3925-3930) conducted a study on the opportunities and challenges of adopting m-payment services in Uganda, while Peyler, Haas and Nagarajan (2010:1-50) studied the effects of m-Pesa in Kenya. However, studies that are based on a South African context are scarce. Therefore, this study sought to determine consumers' future intentions towards m-payment services by unravelling the antecedents of m-payment acceptance that are relevant within a South African context.

1.4 RESEARCH OBJECTIVES

The following research objectives were formulated for the study:

1.4.1 Primary objective

The primary objective of this study was to determine the influence of selected antecedents of m-payment service acceptance and their relationship with attitude and future intentions by consumers towards using m-payments.

1.4.2 Theoretical objectives

In accordance with the primary objective, the following theoretical objectives were formulated:

- to conduct a comprehensive literature review on m-payments.
- to review the literature on the growth and development of m-payments.
- to review the underlying theories that influence m-payment technology acceptance.
- to conduct a literature study on the antecedents of m-payment technology acceptance.
- to theoretically establish the influence of perceived usefulness, perceived ease of use, perceived security and attitude on consumers' future intentions to use m-payment services.

1.4.3 Empirical objectives

In accordance with the primary objective, the following empirical objectives were formulated:

- to determine consumers' perceptions regarding the usefulness of m-payment services.

- to determine consumers' perceptions regarding the ease of using m-payment services.
- to determine consumers' perceptions regarding the security of m-payment services.
- to determine consumers' attitude towards using m-payment services.
- to determine consumers' intentions towards using m-payments in the future.
- to test, empirically a structural model of usefulness, ease of use, security and attitude as antecedents of future intentions to use m-payment services.

1.5 HYPOTHESES FOR THE STUDY

Based on the aforementioned empirical objectives and the theoretical underpinnings of technology acceptance research, the following hypotheses statements were formulated and tested in this study:

H_o1: M-payment future intention is not a five-variable structure comprising perceived usefulness, perceived ease of use, perceived security, attitude and future intentions.

H_a1: M-payment future intention is a five-variable structure comprising perceived usefulness, perceived ease of use, perceived security, attitude and future intentions.

H_o2: Perceived usefulness does not positively influence attitude towards m-payment services.

H_a2: Perceived usefulness positively influences attitude towards m-payment services.

H_o3: Perceived ease of use does not positively influence attitude towards m-payment services.

H_a3: Perceived ease of use positively influences attitude towards m-payment services.

H_o4: Perceived security does not positively influence attitude towards m-payment services.

H_a4: Perceived security positively influences attitude towards m-payment services.

H_o5: Attitude does not positively influence future intentions towards m-payment services.

H_a5: Attitude positively influences attitude towards m-payment services.

1.6 RESEARCH DESIGN AND METHODOLOGY

Two methods of research were conducted, namely a literature review and an empirical study.

1.6.1 Literature review

A theoretical review of selected antecedents towards the acceptance of m-payment services was undertaken. The study utilised textbooks, journal articles, media reports, Internet sites and conference papers as sources of information.

1.6.2 The empirical study

An empirical investigation was conducted in order to obtain a consumer-based perspective of m-payment services. In particular, a quantitative research approach was employed. The rationale for employing this approach was that it possesses the rigour, objectivity and coherence (Zikmund *et al.*, 2013:136) that are necessary for understanding underlying antecedents influencing m-payment acceptance. This is because quantitative studies make use of statistics, facts to describe relationships among constructs (Malhotra 2010:137). Relatedly, the following steps, as alluded to by Malhotra (2010:372), were used to develop the sampling procedure for the empirical component of this study:

1.6.2.1 Target population

For the purpose of this study, the target population comprised consumers who are based in southern Gauteng. Both male and female users of m-payment services who are 18 years and older were included in the study.

1.6.2.2 Sampling frame

A sampling frame is a list of people or objects from which a sample is drawn (Clow & James 2014:227). However, a sampling frame can only be utilised if it is comprehensive and up to date. No comprehensive sampling frame could be established for this particular study, implying that the study is amenable to non-probability based sampling methods, only.

1.6.2.3 Sampling procedure

In this study, a non-probability sampling technique was utilised. More specifically, the snowball sampling technique was used as it has been cited as very beneficial, in the absence of a suitable sampling frame (Churchill, Brown & Suter 2010:333). Snowball sampling relies on the personal discretion of the researcher to make an initial selection of those sampling units that belong to the

located target population (Tustin *et al.,* 2010:346). Thereafter, subsequent respondents are selected based on waves of information obtained from referrals regarding other users of m-payments thereby evoking a "snowball effect" (Malhotra 2010:381).

1.6.2.4 Sample size

The chosen sample size for this study was 500 consumers. The sample size determination was considered appropriate considering the limited time and financial resources available to the researcher (Zikmund *et al.,* 2013:387). In addition, the historical evidence approach whereby previous similar studies were reviewed in order to establish the appropriate sample size was also considered upon determining the sample size for this study. In this vein, the study by Viehland and Leong (2010:39) who utilised a sample size of 132 m-payment users based in New Zealand was taken into consideration. In addition, the studies by Revels, Tojib and Tsarenko (2010:77), who used a sample size of 151 Australian users of m-payment services as well as Tang, Tang and Chiang (2014:42), who utilised a sample size of 318 Chinese m-payment users, were also considered.

1.6.2.5 Method of data collection and measuring instrument

Data were collected by means of an interviewer-administered survey. The study utilised a closed-ended questionnaire that addressed the following elements:

Section A comprised the demographic profile of the respondents as well as items regarding the m-payment usage habits of the respondents.

Section B comprised the scale items relating to the antecedents of m-payment service acceptance. This section comprised five scale items measuring perceived usefulness, adapted from Schierz *et al.* (2010:213), five scale items measuring ease of use, adapted from Liêbana-Cabanillas *et al.* (2014:238) and four items measuring perceived security, adapted from Yousafzai, Pallister and Foxall (2009:604).

Section C comprised five scale items relating to consumers' attitude towards m-payment services gleaned from the study of Schierz *et al.* (2010:213), while section D comprised seven scale items relating to consumers' future intentions towards m-payment services adapted from the study by Lin (2011:259). Sections B, C and D were anchored along a five-point Likert scale, ranging from 1=strongly disagree to 5=strongly agree.

1.7 STATISTICAL ANALYSIS

Initially, the data was captured onto Microsoft Excel and later transferred to the Statistical Package for Social Sciences (SPSS Version 23.0) for analysis. Reliability and validity assessment checks were conducted as the key measures of statistical accuracy of the study. Descriptive statistics were then applied to the empirical data set for analysing the composition of the sample. This comprised measures of central location (mean, mode and median), measures of variability (standard deviation, variance and range), tabulation and frequencies. Correlation analysis was then performed to ascertain the strength and direction of relationships among the study variables. The correlation matrix also served as an indirect indicator of the absence of collinearity problems in the data. Thereafter, the study hypotheses were tested using the structural equation modelling (SEM) procedure, which commenced with an extrapolation of the measurement model. Confirmatory factor analysis (CFA), assessment of model fit indices and statistical accuracy checks were employed using the Analysis of Moment Structures (AMOS Version 23.0) software. This led to the validation of the first alternative hypothesis namely, H_a1. Thereafter, the study hypotheses were tested by evaluating the original structural model (Structural model A) and a subsequent competing model (Structural model B) using model fit indices, path regression weights and significance levels.

1.8 ETHICAL CONSIDERATIONS

The study complied with the following ethical standards of academic research:

- The respondents' permission to complete the questionnaire was requested.
- Participation in the study was voluntary.
- The researcher informed each respondent about the legitimacy and purpose of the survey through the cover letter.
- The identities of the respondents remained anonymous at all times.
- The research findings were used for research purposes and were reported on aggregate basis in the form of a Master's dissertation.

1.9 CLARIFICATION OF TERMINOLOGY

- **M-payment** refers to the use of a mobile phone and related services including text messaging, to make a consumer retail purchase.

- **M-payment acceptance** refers to the relatively enduring, cognitive and affective perceptual orientation of an individual towards m-payment technology and related services.
- **M-payment devices** refer to any mobile infrastructure that can be used as a hardware resource for m-payment transactions. This includes inter alia, personal digital assistants (PDAs), pagers, tablet PCs, notebooks and smart phones among other wireless enabled devices.
- **Attitude**s are a set of beliefs about a certain object or an act, which may translate into intentions to carry out that particular act.
- **Future intentions** refers to the degree to which a person has formulated a conscious plan to perform or not to perform some futuristic behaviour.

1.10 GENERAL

- The referencing is based on the Vaal University of Technology referencing guide, adapted Harvard style.
- Tables and figures are placed on the relevant pages as indicated in the Table of Contents section of this dissertation**.** Where no sources have been cited for tables and figures, it denotes the researcher's own work.
- Appendices are placed at the end of the dissertation.

1.11 DISSERTATION OUTLINE

This dissertation reports on all aspects of the research that was carried out. The dissertation contains five chapters, each with several sections and sub-headings. The contents of each chapter are outlined next.

Chapter 1 provides the background and scope of the study. The problem under investigation, research objectives, and hypotheses as well as an overview of the research design and methodology are also presented. Reliability, validity and ethical issues were also alluded to in this chapter.

Chapter 2 provides the definition and discussion of m-payment, m-payment devices, m-payment development, application and formats. In particular, the m-payment process is evaluated in detail. The benefits and challenges associated with m-payment acceptance are also reported on. A framing of m-payment acceptance within a global, African and South African context is also

delivered in this chapter. Furthermore, Chapter 2 comprises an academic discourse on the fundamental technology acceptance theories. Selected antecedents of m-payment acceptance are identified from the literature. An examination of relationships among constructs is expounded on, culminating in the exposition of selected hypotheses and a research model for this study.

Chapter 3 provides a detailed overview of the research design and methodological approach applied in this work. In order to provide a clear basis for understanding the overall research, the chapter delivers a systematic outline of the methodological considerations regarding the underlying philosophy and methodological paradigm for this research as drawn from the metaphor of the research onion. Chapter 3 provides detail about the empirical fieldwork including the sampling design process, pilot testing of the questionnaire, survey research implementation and overall data gathering. The data analysis and statistical procedures used in this study are also described. The chapter also discusses SEM in depth, with a view to providing a briefing to the reader on this statistical technique and its application in this research.

Chapter 4 reports on the research findings and results of the statistical analysis procedures. The findings of the research are presented in the order of extraction and statistical analysis. The research hypotheses are tested and corroborated with a view to provide validation (or not) of the research model that was formulated for this study.

Chapter 5 reviews the main findings of the study and presents the concluding remarks for this research. The major findings of the study are corroborated against the research objectives that were set at the inception of the research. Recommendations are made to both practitioners and policy makers, alike. Limitations of the study and implications for further research are also alluded to in this chapter.

1.12 SYNOPSIS

The question of implementing convenient and advance payment solutions to the general populace in contemporary society is inevitable and plays a primary role in the banking and retailing propositions of various institutions in South Africa. To introduce effective strategies to combat the challenges in the available payment options, m-payments have been suggested as an effective solution. Nonetheless, the acceptance of m-payments has not been as quick as previously anticipated, especially in South Africa. Therefore, this study attempts to determine consumers' future intentions towards m-payment services by unravelling the antecedents of m-payment acceptance that are relevant within a South African context.

This chapter specified the primary, theoretical and empirical objectives for this research, together with the research hypotheses. A dual approach was elected for this study comprising an initial literature review followed by a survey methodology on a cross-section of 500 m-payment consumers based in Southern Gauteng. Moreover, in the absence of an accurate sampling frame, it was decided in this chapter to apply the snowball sampling approach. The chapter also described the questionnaire as the chosen research instrument, comprising adapted scale items from previous scholars. In addition, the chapter hinted on how the statistical aspects of this research would be handled, including reliability and validity issues. Finally, the main concepts used in the research were clarified while an outline of the dissertation chapters was provided.

The next chapter commences with the review of the theoretical aspects of this study. This comprises an operationalisation of important terminology in m-payment research including a review of various theories of technology acceptance.

CHAPTER 2
M-PAYMENT TECHNOLOGY ACCEPTANCE

2.1 INTRODUCTION

Over the last few years the payment systems used in conducting business activities have been altered by the insurgence of recent technologies such as the Internet and hand-held devices (Dlodlo 2015:161). While the Internet offers the prospect of influencing a broad range of strategic areas that can be harnessed by businesses, mobile telephony represents a new era in which a myriad of traditional marketing conventions are broken. M-payments hold out the prospect of increasing access to appropriate formal financial services by those who presently lack it. Within the same vein, m-payments have been suggested as an immediate alternative for card-less payment services in electronic commerce (e-commerce) environments, thus contributing positively towards global economic growth. Indeed, across the developing world, there are probably more people with mobile handsets than with bank accounts (Porteous 2006:27). Hence, while setting the undertones for this literature synthesis, the appeal and utility of m-payment services for the developing world seems apparent.

Section 2.2 of this study provides an overview of m-payment by unravelling the intricate connections between electronic commerce (e-commerce), mobile commerce (m-commerce) as well as m-payments. The section further delves deeper into providing an understanding of the devices used in m-payments as well as the tripartite set of m-payment based applications and their relative service offerings. The various payment methods presented under the mobile platform are also discussed. Section 2.3 presents a chronological report on the various frameworks offered by m-payment service providers while section 2.4 highlights the primary business formats for m-payment services. Section 2.5 examines the notable features of m-payment services while section 2.6 elaborates on the actual process of conducting m-payments. Relatedly, section 2.7 examines the growth and development of m-payment services across global, African and South African contexts. Section 2.8 presents the benefits of using m-payment services while section 2.9 elaborates on the constraints vested in utilising such platforms. The underpinning theories of technology acceptance are evaluated in section 2.10 of this study. Section 2.11 deliberates on the future intentions of consumers as the key outcome variable of this study while Section 2.12 pinpoints the antecedents of m-payment technology acceptance. Section 2.13 elaborates on the research model that was tested in the work, including the corresponding hypotheses while section 2.14 brings the chapter to a close and hints at the next chapter.

2.2 OVERVIEW OF M-PAYMENTS

The interest in m-payments together with the high diffusion rate of mobile communication technologies are anticipated to provide mobile operators with a phenomenal business prospect (Dan 2014:138). Relatedly, m-payment services are becoming progressively significant to contemporary businesses (Yang 2005:258). Compared with Internet-based services, m-payments operate partially in a different environment due to the characteristics and constraints of mobile terminals. As such, any mobile-based payment activities possess superior advantage in that they are free of temporal and spatial constraints, thus permitting the user, access to a ubiquitous network, anytime and anywhere. The literature posits three perspectives that could be useful for defining m-payments.

First, m-payments can be conceptualised in light of its role in mobile commerce (m-commerce) and electronic commerce (e-commerce) activities (Adedamola 2012:14). This perspective proffers two schools of thought. The first school of thought classifies m-payments as a miniature component of m-commerce, of which the latter is simply considered an extension of e-commerce. For example, Mishra (2014:3) conceptualises m-payments as a "subset of m-commerce", while the latter represents a significant component of e-commerce, where users conduct business transactions electronically. This view assumes that nearly all the services that are offered on platforms that are Internet-based but immobile can also be found on m-commerce. Several scholars support this view (Tiwari, Buse & Herstatt 2008:1; Saidi 2010:3; Adedamola 2012:25). As an instance, a consumer can purchase entrance tickets to a football match both on a desktop computer as well as on their mobile phone. Contrariwise, the second school of thought regards m-payment as a driver of m-commerce, which is considered an independent business field and consequently an alternative mechanism to e-commerce. In this regard, m-payment through the ambit of m-commerce based services opens new business opportunities by enabling innovations that cannot be delivered along immobile platforms (Mallat 2007:415; Dan 2014:138).

The second perspective for defining m-payments is broader, yet emphasises the functions performed thereof. Mallat (2007:415) defines m-payments as the process involved in conducting a payment transaction in which money or funds are transferred from payer to receiver either through an intermediary or directly, without an intermediary. Schierz *et al.* (2010:211) concur that m-payments comprise all payments for goods, services and bills that have been authorised, initiated or realised using a mobile device. Akin to this notion, Kim *et al.* (2010:314) observe that the kinesis of modern society presents a sharp surge in the need for quick, safe and convenient business systems as is provided by wireless mediums. Consequently, m-payments is defined in

light of the ability to complete payment transactions independent of the geographic location of the user. Hence, for any transaction to take place there must be a way for consumers to pay through mobile communication networks (Tiwari *et al.,* 2008:4). This benefit has contributed largely towards transforming economies by reaching consumers that are based in the countryside and can hardly afford to make trips to the cities (Ardic, Heimann & Mylenko 2011:3).

The third perspective for m-payment definitions focuses on the specific devices utilised while performing transactions. M-payment (also referred to as mobile money, mobile money transfer and mobile wallet) generally refers to any transaction with monetary value that is conducted through a mobile telecommunications network (Kumar, Kumar & Rishi 2012:1). Lee (2005:165) pointed out that m-payment services involve the exploitation of wireless devices. Dahlberg *et al.* (2008:165) define m-payments as the payment made for goods, services and bills with a mobile device, such as a mobile phone, smart-phone, or personal digital assistant (PDA), by taking advantage of wireless and other communication technologies. Relatedly, Kim *et al.* (2010:314) delineated m-payment as any commercial transaction conducted through a variety of mobile devices over a wireless telecommunication network without the use of any plug-ins. In simpler terms, the payment services for a wide range of services and digital or hard goods are operated under financial regulation and performed from a mobile device. Thus, a consumer can use a mobile phone to pay. This implies that consumers can shop and thereby pay, wherever they can take their mobile phone (Zmijewska *et al.,* 2004:270).

Upon evaluating the aforementioned perspectives that attempt to define m-payments, a definition was coined to delineate this research. In this study, m-payments are operationalised as the use of a mobile phone and related services including text messaging, to make a consumer retail purchase from any location, what Viehland and Leong (2010:36) have termed, cellular m-payments. Excluded from this study are payments made with cards or tags used in close physical contact to a merchant reader such as proximity contact cards or reader tags. Similarly, the use of a laptop computer to make an e-payment on wireless network is not included in this study's definition of m-payment.

2.2.1 M-payment devices

Any device that is mobile and has Internet connectivity can be used as a hardware resource for m-payment transactions (Sabharwal & Swarup 2012:63). Examples of such devices include personal digital assistants (PDAs), pagers, tablet PCs, notebooks and mobile phones among other wireless enabled devices (Dan 2014:138). These devices enable users to access the Internet without the

need for any dial up connections thereby providing convenience for both consumers and marketers alike.

Of particular importance is the universal acceptance of smartphones as multi-purpose devices, which can be used to send text messages, take pictures, surf the web, download ringtones, play games and further make payment transactions (Yan & Yang 2015:117). Some marketers are starting to see the mobile phone as a potential marketing medium and are consequently seeking ways to tap into this burgeoning opportunity. Adedamola (2012:14) states that there are certain inherent mobile device characteristics that are sacrosanct towards determining device usability for various payment options. The enlisted characteristics include, inter alia:

- size and colour of display.
- network connectivity.
- bandwidth capacity.
- qwerty keyboard device.

An end-user is able to complete m-payment transactions of varying magnitudes, depending on the aforementioned device characteristics, for example, depending on the size and colours of the mobile device display, multiple opportunities are presented to deliver a user-friendly m-payment interface. Secondly, good network connectivity influences the transmission ability of the device for the completion of m-payment transactions. Thirdly, bandwidth capacity of the mobile device is instrumental towards influencing the kind of m-payment services that the end user is able to conduct. Fourthly, the keyboard device facilitates effortless information input.

Latterly, all mobile devices have the ability to connect to the Internet through a Subscriber Identity Module (SIM) card by either connecting to an Internet network or through WIFI (Dlodlo 2015:162; Dan 2014:137). As such, a built-in SIM card from an active mobile phone operator (Chaffey 2009:6) can uniquely identify m-payment devices. In this vein, the benefits offered through a personalised mobile subscription number are twofold. First, the unique personalisation abilities provide businesses with an opportunity for driving economic growth through direct marketing services. Secondly, businesses operate at odds to meet the consumer's need for individual privacy. The usage of mobile devices is largely driven by 3G and wireless application protocol (WAP) which are based on Internet standards that are optimised for the unique constraints of the wireless environment (Omonedo & Bocij 2014:3489).

Kumar *et al.* (2012:2) examined the underpinning systems through which m-payment processes mutate. Primarily, m-payments are made directly inside of an application running on a software system, such as Google Android, Symbian (EPOC), Palm OS and Pocket PC of which these operating systems only run on mobile gadgets. Additionally, the operating systems of these mobile devices are presented in unique Internet standards such as HTML, WML or I-MODE (Hameed, Ahsan & Yang & 2010:112). Logically, these Internet-enabled mobile devices utilise browsers such as Nokia browsers and MS mobile explorer once they are connected to the Internet. Additionally, these systems run on bearer networks such as the Global System for Mobile communication (GSM).

2.2.2 M-payment applications

M-payment applications are best understood by way of categorising the various stakeholders involved in the transaction process. In this study, three distinct categories have been identified and used as the underlying precincts through which m-payment applications can be examined. These are business-to-consumer (B2C), business-to-business (B2B) and consumer-to-consumer (C2C).

2.2.2.1 Business-to-consumer (B2C) m-payment application

B2C mobile-based payment processes follow the outline provided in Figure 2.1 of this study.

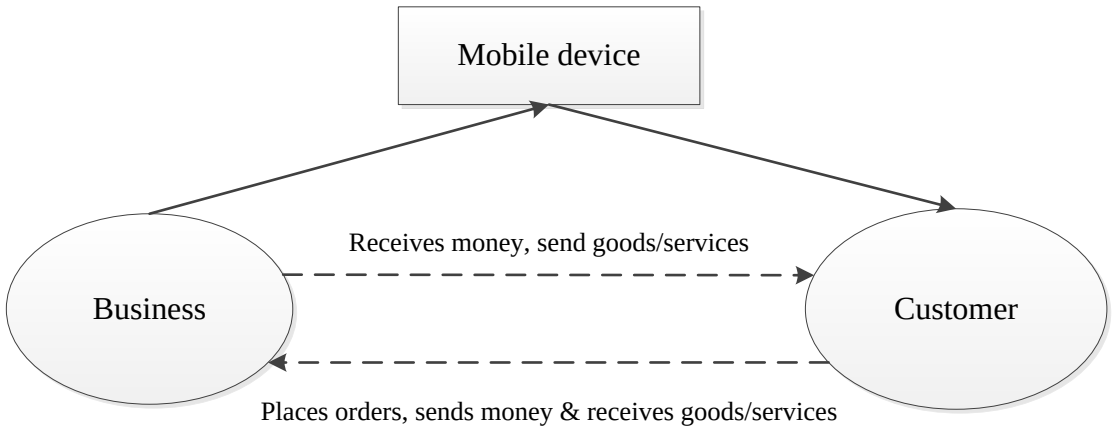


Figure 2.1: B2C m-payment application

A business that sells online merchandise to individual consumers and requires online payments is categorised as B2C. The surge in mobile and Internet based consumer activities has contributed towards catapulting m-payment activities of different forms. Moreover, profitability for device vendors and carriers hinges on high-end mobile devices and the accompanying killer applications. Within the same vein, the worth of global-based B2C m-payments made over mobile platforms

was estimated at 230 billion dollars (USA), with Asia representing almost half of the market and it has been forecast to exceed the 700 billion dollars (USA) mark by 2017 (Niranjanamurthy *et al.*, 2013:2362). Similarly, the Bank of America predicted that over 67 billion dollars (USA) in purchases were made from mobile devices by European and USA shoppers in 2015 (Dan 2014:138). Drawing from the aforementioned discourse, the following B2C based m-payment services are identified from literature:

- **Mobile purchases**

Prominent B2C m-payment services include mobile ticketing, one-click purchasing, mobile parking payments, train ticketing via mobile device and mobile purchases of airline tickets (Nemat 2011:101). The convergence of mobile phones, portable audio players and video players into a single device coupled with the high speeds available with fourth generation (4G) networks, is increasing the purchase and after-payment delivery of full-length music tracks and video content (Jain 2015:715). In addition, mobile content purchases and delivery may consist of the sale of ringtones, wallpapers and games for mobile phones. In some cases, the merchant may even deliver the catalogue electronically, rather than mailing a paper catalogue to the customer. Consumers making mobile purchases can also receive value-add upselling services and offers.

- **Mobile money transfers**

In Kenya, money transfer is mainly conducted using mobile phones. Initially, mobile money transfer was an initiative of a Multi-million Shillings company in Kenya named Safaricom Pty (Ltd), although currently the companies that have active shareholding are both Safaricom Pty (Ltd) and Airtel Pty (Ltd) operating under the names m-Pesa and Airtel Money respectively (Chaix & Torre 2011:7). Similarly, a global system called MobilePay has been developed and operated by Danske Bank in Denmark, since 2013. Latterly, this system has gained considerable popularity globally, with about 1.6 million users by June 2015.

- **Mobile ATMs**

With the introduction of mobile money services for the unbanked, operators are now looking for efficient ways to roll out and manage distribution networks that can support both cash being received and cash being expended. Unlike traditional ATM, Sicap™ Mobile ATM was engineered to connect to mobile money platforms and provide bank grade ATM quality. In Hungary, Vodafone allows cash or bank card payments of monthly phone bills using mobile ATMs (Ravindra 2013:6). The Hungarian market is one where direct debits are not standard practice, so the facility eases the burden of queuing for the post-paid half of Vodafone's subscriber base in Hungary.

- **Mobile banking (m-banking)**

With speedy advances of Internet technologies and diffusion of mobile phones, mobile banking has gained attention as a feasible option in conveying financial services (Jeong & Yoon 2013:31). This is often referred to as m-banking. M-banking involves the use of a mobile phone or another mobile device to undertake financial transactions that are linked to a client's account. As such, m-banking refers to provision and availing of banking and financial services with the help of a mobile telecommunication device (Muisyo, Alala & Musiega 2014:18). Banks and other financial institutions utilise m-banking to permit customers to conduct cash withdrawals and furthermore, to gain access to Internet-bearing savings accounts and loans (Sripalwat, Thongmak & Ngramyarn 2011:66). Through m-banking, users can conduct real-time banking services such as bank account management, balance inquiries, money transfers and bill payments (Sabharwal & Swarup 2012:61). However, m-banking is also directed at clients who do not have bank accounts, while aiming to integrate them onto the formal banking system.

- **Mobile auctions and bidding**

Mobile reverse auction solutions have grown in popularity in recent years. Unlike traditional auctions, the reverse auction (or low-bid auction) bills the consumers' phones each time they place a bid (Golden & Regi 2013:100). Many m-payment solutions based on the short message service (SMS) system rely on a one-time purchase or one-time subscription. However, reverse auctions offer a high return for the mobile vendor, as they require the consumer to make multiple transactions over a long period of time (Chitrangda 2014:568).

- **In-application mobile phone payments**

In-application purchases are m-payments made to buy virtual goods and mobile content that is billed by mobile carriers rather than the application stores themselves (Chitrangda 2014:568).

Approximately 120 Million mobile carriers globally utilise Ericsson's (2010:2) IPX mobile system to offer payment options such as try-before-you-buy, rentals and subscriptions for various phone application content.

2.2.2.2 Business-to-business (B2B) m-payment application

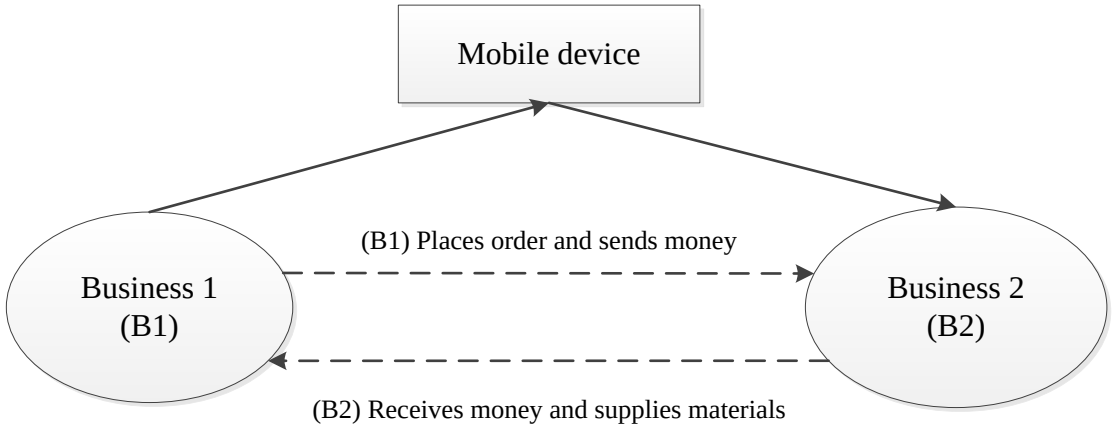


Figure 2.2: B2B m-payment application

The B2B application involves the activities, transactions and relationships that are fostered between business entities that are related. The nature of such B2B relationships is such that interested businesses that are members of a common supply chain can be able to share product information as well as pricing guides (Lillien & Grewal 2012:625). In addition, B2B based m-payments pertain to the bespoke interaction between business-based buyers and sellers through the payment for production components, raw material procurement as well as other operational requirements using mobile devices.

2.2.2.3 Customer-to-customer (C2C) m-payment applications

Figure 2.3 alludes to two scenarios whereby two customers exchange money in the form of funds transfers, or in another instance, a m-payment can be made in exchange for goods purchased or services rendered.

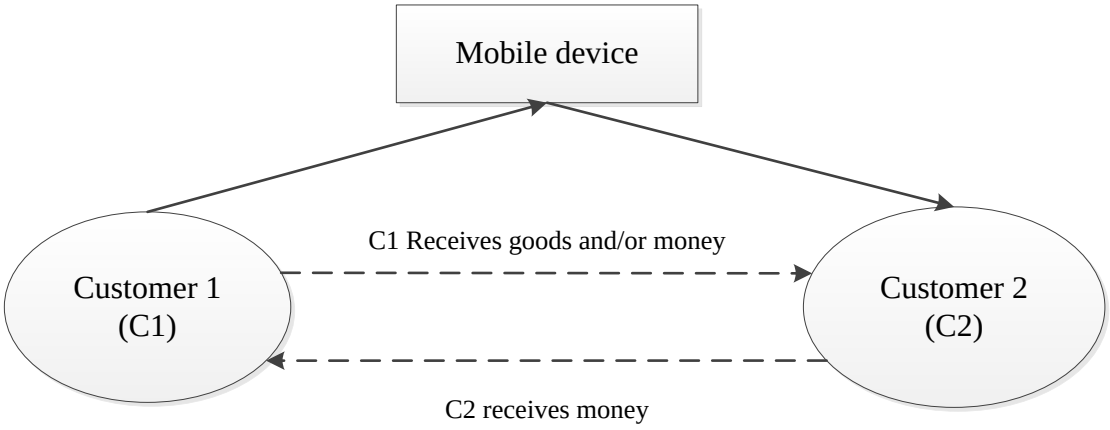


Figure 2.3: C2C m-payment application

Also known as person-to-person (P2P), the unique feature of C2C m-payment transactions is that they allow mobile-based financial transfers only between individual consumers. (Muhammad & Muhammad 2013:3). This system allows the transfer of digital cash (e-cash) via mobile devices between two people who have accounts at e-cash enabled banks (Chitrangda 2014:568). For example First National Bank (FNB™) customers in South Africa utilise some form of C2C payments through the e-wallet services (Sumanjeet 2009:23).

2.2.3 M-payment methods

Consumers can utilise four different payment methods under m-payment contexts.

First, premium-rate telephone numbers are a method of m-payment whereby merchants are able to apply commercial charges to the consumer's long-distance telephone bill (Goggin & Spurgeon 2007:17). In some cases mobile-operator billing can also be used, which allows charges to be added to the consumer's mobile telephone bill, including deductions to pre-paid calling plans.

Secondly, some service providers allow credit cards to be stored within the SIM card or secure element of a mobile device, while other providers are starting to use host card emulation (HCE) such as Google Wallet and Softcard (Crowe & Tavilla 2012:3). Recent developments have also seen several service providers providing the option to store credit card or debit card information in the Cloud™, usually in tokenised form. With tokenisation, the verification of payments, authentication and authorisation are still required, although card numbers do not necessarily need to be stored, entered or transmitted from the mobile device (e.g. Bookit & iSMS).

Thirdly, consumers can pay through micro-payments, a term that identifies mobile-based transactions of low value (Crowe & Tavilla 2012:3). The evolution of micro-payments is enabled

by the growth of broadband infrastructure (Jahangard & Pourahmadi 2013:5), social networks, online gaming and virtual goods related businesses (Hernandez-Verme & Benavides 2013:329) as well as the emergence of new online payment services and user interfaces, which has played a significant role in the micropayments trajectory (Junadi & Sfenrianto 2015:215).

Fourthly, stored-value cards are payment methods that are used with mobile-device application stores such as iTunes. In this prepaid operator-centric payment model, customers are able to pre-store value in their voucher or card and then use their mobile device to make purchases of online entertainment such as music and videos. The next section examines the underlying frameworks upon which m-payment services are built.

2.3 M-PAYMENT SERVICE PROVIDER FRAMEWORKS

M-payment services operate within clearly defined frames of reference. From a broader perspective, m-payment service provider frameworks can be categorised according to the nature of agents or group of agents' co-ordinating the system. Figure 2.4 depicts four m-payment service provider models based on the study by Chaix and Torre (2011:4).

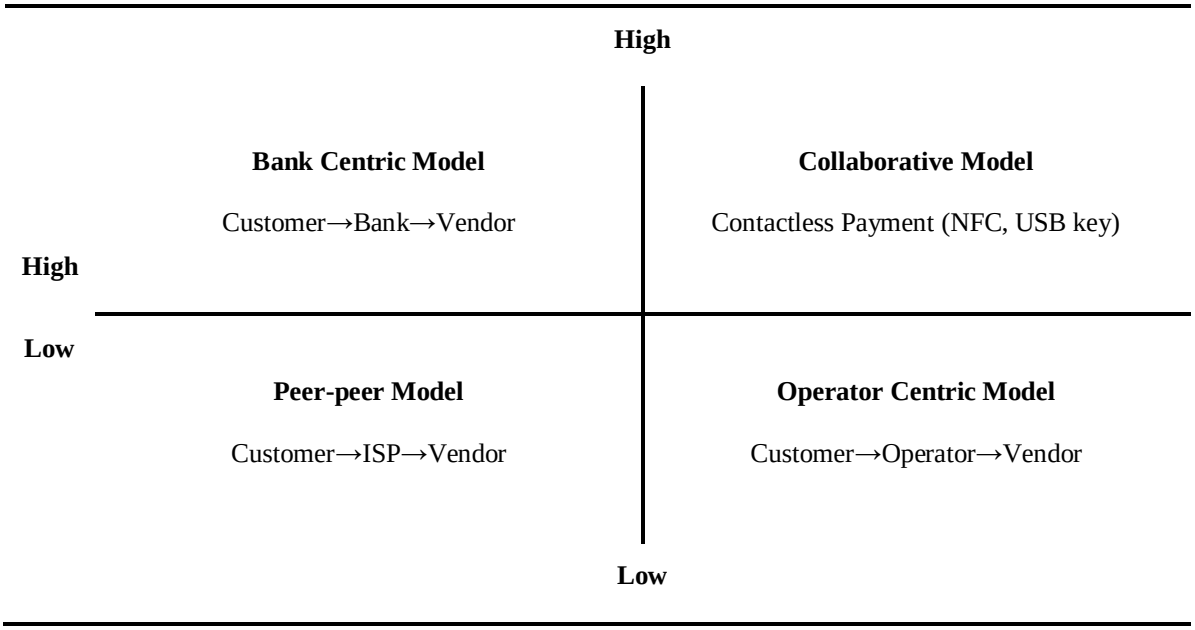


Figure 2.4: M-payment models and the level of implication for partners (Chaix & Torre 2011:4)

2.3.1 Bank-centric model

Yakub, Bello and Adenuga (2013:100) allude to the bank centric model as being a contemporary evolution of the credit card model. In a bank centric model, the payment is transferred from the customer's bank account to the merchant's bank, through either a one or two-way authentication

process (Chaix & Torre 2011:6). A one-way authentication process mandates the users (households or firms) to have an active business relationship with their bank that provides them the payment option. On the other hand, in a two-way authentication process the users receiving the payments (frequently commercial intermediaries) are not necessarily clients of the same bank as the payer. According to the Smart Card Alliance White Paper (2008:14), payments can only occur because of the dual process of verification and approval by both banks. A general compensation system must then operate between banks with or without connections with the classic inter-bank flow system. The partner banks of this compensation system are also required to pay fees to one or many mobile operators associated to the m-payment (Chaix & Torre 2011:11). Credit card based payments are a classic example of a bank-centric model.

2.3.2 Collaboration model

The collaboration model requires a joint effort between operators, banks and a trusted third party in order to create a link in the m-payment process (Chaix & Torre 2011:17). First, a mobile operator can collaborate with one bank to offer a bank specific m-payment service. In the second scenario mobile operators and financial institutions negotiate and set standards for m-payment applications using secure elements in the mobile device and further permitting credit cards and debit cards from different banks to be used. All partners derive their revenue from fees charged to merchants and final users. This model allows each partner to focus on their own skills, for example the bank concentrate on financial responsibility whilst operators focus on the transmission network (Yakub *et al.*, 2013:100).

2.3.3 Peer-to-peer model

Contrary to either the collaborative or the bank centric models, the peer-to-peer model functions through the operations of a third company (Chaix & Torre 2011:17). Pay Pal™ utilises the infrastructure of banks worldwide while acting independently of financial institutions and network operators. As such, the transaction is performed peer-to-peer between customer and seller (Hernandez-Verme & Benavides 2013:330; Yakub *et al.*, 2013:106).

2.3.4 Operator-centric model

The operator centric model relies on the involvement of the telecommunication operator within the three-step iterative process of offering the m-payment technology, operating the money-based transactions as well as compensating the system. After the last transaction has been cleared, either the recipients are paid in cash or their mobile phone accounts are credited. At this level, a third party, such as the individual customer provides liquidity to the system and be compensated by the

operator (Chaix & Torre 2011:6). According to the Smart Card Alliance White Paper (2008:10) in an operator-centric model, consumers pay the merchant through an operator without interacting directly with a financial institution. The operator could be a mobile carrier, the merchant itself or a third party payment company such as Paypal™.

The operator-centric model could be divided into either a prepaid system or a billing system (Chaix & Torre 2011:6). The Starbucks™ gift card in the United Kingdom utilises a prepaid merchant-driven operator-centric payment model. On the other hand, a South African based example of the billing system is pinpointed by an ITWeb Unified Communications (2015:1), which highlights TelkomSA's recent launch of an integrated billing service. On this platform customers are able to make purchases for books and software applications from the Google play store and payments are charged directly to their mobile phone account or through phone airtime credit.

The next section examines the primary formats of m-payment services.

2.4 M-PAYMENT FORMATS

In developing countries, m-payment solutions have been deployed as a means of extending financial services to the community by way of providing financial inclusion to the unbanked or under-banked who are estimated to be at 56 percent of the world's adult population (Ardic *et al.*, 2011:3). Different scholars have identified a plethora of presentations and formats for m-payment services. The primary formats for m-payment solutions are discussed in the following section.

2.4.1 Premium SMS-based transactional payments

Premium SMS based transaction are a text message service that enables short messages (140-160 characters) that can be transmitted from a mobile device (Ahsan, Chang & Issa 2012:3). Short messages are stored and forwarded by SMS centres. SMS text messages can be used either to provide information about the status of one's account with the bank (informational), or they can be used to transmit payment instructions from a mobile device (transactional) (Karsikko 2015:9). Users are able to type a message in the standard SMS format. Alternatively, they are able to use applications that generate a message from the information that has been entered. On the other hand, the receiver can send a message to the sender requesting payments, while alternately, the sender authorises such payments by replying with either a yes or no response and possibly entering a password. Presently, Obopay™ and Paypal™ are leading global examples of the use of SMS for mobile-based person-to-person payments (Crowe *et al.*, 2010:8).

2.4.2 Direct mobile billing

Direct mobile billing allows consumers to use the mobile billing option during checkout in order to make a payment (Muriira & Kibua 2012:82). This payment format utilises a two-factor authentication process that includes a secure personal identification number (PIN) as well as One Time Password (OTP) to charge the consumer's mobile account. This payment format is an alternative that attempts to evade bank involvement since it does not require the use of a debit or credit card as a payment solution (Hnaif & Alia 2015:83).

2.4.3 Mobile web payments

Mobile web payments are a format that uses Wireless Application Protocol (WAP) as an underlying technology (Ahsan *et al.*, 2012:3). To make a payment, the consumer uses Web pages or applications downloaded and installed on the mobile device. Commonly, the mobile account of the user is directly charged through a mobile network operator. Conversely, the use of credit and or debit cards is also permitted, although pre-registration at the m-payment station would still be a requirement (Hnaif & Alia 2015:84).

2.4.4 Near field communication (NFC)

Contactless NFC technology allows two autonomously powered devices, namely a mobile phone and a merchant card reader to communicate over short range (Muriira & Kibua 2012:73; Hayashi 2012:37). NFC devices utilise the contactless communication protocol, implying that a merchant reader is able to communicate with a contactless card, such as MasterCard™ or Visa™ from any location. Thus, an NFC-enabled mobile phone can interact with a merchant reader designed to accept contactless cards (Noh, Lee & Choi 2014:2). Broadly, contactless technology can be embedded in several devices, such as plastic cards, a key chain, cell phone covers or as a sticker that can be attached to any object including mobile devices (Arcese *et al.*, 2014:147). Contrastingly, the NFC chip and antenna are embedded within a mobile device, where payment account information can be programmed, pre-loaded or downloaded, simultaneously (Crowe *et al.*, 2010:5). As such, the use of NFC based contactless technology offers the benefit of a storage chip that can store information on a magnetic strip inside the mobile device.

2.4.5 Direct carrier bank (bank co-operation)

Also known as operator billing, mobile content billing, WAP billing and carrier billing, the direct carrier bank is a mechanism of buying content from Internet sites that is then charged directly to a consumer's mobile phone bill (Hnaif & Alia 2015:84). In this payment format, the consumer

can purchase goods, transfer money and perform both cash-out and cash-in. The front-end interface to the consumer is the mobile phone as well as the network carrier. A special code can be entered on the mobile phone to open a 'mini-wallet' account by depositing money at a participating local merchant using the individual's mobile phone number. Similarly, other transactions can be accomplished by entering special codes and the phone number of the other party on the consumer's mobile phone. Consumers can download content by clicking on a link and agreeing to make a purchase. Moreover, mobile content can be purchased and paid for without necessarily registering or entering a username or password.

The limited diffusion of some m-payment formats in South Africa lends the focus of this study to lean towards premium-based SMS transaction payments, only. Beyond the aforementioned formats, m-payment services are awash with a plethora of features that equip this platform with relative advantages when compared with conventional payment options (Omonedo & Bocij 2014:3492; Tiwari *et al.*, 2008:8). These features are discussed in the next section.

2.5 M-PAYMENT FEATURES

M-payment service providers are continuously looking for the right set of features that could facilitate useful services to their clientele. However, it remains vital for both scholars and practitioners to enlist what these unique features of m-payment services could be. The following features are identified from the literature.

M-payment services are **ubiquitous**, implying that the opportunity to utilise mobile technology is available everywhere, at any time regardless of physical location (Dan 2014:136). Generally, m-payment services allow users to perform transactions in real-time. In addition, Rouibah (2009:153) posits that m-payments can be conducted independent of location, thereby complementing the extensive e-payment solutions such as digital credit cards, digital wallet systems and stored value payment systems (smart cards) among other electronic-based payment systems.

Closely related to ubiquity, **immediacy** is a feature that is predominantly attractive for services that are time-critical and requiring fast reaction. In most cases, users of m-payment services require swift response and convenience when making payments. Furthermore, the m-payment platform is available immediately as and when the user requires (Tiwari *et al.*, 2008:8).

Unlike a home personal computer (PC), the location of a mobile phone user is an important piece of information that is useful when conducting m-payment transactions. Knowing the location of the user is made possible using either Bluetooth or wireless LAN, thus permitting extraneous **location-based** service offerings such as local maps, local product offers, local weather,

transaction tracking and monitoring (Adedamola 2012:29). In view of this, m-payment services renew the importance of the user's location reference, as a conduit for the delivery of secure-end based payment options.

Mobile telecommunication devices operate through an electronic chip referred to as a SIM. To add an element of unmistakeable **identification**, m-payments operate through mobile phones attached with a SIM card number that is issued and registered with a registered network operator. Such clear identification of the user in combination with a PIN makes any further time-consuming, complicated and potentially inefficient authentication processes much redundant (Tiwari *et al.*, 2008:9). Within the same vein, the simple tenets of a SIM card number coupled with legislative registration requirements under the Regulation of Interception of Communications Act (RICA) of South Africa make it possible for service providers and merchants to trace the source of m-payment transactions.

Richness refers to the value and content of a message (Dan 2014:137). M-payment services present the quality of having many aesthetics that are both valuable and interesting to users. Commonly high intrinsic value is offered in the form of audio, video and animated designs that float across the screen of a mobile device when conducting m-payments.

Personalisation is a key success factor in m-payments since each mobile device is usually attached to a specific owner or user. Personalisation of mobile devices has a primary goal of reducing load and delivering highly relevant content to users (Tiwari *et al.*, 2008:9). In preference based m-payment transactions, users can modify their wallpapers, change views and setting or modify account information while simultaneously conducting payment transactions (Chitrangda 2014:566). The payment information that is delivered to mobile devices can be filtered according to the preferences of a user (Asif & Krogstie 2013:2). Furthermore, contents can be adapted according to the user's chosen profile for easier navigation and browsing. However, as personalised services become critical in enriching consumers' experiences, Dan (2014:138) notes that trust could seemingly become a pertinent matter since violation of consumer privacy and security breaching are a concern for m-payment users.

Lee and Korea (2005:166) define interactivity as the capability of a computer enabled communication system to allow for an exchange of roles between the sender and receiver in either real-time or delayed time. In m-payments, the role players switch between being initiators, authorisers and confirmers of a payment. Such interactive roles permit communicators to have more control over the pace, structure and content of the communication process.

2.6 THE PROCESS OF M-PAYMENTS

With emerging technological innovations within the m-payment service environment, various electronic payment systems have emerged utilising a myriad of systemic procedures to perform the transactions. While the implementation detail of different m-payment systems vary, their structure is comparatively inter-connected and typically follows the following five-step process as shown on Figure 2.5.

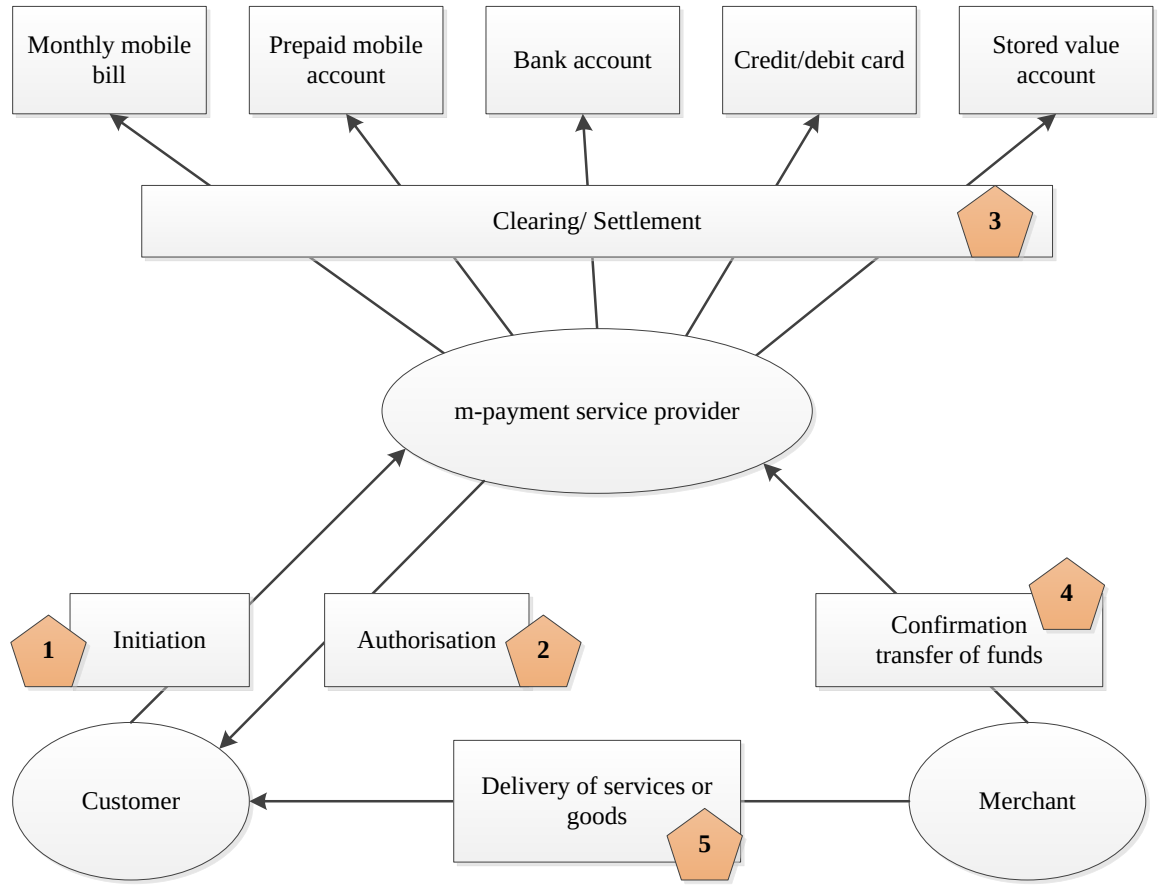


Figure 2.5: The simple process of m-payments (Little 2010:5)

2.6.1 Initiation

The first step in m-payments is initiation. During the initiation phase, a customer recognises a need for a product or service and then decides to conduct a transaction using his or her mobile device in order to satisfy that particular need. Upon conducting a transaction, the customer and the merchant come to an agreement regarding the terms and subsequent costs of the transaction (Van der Heijden 2002:432). Simultaneously, the m-payment service provider is notified about the transaction in question.

2.6.2 Authorisation

Once a customer has made a request to make a payment, the m-payment provider permits the process by authorising the transaction on the customer's mobile phone (Van der Heijden 2002:432).

2.6.3 Clearing (funds settlement)

After authorisation, the mobile service provider administers the transaction and stores the appropriated fund transfer instruction. Funds settlement can take place in a variety of ways. On the merchant's side, usually, the bank account is updated. Contrariwise, on the customer's side, one of prepaid accounts, a bank account, or a credit card account may be updated (Van der Heijden 2002:432). Within a retail environment it is the terminal at the point of sale contacting the provider. The provider then notifies the customer of the completed funds settlement procedure by calling or texting his or her mobile number.

2.6.4 Confirmation (funds transfer)

Confirmation of funds in the m-payment process takes place by entering a PIN (Van der Heijden 2002:432). Thereafter, both the customer and the merchant receive a payment confirmation message. As such, m-payment can be regarded as a type of point-of-sale payment transaction that is conducted through a mobile device, such as a cellular phone or a personal digital assistant (Crowe *et al.*, 2010:2).

2.6.5 Delivery of goods and services

Upon confirmation of the transferred funds by the merchant, goods and/or services are delivered to the customer (Van der Heijden 2002:432). Nonetheless, delivery either can be in real-time or delayed, depending on the type of product or service paid for.

2.7 THE GROWTH OF M-PAYMENT SERVICES

As the mobile technology industry sector continues to mutate, an exponential growth in terms of subscriptions, data traffic as well as mobile penetration rates are being witnessed across the globe. According to an intelligence report by the Groupe Speciale Mobile Association (GSMA 2014:9), numerous industry sectors are progressively digitising and mobilising their products and services with a view to reduce costs and thereby provide compelling new experiences for consumers. Essentially, this innovative trajectory has played an unequivocal role in unlocking socio-economic advancements across various industrialised countries of the world as explained next.

2.7.1 The growth of m-payments (globally)

Central to the m-payment adoption process, different research endeavours have attempted to enumerate the m-payment readiness index score of different countries. This index is fundamental as it represents a nation's capacity to create, adopt and diffuse various payment applications whilst enjoying benefits derived from mobile technologies (Dlodlo 2015:161). Interestingly, not even a single market has reached the optimum MPRI of 60, which is considered to be the inflection point or the stage at which mobile devices account for an acceptable share of the country's payment mix (Grubb 2012:1). Nonetheless, on a scale ranging between zero (no readiness) and 100 (complete readiness), only 34 global countries had achieved an average mobile readiness index score of 33.2 by 2012. Relatedly, findings of the MasterCard report (2012:6) show that the most globally advanced country in light of the readiness index is Singapore (MPRI =45.6), although followed closely by Canada (MPRI=42.0) and the USA (MPRI=41.5).

Apart from the examination of the MPRI, global 3G subscription rates are also a significant indicator of a country's success towards the acceptance of m-payment related technologies. This measure is equally important as 3G offers high-speed Internet and is a key driver of m-payment success. While the USA (208 Million), Japan (122 Million), China (57 Million), Korea (45 Million) and Italy (44 Million) are among the top five world countries in terms of 3G subscription numbers, it is only Japan and Korea that are trailblazers in terms of actual 3G penetration rates, at 95 percent and 85 percent, respectively (Adedamola 2012:53). Notably, 3G penetration rates are a salient indicator of technology acceptance, rather than subscription rates when observed in isolation.

In some developed countries, there have been apparent advantages to consumers for adopting m-payments. In particular, m-payments were adopted rapidly in Japan and South Korea as a convenient way of paying for mass transit (Goyal, Pandey & Batra 2012:56). Both these countries are high-income countries with already widespread Internet and mobile phone penetration. Nonetheless, these economies proved that m-payments could still flourish even where there are already established payments channels (Porteus 2006:23). The emergence of NTT DoCoMo, a mobile operator in Japan was a significant development that boosted m-payment uptake in that country. NTT DoCoMo added the functionality of a credit card embedded on the chip of users' mobile phones in 2005. Using contactless FeliCa™ technology, the account represented by the chip in the phone can be charged by waving the phone in close proximity to a FeliCa™ point of sale device. Consistently, in 2009 NTT DoCoMo started an m-payment service application

permitting consumers to receive statements and pay their bills through mobile phones (Amoroso & Ogawa 2011:8).

Among the emerging markets, particularly BRICS nations, South Africa is ranked first in terms of 3G penetration currently reported at 21 percent (13 million subscribers; 49 percent year on year growth potential) (Adedamola 2012:53). Brazil is ranked second place (17 percent 3G penetration rate; 41 million subscribers; 99 percent year on year growth potential), while Russia is in third place (8 percent 3G penetration rate; 17 million subscribers; 30 percent year on year growth potential). China (6 percent 3G penetration rate; 57 million subscribers; 115 percent year on year growth potential) and India (4 percent 3G penetration rate; 39 million subscribers; 841 percent year on year growth potential) lag behind in terms of penetration rates. Table 2.1 summarises these figures.

Table 2.1: Global mobile 3G subscriptions (Adedamola 2012:53)

Rank	Country	3G Sub (Million)	3G Penetration (%)	3G Sub Y/Y Growth (%)	Rank	Country	3G Sub (Million)	3G Penetration (%)	3G Sub Y/Y Growth (%)
1	USA	208	64	31	16	Canada	16	62	34
2	Japan	122	95	9	17	Taiwan	14	48	17
3	China	57	6	115	18	South Africa	13	21	49
4	Korea	45	85	10	19	Turkey	13	20	62
5	Italy	44	51	25	20	Portugal	13	78	19
6	UK	42	53	25	21	Vietnam	12	11	358
7	Brazil	41	17	99	22	Mexico	11	11	55
8	India	39	4	841	23	Malaysia	10	27	7
9	Germany	38	36	23	24	Sweden	10	73	25
10	Spain	33	57	21	25	Philippines	10	11	45
11	France	30	45	35	26	Saudi Arabia	10	19	17
12	Indonesia	29	11	27	27	Netherlands	9	44	34
13	Poland	28	57	17	28	Egypt	8	10	60
14	Australia	22	76	21	29	Austria	7	58	24
15	Russia	17	8	30	30	Nigeria	6	6	51
Global 3G Statistics: M-payment penetration = 18%; M-payment growth = 37%									

Despite the upsurge in m-payment applications, developments and usage, most countries are still lagging behind on m-payment adoption. Among the top barriers towards the global expansion of m-payments has been the excessive difficulty of coordinating all parties that would have to be

involved in order to develop industry-wide m-payment standards (Crowe *et al.,* 2010:17). Such standards affect the security, sturdiness and efficiency of the m-payment system as a whole. Such difficulty is aggravated by the likelihood that the significant players may want to position themselves to own the relationship with the customers and the rich set of information that m-payment services could subsequently yield. As such, privacy and customer management become pertinent matters to be agreed upon if the systems are to be fully adopted.

2.7.2 The growth of m-payments in Africa

In a majority of African countries most consumers have mobile phones but few have bank accounts, thus stimulating interest in mobile devices as a conduit for facilitating financial payments (Porteus 2006:19). However, In March 2007 Safricom (Kenya's largest mobile operator) introduced a mobile money service called m-Pesa (Mbiti & Weil 2014:1). The m-Pesa payment solution facilitates a variety of financial transactions such as account balance checks, deposits and withdrawals, bill and merchant payments, airtime purchases and money transfers through mobile phones. Prior to Safricom's m-Pesa launch, Kenyans had several options for local payment services such as commercial banking halls, post offices, forex bureaus and bus companies, among others. While this was so, at least all or most of the options were either unavailable to the majority of Kenyans consumers or were very unreliable and insecure (Buku & Meredith 2013:382).

Since inception m-Pesa has grown remarkably rapidly, covering the majority of geographical areas in Kenya and attracting over 250 000 customers in the first quarter of 2007. About 1 million customers registered with m-Pesa by the end of 2007. By august 2009, over 7.7 million Kenyans (about 38 percent of the adult population) had become registered users of m-Pesa, far beyond initial projections (Peyler *et al.,* 2010:4). The continuing success of m-Pesa has been due to the creation of an affordable m-payment solution with limited involvement of the bank. Interestingly, Kenya leads the African countries in terms of m-payment readiness (MPRI= 44.4), followed by Nigeria (MPRI=31.3), Egypt (MPRI=30.2) and South Africa (MPRI=29.1).

2.7.3 The growth of m-payments in South Africa

South Africa has attempted to replicate the m-Pesa business model without much success. In particular, the Nedbank group initiated the Wizzit (the bank in your pocket) m-payments model in 2005, using software developed by Cointel™. Wizzit Pty Ltd is formally a division of the Bank of Athens of South Africa, which is liable legally for the deposits taken by the bank (Ivatury & Pickens 2006:48). However, the brand was owned and run by a separate entity of independent entrepreneurs who believed in the market potential for this type of service. The linkage to a

clearing bank provided Wizzit account holders with access to the conventional m-payments system within South Africa, including obtaining cash via ATMs using a maestro-branded debit card, which was issued as part of the offering. Commission paid agents called Wizzkids were also able to open and operate Wizzit bank accounts remotely (Porteus 2006:27).

Initially, the availability of m-Pesa services in South Africa was predicated as a solution that would significantly contribute towards easing many of the burdens faced by consumers such as high bank charges, long queues and travelling long distances to the bank. The m-Pesa endeavour aimed to bring the marginalised individuals into the economic stream. However, in reality since 2010, m-Pesa has been slow to exploit the unbanked population within the South African market. When m-Pesa was first launched, Vodacom projected that it would sign up 10 million consumers in the following three years. However, by May 2011 it had registered only approximately 100 000 customers (Makhubedu 2012:19). The gap between the expected performance of m-Pesa and its actual adoption can be attributed to significant differences between the Kenyan and South African markets. In particular, the banking regulations of the two countries differ considerably, rendering replication of m-Pesa nearly impracticable. Moreover, there is limited evidence of concerted efforts made to educate the public about the efficacy of m-Pesa at the time it was launched in South Africa.

Another unsuccessful payment model was the much-anticipated launch of Paypal™ in 2010 within the South African market (Dlodlo 2015:161). Paypal™ is a system that allows users to receive and make payments for goods and services with other Paypal™ account holders. Initially, both business entities and consumers who presumed that this payment method would provide the long awaited universal payment solution to consumers, hailed Paypal™. Nonetheless, Grubb (2012:1) affirms that consumer excitement has deteriorated over the years. This is because South Africans now recognise that in order to conduct a Paypal™ transaction they have to satisfy three stringent requirements. First, customers are required to have an active FNB account. Secondly, Paypal™ customers are expected to withstand scrutiny from the National Reserve Bank before their financial transactions can be cleared. Thirdly, all Paypal™ transactions are conducted in American dollars. The last factor presents an evident paradox in that Paypal™ charges commission of between 2.4 percent and 3.9 percent for each transaction while FNB quotes a South African Rand to United States Dollar (ZAR to USD) exchange rate on each withdrawal transaction.

Findings of the MasterCard report (2012:8) indicate that the average mobile readiness score across the 34 global countries is 33.2, whereas South Africa has only attained an MPRI score of 29.1. Several factors are cited as major contributors towards the MPRI score that is below average,

including a lack of partnerships as well as lagging infrastructure (Porteus 2006:19). Furthermore, the regulatory environment is burdensome in South Africa. However, other areas of the overall environment require attention before any party can seriously attempt to mount a complete move to m-payments. It is important to note that, overall consumer readiness scores propelled South Africa to twenty-sixth spot, in terms of global ratings (MasterCard report 2012:6). The consumer-based score was considered significantly higher than the average figure, owing to familiarity with and willingness to use P2P payments (Anthony & Mutalemwa 2014:84).

A report by Accenture (2014:3) highlights that South African consumers are likely to conduct m-payments if they are able to use their phones to pay for services outside of the conventional store environment. The report suggests that the most important B2C based m-payment activities are in the order of person-to-person payments (56 percent), fuel purchases (56 percent) as well as payments for utilities (55 percent).

Overall, the development of the m-payment market in South Africa has been sporadic and it is still unclear how this market will evolve. However, what is clear is that consumers are willing to pay using their phones. As such, the MasterCard report (2012:8) concluded that the biggest opportunity within South Africa is likely in improving the mobile experience for P2P payments, as it appears to hold the greatest interest among consumers. The willingness to use m-payment services is high among South Africans aged 18 to 49, demonstrating mass appeal. Moreover, m-payments are of equal interest to both male and female users. High and medium-income earners in South Africa tend to favour P2P while usage for all payment types is greatest among consumers with high incomes. In addition, NFC terminalisation in South Africa is still in early days but could pave the way for future extensive m-payment applications.

2.8 BENEFITS OF USING M-PAYMENT SERVICES

Table 2.2 provides a summary of some of the most commonly cited benefits of conducting m-payments.

Table 2.2: Benefits of m-payments

Author/s	Benefit	Summary
Haanpera (2012:22)	Transaction speed	Consumers are eager to use payment instruments because they are generally fast. The time from need realisation, initiation of the payment process and making the actual payment is relatively accomplished by only a few simple steps.
Hayashi (2012:43)	Convenience	A mobile phone eradicates the inconvenience of carrying multiple plastic cards in a physical wallet by enabling consumers to link m-payments directly to those bank accounts.
Hayashi (2012:43)	Flexibility	Mobile phone based payment methods are easily integrated with other payment options such as Paypal™ or Easypay™, which allow users to pay directly from their bank accounts through the services of Automated Clearing Houses (ACH).
Goyal *et al.* (2012:57)	Increased efficiency	Consumers can check their bank balances on their mobile phones and further, authorise the required amount for payments in real-time. Payments and/or withdrawals can also be viewed as they occur.
Goyal *et al.* (2012:57)	Mobility	A mobile phone is almost, always within the user's vicinity. However, m-payments can be conducted independently of the user's geographic location.
Mbogo (2010:183)	Affordability	Both business operators as well as individual customers have adopted the use of m-payment as a way of transacting because of the comparative affordability of mobile phones as well as the economic services they offer.
Niranjanamurthy *et al.* (2013:2367)	Ease of connectivity	If either a conventional Internet network, WIFI or a mobile signal is available, mobile phones can connect and perform numerous financial transactions with ease.
Niranjanamurthy *et al.* (2013:2367)	Real-time services	The services that are conducted via mobile phones are not sensitive towards operating times and can therefore, be conducted 24 hours a day and seven days a week.

Similar to any other bespoke innovations of the 21st century, it is clear that mobile telephony has brought many opportunities for businesses such as improved efficiency, economic benefits and enhanced status (Sohail & Al-Jabri 2013:337). Akin to this notion, individual consumers enjoy relative benefits in terms of convenience (Hayashi 2012:43) and mobility (Goyal *et al.*, 2012:57) in particular. While the aforementioned benefits are acknowledged, m-payment services are not without inherent shortfalls. The next section elucidates on some of the constraints associated with conducting transactions using m-payments.

2.9 CONSTRAINTS OF USING M-PAYMENT SERVICES

Despite the myriad benefits that accrue from conducting m-payments, the intricacies associated with the platform presents an avalanche of challenges for both businesses and consumers. An example of this is the fact that both developing and developed markets have endured wide apprehension and limited consumer confidence in mobile-based payment systems (Mallat

2007:417). In addition, Apanasevic (2013:6) postulates that the cost of equipment and materials required for using the m-payment option are a major barrier towards adoption.

Security and privacy concerns have also been cited as an obstacle towards m-payment technology acceptance because mobile devices are quite vulnerable to theft, loss, hacking and corruptibility (Lai, Lai & Jordan 2009:723). Within the same vein, since m-payment is a relatively novel innovation, consumers may have uncertainties with regard to its operational environment. In particular, concerns about m-payment resistance to external attacks from hackers and terrorists are always at the forefront of users' minds (Goyal *et al.,* 2012:57).

Some infrastructure-based constrictions constitute a major obstacle for the swift adoption of m-payments. Perhaps the biggest problem is related to typing on a soft keyboard since users need to continuously divide attention between the content that they are typing and the small keypad area (Omonedo & Bocij 2014:3489). On the other hand, it is generally difficult to type proficiently on a tiny virtual keyboard and it is easy to accidentally touch the wrong target. The soft keypads for mobile phones where originally designed for regular calls and texts, only and this might add an element of complexity when used for payment transactions (Adedamola 2012:36). Additionally, while the small screen size of mobile devices lends them as the most convenient and portable gadgets on the technology market, they inevitably accommodate less transaction content at any given time (Mallat 2007:416). Thus, with difficulty, m-payment users tend to incur higher interaction costs in order to access the same amount of information as desktop users. Relatedly, m-payment users are compelled to rely on short-term memory to refer to information that is not visible on the screen, while conducting financial payments on their mobile phones.

Limited bandwidth is another constraint, which provides a reason why m-payments has not taken off as rapidly as projected (Adedamola 2012:36). Even in the era of fast cellular networks and ubiquitous Wifi, coverage is not universal or equally good (Sabharwal & Swarup 2012:63). Phone users frequently complain about connectivity problems. Every new page load translates into significant waiting time when the network does not co-operate. Inevitably, m-payment users spend more time and money attempting to reconcile the financial transaction progress with the merchant server, thereby reducing the efficiency with which users can conduct payments on their devices.

The next section provides a review of the various theoretical perspectives that underlie m-payment technology acceptance.

2.10 THEORETICAL PERSPECTIVES ON M-PAYMENT TECHNOLOGY ACCEPTANCE

While undertaking the literature review for this chapter, it became imperative to provide an appropriate frame of reference that would provide theoretical lenses on the issues surrounding m-payment technology acceptance. However, because of its nature of having multiple contextual applications, in this study 'technology acceptance' was operationalised as the relatively enduring cognitive and affective perceptual orientation of an individual towards m-payments. As such, in this review it became integral to consider the use of some previously recognised and tested technology acceptance theories. Drawing from early research on how technology is generally accepted into society, the following underpinning theories are examined:

- Rogers' diffusion of innovation theory
- Theory of reasoned action (TRA)
- Theory of planned behaviour (TPB)
- Technology acceptance model (TAM)
- Unified theory of acceptance and use of technology (UTAUT)

2.10.1 Rogers' diffusion of innovation theory

The framework of exploring consumer acceptance of new products, services and/or technologies is drawn from the area of research known as the diffusion of innovations. Consumer researchers specialising in the diffusion of innovation theory are predominantly interested in understanding the two closely related processes, namely the diffusion process and the adoption process (Schiffman *et al.,* 2014:372). In a broader sense, diffusion is the macro process concerned with the spread of an innovation from its source to the consuming public. In contrast, adoption is a micro process that focuses on the stages through which an individual consumer passes when deciding to accept or reject any innovation. An innovation is an idea, practise or object that is alleged as new by an individual or other unit of adoption (Daugherty & Reece 2002:46). Affirmation by Evans, Jamal and Foxall (2009:340) further specify that an innovation is anything (e.g. idea, concept product or service) perceived as being new in the marketplace. As such, the diffusion process analyses, as well as clarifies the adaptation of an innovation (Rogers 1995:10). It helps to elucidate the development of social change through the spread of numerous innovations or their assimilation into the market.

Not all individuals in a society adopt an innovation simultaneously but they rather, adopt at different periods. This leads to the classification of consumers into adopter categories based on when they first begin to use the innovation (Rogers 1995:16). The classification of consumers into adopter categories enables researchers to determine where consumers stand in relation to others in terms of their decision to adopt innovations at different timeframes. The distribution of these adopter population groups typically follows a normally distributed curve as shown in Figure 2.6.

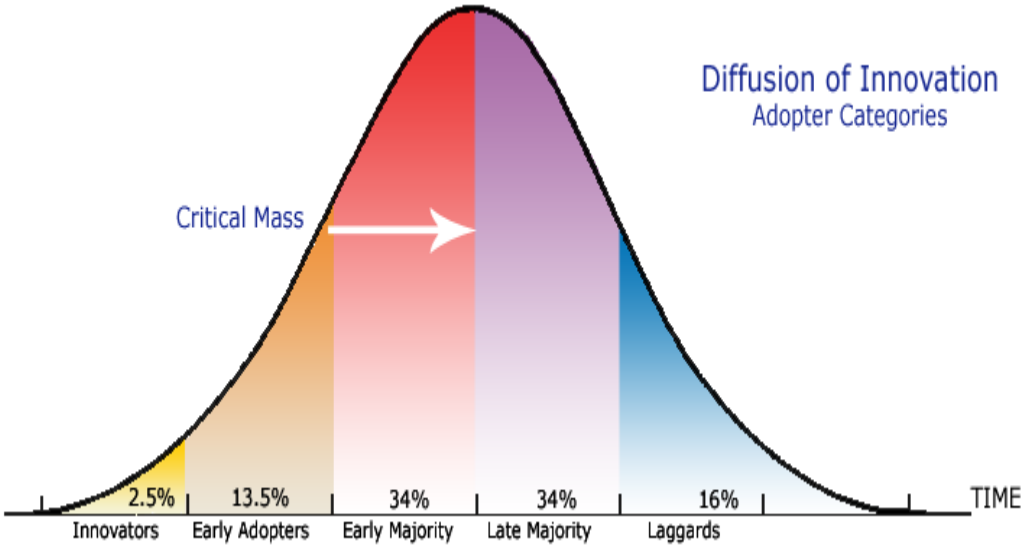


Figure 2.6: Diffusion of innovation adopter categories (Schiffman *et al.*, 2014:386)

The diffusion of innovations curve could be used to explain the classes of consumers that adopt m-payment solutions at different stages. Schiffman *et al.* (2014:385) elaborated on the five-adopter categories.

Innovators are usually the first to try out an innovation. They are venturesome and interested in new ideas. While they only comprise approximately 2.5 percent of the consumers in the marketplace. Innovators are willing to take risks and even pay high prices for newly introduced products or services (Schiffman *et al.*, 2014:385). Innovators play a role in the innovation process as they act as gatekeepers in adopting new ideas into the system (Karsikko 2015:26).

Early adopters comprise approximately 13.5 percent of the consumer mass market. These consumers ordinarily make purchases of innovations immediately after innovation, although not as early as innovators. While the early adopters often function as opinion leaders, they normally have a shorter adoption-decision span when compared with the late adopters (Kim *et al.*, 2010:314). They quickly embrace change opportunities, thereby triggering the critical mass in innovation adoption (Karsikko 2015:26). These individuals are also very comfortable with

providing evaluative information and advice to their peers, thus encouraging others to adopt innovations (Schiffman *et al.,* 2014:385).

The early majority consumers are members of the first half of the mass market which includes those individuals that are rarely leaders but simply adopt new ideas before the average person does (Karsikko 2015:26). They comprise approximately 34 percent of the consumer market. These consumers typically need to see evidence that the innovation works before they are willing to adopt it since they consider any innovation to be risky (Schiffman *et al.,* 2014:385). Robinson (2009:5) suggests that a good way to appeal to this population group is to reiterate the success stories about new products or technology, while providing evidence of the innovation's effectiveness.

Late majority consumers are members of the second half of the mass market which includes those individuals that are sceptical of change and might only adopt an innovation after it has been tried by the majority (Karsikko 2015:26). They comprise approximately 34 percent of the consumer market. These individuals take a relatively long time to evaluate the benefits of an innovation and are likely to adopt a product, service or technology during the maturity phase of its development (Schiffman *et al.,* 2014:385).

The last consumer category known as laggards is also termed traditionalists or conservatives because they are usually the last group of consumers to demonstrate interest in purchasing any innovation. Schiffman *et al.* (2014:386) consider this consumer group as being generally high-risk perceivers. They are very sceptical of change and are the hardest group to bring on board towards recognising the value of an innovation (Karsikko 2015:26). A strategy that marketers often use to appeal to this population includes statistics on successful innovators, fear appeals and pressure from people in other adopter groups.

Rogers (1995:15) describes the innovation diffusion process as an uncertainty reduction process implying that consumers seek out an innovation that they are more comfortable with since it presents less usage risks. As such, if an innovation possesses certain attributes that help to decrease uncertainty about the innovation, then users are likely to adopt it. The uncertainties may be reduced if marketers could anticipate how consumers react to their products. Although there is no formula for determining the likely success of new products, Schiffman *et al.* (2014:376) assert that the rate and speed with which an innovation is adopted by society is largely dependent on the five key attributes.

Relative advantage is described as "the extent to which the potential customer perceives a new product, technology or service as being superior to existing substitutes" (Schiffman *et al.*, 2014:376). Relative advantage results in increased efficiency, economic benefits and enhanced status. Thus, when users realise the relative advantage of a new technology over an old one, then they are prone to adopt it faster. M-payments provide consumers with ubiquitous payment possibilities, timely access to financial assets and an alternative to cash payments (Mallat 2007:416). For example, the users could pay for transportation tickets or car parking remotely without the need to visit an ATM. Relatedly, when m-payments are perceived as having distinct advantages over other traditional payment methods, then users are more likely to have positive affect towards m-payment usage.

Compatibility refers to "the degree to which potential consumers feel a new innovation is consistent with their present needs, values and practices" (Schiffman *et al.*, 2014:453). In adoption research, the compatibility of a new technology has commonly been assessed in relation to how the technology enables the consumer to integrate the solutions into their daily tasks and work life. Therefore, ccompatibility is an important aspect of innovation since conformance with a user's lifestyle can impel a quicker rate of adoption. Mwambia (2015:10) furthermore avers that consumers are more likely to adopt technology when they perceive it as consistent with their beliefs, culture and values. Hence the greater the compatibility with the felt needs and lifestyle of users, the greater the adoption rate of m-payment.

Complexity refers to "the degree to which an innovation is perceived as relatively difficult to understand and use" (Rogers 1995:16; Nayak, Nath & Goel 2014:218). Generally, users opt to adopt innovations that are easy to use and, thereby, easy to understand and operate. Lee, Hsieh and Hsu (2011:127) posit that new ideas that are easy to understand are adopted more rapidly than innovations that require consumers to develop new skills and understanding. On the other hand, complex innovations that demand that users develop completely new skills set usually take time to diffuse into the market. M-payments are commonly expected to increase consumer convenience by reducing the need for coins and cash in small transactions, while increasing the availability of payment possibilities (Mwambia 2015:11). However, if generic m-payment services are developed with easy to use interfaces, users are likely to develop a positive attitude towards them (Sohail & Al-Jabri 2013:337).

Trialability refers to "the degree to which an innovation may be tested on a limited basis" (Nayak *et al.*, 2014:218). Potential adopters who are allowed to experiment with an innovation feel more comfortable with an innovation if they are permitted to experiment with it. Hence, an increase in

trialability opportunities is likely to increase the speed with which an innovation is accepted in a society.

Observability refers to "the degree to which an innovation or its effects can be sensed by consumers" (Mwambia 2015:11). According to Evans *et al.* (2009:342), new products, technologies or services that are public and frequently discussed or seen, are likely to be adopted rapidly. Within m-payment contexts, observability refers to the ability to see the beneficial results of a payment transaction that is conducted over a mobile device (Mwambia 2015:13). Such observable results include immediate access to financial transactions anytime anywhere, which adds convenience and an effective way to manage one's business transactions. Resultantly, when users perceive m-payment as being observable or easy to describe to others, they tend to perceive it (m-payment) as more useful and easy to use (Lee *et al.*, 2011:127).

Apart from an understanding of the product characteristics as well as the adopter categories that determine the manner in which an innovation spreads within a society, the theories that are based on actual technology usage are an important field of study. With growing technology needs in the 21st century and increasing failures of system adoption, predicting system use and acceptance has become an area of interest for many researchers as it helps to identify the future intentions of a given market. Many behavioural decision theories have been developed in the literature to analyse people's behaviour when faced with an innovation, the majority of which are based on social psychology studies. In the next sections, different models are discussed in terms of the extent to which they can explain intentions to conduct m-payment transactions and subsequent usage of related services.

2.10.2 Theory of reasoned action (TRA)

The TRA is used to predict behaviour in B2C relationships as shown on Figure 2.7.

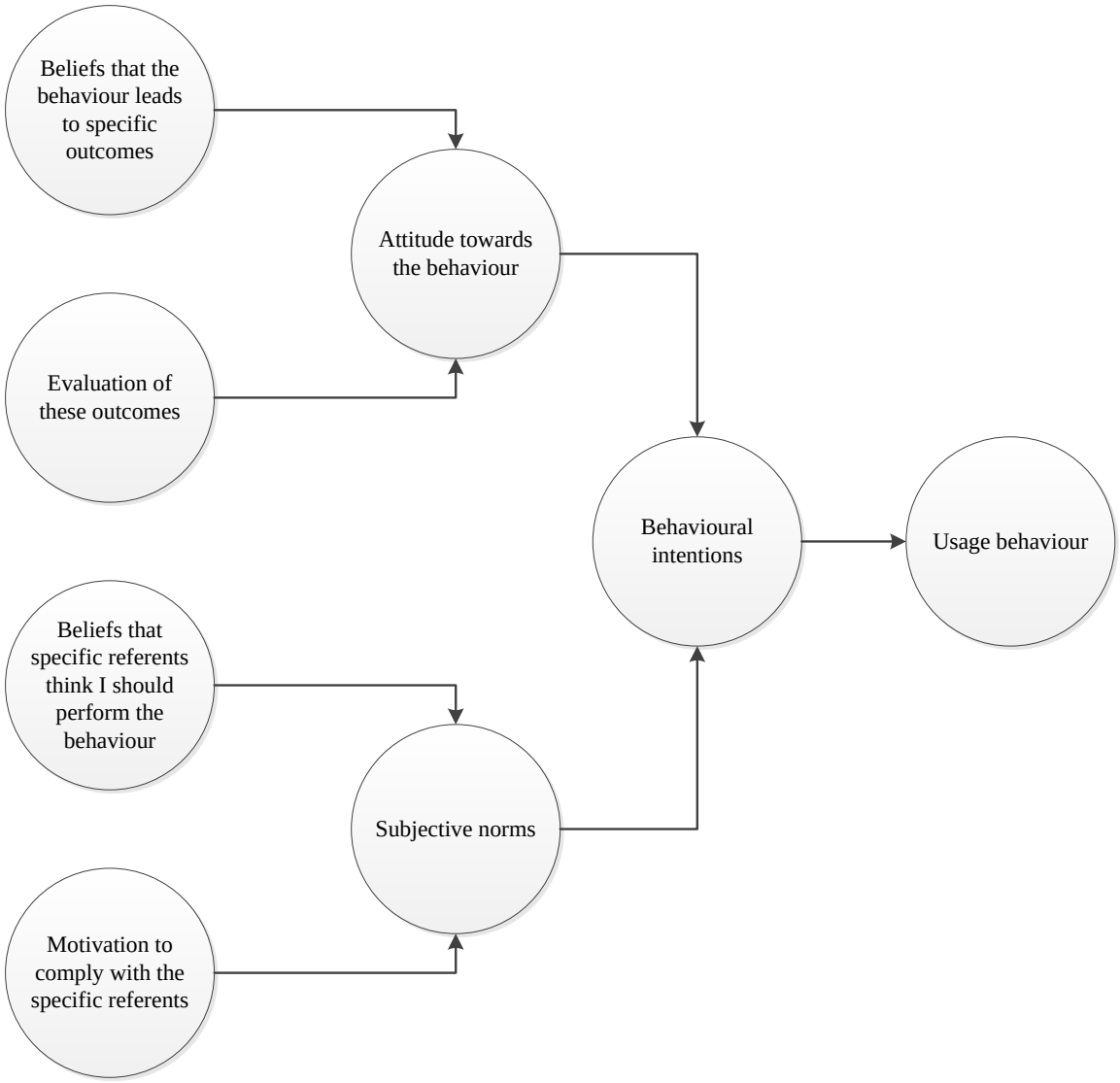


Figure 2.7: Theory of reasoned action (Fishbein & Ajzen 1975:302)

The TRA originates from learning theory and assumes that behaviour towards a particular object is approximated by an intention to perform that behaviour (Davis, Baggozi & Warshaw 1989:984). Intention represents a person's conscious plan to exert effort to carry out behaviour. The TRA was originally introduced in the field of social psychology, yet it has been widely used to explain individual's behaviour. This theory can be depicted using the following formulae:

$$\mathbf{B \sim BI = Ab\ (w1) + SN\ (w2)}$$

Where:

- ***B ~ BI*** refers to the actual behaviour as approximated by behavioural intentions
- ***Ab*** refers to the attitude toward performing behaviour
- ***w1***and ***w2***are weights that reflect the relative influence of the attitude component and
- ***SN*** is the subjective norm component.

According to Nayak *et al.* (2014:216), the TRA hypothesises that actual behaviour is predicated by the individual's intention to engage in that given behaviour. Intention, in turn, is predicted by two factors, namely the individual's attitude towards the outcome of the behaviour *(Ab)* and subjective norms *(SN)*. These two components influence behavioural intention *(BI)*, which is a pre-cursor to actual behaviour *(B)*. As such, the proximate determinants of the intent to adopt a given behaviour are the individual's personal attitude towards performing the behaviour in question as well as the influence of social factors such as family, reference groups and culture (Godin 1994:1391). While attitude refers to the learned tendency to react in a consistently favourable or unfavourable manner with respect to a given object (Gomez & Rubio 2010:517; Burton *et al.,* 1998:298), subjective norms refer to an individual's belief that he/she should perform certain behaviour since it is expected of him/her by other reference groups that are important to him/her. Therefore, behavioural intentions relate to both the evaluation of outcomes and the motivation to comply with certain reference groups.

In sum, the TRA suggests that human behaviour is not determined in a vacuum. Moreover, what people think others would like them to do, may be more crucial than their own individual preferences. Such influence from other people is termed social pressure. Schiffman *et al.* (2014:201) further pronounce that the development of consumer attitude is influenced strongly by personal experiences as well as the influence of family and friends.

2.10.3 Theory of planned behaviour (TPB)

The TPB is an extension of the TRA (Godin 1994:1391; Ajzen 1991:181). The TPB categorises attitude towards behaviour, subjective norms and perceived behavioural control as the three exploratory determinants of behaviour as shown on Figure 2.8.

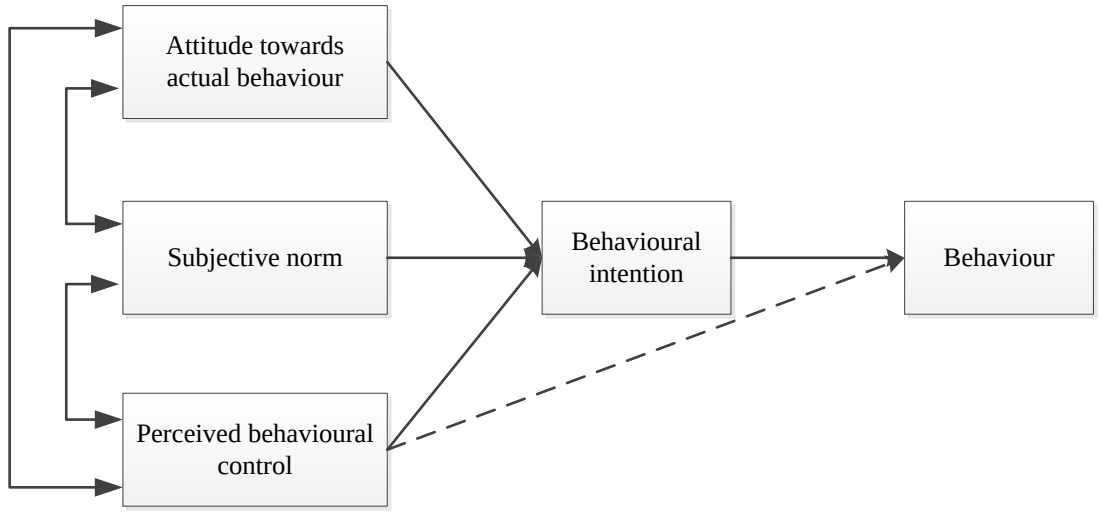


Figure 2.8: Theory of planned behaviour (Ajzen 1991:182)

The TPB considers the 'intentions' construct as the best predictor of behaviour as it expresses the effort that the individuals are prepared to make in order to develop a particular action (Bosque & Crespo 2011:162). A central factor to the TPB is the individual's intention to perform behaviour. Intentions are expected to capture the motivational factors that influence behaviour. They are indicators of how hard people are keen to try or how much an effort they are planning to apply in order to perform a specific action or behaviour. The stronger the intention to engage in behaviour, the more likely its performance should be (Ajzen 1991:181).

Attitude towards behaviour refers to the overall propensity towards favourableness or unfavourableness in the development of a particular behavioural conduct (Ajzen 1991:183). This usually develops because of the individual's beliefs with respect to the behaviour and its consequences. Therefore, consumers may generate a feeling of favourableness towards m-payments if they believe that it may lead to improved outcomes such as convenience and saving of time.

Subjective norms refer to a consumer's perception regarding the use of m-payment through the opinions of referent groups such as family, friends and/or co-workers. On the other hand, perceived behavioural control signifies the individual perception with regard to the presence or absence of the essential resources and opportunities to develop the conduct (Bosque & Crespo 2011:162). Summative, the superseding idea is that behavioural achievement depends jointly on intentional motivation as well as the individual's ability, termed behavioural control. As a rule, the more favourable the attitude and the greater the influence of subjective norms coupled with

greater perceived control, the stronger should the person's intention be to perform the behaviour in question.

2.10.4 Technology acceptance model (TAM)

A fundamental purpose of TAM is to provide a basis for outlining the impact of external factors on internal beliefs, attitudes and intentions of technology users (Davis *et al.,* 1989:985). An illustration of the TAM is shown on Figure 2.9.

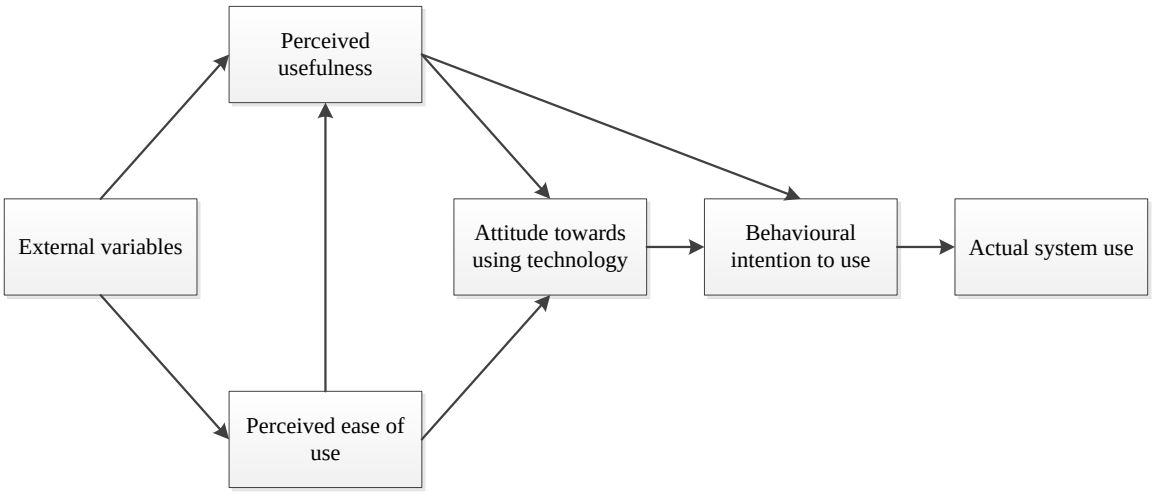


Figure 2.9: Technology acceptance model (Davis *et al.,* 1989:985)

One of the reasons for the slow diffusion of mobile applications in general and m-payment in particular might be a failure in communicating a clear benefit to possible users (Schierz *et al.,* 2010:211). Consumers are keen to accept m-payment innovations if those innovations offer a distinct advantage compared to the current solutions. TAM proposes that two particular beliefs, namely perceived usefulness and perceived ease of use are the primary drives of technology acceptance. These two variables influence intention to use a system, which in turn correlates with the actual use.

Perceived usefulness is related to the belief that the use of innovative technology improves the user's performance (Shin & Lee 2014:1617). Kim, Yoon and Han (2014:2) define usefulness as the degree to which a person believes that using a particular system would enhance his or her job performance. This definition coincides with the Oxford Advanced Learners Dictionary (OALD 2010:1320) linguistic synonyms of the word "useful," namely beneficial, suitable, can help you achieve what you want and capable of being used advantageously. Existence of this construct is demonstrated when the use of a given technology seems valuable for achieving a particular result, when compared with the use of alternative technology. In an organisational context, the measures

of perceived usefulness include productivity increase, effectiveness, overall usefulness and time saving.

Perceived ease of use is the degree to which the potential user expects the target system to be free of effort (Davis *et al.,* 1989:985). Interestingly, this definition coincides with the linguistic synonyms of "ease," namely effort-free, simple to use, lack of difficulty (OALD 2000:367). Perceived ease of use is explained by the level of easiness in using technology (Shin & Lee 2014:1617; Belkhamza & Wafa 2009:4). Given the technical limitations of mobile devices, ease of use inevitably becomes an imminent driver of acceptance. This is because mobile applications compete with traditional payment solutions on key aspects such as clear symbols, function keys, graphic display etc. As such, it is the perception of user friendliness rather than the actual system characteristics, which underlies this construct.

In contrast to the TRA, which assumes that attitude and subjective norms independently affect intentions, in the TAM, perceived usefulness and perceived ease of use are understood to affect behavioural intentions through the attitudinal construct (Kim *et al*., 2014:2). In so much as it may seem worthwhile to find technology that is useful for improving one's effectiveness on the job, the literature cautions that while users may believe that technology is useful, they may at the same time perceive it to be difficult to use (Teo, Luan & Sing 2008:267). In such instances, the benefits of usage do not justify the amount of effort needed to use the technology. As such, it is possible that technology with high levels of usefulness is more likely to induce positive attitude in cases where there is effortless use (Belkhamza & Wafa 2009:4). Additionally, the TAM assumes that usefulness directly affects behavioural intentions. Furthermore, the TAM postulates that it is attitude that inevitably affects behavioural intentions, which in turn influences the actual behaviour of consumers.

Attitudes are a set of beliefs about a certain object or an act, which may translate into intentions to carry out the act (Ramayah, Lee & Mohamad 2010:1421). Zubaidi and AL-Alnsari (2010:295) defined attitude as "the degree of evaluative affect that an individual associates with using the target system in his or her job". In this case, attitudes signify the favourable or unfavourable evaluations of an individual form of a specific behaviour. Attitude impacts the intention held by technology users. Specifically, the more favourable the attitude, the bigger is the intention to perform the behaviour under scrutiny (Vazifehdoust *et al.,* 2013:2491).

2.10.5 Unified theory of acceptance and use of technology (UTAUT)

Figure 2.10 illustrates the UTAUT.

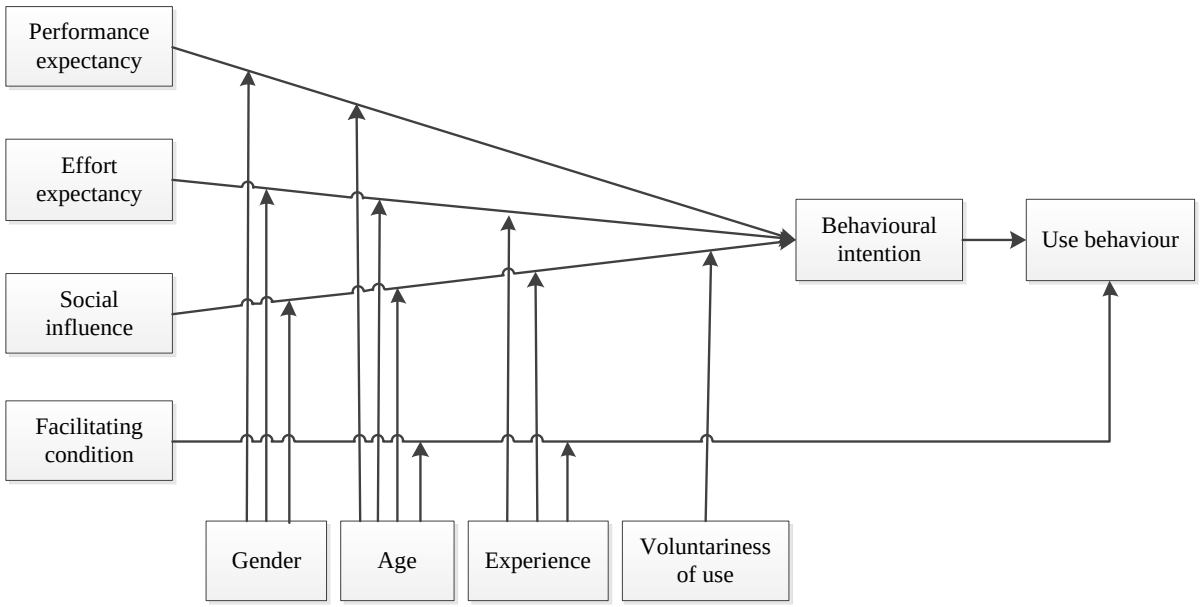


Figure 2.10: Unified theory of acceptance and use of technology (Venkatesh *et al.*, 2003:447)

As a comprehensive synthesis of previous competing models of technology acceptance, Venkatesh *et al.* (2003:447) developed the UTAUT. The UTAUT underscores that behavioural intention to use technology and ultimate technology use is influenced by four constructs. According to UTAUT, performance expectancy, effort expectancy and social influence are theorised to influence behavioural intentions to use technology, directly (Coeurderoy, Guilmot & Vas 2014:1085). Relatedly, behavioural intention and facilitating conditions are expected to determine technology use. As a unique variant to previous theories, UTAUT takes into consideration demographic variables such as age, gender and experience as the main moderators of the various UTAUT path relationships.

Similar to the usefulness construct under the TAM (Davis *et al.*, 1989:985) as well as the relative advantage element in the diffusion theory (Rogers 1995:16), performance expectancy in the UTAUT refers to "the degree to which an individual believes that using a system could help him or her to attain gains in job performance" (Qingfei, Shaobo & Gang 2008:259). Put simply, performance expectancy measures the degree to which using a technology provides benefits to consumers in performing certain activities.

Effort expectancy refers to "the degree of ease associated with the use of an innovative system" (Qingfei *et al.,* 2008:259). It explains the extent to which an individual believes in the ease (or difficulty) of using a system that has been introduced as an innovation in the market.

Social influence refers to "the degree to which an individual perceives that important referents believe that he or she should use the new system" (Fishbein & Ajzen 1975:302). It refers to the extent of influence other users could have on one another in using an innovation once it has been introduced. Accounting for the social context within the UTAUT is consistent with new product growth models, which emphasise that innovation adoption is significantly influenced by pressures from the social system. As such, Venkatesh *et al. (*2003:451) put together subjective norms, social factors and image as latent indicators of the social influence construct.

Facilitating conditions refer to "the degree to which an individual believes that organisational and technical resources and infrastructure exist to support the use of an innovative system" (Venkatesh, Thong & Xu 2012:159). As such, the more convenient access to mobile devices by consumers, the more proficient their use of technology is, resulting in higher adoption rates.

There have been considerable differences of opinion regarding the appropriate technology acceptance theory to use in different contexts. While the UTAUT has been successfully replicated in numerous studies, thus proving its generalisability, its origins in explaining technology acceptance and use among corporate employees render it inappropriate towards understanding m-payment acceptance by individual consumers. However, the TAM seems to be one of the most widely used, owing to its simplicity and parsimony (Jeong & Yoon 2013:34). In addition, the TAM seems to be a better foundational theory for this study owing to its specificity in addressing the antecedents of m-payments as compared to TRA and TPB, which are generally considered generic human behaviour theories.

Kim *et al.* (2010:312) assert that TAM fulfils the research purposes of most m-payment studies better than UTAUT. In addition, the TAM has been widely applied in several researches on information system use (Schierz *et al.,* 2010; Jeong & Yoon 2013; Liébana-Cabanillas *et al.,* 2014), proving satisfactory reliability across technologies, contexts and time of evaluation. Table 2.3 provides a summary of some studies that have utilised the TAM by way of applying different factors.

Table 2.3: Summary of previous studies focusing on the classic TAM

Source	Underlying model	Factors	Sample	Context	Country
Liébana-Cabanillas *et al.* (2014:223)	TAM	• Usefulness • Ease of use • Subjective norms • Trust • Risk • Social image	Mobile phone users	Mobile-payment systems (Zong™ users)	Finland
Jeong and Yoon (2013:34)	TAM	• Usefulness • Ease of use • Credibility • Self-efficacy • Perceived financial cost	Mobile phone users	M-banking	Singapore
Amin, Supinah and Aris (2012:7)	TAM	• Usefulness • Ease of use • Social influence • Security	Mobile phone users	M-banking	Malaysia
Schierz *et al.* (2010:212)	TAM	• Usefulness • Ease of use • Social influence • Security • Compatibility • Individual mobility	Mobile phone users	Mobile-payment systems	Germany
Pousttchi and Wiedemann (2007:3)	TAM	• Usefulness • Ease of use • Trust • Confidentiality • Task-technology fit	Mobile phone users	M-payments	Germany

This study shall draw from the underlying tenets of the TAM while enhancing the predictive power of the theory by incorporating the security construct along m-payment contexts.

Understanding individual acceptance and use of information technology is one of the most mature streams of information systems research. However, empirical findings underscore the idea that intention to use is an appropriate predictor of later usage (Schierz *et al.*, 2010:211). This study utilises the intentions construct as a proxy for consumer acceptance of m-payments and invariably denotes it as the dependent variable for this research. The next section delves into an examination of future intentions to use m-payment services.

2.11 FUTURE INTENTIONS TOWARDS USING M-PAYMENT SERVICES

Fishbein and Ajzen (1975:307) define behavioural intentions as the degree to which a person has formulated conscious plans to perform or not perform some futuristic behaviour. Usually these plans are formed as a result of both a personal evaluative and a normative construct, implying that behavioural intention is carefully reasoned and transformed into actionable goals based on an individual's needs and experiences at a given time (Malhotra & McCort 2001:241). Such intent serves to predict the likelihood of an individual behaving in a particular way (Schiffman *et al.,* 2014:199). According to Zubaidi and Al-Alnsari (2010:295), behavioural intention is a measure of the strength of one's intention to perform a specific behaviour. The stronger the intention a person has to engage in a particular behaviour, the higher the possibility that he or she will perform that behaviour.

Zeithaml, Berry and Parasuraman (1996:32) construe behavioural intentions as either favourable or unfavourable, based on the customer's perceptions. Favourable behavioural intentions are always desirable since they lead to positive outcome measures such as the forging of bonds with the company. In addition, favourable intentions lead to increased volume of business (Parumasur & Roberts-Lombard 2012:69) and spreading positive word-of-mouth about the company (Manders 2013:7). The rationale for electing future intentions as the dependent variable in this study lies in that intentions to behave are a prime determinant of the actual behaviour (Ajzen 1989:243). This suggests that behavioural intentions can be correlated with adoption intentions and actual usage, since they are relevant to a customer's decision to use (or not to use) a certain technology.

In this research, the construct future intentions is measured by consumers' intention to accept technology, which refers to users' willingness and readiness to use m-payment services in future encounters. In consumer behaviour terms, this factor is commonly measured by an evaluation of consumers' inclination to buy and to return for additional purchases, of which the latter contributes to re-patronage intentions (Balabanis Reynolds & Simintiras 2006:218). Therefore, when managers understand how customers evaluate new technology innovations and the consequences of such evaluations on future intentions, they can better allocate resources to increase loyalty to the firm.

This study concurs with several researchers who use 'intentions' as a proxy for actual behaviour (Teo *et al.,* 2008:268; Kim, Chun & Song 2009:4). This is because the intentions construct is a decent indicator of behaviour as it expresses the effort that an individual is prepared to make in order to develop a particular action. In this study, 'future intentions' is defined as the positive

outcome of a usage experience, which is exhibited by a consumer consciously planning to re-use, make referrals and spread positive word of mouth about m-payments and their related services. In light of this, an understanding of when and how technology users prepare themselves for such favourable outcomes is essential as it contributes towards the development of loyalty.

2.12 ANTECEDENTS OF M-PAYMENT TECHNOLOGY ACCEPTANCE

Various studies go to considerable lengths to distinguish among several antecedents of the behavioural intentions variable in technology-based studies. Although different behavioural patterns may be expected across product categories, a prime facie assessment of the theories of technology acceptance pinpoints to the sacrosanct influence of usefulness and ease of use as the underlying factors that exert a fundamental influence on consumer attitude and ultimately, intentions towards using technological innovations. Actual system usage is determined by a person's behavioural intention, which is ultimately determined by his or her attitude towards the system.

Davis (1989:321) suggests that the three factors, namely perceived usefulness, perceived ease of use and attitude towards using technological innovations have an influence on users' motivations, which then determines their ultimate intention to use technology. In addition, this study has identified perceived security as the other factor that is salient towards m-payment based studies.

In a mobile environment, lack of security is a major barrier towards the acceptance of m-payment transactions. Consumers' concerns about the privacy and security of m-payments are commonly related to authentication and confidentiality issues as well as to concerns about secondary use and unauthorised access to payments and user data (Mallat 2007:416). Since the applications that operate on a majority of mobile devices function on an open network with no direct human control over individual transactions, it is necessary to develop infrastructure that is hardened against security breaches. A secure m-payment system should protect consumers against fraudulent activities and further support consumer privacy (Kim *et al.*, 2010:86).

Security factors that seem important to consumer adoption are anonymity and privacy, which relate to use policies regarding the consumers' personal information and transaction records. Users' perceptions of m-payment security allude to the level of assurance that a particular transaction could be performed without security breaches (Mekovec & Hutinski 2012:1884). Within the m-payment domain, perceived security depends on the reliability of the payment methods as well as the quality of tools and processes used for personal information transmission

and storage (Ozguven 2011:991). As such, this study recognises the importance of security as an antecedent of consumers' future intentions to conduct m-payments.

This section explored the explanatory power of usefulness, ease of use and security as vital predictors of attitude and future intentions towards using m-payments. In view of additing to the cumulative research, the next section presents the research model including the supporting hypotheses that were formulated and later tested in Chapter 4 of this study.

2.13 RESEARCH MODEL AND HYPOTHESES DEVELOPMENT

The forgoing discussion of antecedents helps to present an overview of m-payment technology acceptance and further assists to generate an enriched academic discourse regarding the future intentions of users. Drawing from this, Figure 2.11 is presented as the research model for the study.

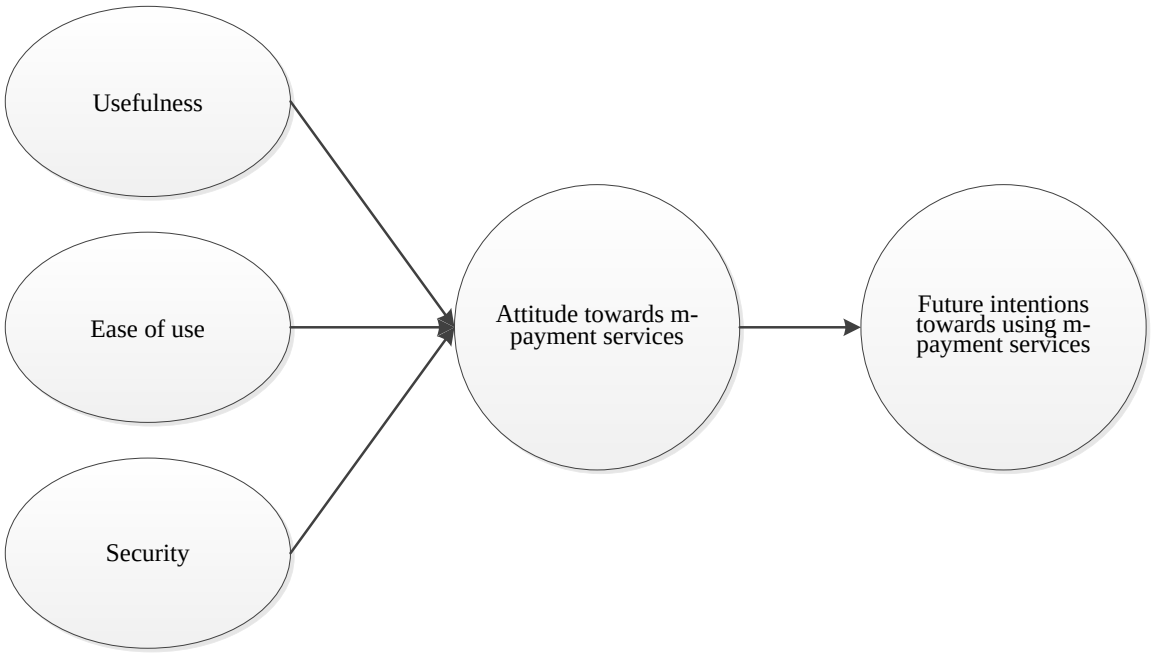


Figure 2.11: Model of the antecedents towards the acceptance of m-payment services

Upon recognising that m-payment acceptance and usage behaviour can be addressed in more than one way, the current research emulates this line of thought by adopting the notion of an attitudinal construct that is broadly represented as a three-dimensional phenomenon. As such, perceived usefulness, perceived ease of use and perceived security are expected to influence users' attitude towards m-payments. Effectually, once a user exhibits favourable attitudes towards m-payment related services, it culminates into a linear relationship between user attitude and the outcome variable of this study, namely future intentions. Following this, the following one-tailed

hypotheses statements were formulated as the foundational anchor for testing the research model developed in this study:

H_o1: *M-payment future intentions is not a five-variable structure comprising perceived usefulness, perceived ease of use, perceived security, attitude and future intentions.*

H_a1: *M-payment future intentions is a five-variable structure comprising perceived usefulness, perceived ease of use, perceived security, attitude and future intentions.*

Consistent with the linkages shown on the research model in Figure 2.11 and the initial null (H_o1) and alternative (H_a1) hypotheses, the study went further to explain the linkages among the variables leading to a development of four more one-tailed hypotheses for testing.

Usefulness can be defined as "the prospective user's subjective assertion that using a specific application system will increase his or her job performance" (Davis *et al.*, 1989:985; Suki & Suki 2011:3). According to Zubaidi and Alnsari (2010:296), the decision to use or not to use the technology system depends on the degree to which individuals feel that using the m-payment system could help them to perform and manage their financial transactions better.

Usefulness is an antecedent towards favourable attitude evaluations of technology (Revels *et al.*, 2010:76). The ability to access m-payment services at the consumer's own convenience at anytime and anywhere, evidently highlights the practicality of using the mobile system. If consumers understand that they can constantly connect to the service whenever required, they are more likely to perceive a m-payment service to be useful. In turn, satisfaction with the mobile-payment system is realised and thereby, increasing the likelihood of using the service (Revels *et al.*, 2010:76). Thus, the expectation is that usefulness could influence the attitude of m-payment users in a positive way. Against this background the following hypotheses were formulated for this study:

Ho2: *Perceived usefulness does not positively influence attitude towards m-payment services.*

Ha2: *Perceived usefulness positively influences attitude towards m-payment services.*

According to Venkatesh (2000:344), ease of use is defined as "the degree to which a person believes that using technology will be free of effort". Sohail and Al-Jabri (2013:337) further reinforced this declaration as they indicated that ease of use is the extent to which an innovation is easy to use. This assertion is tied closely to an individual's assessment of the effort involved in the process of using an electronic system. Zubaidi and Alnsari (2010:296) further maintained that

"ease" is synonymous with freedom from difficulty. As such, ease of use incorporates the ease of learning, ease of control, ease of understanding, ease of use, clarity and flexibility of conducting m-payment transactions. In this research, ease of use was operationalised as the degree to which customers perceive m-payment as easy to use while conducting financial transactions.

Due to m-payment services having very user friendly interfaces, customers are likely to view them as being easy to use and hence they tend to exhibit a positive attitude towards them (Lin 2011:254). Song *et al.* (2008:17) also asserted that perceived ease of use affects user attitude in a positive manner. As such, the expectation is that ease of use could influence the attitude of m-payment users positively. It is against this background that the following hypotheses were formulated for this study:

Ho3: *Perceived ease of use does not positively influence attitude towards m-payment services.*

Ha3: *Perceived ease of use positively influences attitude towards m-payment services.*

Security in e-commerce is defined as "the organisation's efforts to circumvent any threats, which create the circumstances, conditions, or events that potentially lead to instabilities to data or network resources leading to financial losses for the users" (Yousafzai *et al.,* 2009:595). In some cases, fraud and abuse of systems may potentially result from security breaches. According to Mekovec and Hutinski (2012:1885), online users are gradually finding themselves exposed to security risks throughout their activities. Security risks include the manipulation of personal information and networks or various types of fraud and misuse.

When consumers advance a positive perception of security and trust in the technology, confidence in the exchange relationship also increases and could encourage open, substantive and influential information exchanges (Yousafzai *et al.,* 2009:596). Koved *et al.* (2013:1) suggest that the willingness to perform actions for security purposes is determined strongly by the costs to the individual coupled with his/her perception of risk. When end users' perceptions of risks are not aligned with those on which the system is based, there is a mismatch in perceived benefits, leading to poor user acceptance of the mobile-payment system (Sasse, Brosthoff & Weirich 2001:126). Therefore, security is a key element in consumers' decisions to adopt m-payments (Lin 2011:256). Moreover, security is linked positively with the intentions variable through the attitudinal construct. It is against this background that the following hypotheses were formulated for this study:

Ho4: *Perceived security does not positively influence attitude towards m-payment services.*

Ha4: *Perceived security positively influences attitude towards m-payment services.*

Numerous studies have supported attitude as a significant predictive variable of intention to use new technology (Ajzen 1989:17; Kim *et al.,* 2009:4). Attitudes are a set of beliefs about a certain object, or an act, which may translate into intent to carry out the act (Jain 2015:716). They emanate from the individual's beliefs regarding the behaviour and its consequences, as well as the importance given to those beliefs (Herrero & Martin 2012:843). Thus, a favourable attitude is formed through the perceptions of risks and benefits associated with being involved in m-payment transactions. Such perceptive evaluations determine future intentions, which most likely ascertain users' acceptance of m-payment technology and related services (Choi, Lee & Ok 2014:226). Similarly, Hsiao and Chang (2013:732) conceded that technology users' participation in mobile-based transactions is affected by both rational decisions and affective commitment. Therefore, it is against this background that the following hypotheses were formulated for this study:

Ho5: *Attitude does not positively influence future intentions towards m-payment services.*

Ha5: *Attitude positively influences future intentions towards m-payment services.*

2.14 SYNOPSIS

In today's rapidly changing, dynamic and competitive market environment it is imperative that organisations gain an understanding of the environment they are operating in so that they may succeed when attempting to encourage consumers to adopt an innovation. This chapter provides a definition of m-payments and distinguishes between the different m-payment devices, applications and service provider frameworks. Furthermore, the chapter reviews technology acceptance theories, which confirms the salience of usefulness, ease of use, security and attitude as the underlying predictors of intentions to adopt technology.

While taking a departure point from the underpinnings of the TAM, this study in the first instance, aimed to develop and extend existing research by proposing, operationalising and testing a model of the antecedents of m-payment future intentions. Secondly, motivated by a desire to generate a greater understanding of the future behaviour of m-payment users, an objective of this research was to evaluate how consumer attitudes moderate the future intentions of m-payment users. Thirdly, given the salience of the intentions construct, as a proxy for actual technology usage, a

research model was developed that could supply insights into the nature of m-payments and their related services within a South African context.

The next chapter shifts from a theoretical frame towards addressing the research design and methodology used in the study. Sampling techniques, measures and data collection methods are explored. This further incorporates the actual fieldwork administration for the entire research. Data analysis techniques that were used for the study are highlighted in Chapter 3. The chapter further discusses issues relating to how the reliability, validity and ethical issues pertaining to the study were addressed.

CHAPTER 3
RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

Marketing research is the systematic and objective identification, collection, analysis, dissemination and use of information for the purpose of improving decision making related to the identification and solution of problems and opportunities in marketing (Malhotra 2010:39). The purpose of this chapter is to describe the research methodology that was used in this research. This is achieved by specifying how the actual data were collected, consistent with Saunders, Lewis and Thornhill's (2009:108) metaphor of the research onion shown on Figure 3.1.

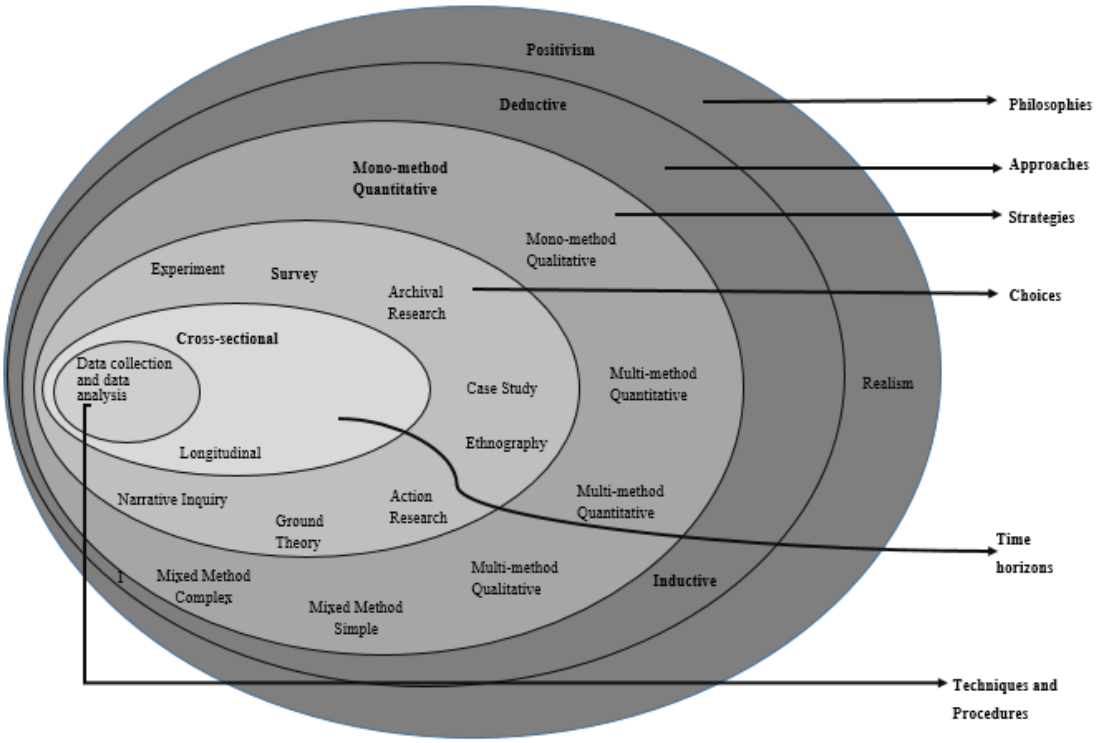


Figure 3.1: The research onion (Saunders *et al.*, 2009:108)

In this chapter, the metaphor of the research onion was used to illustrate how the final elements of data collection need to be considered in relation to other design elements (Saunders *et al.*, 2009:108). The layers of the research onion provide an understanding of

the progression of phases through which a research can be conducted (Saunders & Tosey 2013:58). It is the understanding and associated decisions in relation to these onion layers that provided the context and boundaries within which data collection techniques and analysis procedures were selected in this study.

The first layer of the research onion contains the philosophical stances and related worldview taken to interpret the research as explained under Section 3.2 of this study. Each of the possible choices at this level provided structure, guidance as well as any possible limitations to following certain data collection and analysis decisions, thereby creating valid empirical findings. Layer two of the research onion explains the premise under which the purpose of the research was considered, consisting of deductive and inductive research approaches described in Section 3.3 of the study. Nonetheless, the decision that was made on this level was strongly directed by the choices made during the philosophical phase of the research onion layer.

Based on the considerations made regarding the research approach, layer three of the research onion advances to examine the strategies followed in research, comprising either mono method, mixed method or multi method. This study adopts the mono method, whereby only one data approach, namely the quantitative approach was applied on a single sample of elements.

Layer four of the research onion interrogates the choices pertaining to the survey data collection method that was selected for this study. In view of the survey choice decision, Section 3.4 of this chapter delves into quantitative and qualitative research approaches. While each has its benefits and associated limitations, these specified approaches do not have a layer of their own in the research onion diagram, although they should be continually considered as the researcher travels throughout the centre (Saunders *et al.*, 2009:108).

The decision to adopt a survey corresponds with the fifth layer of the research onion which relates to time horizons. Time horizons can be indicated as a fixed time target (Saunders *et al.*, 2009:108). In this study, a fixed time limit was set for the completion of the data collection process, which followed a single, cross-sectional research design as explained in Section 3.5 of this study. Moreover, the final or central layer of the research onion moves the research design further into practicalities of the sampling process (Section 3.6), data collection (Section 3.7), instrument design (Section 3.8) and data analysis (Section 3.9).

During the sampling design phase, decisions were made regarding which data collection methods work best and what type of analysis to employ to create the results to answer the primary objective of the study.

3.2 RESEARCH PHILOSOPHY

A research philosophy is a belief about the method in which data regarding a phenomenon should be gathered, analysed and used (Saunders *et al.,* 2009:112). What differentiates philosophy from other sciences are its questions and the standards their answers are intended to satisfy. As such, the term epistemology (what is known to be true) as opposed to doxology (what is believed to be true) encompasses the various philosophies of research. The purpose of science, then, is the process of transforming things believed into things known, termed *doxa* to *episteme*. Two major research philosophies have been identified in the Western tradition of science, namely positivist (also termed scientific) and interpretivist (also termed anti-positivist).

3.2.1 Interpretivist philosophy

Interpretivists contend that only through the subjective interpretation and intervention in reality can that reality be fully understood (Aliyu *et al.,* 2014:82). The key view point of interpretivists is to find new interpretations or underlying meaning and adhere to the ontological assumption of multiple realities that are both time and context based (Saunders *et al.,* 2009:116). The interpretivist paradigm is denoted as constructivism since it accentuates the ability of an individual to construct meaning. Therefore, the role of the researcher within the interpretivist paradigm is to understand, explain and clarify social reality. According to Collins (2010:38), interpretivism pursues the understanding of particular contexts, while leaning on the primary belief that reality is socially constructed. Interpretivism examines research questions aimed at understanding phenomena that occur in natural settings (ethnographic), while utilising verbal data. In view of this, the term "naturalistic" has often been used to connote this type of research that is conducted in a natural setting rather than in a laboratory (Zikmund *et al.,* 2013:8).

3.2.2 Positivist philosophy

Positivists believe that reality is stable and can be observed and described from an objective viewpoint without interfering with the phenomena being studied. Positivism is embedded

in the ontological principle and doctrine that truth and reality are both independent of the viewer and observer (Zikmund *et al.,* 2013:8). Positivistic research is intended to produce an exact representation of reality that is unbiased and value free (Saunders *et al.,* 2009:119). Positivists believe that reality is stable and can be observed and described from an objective point of view. Saunders *et al.* (2009:119) postulate that positivist research relies primarily on quantitative research approaches where data comprises numbers and analysis is done by statistical methods instead of verbal data. Methodologies normally employed by positivist researchers comprise confirmatory analysis, nomothetic experiments, quantitative analysis, laboratory experiments and deduction (Aliyu *et al.,* 2014:82). As such, positivism dominates in science and assumes that science quantitatively measures independent facts around a single apprehensible reality.

Positivists contend that phenomena should be isolated and that observations should be replicable. This often involves manipulation of reality with variations in only a single independent variable to identify regularities in and to form relationships between some of the constituent elements of the social world (Saunders *et al.,* 2009:113). In view of this, this study followed a positivistic research approach to investigate the relationship between usefulness, ease of use and security with user attitude and future intentions towards m-payment services usage. Consistent with the propositions of positivists, the study sought to make theoretic-based predictions of the perceptions of m-payment users, based on empirical observations of individual behaviour. As such, the aim was to apply a structured measure or instrument to reduce the perceptual experiences of individuals into simple elements, in an objective manner. Logically so, positivism is hinged upon a deductive epistemology, which follows a deductive form of theoretical reasoning (Neuman 2006:59-60). As such, the next section alludes to the research purpose that was followed upon framing this study.

3.3 RESEARCH PURPOSE

Given that academic research can be viewed as a formal mode of knowledge acquisition, it remains imperative to reflect on this learning phenomenon based on a critique of marketing research methodologies. In view of this, the inductive and deductive theories of research reasoning have often been postulated as being widely applicable in framing any research methodology. These are specified as guiding the purpose of a research and are therefore explained next.

3.3.1 Inductive theory building

Figure 3.2 illustrates inductive theory building.

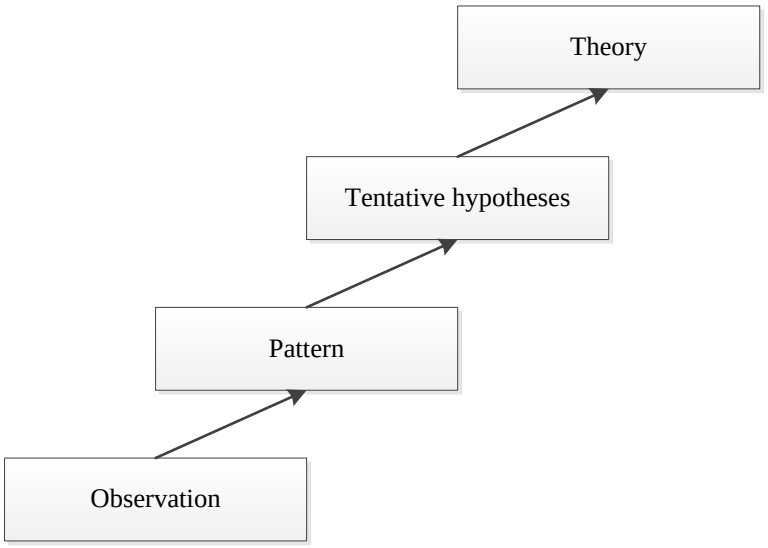


Figure 3.2: Inductive research (Burney 2008:5)

Neuman (2006:59) defines inductive theory as the approach to developing or confirming a theory that begins with concrete empirical evidence and works towards a more abstract concepts and theoretical relationships. This is a "bottom up" approach to research. Similarly to the notion of hill climbing, inductive reasoning is commonly described as moving from the specific observations of phenomenon to broader generalisations and theories. Put simply, researchers begin by observing the world, then they search for a pattern in what is observed, after which they are able to make a generalization about what is occurring (Burney 2008:5). The implications, therefore, are that inductive research scantly follows specified theoretical frameworks. Once the data has been analysed, the patterns or themes that emanate are used to stipulate tentative hypotheses and subsequently position a new theory within the discipline (Saunders *et al.,* 2009:125). Inductive reasoning is usually associated with qualitative research since it aims to generate new theory that emerges from observed data patterns (Zikmund *et al.*, 2013:44).

3.3.2 Deductive theory building

Figure 3.3 illustrates deductive theory building.

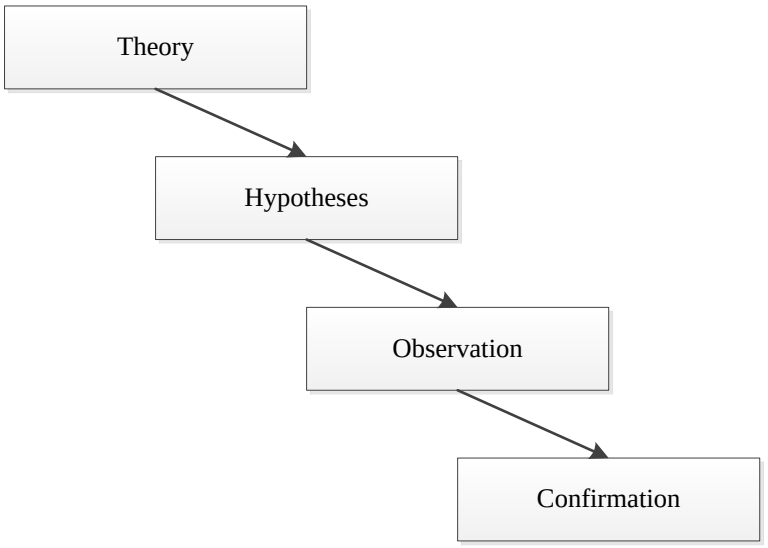


Figure 3.3: Deductive research (Burney 2008:4)

Deductive theory is the approach to developing or confirming a theory that begins with abstract concepts and theoretical relationships and works towards concrete empirical evidence (Neuman 2006:59). Similar to the waterfall metaphor, deductive reasoning works from more general theories moving down to the more specific elements, sometimes called the "top-down" approach (Burney 2008:7). In other words, deductive research seeks to test existing theory by commencing with the stating of theoretic-based hypotheses, which emphasise causality among variables (Saunders *et al.*, 2009:125). Thereafter, empirical observations are made through a structured data collection process that is usually quantitative in nature (Zikmund *et al.*, 2013:44). Inferences and conclusions to the research problem can then be drawn based on the observations made, thereby permitting the acceptance (or not) of the stated hypotheses.

This study followed the deductive research logic since it was concerned with testing a research model that was developed from existing technology acceptance theories. The research commenced with modifying the technology acceptance model (TAM) by Davis *et al.* (1989:985) and then applying a research model to establish testable statements. The statements were then expressed in operational terms (termed hypotheses) by stating the existing relationships among usefulness, ease of use, security, attitude and future intentions

towards m-payment acceptance. Thereafter, a field survey was instigated to observe consumers' perceptions after which the raw data were statistically analysed with a view to confirm the theory, or refute or further indicate the need for theory modification in light of the empirical findings.

While a deductive research was considered notable in this research, it was still considered vital to specify the fundamental research strategy to be followed in the study. In light of this, the quantitative and qualitative research approaches are briefly discussed in the next section.

3.4 RESEARCH APPROACH

In research either qualitative or quantitative research approach can be applied.

In qualitative research, the objective is to discover an identification of new ideas, thoughts, feelings and preliminary insights on an understanding of ideas and objects (Malhotra 2010:175; Shiu *et al.,* 2009:171). Assertions by Tustin *et al.* (2010:90) are that qualitative research entails the use of unstructured, semi-structured, deep probing and open-ended questioning, which is more flexible or amorphous. Data are collected from small, non-representative cases (Schiffman *et al.,* 2014:38). As a result, qualitative data collection methods are amenable to in-depth interviews, source documents as well as the researchers' impressions and reactions (Hoy 2010:1). For these reasons, qualitative research is considered as being subjective, meaning that the results are researcher-dependent.

Hair, Bush and Ortinau (2009:207) affirm that in qualitative research, data obtained is in the form of words so that there is a clear understanding of meaning, which is attached to the experiences of respondents. This approach assists researchers to uncover the perceptions and underlying beliefs of respondents to acquire complete understanding about a particular occurrence. According to Bryman and Bell (2011:302), qualitative research approach is characterised by an inductive view of the relationship between theory and research, thereby assisting the researcher to understand the social world through an investigation of how participants interpret the world.

Quantitative research data is typically obtained through empirical assessments, which are measured and analysed statistically (Tustin *et al.,* 2010:89). Quantitative research emphasises precision and objective accuracy with the researcher being an independent

observer (Zikmund *et al.*, 2013:134). As such, quantitative research is understood to be more objective than qualitative research since its key emphasis is the discovery of facts or causes of social phenomena (Malhotra 2010:171). In view of this, the findings of quantitative research are often treated as conclusive and can be used to recommend a final cause of action. Additionally, quantitative research entails the collection of data from larger, more representative samples (Tustin *et al.*, 2010:89). According to Hair *et al.* (2010:77), quantitative research seeks to understand research participants by fitting their answers into pre-determined categories, rather than opening up room for qualifying or explaining their choices.

Applying a quantitative approach enabled the use of statistical analysis, thereby ensuring a comparative review with previous research findings in order to validate the findings on the present sample. Furthermore, quantitative research was preferred since the approach is value-free, considering that, the findings are reported in a manner that is deliberately isolated from the research enquiry. In other words, the quantitative approach dictates that the researcher should be an uninvolved observer for research results to be objective. Likewise, since most of the previous research on m-payments also adopted quantitative research (Schierz *et al.*, 2010; Viehland & Leong 2010; Muhammad & Muhammad 2013; Mishra 2014), using a similar research approach was considered consistent with previous scholarship.

This study falls under the ambit of quantitative research because of the underlying tenets of positivism and the inclination towards deduction reasoning. Moreover, in order to reach the primary objective that was developed at the beginning of the study, it was considered necessary to test hypotheses by utilising objective information that was empirically collected from a sample of m-payment users. Hair *et al.* (2009:154) posit that the objective of quantitative research is to explain the possible existence of predictive relationships among related constructs using a sample measurement. Therefore, the intention was to test a model of the antecedents of future intentions towards m-payment acceptance among South African consumers, empirically.

A discussion relating to the chosen research design follows in the next section.

3.5 RESEARCH DESIGN

A research design is a set of advanced decisions that make up a master plan specifying the methods and procedures for collecting and analysing the desired information (Burns & Bush 2014:98). It is a blueprint for conducting the marketing research project (Malhotra 2010:103). When undertaking a research project, a research design is followed in order to achieve the research objectives with success. Malhotra (2010:103) dissects the specific designs used in research into either exploratory research or conclusive research.

3.5.1 Exploratory research design

The key purpose of exploratory research is to examine a relatively unknown situation with a view to gain ideas and insight for further research (Malhotra 2010:104; Iacobucci & Churchill 2010:60). The research methods used under exploratory research are highly flexible, unstructured and qualitative in nature (Tustin *et al.,* 2010:84). According to Kotler and Armstrong (2012:127), exploratory research aims at gathering information that facilitates the definition of the research problem and formulation of hypotheses.

3.5.2 Conclusive research design

Conclusive research involves quantitatively analysing data from large representative samples in order to use the findings as an input in making decisions (Malhotra 2010:104). Conclusive research confirms whether the insights are true, allowing the researcher to make a decision about the cause of action. However, for the purposes of simplifying research procedures, conclusive research can be categorised into either causal research designs or descriptive research designs. The next sub-sections assist in the deliberation of these two categories of conclusive research.

3.5.2.1 Causal research design

Tustin *et al.* (2010:84) as well as McDaniel and Gates (2013:43) posit that causal research determines whether one variable causes or controls the values of other variables. Causal research is used to acquire evidence of cause-and-effect (causal) relationships among associated variables (Malhotra 2010:113). Zikmund *et al.* (2013:58) further pointed out that causal or explanatory research designs provide evidence of the extent to which, two or more variables occur together or vary together systematically as predicted by the hypotheses.

3.5.2.2 Descriptive research design

Descriptive research serves a variety of research objectives as suggested by Zikmund *et al.* (2013:55). First, descriptive research is aimed at providing descriptions of phenomena or characteristics associated with a population. This refers to the; who, what, when, where and how elements of a sample. Moreover, descriptive research is used to describe rather than explain the market situation, attitudes, beliefs and opinions (Malhotra 2010:106). The researcher, therefore, begins with a well-defined subject and conducts research to describe it with precision. Secondly, descriptive research seeks to make estimates of the frequency of appearances and the proportion of the population that has specified characteristics. In other words, descriptive research aims to estimate the amount of individuals reacting and behaving in a certain way (Hair *et al.,* 2009:233). Thirdly, descriptive research seeks to discover associations among different variables. This is often achieved by preferring plausible explanations as to why the criterion variable occurred and thus, offer specific predictions about the association among research variables (Hair *et al.,* 2013:79). Hair *et al.* (2009:232) pinpoint that, taken together, if a combination of these three factors characterises the prevailing research challenge, then this logically suggests the need to use descriptive research designs.

The choice of a descriptive research design for this study was motivated by three determining factors. First, the nature of the study was to describe specific characteristics of m-payment users. Therefore, descriptive studies were applied in this study with a view to estimate the percentage of population-payment users exhibiting current or potential m-payment usage behaviour (Churchill *et al.,* 2010:107). Secondly, the study sought to provide a detailed picture regarding the perceptions of m-payment users. Thirdly, a descriptive research design was considered an appropriate choice for identifying and validating the existence of relationships among marketing phenomena. As such, this study aimed at investigating the antecedents towards the acceptance of m-payment services and the relationship with attitude and future intentions. There are two types of descriptive studies, namely cross-sectional studies and longitudinal studies (Churchill *et al.,* 2010:109).

In this study, a single cross-sectional descriptive research design was employed. This is because a single cross-sectional design allows for a singular snapshot of a sample of respondents to be drawn only once from the target population and information (Malhotra 2010:108). Longitudinal research refers to the type of research involving a fixed sample of

population elements that are measured repeatedly on the same variable (Burns & Bush 2014:105). A longitudinal design differs from a cross-sectional design in that the samples remain the same over time (Malhotra 2010:110). On the other hand, cross-sectional studies measure units from a sample of the population only at a specific point in time. While cross-sectional samples can be based on either small or large samples, the sample surveys are drawn in such a way as to be representative of some larger population.

The following section describes the sampling process that was followed in this study.

3.6 SAMPLING PROCESS

An adaptation of the procedure by Churchill and Iacobucci (2002:449) for drawing a sample was made as shown on Figure 3.4.

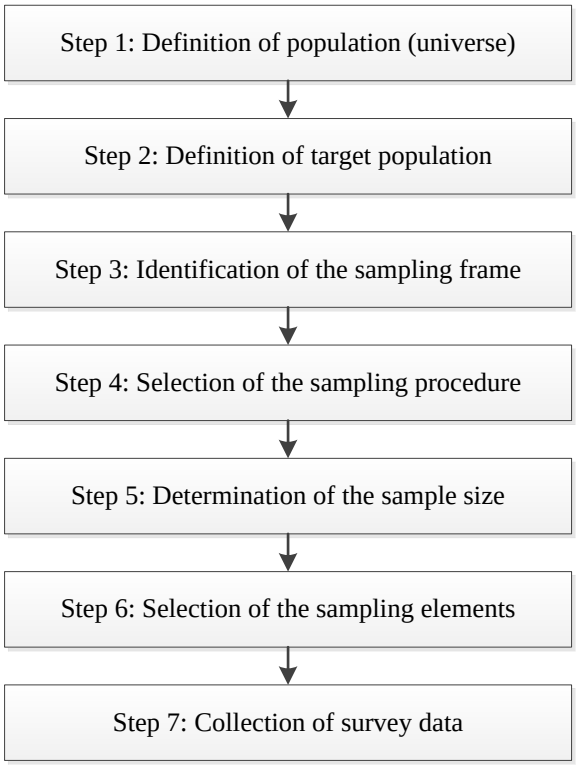


Figure 3.4: The procedure for drawing a sample (Churchill & Iacobucci 2002:449)

3.6.1 Population

A population is the sum of the elements or objects that have certain shared characteristics relevant to a particular marketing research issue (Malhotra 2010:371). It comprises a homogeneous group of individual units that are considered noteworthy for undertaking the

marketing research problem (Malhotra 2010:370). As such, the population for this study comprised South African retail consumers.

3.6.2 Target population

While a population comprises the aggregate of all the elements, a target population (also termed a research sample) is the element of the population considered for actual inclusion in a particular study (Churchill & Iacobucci 2002:450). In other words, target population refers to the entire group of people about whom the researcher needs to obtain information. Similarly, Zikmund *et al.* (2013:387) define a sample as a "subset, or some part of a larger population". According to Aaker *et al*. (2011:336), identifying a target population correctly is of great importance, since a vaguely defined target population is deemed to produce inaccurate results in a study. In this study, the target population specifically comprised consumers who are based in southern Gauteng. Both male and female users of m-payment services who are 18 years and older were included in the study. By implication, m-payment users conduct payment transactions using their mobile devices, while connected to a network.

Figure 3.5 shows the southern Gauteng region map and its surrounding areas.

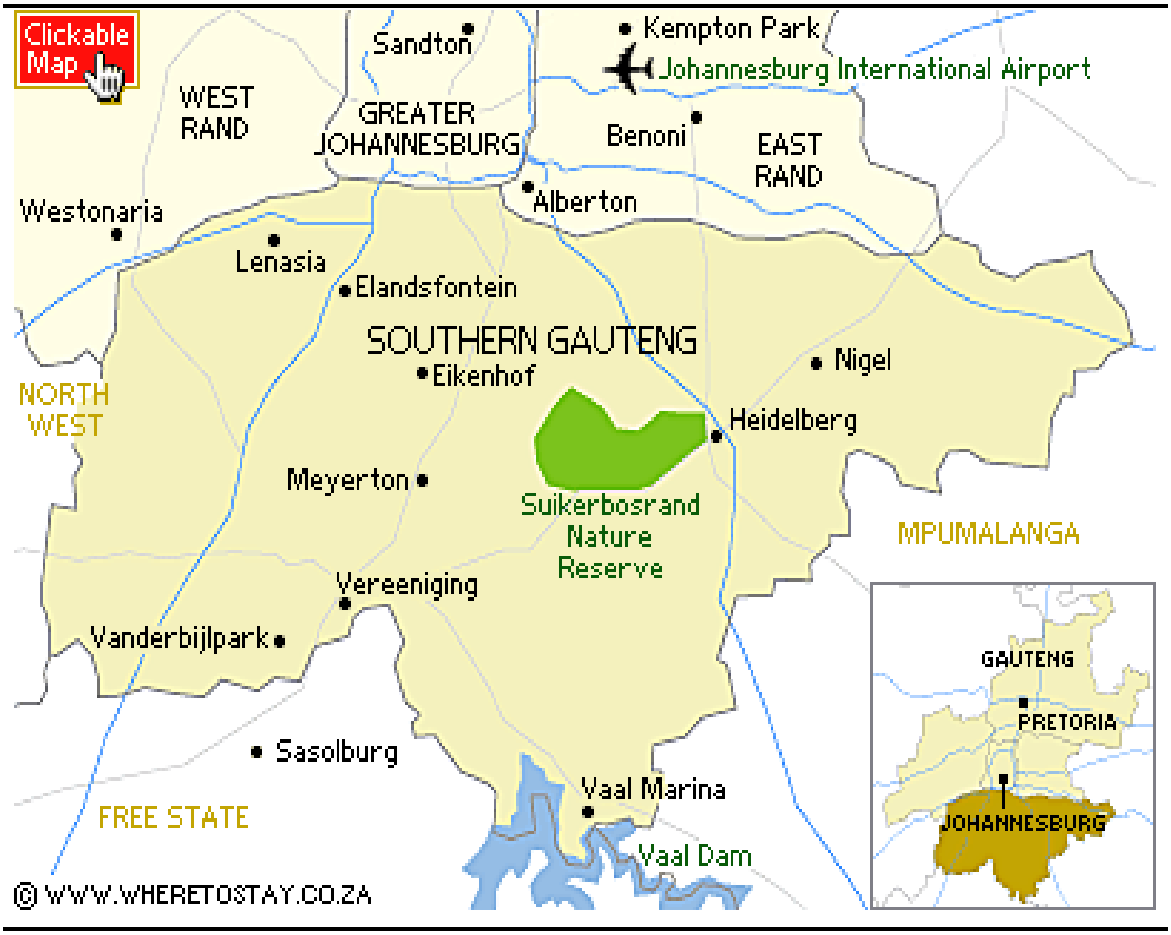


Figure 3.5: The southern Gauteng region map and its surrounding areas

The reason for using the southern Gauteng demarcation in this study is that it has five main town centres within proximity, namely Walkerville, Heidelberg, Meyerton, Vereeniging and Vanderbijlpark within the area. Collectively these towns are referred to as southern Gauteng region, mainly due to their geographic location within the Gauteng province. Other compelling reasons for the demarcation of this geographic area include time and cost involved, ease of access to respondents including greater speed of data collection and availability of population elements (Strydom 2005:194).

3.6.3 Sampling frame

A sampling frame is a list of the members or elements of the population from which units to be sampled are to be selected (McDaniel & Gates 2013:281). Malhotra (2010:373) defines a sampling frame as a record of all sample units available for selection at a given stage in the sampling process. However, sampling frames must be up to date, complete, affordable and easy to use in a sense that they can be manipulated and transferred into other

media (Bradley 2007:166). No sampling frame could be established for this study since there is no up to date, documented list of the entire populous of South African m-payment users. The implications, therefore, are that not all the population members have equal probability of being selected hence the study had to be restricted to other forms of sampling, which are non-probability based.

3.6.4 Sampling procedure

According to Zikmund *et al.* (2013:68), the sampling procedure is an indication of the method or approach used in selecting a sample. According to Burns and Bush (2014:242), probability sampling is a procedure where each element in the population has a known, equal chance of being selected as part of the sample. With probability sampling, statistical projections of the sample are generalised to represent the total population though there may be a calculation of sampling error (Malhotra 2010:377). This suggests that statistical inferences can be made from probability samples leading to the conventional 90 percent, 95 percent or 99 percent confidence levels (Tustin *et al.,* 2010:350). Methods used in probability sampling include but are not limited to, simple random sampling, systematic sampling, stratified sampling and cluster sampling.

In non-probability sampling, "the odds of selecting a particular individual are not known because the researcher does not know the population size or the numbers of the population" (Hair *et al.,* 2009:312). In this regard, it is not possible to make estimations of sampling error. Nevertheless, non-probability sampling relies on the judgment of the researcher and interviewing skills (McDaniel & Gates 2013:292). Relatedly, non-probability sampling presents an opportunity for the researcher to delve into their personal experiences with the subject matter, especially considering the evolutionary nature of the research process. Convenience sampling, judgement sampling, quota sampling and snowball sampling are some of the methods that are applicable under non-probability sampling.

A non-probability sampling procedure was utilised in this study. Specifically, the snowball sampling procedure was used as it has been cited as very useful where there is no suitable sampling frame (Churchill *et al.,* 2010:333). Initially, the researcher identified a random group of m-payment users. After being interviewed, these respondents were then asked to identify others who belong to the same target population of interest (Churchill *et al.,* 2010:333). Subsequent respondents were then selected based on referrals until the required

sample size was attained. While this initial process required a probability based approach (random sampling), the final sample was picked using non-probability methods.

The major objective for employing the snowball sampling procedure is that it enabled the researcher to estimate the characteristics that are rare, scattered and cannot be easily established from the population (Malhotra 2010:381). As such, snowball sampling was useful in that it substantially increased the likelihood of locating the desired characteristics of actual and potential future m-payment users. Moreover, snowball sampling was considered to be the most appropriate sampling procedure as it results in relatively low sampling variance and low cost.

3.6.5 Sample size

Malhotra (2010:371) defines sample size as the specific number of sample elements to be included in a study. The determination of the sample size is often a scientific judgment made by the researcher. In this study, three approaches were utilised upon deciding on the most appropriate sample size for this study.

First, the degree of accuracy and reliability that was required in the study was taken into consideration. Generally, larger sample sizes are good when predicting the reliability of a study, implying that they improve generalisability. In view of this, determination of the sample size was made consistent with Avikaran (1994:15) who suggested that empirical, consumer-based studies should utilise a sample size of between 200 and 500. Moreover, the choice of a large sample size was reinforced based on the variability expected in the data, thereby enhancing the overall reliability of data in this study.

Secondly, the selected sample size was deliberated to be appropriate considering the resources available to the researcher. Where larger sample sizes could have helped to improve the precision of the statistical estimates, the researcher was constrained in terms of time and financial resources. However, there is no point in carrying out a study that is too small, only to come up with results that are inconclusive. As such, another sample size consideration had to be made.

Thirdly, the historical evidence approach was considered, whereby previous similar studies were reviewed upon determining the appropriate sample size for this study (Zikmund *et al.*,

2013:69). Therefore, a comparative assessment of sample sizes used by previous researchers was made as shown on Table 3.1.

Table 3.1: Sample size determination based on the historical evidence approach

Author/s	Country	Scope of study	Sample size
Viehland and Leong (2010:39)	New Zealand	Consumer willingness to use and pay for mobile payment services	132
Revels *et al.* (2010:77)	Australia	Understanding consumer intention to use mobile services	151
Tang *et al.* (2014:42)	China	Effects of users' usefulness and efficiency towards continuance intention	318

Drawing from the aforementioned considerations, a final sample size of 500 m-payment users was utilised in this study.

3.6.6 Selection of sampling elements

The process of selecting sampling elements is often entwined in the development of a sampling plan (Malhotra 2010:372). This entails the execution of the entire sampling process by specifying how the sampling design decisions with respect to the target population, sampling frame, sampling technique and sample size were implemented. In other words, the objective of executing the sampling process is to achieve the maximum amount of information from the respondents while reducing the potential for errors. Table 3.2 summarises the sampling plan that was followed in this study.

Table 3.2: Sampling plan for the study

Stage	Sampling plan	Choice for the study
Stage 1 ***Defining the target population***	Precisely specified group of cases from which a researcher studies a sample and to which results are generalised using the following criteria: ***Content*****:** *Particular characteristics that bind the population together (population parameters)* ***Extent*****:** *Spatial or geographic dispersion of the population members* ***Time*****:** *Temporal period during which the sampling elements possess specific characteristics*	Have been associated with m-payment users 18 years and older Male and female consumers All race groups Southern Gauteng Have engaged in m-payment transactions within the past 12 months
Stage 2 ***Identifying a sampling frame***	A complete and accurate list of population elements by name and e-mail identification, from where to draw the sample	None

Stage 3 ***Determining the sampling size***	Specific number of elements in a sample	500
Stage 4 ***Choosing the sampling elements***	A single unit that is selected from a population because it possesses the information sought by the researcher. It refers to the basis of analysis or the primary level of investigation	Selection of southern Gauteng m-payment users using snowball sampling.

The methods of data collection that were utilised in this study are discussed in the next section.

3.7 DATA COLLECTION

Tustin *et al.* (2010:116) are of the view that in order to achieve quality from a research project, it is vital to choose the appropriate method for collecting data. In this study, data was collected in two phases, a secondary data collection phase and an empirical data collection phase.

3.7.1 Secondary data collection

Secondary data (also termed desk research) refers to information not gathered for the immediate study at hand but for some other purpose (Malhotra 2010:132; Zikmund *et al.*, 2013:159). No marketing research study should be undertaken without prior research from secondary sources. This is because secondary data is much more cost-effective to collect, when compared with primary data (Churchill *et al.,* 2010:136). In addition, secondary data can play a substantial role during the exploratory phase of a research when the task is to define the research problem and to generate hypotheses. As such, the assembly and analysis of secondary data invariably improves the researcher's understanding of the marketing problem as well as the various lines of inquiry that should be followed in m-payment research. The secondary data review process is described in Chapter 2 of this study, thereby serving to answer the theoretical objectives that were established at the beginning of the research.

3.7.2 Empirical data collection

Empirical data refers to information collected specifically for the research problem or opportunity at hand (Churchill *et al.*, 2010:136; Hair *et al.,* 2009:37). The survey method was deemed appropriate for collecting empirical data in this research. Malhotra (2010:211) defines a survey as "an interview with a large number of respondents using a pre-designed

questionnaire." Surveys are useful as they accommodate large sample sizes, at low cost and with great ease of administration (Burns & Bush 2014:172). A survey strategy enables the researcher to have more control over the research process. A survey is also ideal because it provides quick, inexpensive, efficient and accurate means of assessing information about a population (Hair *et al.,* 2013:115).

In this study, an interviewer-administered survey was administered grounded upon the situation and the volume of data required. Specifically, large volumes of data were required at the lowest possible levels of difficulty in administration. The use of a questionnaire as an instrument enabled the generation of essential information for improving response rates. Put simply, the social interaction between the interviewer and respondent in a face-to-face interview increased the likelihood that the respondent would answer all the items on the questionnaire, truthfully thereby increasing response rates (Malhotra 2010:222). The social interaction also gave the researcher a chance to justify the importance of the research.

The design of the survey instrument is discussed in the next section.

3.8 QUESTIONNAIRE DESIGN

Burns and Bush (2014:214) speak of a questionnaire as a "vehicle used to present the questions that the researcher desires respondents to answer". Similarly, Hair *et al.* (2013:188) pinpoint that a questionnaire is a document consisting of a set of questions and scales designed to gather primary data. This denotes that a questionnaire utilises a formal set of questions that are generated in accordance with the objectives of the study. The use of questionnaires as survey instruments serves to standardise the data collection process by ensuring that all the study participants are asked the same question in the same manner (Clow & James 2014:323). This allows for easier replication. As such, the questionnaire enabled the researcher to achieve the following functions in this study, as alluded to by Burns and Bush (2014:214):

- to translate the empirical research objectives into specific statements.
- to standardise questions and the response categories so that every participant responds to identical stimuli.
- to foster co-operation and keep participants motivated by its wording, flow and sequence.

- to provide a permanent documentation and record of the research.
- to speed up the process of data analysis.
- to generate follow-up validation of respondents' participation in the survey.

Malhotra (2010:335) states that the overall design of a questionnaire could influence a respondent's willingness to participate in a study. As such, the following sections elucidate on the aspects of the questionnaire structure, format, content, pilot testing and final administration.

3.8.1 Questionnaire structure

The statements within a questionnaire can either be unstructured (also termed open-ended), semi-structured or structured questions (also termed close-ended questions) (Tustin *et al.*, 2010:393; Hair et *al.*, 2013:190).

Unstructured questions are open-ended questions that the respondents answer in their own words. According to Burns and Bush (2010:300), unstructured questions require that the participants respond by writing a word, phrase or comment in the space provided. While operating as free response questions, unstructured questions are less prone to influences from response bias or interviewer bias (Malhotra 2010:343; Tustin *et al.*, 2010:392). This is because there is no pre-determined list of response options available to aid the respondents' answers (Hair *et al.*, 2009:406). If administered correctly, unstructured questions can provide the researcher with a rich array of information by tapping into attitudinal changes among the target market or providing new ways of looking at a situation that the researcher never considered (Clow & James 2014:327). However, unstructured questions are not always desirable since they require more cognitive effort and memory on the part of the respondents (Hair *et al.*, 2009:406).

Semi-structured questions are sets of pre-determined questions on an interview schedule that guide the interview. The advantage of using semi-structured questions is that they illuminate the participants' experience with the guide of the researcher (Tustin *et al.*, 2010:393). Semi-structured questions utilise both open-ended and close-ended questions simultaneously.

Structured questions are close-ended questions that require the respondents to choose a response from a pre-determined set of responses or scale points (Hair *et al.*, 2009:406). In this regard, the format of structured questions reduces the amount of thinking and effort required by respondents. According to Tustin *et al.* (2010:394), structured questions specify the set of response alternatives as well as the desired response format.

While the use of unstructured questions generally helps to gather varied data responses, their use would defeat the structured nature of this study, which leans along positivist principles. Moreover, semi-structured questions were considered undesirable for this study since they are subjective and value-free deficient. As a result, the questionnaire in this study comprised only structured questions. Structured questions permit a closed-ended response option since they specify a pre-determined set of response alternatives as well as the response format (Malhotra 2010:344). Generally, closed-ended questions are employed for person-administered questionnaires in order to enhance participants' cooperation (Bryman & Bell 2011:232).

3.8.2 Questionnaire format

The format of structured questions can either be dichotomous, multiple choice or scaled response options. Consistent with Malhotra (2010:344) as well as Hair *et al. (*2009:407), this study utilised dichotomous questions with only two possible response alternatives as well as multiple-choice questions with more than two possible response alternatives on the categorical data.

Multi-item scaled questions were used to measure perceptions, opinions and feelings of respondents on the non-categorical data. In particular, the study adopted a five-point Likert scale also referred to as a summated scale since it is considered flexible and easy for respondents to understand and complete (Churchill *et al.*, 2010:271). A Likert scale with fewer categories (disagree, neutral and agree) was considered inadequate for this research since it would not provide significant information for further analysis (Clow & James 2014:305). Relatedly, a scale with numerous categories would render the data analysis process, cumbersome. As a result, a five point Likert scale was considered accurate to capture the psychological constructs that included non-categorical variables of the questionnaire.

3.8.3 Questionnaire content

The concepts that are often used by researchers are rather diffuse, with no generally agreed measuring instrument. Therefore, when deciding on the development of a questionnaire, a researcher can choose one of three options. Either to formulate a completely new set of questionnaire scale items in the case of explorative studies, or to adopt an existing scale fully as it is, that is if one exists already. Alternatively, a researcher can nominate to adapt and modify variables that were used in previous studies. The process of scale adaptation was chosen for developing the questionnaire in this study since it saves time and further helps to make reliability comparisons with variables that have been used in previous empirical researches.

Table 3.3 summarises the questionnaire structure and format that was utilised in this study.

Table 3.3: Questionnaire structure and format

Section	Nature	Evaluation statements	Structure	Format
Section A	Question 1: Gender	A1	Closed ended	Dichotomous
	Question 2: Age	A2	Closed ended	Multiple choice
	Question 3: Ethnicity	A3	Closed ended	Multiple choice
	Question 4: Mother tongue	A4	Closed ended	Multiple choice
	Question 5: Marital status	A5	Closed ended	Multiple choice
	Question 6: Highest qualifications	A6	Closed ended	Multiple choice
	Question 7: Income	A7	Closed ended	Multiple choice

Table 3.3: Questionnaire structure and format (continued …)

Section	Nature	Evaluation statements	Structure	Format
	Question 8: Usage	A8	Closed ended	Dichotomous
	Question 9: Frequency of m-payment transactions	A9	Closed ended	Multiple choice
	Question 10: Average cost of single m-payment transaction	A10	Closed ended	Multiple choice
	Question 11: Type of m-payment service used	A11	Closed ended	Multiple choice
	Question 12: Preferred m-payment service	A12	Closed ended	Multiple choice
Section B	Consumers' perceptions of m-payment acceptance	B1-B14	Closed ended	5-point Likert-scale

Section C	Consumers' attitude towards m-payments	C1-C5	Closed ended	5-point Likert-scale
Section D	Consumers' future intention towards m-payments	D1-D7	Closed ended	5-point Likert scale

The questionnaire used for this study comprised four sections.

Section A includes information relating to the demographic characteristics of the respondents as well as m-payment usage. This section comprised questions pertaining to the respondents' gender (A1), age (A2), ethnicity (A3), mother tongue (A4), marital status (A5), highest level of qualification (A6), monthly income (A7), m-payment usage (A8), frequency of m-payment usage (A9), average cost of a single m-payment transaction (A10), type of m-payment service used (A11) as well as the preferred m-payment service (A12).

Sections B comprises questions relating to consumers' perceptions of m-payment acceptance. Five items measuring perceived usefulness (B1-B5) were adapted from Schierz *et al.* (2010:213) while five items relating to ease of use (B6-B10) were adapted from Liêbana-Cabanillas *et al.* (2014:238). Additionally, four items measuring perceived security (B11-B14) were included in this section, as operationalised from the study of Yousafzai *et al.* (2009:605). The respondents were asked to indicate their perceptions of m-payment services using a five point Likert scale where 1= strongly disagree, 2=disagree, 3=neither disagree nor agree, 4=agree and 5=strongly agree.

Section C comprises five questions relating to respondents' attitude towards m-payments (C1-C5), adapted from a scale that was used by Schierz *et al.* (2010:213). The respondents were asked to document their attitude towards m-payment services using a five point Likert scale where 1= strongly disagree, 2=disagree, 3=neither disagree nor agree, 4=agree and 5=strongly agree.

Section D comprises seven questions relating to consumers' future intention towards using m-payment services (D1-D7) adapted from Lin (2011:259). The respondents were asked to indicate their future intentions towards the utilisation of m-payment services using a five point Likert scale where 1= strongly disagree, 3=neither disagree nor agree and 5=strongly agree.

3.8.4 Pre-testing the questionnaire

A pre-test refers to the testing of a questionnaire on a small sample of respondents to identify and eliminate potential problems (Malhotra 2010:354). Pre-tests and pilot surveys are mandatory in research, regardless of the experience of a researcher. This is because they help to identify and correct deficiencies while ensuring that the questionnaire communicates the information correctly and clearly to the respondents. In this study, a pre-testing exercise comprising two academic professionals and two non-academic professionals was conducted. The members of the pre-test attested that they were experienced in conducting m-payments. These reviews culminated into a subsequent procedure of re-arranging the layout and sequencing of statements in the questionnaire. Specifically, negatively worded statements, double-barrelled statements and leading questions were avoided. As a final adjustment, consultations with a statistician as well as the research supervisor led to the development of the pilot questionnaire.

3.8.5 Pilot study

Pilot studies are surveys that utilise a limited number of respondents and often employing less rigorous sampling techniques than are employed in large quantitative studies (McDaniel & Gates 2013:37). According to Malhotra (2010:354), in order to identify and eliminate potential problems, a questionnaire should be tested on a small sample of respondents. The researcher made use of a pilot survey prior to the main survey to establish the internal consistency of the scale indicators.

A pilot study was conducted on a sample of 55 participants gleaned from the Vaal University of Technology aged 18 years and older who have engaged in m-payment transactions. However, it was necessary to identify a group of respondents that would bear the characteristics of the target population and yet not form part of the main survey. Therefore, international students (non-citizens) from the institution were included in the pilot study and were subsequently eliminated from the main survey. The pilot test results revealed that the respondents did not have trouble with understanding and answering the questionnaire. The reliability results of the pilot survey are included under Section 4.2 of this study.

3.8.6 Questionnaire administration

The researcher personally carried out the data collection task to avoid bias as well as any inherent costs associated with the training of fieldworkers regarding the subject knowledge, interviewing skills, interpersonal skills and research decorum. The data collection process took place between 1st May 2016 and 30thAugust 2016 with many unanticipated challenges that included time and costs of travelling to various locations within southern Gauteng. In addition, setting up survey interview appointments with some referrals proved cumbersome and unwieldy.

A cover letter enlisting the researcher's details, research title, research purpose as well as contact details of both the supervisor and the co-supervisor was presented. The interviewer-administered survey was in the form of a paper and pencil based study. It was indicated that participation was purely on a voluntary basis. Data were collected at different times and days of the week to ensure randomisation. The questionnaire took about 10-15 minutes to complete.

3.8.7 Ethical considerations

Scientific social research is a form of human conduct, which has to conform to accepted values and norms. The essential purpose of research ethics is to protect the welfare of research participants and extending into areas such as scientific misconduct and plagiarism. However, Blanche, Durrheim and Painter (2006:61) are of the view that ethics in research involve more than just a focus on the welfare of the participants. As such, the researcher was prompted to be cautious during project planning, designing, implementing and report writing. In particular, this study complied as follow with the aforementioned ethical standards of academic research:

3.8.7.1 Informed consent and voluntary participation

According to Malhotra (2010:200), ethical guidelines suggest that respondents should be informed and their consent obtained prior to commencing with a research. Participation in research should always be voluntary and none should be forced to participate. Tustin *et al.* (2010:48) indicated that, researchers must provide potential participants with clear, detailed and factual information regarding the study, its methods, its risks and benefits, along with assurances of the voluntary nature of participation.

3.8.7.2 No harm to participants

The principle of non-maleficence requires that social research should bring no harm to the people being studied (Hair *et al.,* 2009:20). In this vein, the respondents should be informed of the potential impact of the research, its purpose, the type of questions that could be asked as well as how the research results are to be used (Tustin *et al.,* 2010:46).

3.8.7.3 Anonymity and confidentiality

Anonymity assures that the respondents' names or any identifiable designation is not associated with them. According to Hair *et al.* (2009:428), a statement of confidentiality should assure the prospective respondents that their names and personal information gathered during the interviews would not be divulged to any third party.

In this study, survey participation was strictly confidential and participants' identity was protected since the respondents were identified by numbers only. Each respondent was informed about the legitimacy and purpose of the survey through the cover letter that was attached to the questionnaire (refer to Appendix A of this study).

3.8.8 Response rate

Malhotra (2010:225) defines response rate as a percentage of returned useable questionnaires of the total number of eligible respondents who were identified to partake in the survey. A total number of 500 questionnaires were distributed. However, owing to a variety of reasons, 26 of the questionnaires were returned with inconsistent responses that did not match the target population requirements, thereby rendering them unusable for further data analysis. Therefore, a total number of 474 usable questionnaires was received for analysis, representing a 94.8 percent response rate.

The next section alludes to the process of data preparation that was followed immediately prior to subjecting the data set to statistical analysis.

3.9 DATA PREPARATION

Data preparation refers to the process of checking whether the quality of the collected data is correct before converting it into an electronic format (Shiu *et al.,* 2009:494). The first

step after receiving the completed questionnaires was to conduct data editing, coding, cleaning and tabulation (Malhotra 2010:452).

3.9.1 Data editing

Editing is the review of the questionnaire with the objective of increasing accuracy and precision (Tustin *et al.*, 2010:452). It consists of screening the questionnaire to identify illegible, incomplete, inconsistent or ambiguous responses (Malhotra 2010:453). This process includes the identification of errors in order to make the required corrections.

3.9.2 Data coding

According to Iacobucci and Churchill (2010:351), coding is a procedure in which the researcher takes raw data and transforms it into symbols with the help of a statistical analysis program. Hair *et al.* (2009:461) further affirm that coding is the assignment of numerical values to each individual response for each question on the survey. In this study, data were coded onto Microsoft Excel™ in preparation for statistical analysis as presented in Section 4.3.1 of this study.

3.9.3 Data capturing

Zikmund *et al.* (2013:477) described data capturing or data entry as the process of transferring data from the research questionnaires to a computer. In this study, data capturing was performed using data-sort cases on SPSS (Version 23.0).

3.9.4 Data cleaning

Data cleaning involves consistency checks and treatment of missing responses (Malhotra 2010:461). There are several options available for handling missing responses, including substitution of a neutral value such as the mean, substitution of an imputed response, case-wise deletion and pair-wise deletion. After data collection, the inconsistencies and missing values observed on 26 questionnaires were greater than ten percent in each case, implying that imputation of responses was not possible. In addition, since it was no longer possible to return to the field, a decision was taken to completely discard the cases as their expulsion would not invariably have an effect on the eventual data analysis.

The next section examines the statistical analysis methods applied, which is useful for the presentation of the data collected from the survey.

3.10 STATISTICAL ANALYSIS

Statistical analyses are mathematical methods for systematically organising and analysing data once entered into the computer (Stangor 2007:326). Initially, data were analysed using the SPSS (Version 23.0). For the purpose of this study, descriptive and inferential statistics were applied in the order presented next.

3.10.1 Frequency distributions

Frequency distribution is a summary of how many times each possible response to each scale question was recorded by the total group of respondents (Zikmund *et al.*, 2013:413). The result is usually converted to a percentage or to histograms to determine if the distribution is even across categories or clustered around a certain category.

3.10.2 Tabulation

Once the data is coded, the next step is to tabulate the data. According to Iacobucci and Churchill (2010:32), tabulation is the process of arranging data in an orderly manner by counting the frequency of responses allocated to each of the questions. Shiu *et al*. (2009:509) state that tabulation can be done either through one-way tabulation or through cross-tabulation. One-way tabulation focuses on the categorisation of a single variable at a time, whereas cross-tabulation simultaneously compares two or more variables in one table.

3.10.3 Reliability assessment

Reliability is the assurance that the items posited to measure a construct are related sufficiently (Coldwell & Herbst 2004:17). According to Saunders *et al.* (2009:373), the reliability of a measurement scale depends on whether it provides consistent results over repeated measures. Malhotra (2010:319) adds that reliability is determined by assessing the correlation between scores obtained from different administrations of the scale, whereby a high correlation coefficient score suggests a more reliable scale. Generally, there are three types of reliability in research, namely test-retest, alternative forms and internal consistency reliability.

3.10.3.1 Test-retest reliability

Test-retest reliability of a scale is measured by administering the same scale or measures to the same participants at two different instances to test for stability of a scale (Zikmund *et al.,* 2013:306). Hair *et al*. (2009:352) states that there might be problems that can be associated with test-retest reliability. The scholars identify problems such as participants' unwillingness to partake in a second test as well as other environmental or personal factors that may result in a change in the second measurement, including changes in geographic location of the participants or they may become deceased and resultantly become unavailable for the re-test.

3.10.3.2 Alternative-forms reliability

The alternative or parallel forms measure of reliability assesses the degree to which alternative forms of the same measure produce similar results when administrated simultaneously without a time delay (Malhotra 2010:319). Equivalent form reliability is then determined by measuring the correlation of the scores on the two instruments. There are two problems with equivalent forms reliability. First, it is very difficult and perhaps impossible, to create two totally equivalent forms of a research instrument. Secondly, if equivalence can ever be achieved, it may not be worth the time, trouble or expense.

3.10.3.3 Internal-consistency reliability

Internal consistency reliability can be assessed using two different approaches, namely the split-half test and coefficient alpha (referred to as Cronbach's alpha technique). Split-half tests involve dividing items in the scale into two halves and correlating the scores against one another. High correlation between the halves indicates good internal consistency and low correlation indicate poor internal consistency (Hair *et al.,* 2009:353). Cronbach's alpha coefficient is computed by taking the average of all possible split-half measures that result from different ways of splitting the scale items. Upon determining the degree to which these individual items correlate collectively with the scale, the internal consistency or reliability of the scale can then be established (Zikmund *et al.,* 2013:306).

In this study, Cronbach's alpha test was utilised to assess the internal consistency of the scale. Generally, Cronbach alpha coefficient values range in value from zero, meaning no consistency, to one, meaning complete consistency. Zikmund *et al.* (2013:306) observed

that scale thresholds could reveal very high reliability ($0.80 \geq \alpha \leq 0.95$), good reliability ($0.70 \geq \alpha \leq 0.80$), fair reliability ($0.60 \geq \alpha \leq 0.70$) or poor reliability ($\alpha < 0.60$). Similarly, Malhotra (2010:319) suggests that alpha values of 0.70 or greater are generally acceptable measures of scale reliability.

3.10.4 Validity assessment

Research validity measures the extent to which, what is supposed to be measured is actually measured (Malhotra 2010:320). Zikmund *et al.* (2013:307) define the validity of a survey as "that quality of a questionnaire that ensures that what is measured reflects reality". This study tested for both content and construct validity since increased validity reproduces accurate results even if the measuring instrument is replicated.

3.10.4.1 Content validity

Content validity indicates the extent to which the scale items represent the entire universe of the task at hand (Zikmund *et al.*, 2013:307). Hair *et al.* (2009:337), state that content validity can also be referred to as face validity. Contrastingly, Babbie (2013:66) is of the opinion that content validity differs from face validity due to face validity being an evaluation of whether the measurement instrument looks like it measures what it is supposed to measure. This latter view guided this research. As such, to ascertain the content validity of the study, a pilot study was conducted while pre-testing served to evaluate face validity in this research.

3.10.4.2 Construct validity

Construct validity regulates whether a measured variable actually measures the conceptual variable that it is intended to measure (Hair *et al.*, 2009:283). Malhotra (2010:321) asserts that construct validity is needed for standardisation and it has to do with how well the construct covered by the instrument is measured by different groups of related items. Assessing construct validity involves considering convergent, discriminant and nomological validity of a measurement scale.

Convergent validity is the extent to which variables measuring the same theoretical dimension in a scale positively correlate with each other (Malhotra 2010:321). An initial assessment of the item-to-total correlation values was useful in determining the specific items that could potentially be a problematic compromise on convergent reliability of this

work. In this regard, Field (2009:678) advises on the deletion of any items with item to total correlations that fall below 0.30, when attempting to assemble a scale with internally consistent items. Only items with item to total correlation values above 0.30 were retained in this study (Refer to Section 4.5). Additionally, Clark and Watson (1995:316) suggest that an average inter-item correlation value of between 0.15 and 0.50 is indicative of convergent validity.

Discriminant validity refers to the extent to which variables measuring different theoretical dimensions in a scale do not correlate with each other (Zikmund *et al.*, 2013:308). In other words, the requirements for construct validity are that the variables that are measuring the same construct should be theoretically related with the other measures of the same construct (convergent), while they should remain highly uncorrelated with measures from which the construct is meant to differ (discriminant).

Hair *et al.* (2013:167) affirm that discriminate validity represents the uniqueness of a construct in a study. As such, low correlation coefficients between measurements, which are theoretically different from the construct under study signify discriminant validity. Field (2009:349) suggests that if the predictor variables correlate too highly as evidenced by a correlation coefficient value greater than 0.90, then there is no discriminant validity in a study. Relatedly, the rule of thumb by Costello and Osborne (2005:6) is to have correlation coefficients of less than 0.70 between the research constructs. Tolerable correlation coefficient values were observed on the inter-construct correlation matrix with a highest correlation coefficient (*r*) value of 0.689.

Nomological validity is "the extent to which the scale correlates in theoretically predicted ways with measures of different but related constructs" (Malhotra 2010:321). The Pearson product-moment correlation coefficients between each pair of constructs were calculated to assess nomological validity in this study.

3.10.5 Descriptive statistics

Descriptive statistics are used to summarise and describe the data obtained from a sample of respondents (Hair *et al.*, 2009:471). Malhotra (2010:486) opines that, descriptive statistics are associated with frequency distributions and are used to summarise the captured data. According to Burns and Bush (2010:461), in marketing research the numerical measurement mostly used to depict the frequencies are standard deviations, range, mode,

median and mean. In this study, descriptive the statistics utilised were measures of central tendency, measures of variability and measures of shape. These are examined next.

3.10.5.1 Measures of central tendency

Measures of central tendency refer to the sample statistics that are generated through analysing the collected data (Shiu *et al.*, 2009:406). The mean, median and mode are the measures of central tendency that are frequently used.

Mean is the arithmetic average score calculated by summing all variables in a data series and then dividing the total by the number of variables (Malhotra 2010:486). It is a common and widely employed measure of central tendency. Considering that a 5-point Likert scale was utilised in this study, mean values of 3.0 and above [(1+2+3+4+5) ÷ 5] were considered favourable.

The median of a sample is the middle value when the data are arranged in an ascending or descending sequence (Malhotra 2010:486). According to Hair *et al. (*2009:484) the median is normally useful as a measure of central tendency for ordinal data and for data that is skewed to either right or left.

Burns and Bush (2014:319) referred to the mode as a descriptive analysis measure, defined as that value in a string of numbers that occurs most often. The mode is the value that represents the highest peak of the distribution (Hair *et al.*, 2009:484). Section 4.3 of this study reports on the model values obtained in this research.

Malhotra (2010:487) defines the range as the difference between the largest and the smallest values of the distribution. With regard to the non-categorical variables in this study, the minimum value is 1 whereas the maximum value is 5.

3.10.5.2 Measures of variability

According to Malhotra (2010:487), measures of variability are "statistical ratios" which describe the "variability of the observations". Put simply, the measures of variability refer to the level of dispersion or scatter of observations in a data set as calculated on ratio or interval data. In this study, standard deviation values were observed under this category of measures.

Churchill *et al.* (2010:430) refers to the standard deviation as the square root of the calculated variance on a variable. The sample standard deviation (close to ±1.0) provides a convenient measure of the variation in responses for continuous measures.

Variance is the average squared deviation about the mean of a distribution of values (Shiu *et al.*, 2009:533). Sample variance is used as a description of the variation amounts in the measurement of a particular sample. The concept is usually referred to as sample variance that is the mean of squared differences (Tustin *et al.*, 2010:550).

3.10.5.3 Measures of shape

Measure of shape consists of the assessment of skewness and kurtosis. These measures are useful for understanding the characteristics of data distribution (Malhotra 2010:488).

According to Tustin *et al.* (2010:553), skewness provides an indication of the symmetry of a data distribution. For a symmetric distribution the values on either sides of the centre of distribution are the same, suggesting that the mean, mode and median are equal.

Kurtosis provides information indicating how the distribution is peaked. The kurtosis for a normal distribution is equal to zero (Tustin *et al.*, 2010:554). When the scores obtained is not zero, the data could be either positive or negatively skewed. When the kurtosis is positive then the distribution is more peaked than the normal distribution, whereas a negative kurtosis has a flatter peak than a normal distribution (Saunders *et al.*, 2009:436).

3.10.6 Correlation analysis

Correlation analysis measures the strength of the linear relationships between two continuous variables (Churchill *et al.*, 2010:467). For statistical measurement, there are various correlational research techniques available. However, according to Malhotra (2010:562), the Pearson's product-moment correlation (*r*) method is the most commonly used statistical method for measuring the relationship between two variables (independent *X* and dependent *Y*). A coefficient of -1.00 indicates a perfect negative relationship, whereas a coefficient of +1.00 indicates a perfect positive relationship (Saunders *et al.*, 2009:459). The rule of thumb suggested by Cohen (1988:79) is that coefficient values ranging between ±0.50 to ±1.00 denote strong relationships, values between ±0.30 and ±0.49 denote moderate relationships, values between ±0.10 to ±0.29 denote weak relationships while values between 0 and ±0.09 denote very weak to no relationship between variables.

In this study, the correlation analysis was used to establish if there is a significant relationship between usefulness, ease of use and security with user attitude and future intentions towards m-payment services. The results are presented in Section 4.7 of this study.

3.10.7 Multicollinearity assessment

Multicollinearity refers to situations where measured variables are too highly related. This problem is a concern especially in structured equation modelling (SEM) because researchers use related measures as indicators of a construct and sometimes measures are too highly related for certain statistical operations to function properly. As a preliminary procedure, the correlation matrix was examined for the existence of multicollinearity. Field (2009:349) suggests that if the predictor variables correlate too highly (r>0.9) among themselves, then collinearity is a cause for concern. No multicollinearity problems were observed in this study as the maximum reported correlation coefficient was reported at 0.689 as shown on Table 4.6 of this study.

3.11 STRUCTURAL EQUATION MODELLING (SEM)

According to Schumacker and Lomax (2004:3), the goal of SEM is to determine the extent to which a theoretical model is supported by sample data. If the sample data support the theoretical model, more complex theoretical models can be hypothesised. However, if the sample data do not support the theoretical model then the original model needs to be modified and re-tested, or other theoretical models need to be developed and tested.

SEM in this study relates to two types of models. The first, a measurement model of confirmatory factor analysis (CFA), is an analytic procedure that measures links between observed and latent variables that are unknown or uncertain. The measurement model estimation was completed using AMOS Version 23.0. Typically, the researcher sought to identify the minimal number of factors that underlie co-variation among the observed variables. The second model is the path model, which involves the estimation of presumed causal relations among observed variables. According to Kline (2013:75), in path analysis the researcher specifies a model that attempts to explain why X and Y are correlated. Part of this explanation may include presumed causal effects (e.g. X causes Y), or presumed non-causal relations, such as a spurious association between X and Y. The overall goal of

the path analysis is to assess how well the model accounts for the data that is the observed correlations or co-variances. These two models are explained in detail in the next sections.

3.11.1 The measurement model

The measurement model refers to the relationship between latent variables and manifest variables within a given study (Anderson & Gerbing 1988:414; Kline 2013:6). This study utilised the Maximum Likelihood Estimation (MLE) technique consistent with Shiu *et al.* (2009:626) who recommends the use of the iterative MLE technique as it possesses desirable asymptotic properties such as absence of bias and minimum variance (Blunch 2008:81). The consistency of a measurement model is evaluated through model-data fit, CFA as well as statistical measures of model accuracy (Schumacker & Lomax 2004:6). These three procedures are outlined next.

3.11.1.1 Fit criteria for the measurement model

Determining the extent to which the model best represents the research data depends on several model fit criteria called fit indices. Initially, the measurement model was subjected to a model fit assessment. The main goal of model fitting is to determine how well the sample data fits the measurement model (Kline 2013:14). It is recommended that various model fit criteria be used in combination to assess model fit as global fit measures (Kline 2013:133). The model fit criteria indices used in this study as well as their recommended acceptable fit level are shown in Table 3.4. The results of these model fit criteria are found under Section 4.8.1 of this study.

Table 3.4: Criteria for assessing model fit

Indices	Model Fit Index	Interpretation	Acceptable Level	Source
Fit indices based on the non-central chi square distribution (test a null hypothesis that is known to be false, hence implying that the actual model is correct)	CMIN/DF	Generally, global chi square should not be significant but because the chi-square test is sensitive to sample size and is only meaningful if the degrees of freedom are taken into account, its value is divided by the number of degrees of freedom as an attempt to adjust for sample size.	$2.0 \leq \chi 2/df \leq 5.0$	• Wheaton *et al.* (1977:98)
	Root mean square error of approximation (RMSEA)	RMSEA shows how well the model fits the population covariance matrix after taking the number of degrees of freedom into consideration favours parsimony, therefore values less than 0.05 are considered to demonstrate excellent fit.	RMSEA $\leq$ 0.05	• Malhotra (2010:731)
	Standardised Root Mean Residual (SRMR)	SRMR is the standardised value of RMSEA, which helps in comparing the fit across models.	SRMR $\leq$ 0.05	• Malhotra (2010:731)
	Goodness-of-fit (GFI)	Goodness of fit index is a comparison of the squared residuals from prediction with the actual data, not adjusted for the degrees of freedom **0 (no fit) to 1 (perfect fit)**	GFI $\geq$ 0.90	• Malhotra (2010:731) • Blunch (2008:114)
	AGFI	Shows a Goodness of Fit Index that is adjusted for the degrees of freedom **0 (no fit) to 1 (perfect fit)**	AGFI $\geq$ 0.90	• Malhotra (2010:731) • Blunch (2008:114)

Table 3.4: Criteria for assessing model fit (continued …)

Indices	Model Fit Index	Interpretation	Acceptable Level	Source
Incremental fit indices (Also termed the relative fit indices, these tests respond to how well the proposed model is performing when assessed against baseline or null models)	NFI	Normed fit index shows how much better the model fits, compared to a baseline model, normally the null model, adjusted for the degrees of freedom (can take values greater than one) **0 (no fit) to 1 (perfect fit)**	NFI ≥ 0.90	• Malhotra (2010:731) • Blunch (2008:114)
	Comparative fit index (CFI)	Comparative fit index (CFI)shows how much better the model fits, compared to a baseline model by assuming zero population covariances (no covariances) among the observed variables and ranges	CFI ≥ 0.90	• Malhotra (2010:731) • Blunch (2008:114)
	Incremental fit index (IFI)	Incremental fit index shows how much better the model fits, compared to a baseline model, normally the null model, adjusted for the degrees of freedom (can take values greater than one)	IFI ≥ 0.90	• Malhotra (2010:731) • Blunch (2008:114)
	Tucker-Lewis Index (TLI)	Tucker-Lewis index is a modified version of the NFI **0 (no fit) to 1 (perfect fit)**	TLI ≥ 0.90	• Malhotra (2010:731) • Blunch (2008:114)

3.11.1.2 Confirmatory Factor Analysis (CFA)

In general, factor analysis is a statistical technique used to reduce large numbers of data or variables into a manageable number by using a smaller set of factors or components and detection of underlying dimensions the research variables (Malhotra 2010:726). Factor analysis also identifies components that explain the patterns of correlations among variables (Pallant 2011:181). In SEM, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) are the two main approaches to factor analysis. However, EFA is not considered a member of the SEM family since it does not require *a priori* hypotheses of the measuring variables (Kline 2013:71). Nonetheless, EFA is used to gather or explore information about the interrelationships among a set of variables using key procedures such as principal components, centroid and principle axis analysis among others. On the other hand, CFA is a rather complex technique used to test hypotheses since it requires a *priori* measurement model in which the numbers of the measuring variables are already specified (Byrne 2010:76). The CFA procedure was applied in this study and the results are presented in section 4.8.2 of this study.

CFA is used appropriately when the researcher has some knowledge of some underlying latent variable structure. Based on knowledge of theory and empirical research, the researcher proposes relationships (termed research hypotheses) between the observed measures and underlying factors. The hypothesised relationship between two measures is tested statistically (Byrne 2010:73).

The measurement model (Refer to Figure 4.12 of this study) comprised all latent and manifest variables that is usefulness (three items), ease of use (four items), security (two items), attitude towards m-payment (five items) and future intentions (seven items). Based on CFA, the quality of the measurement model was assessed by checking the following reported statistics, consistent with Hair *et al.* (2010:706):

- Items reporting standardised factor loadings below the minimum acceptable threshold of 0.50 were deleted.
- Items reporting standardised factor loadings above 1.0 or below -1.0 were eliminated.
- Observations of negative error variances (known as Heywood cases) were deemed undesirable and thereby deleted since they suggest that there could be one dominant observed variable on a latent variable.

After the CFA, it is imperative to conduct stringent statistical tests to ascertain the absence of any underlying problems within the model. In this regard, the next section reports on the accuracy of statistics that were conducted to verify the reliability and validity of the measurement model.

3.11.1.3 Measures of statistical accuracy of the measurement model

This section discusses the reliability and validity of the measuring scales assessed to validate data analyses. This is particularly important for this study since the scales have been modified to adapt to the particular m-payment services context.

- **Reliability of the measurement model**

Composite reliability (CR) is one test used to check the internal consistency of a measurement model. According to Malhotra (2010:734), "composite reliability represents the shared variance among a set of observed variables that measures an underlying construct". The result of composite reliability is similar to that of Cronbach's alpha. The formula for CR is as follows:

$$CR = \frac{(\sum_{i=1}^{n} \lambda_i)^2}{(\sum_{i=1}^{n} \lambda_i)^2 + (\sum_{i=1}^{n} \delta_i)}$$

Where CRη = Composite reliability, $(\Sigma\lambda yi)^2$ = Square the sum of the factor loadings; $(\Sigma\varepsilon i)$ = Sum of error variances.

A CR value of 0.70 and above is indicative of a good reliability and suggests that the variable scales are consistently measuring the measurement model (Malhotra 2010:734). For this study, the composite reliability for all the constructs in the measurement model ranged between 0.905 and 0.957, which is higher than the 0.7 threshold, which, therefore, suggests that the model has excellent reliability. Section 4.8.3 and Table 4.9 of this study report on the respective CR values for each measurement items on their respective construct.

- **Validity of the measurement model**

First, the variance extracted estimate (AVE) was calculated as a measure of the overall amount of variance in the indicators accounted for by the latent construct in relation to the variance due to random measurement error (Malhotra 2010:734). Relatedly, Chen (2009:314) defined the AVE as a measure of the amount of variance captured by the construct and its items relative to the amount of variance that result from measurement error.

AVE is more conservative than Cronbach's alpha and composite reliability and can thus be used to evaluate convergent validity. An AVE score of 0.50 and above is treated as an indication of convergent validity in the measurement model. The formula below was used to calculate average variance extracted (AVE) values in this study:

$V\eta = \Sigma\lambda yi2/ (\Sigma\lambda yi2+\Sigma\varepsilon i)$

AVE = (summation of the squared of factor loadings)/ (summation of the squared of factor loadings) + (summation of error variances)

For this study, the AVE estimates ranged between 0.631 and 0.815, implying that the measurement model has adequate convergent validity as shown in section 4.8.3 of this study. Additionally, the CFA factor loadings or standardised regression weights above 0.50 (Refer to Section 4.8.2) were accepted as evidence of convergence of the scale indicators along their respective constructs, consistent with Hair *et al. (*2013:167).

The square roots of average variance extracted (AVE) values was used to determine discriminant validity of the research constructs. According to Fornell and Larcker (1981:46), discriminant validity is evidenced when the square roots of all AVE values is greater than the correlation coefficient values between the constructs in the model (Malhotra 2010:734). The square root values of the AVE estimates for each construct ranged between 0.794 and 0.903, which was greater than the correlation coefficient values across all pairs of corresponding constructs shown on Table 4.9 of this study.

Secondly, the square roots of all AVE values should be larger than the computed shared variance (SV) values, to confer discriminant validity. Shared variance is the amount of variances that a variable is able to explain in another variable (Farrell 2010:325). Table 4.9 indicates that all AVE value estimations in this study were larger than the highest computed SV value of 0.477, thereby demonstrating discriminant validity of the measurement model.

To complement the SEM procedure, an evaluation of the correlation matrix was considered useful in evaluating the nomological validity of the proposed measurement model (Hair *et al.*, 2010:710). Therefore, the moderate Pearson correlation coefficients between each pair of constructs that were computed in Table 4.9 confirmed the uniqueness of each construct applied in this study.

3.11.2 The structural model

After assessing the quality of the measurement model, the structural model is computed by means of AMOS (Version 23.0) employing the MLE technique. The structural model captures the relationships amongst the latent variables (Kline 2013:7). Structural models provide estimates of correlations among latent variables. Structural models differ from measurement models in that the emphasis moves from the relationship between latent and their measured variables to the nature and magnitude of the relationship between constructs (Kline 2013:7). In structural model analysis, relationships between variables are referred to as path coefficients (also termed standardised path regression coefficients) and are depicted by single headed arrows. The higher the path regression coefficient value, the greater the effect the independent variables have on dependent variables.

Path modelling was conducted using structural equation modelling to predict the nature and directions of relationships of the antecedents of m-payment acceptance among South African consumers. In this study the path model helped the researcher to be more precise in the operationalization of constructs. It guided confirmatory research in a manner combining self-insight and modelling skills (Bagozzi & Yi 2012:12). The path model included all latent variables, that is, usefulness, ease of use, security, attitude and future intentions towards m-payment services.

3.11.2.1 Fit indices for the structural model

The fit of the structural model was assessed using the indices that were described on Table 3.4. In this study the sample data did not support the original structural model adequately, since four of the model fit indices (NFI=0.894, CFI=0.899, RMSEA=0.051, SRMR=0.059) did not meet the recommended thresholds, thereby suggesting the need for modification and re-testing of a competing structural model (Malhotra 2010:749).

3.11.2.2 Testing a competing structural model

Introducing competing models as alternatives is encouraged in research, even if the original SEM model demonstrates acceptable fit. The reason for this is that comparing competing models helps in the acceptance of the best probable fit based on a superior model and interpreting the results accordingly (Hair *et al.,* 2010:675). Path model adjustments were made through specification searches that were based on literature. In this work, modification indices suggested adding additional paths in the existing model until a final model showed only acceptable fit statistics and significant path coefficients greater than ±0.20. Therefore, in view of finding the right balance between models' fit and parsimony, over and above the fit indices presented in Table 3.4, Akaike's Information Criterion (AIC) and Bozdogan's consistent version of the AIC, termed CAIC, were

also considered. Byrne (2010:82) suggests that when comparing competing models the lower the AIC and CAIC values, the better the fit. Table 4.11 in this study presents the model fit indices of the original structural model as well as the subsequent, competing model of which the latter is accepted for this research.

3.12 SYNOPSIS

This chapter followed the metaphor of the research onion to deduce the research methodology employed in this study. In particular a positivist research paradigm was favoured, leading to deductive reasoning as well as selection of a quantitative research approach. In addition, a single-cross sectional research design was nominated as the blue print to be followed in this research. The sampling strategy used in the study was described, including the target population, sampling frame, sampling procedure and sample size. The design and preparation of a 5-point Likert scale questionnaire comprising only structured questions was discussed. The chapter concluded with a brief description of the statistical techniques utilised to analyse the collected data. Additionally, pilot testing was undertaken to ensure reliability and validity of the questionnaire. The SEM procedure, encapsulating the measurement model as well as the structural (path) model, was explained in detail. In the following chapter, the data obtained during the research were analysed and interpreted.

CHAPTER 4
DATA ANALYSIS AND INTERPRETATION OF EMPIRICAL FINDINGS

4.1 INTRODUCTION

This chapter reports on the main survey findings and interpretation of the study results. The data for this study were analysed using SPSS (Version 23.0) as well as AMOS (Version 23.0) for the modelling procedure. Data analysis for this study was undertaken in two phases. First, the questionnaire was pilot tested on a conveniently selected sample of respondents. Secondly, a consolidation of the main survey findings was done through a more comprehensive statistical analysis of the empirical results. The data was analysed with a view to addressing the objectives of the study. In ensuring that high quality analysis is obtained, all evidence and interpretations were considered. Moreover, an analysis, interpretation and the discussion of empirical findings is presented. The sequence that is followed in presenting the results of this chapter is consistent with the methodological and statistical outline presented in Chapter 3 of this study:

- Pilot test results
- Preliminary data analysis at the main survey (coding, cleaning and tabulation)
- Frequency distribution tables and charts
- Reliability assessment
- Descriptive statistical analysis
- Correlation analysis and multicollinearity testing
- Measurement model assessment
- Structural model assessment

The next sections illustrate the data analysis procedure at the pilot phase of the study, followed by a descriptive illustration of the main survey findings.

4.2 PILOT TEST RESULTS

Table 4.1 presents a summary of the pilot test results in terms of the scale reliability and average inter-item correlation values as well as descriptive statistical results.

Table 4.1: Summary of the pilot test results

Items	N	Cronbach alpha	Average inter item correlation	Mean	Standard deviation
B1-B5	55	0. 783	0.437	4.331	0.502
B6-B10	55	0.827	0.518	3.978	0.530
B11-B14	55	0.854	0.542	3.736	0.5867
C1-C5	55	0.934	0.423	4.421	0.578
D1-D7	55	0.941	0.522	4.366	0.619
Overall Cronbach's alpha coefficient = 0.896					

A pilot test was carried out before administering the main survey questionnaire to the target population thus eliminating ambiguity and ensuring consistency and reliability of the scale variable. As indicated in Table 4.1, the overall Cronbach's alpha coefficient value for the entire scale was reported at 0.896. In addition, Cronbach's alpha coefficient values of 0.783, 0.827 and 0.854 were reported along the perceived usefulness (B1-B5), perceived ease of use (B6-B10) and perceived security (B11-B14) variables, respectively. In addition, attitude towards m-payment services and future intentions towards m-payment services reported Cronbach's alpha coefficient values of 0.934 and 0.941. By implication, the Cronbach's alpha coefficient values for all five constructs are within the recommended range of 0.70 to 1.0, thereby indicating that the scale is reliable (Pallant 2010:97).

Perceived usefulness (0.437) and attitude towards m-payment services (0.423) are the two constructs that were within the recommended threshold of 0.15 to 0.50 for inter-item correlation values, as recommended by Clark and Watson (1995:316). However, the inter-item correlation values for perceived ease of use (0.518), perceived security (0.542) and future intentions towards m-payment services (0.522) were slightly above the recommended threshold. While this is so, the reported results for these three variables only shows the level to which the items on those constructs are closely related. Therefore, these constructs were retained within the study based on acceptable Cronbach's alpha coefficient values. These results point to a strong relationship between the items on each construct, which is indicative of convergent validity (Pallant 2010:100).

During the analysis of the pilot test results, it was considered important to supplement the reliability results with descriptive statistics to summarise the pilot data set. All the constructs in the pilot study retained mean values above 3.0 thereby suggesting the level with which the respondents' were agreeable towards the statements that were included on the questionnaire. In particular, attitude towards m-payments services reported the highest mean score value (mean

=4.421; SD=0.578). This was closely followed by future intentions towards m-payments services (mean=4.366; SD=0.619) and perceived usefulness (mean=4.331; SD=0.502). While this is so, both perceived ease of use (mean =3.978; SD=0.530) and perceived security (mean =3.736; SD=0.5867) reported the lowest mean values on the pilot results.

4.3 PRELIMINARY DATA ANALYSIS FOR THE MAIN SURVEY

This section discusses elements relating to the preliminary data analysis that was conducted immediately after the fieldwork exercise, namely data coding, cleaning and tabulation at the main survey stage.

4.3.1 Data coding at the main survey

The process of coding entails converting respondents' responses into numbers or codes that represent the answer they choose. In this study, the questionnaire was categorised into four sections, namely:

- Section A: Demographic and m-payment usage information
- Section B: Consumers' perceptions of m-payment acceptance
- Section C: Consumers' attitude towards m-payment services
- Section D Consumers' future intentions towards m-payment services

First, all the variable were assigned numerical codes to facilitate computer data input. Secondly, data files were carefully screened in order to minimise possible omission or data entry errors. In this regards, frequencies for each variable were checked in order to detect any out of range values. However, there was no need for re-coding or assigning of new values in this study since there were no negative worded scale items. Table 4.2 shows the coding process that was conducted during the main survey phase.

Table 4.2: Coding of the questionnaire

Item	Code	Construct measured	Value assigned to response
Question 1	A1	Gender	Male (1), Female(2)
Question 2	A2	Age	18-20 years (1), 21-30 years (2), 31-40 years (3), 41-50 years (4), over 50 years (5)
Question 3	A3	Ethnicity	Black African (1), Coloured (2), Indian/Asian (3), White (4), Other (5)

Table 4.2: Coding of the questionnaire (continued…)

Item	Code	Construct measured	Value assigned to response
Question 4	A4	Mother tongue	Afrikaans (1), English (2), IsiNdebele (3), IsiXhosa (4), IsiZulu (5), SePedi (6), SeSotho (7) SeTswana (8), SiSwati (9), Tshivenda (10), Xitsonga (11), Other (12)
Question 5	A5	Marital status	Single/never been married (1), Married (2), Separated (3), Divorced (4), Widowed (5), Other (6)
Question 6	A6	Highest qualification	Grade 12/Matric (1), Diploma (2), Degree (3), Masters/PhD (4), Other (5)
Question 7	A7	Monthly income	Less than R5 000 (1), R5 000-R10 000 (2), R10 001-R20 000 (3), R20 001-R30 000 (4), Above R30 000
Question 8	A8	Completed m-payment transaction	Yes (1), No (2)
Question 9	A9	Frequency of m-payment transactions	Annually (1), Bi-annually (2), Quarterly (3), Monthly (4), Weekly (5)
Question 10	A10	Average cost of single m-payment transaction	Less than R300 (1), R301-R600 (2), R601-R1 000 (3), More than R1 000 (4)
Question 11	A11	m-payment service used	Money transfers (1), Pre-paid purchases (2), Mobile application payments (3), Bank deposits and payments (4), Other (5)
Section B: Consumers' perceptions of m-payment acceptance			
Item 1	B1	Perceived usefulness	Strongly disagree (1), Disagree (2), Neutral (3), Agree (4), Strongly agree (5)
Item 2	B2		
Item 3	B3		
Item 4	B4		
Item 5	B5		
Item 6	B6	Perceived ease of use	Strongly disagree (1), Disagree (2), Neutral (3), Agree (4), Strongly agree (5)
Item 7	B7		
Item 8	B8		
Item 9	B9		
Item 10	B10		
Item 11	B11	Perceived security	Strongly disagree (1), Disagree (2), Neutral (3), Agree (4), Strongly agree (5)
Item 12	B12		
Item 13	B13		
Item 14	B14		
Section C: Consumers' attitude towards m-payment services			
Item 15	C1	Attitude towards m-payment services	Strongly disagree (1), Disagree (2), Neutral (3), Agree (4), Strongly agree (5)
Item 16	C2		
Item 17	C3		
Item 18	C4		
Item 19	C5		
Section D: Consumers' future intentions towards using m-payment services			
Item 20	D1	Future intentions towards m-payment services	Strongly disagree (1), Disagree (2), Neutral (3), Agree (4), Strongly agree (5)
Item 21	D2		
Item 22	D3		
Item 23	D4		
Item 24	D5		
Item 25	D6		
Item 26	D7		

The next section explains how the completed questionnaires were edited and cleaned for errors prior to statistical analysis.

4.3.2 Data cleaning at the main survey

In order to ensure consistency of treatment, the cleaning and editing of completed questionnaires was conducted after the fieldwork. In line with the specified sample size, 500 questionnaires were returned. The 500 returned questionnaires were then coded data on a Microsoft Excel™ spread sheet and further checked before the actual statistical analysis began. According to Pallant (2010:53), it is very important to check the data file for errors and mistakes in order to rectify any missing values and data that are not within the minimum and maximum range of the coded data. In other words, values that are far below or far above the data scores need to be corrected. For example, the researcher might enter 55, instead of actually capturing a 5. These mistakes can negatively interfere with the result of the statistical analysis. The screening and cleaning process of the raw data for this study involved two stages.

First, the data were checked for errors and out of range values through the SPSS (Version 23.0) by way of identifying both the valid and missing cases. Secondly, the researcher attempted to find and correct possible errors in the data file. Finding the actual mistake was achieved through SPSS data sort cases to rectify or delete the mistaken values. Errors of inconsistency and missing values were identified on 26 responses. The researcher then checked the record of the physical questionnaire to find out what the missing value should be so that it could be imputed and this was not possible, leading to the decision to delete all 26 cases and remain with only 474 usable questionnaires for statistical analysis. Moreover, frequencies were repeated to double-check that there were no missing values in the data set.

4.3.3 Tabulation

According to Zikmund (2013:488), tabulation refers to the orderly arrangement of data in a table or other summary format. Table 4.3 presents the frequencies of the scaled responses.

Table 4.3: Frequency table for the scaled responses

Scale item	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
	(1)	(2)	(3)	(4)	(5)
B1	8	11	12	250	193
B2	1	9	25	305	134
B3	0	1	33	188	152

Table 4.3: Frequency table for the scaled responses (continued …)

Scale item	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
	(1)	(2)	(3)	(4)	(5)
B4	0	10	26	271	167
B5	0	2	31	261	180
B6	1	13	8	282	170
B7	5	3	32	298	136
B8	11	19	80	242	122
B9	5	1	19	312	137
B10	5	6	17	309	137
B11	8	20	93	184	169
B12	7	21	87	217	142
B13	1	16	68	272	116
B14	1	21	32	294	126
C1	1	0	10	174	289
C2	0	1	31	197	245
C3	1	0	13	215	245
C4	1	0	16	216	241
C5	1	0	16	180	277
D1	2	0	10	196	266
D2	2	0	20	186	266
D3	0	3	19	151	301
D4	3	0	19	164	288
D5	0	2	31	167	274
D6	0	9	19	163	283
D7	0	1	12	157	304

The next section presents the demographic profile of the respondents' as well as their m-payment usage information.

4.4 DEMOGRAPHIC PROFILE AND M-PAYMENT USAGE INFORMATION

This section provides a detailed description of the study sample and other general m-payment information such as average monthly income spent as well as frequency of m-payment service usage.

4.4.1 Sample characteristics

The demographic profile of the study respondents is reported in this section. A description of the characteristics of the 474 sample participants who were included in this study is provided. The

sample comprised only users residing within the Southern Gauteng region, comprising the towns of Walkerville, Heidelberg, Meyerton, Vereeniging and Vanderbijlpark. As such, the frequencies and percentages reported in this section pertain to categorical data, only as stipulated under section A and section B of the questionnaire. In other words, a description of the samples' demographic characteristics is made against the gender, age, ethnicity, mother tongue, marital status, highest qualification and monthly income. Note that the reported percentages in this section have been rounded off to one decimal place for easier interpretation.

4.4.1.1 Gender

Figure 4.1 presents the demographic information of the respondents' gender (A1).

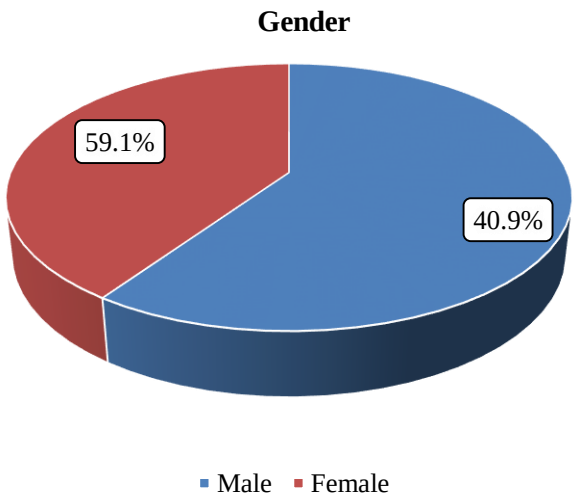


Figure 4.1: The respondents' gender

Of the 474 respondents that were included in the survey, the majority were male (n=280; 59.1%) while the female (n=194; 40.9%) respondents represented the minority cohort in this study. These results indicate that male consumers who participated in this survey are more likely to partake in m-payment transactions when compared to their female counter parts in southern Gauteng.

4.4.1.2 Age

Figure 4.2 reports on the age of respondents (A2).

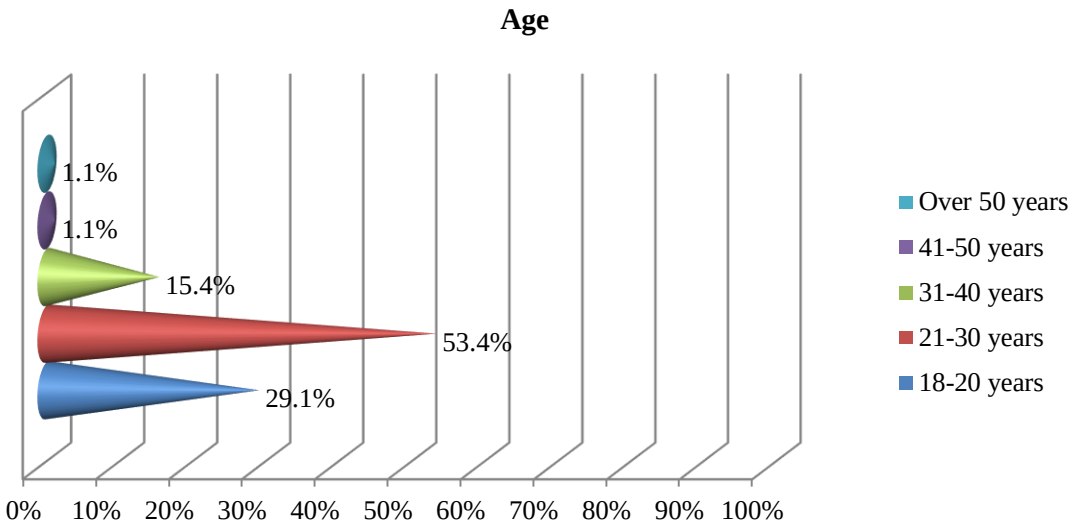


Figure 4.2: The respondents' age

The respondents surveyed in this study were classified into five age groups. The majority of respondents were in the 21-30 years age range (n=253; 53.4%), followed by the 18-20 years age group, which accounted for 29.1 percent of the sample (n=138). Relatedly, only 15.4 percent of the sample (n=73) indicated that they were in the 31-40 years age category, whereas 1.1 percent of the sample (n=5) fell either in the 41-50 years age range or over 50 years age category.

4.4.1.3 Ethnicity

Figure 4.3 illustrates categories of the respondents' population groups (A3).

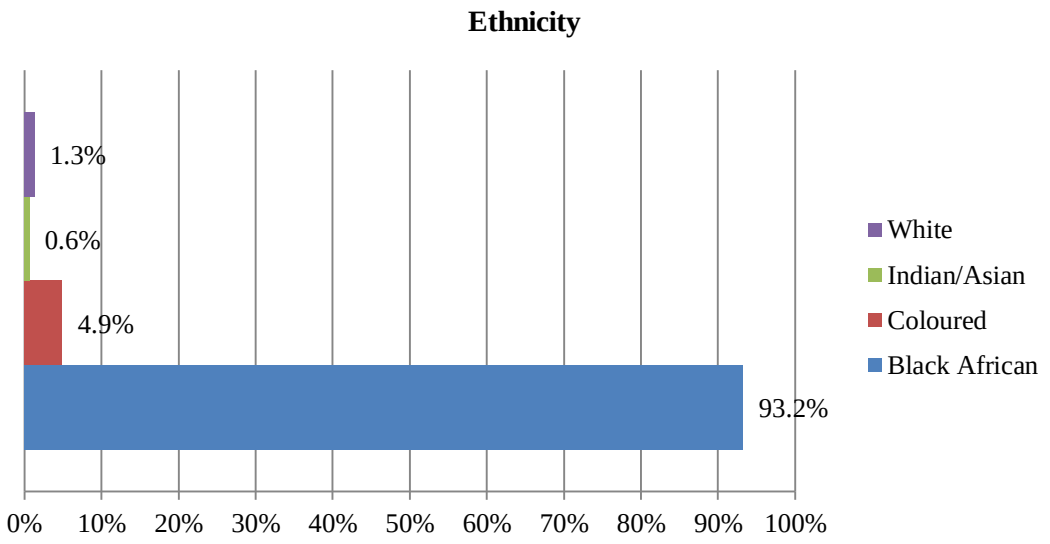


Figure 4.3: The respondents' ethnicity

The majority of participants were of Black African ethnicity (n=442; 93.2%), followed by the Coloured consumers (n=23; 4.9%). The white consumer cohort comrpised 1.3 percent of the sample (n=6), while Indian/Asian represented only 0.6 percent of the sample, comprising only 3 respondents.

4.4.1.4 Mother tongue

Figure 4.4 provides a summary of the responses obtained regarding respondents' mother tongue (A4).

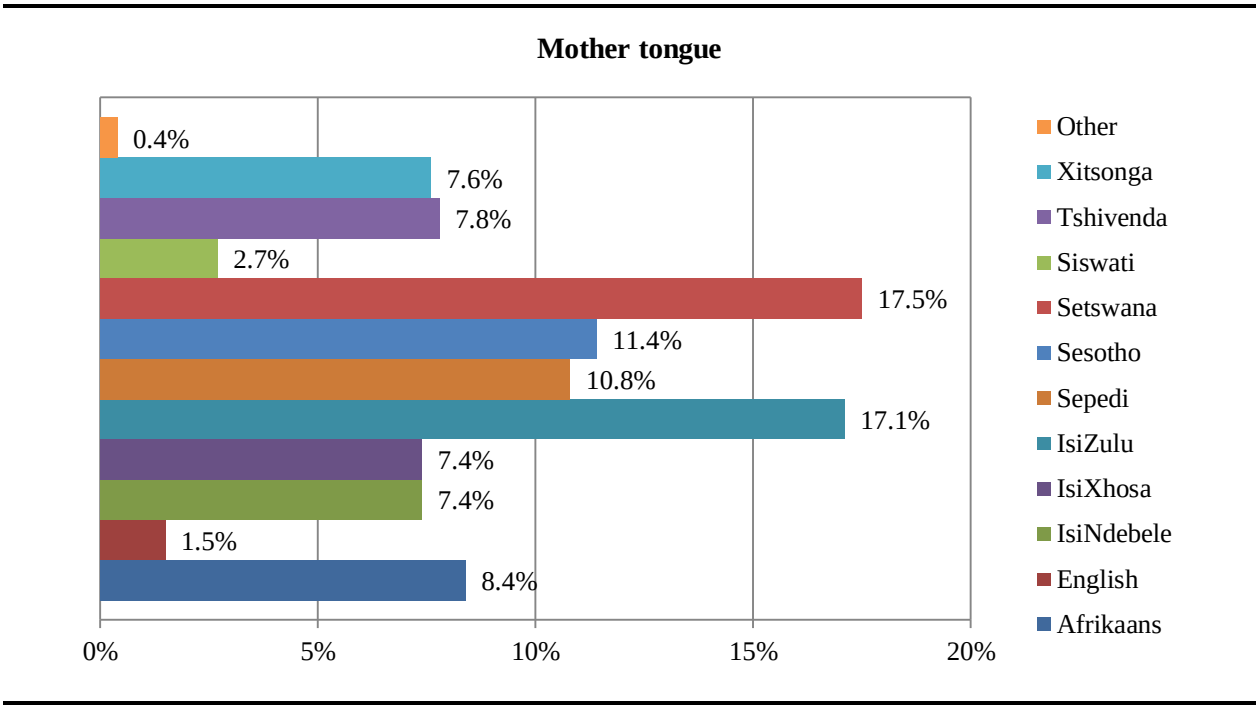


Figure 4.4: The respondents' mother tongue

Each of the 11 official languages was represented in the sample group. The majority of the respondents were Setswana speaking (n=83; 17.5%), followed by respondents' who alluded to IsiZulu (n=81; 17.1%) as their mother tongue. While this is so, there were approximately 54 respondents who indicated that Sesotho was their mother tongue, comprising 11.4 percent of the sample, whereas 51 respondents reported that Sepedi was their mother tongue (10.8% of the sample). A report was also made regarding reports about Afrikaans (n=40; 8.4%), Tshivenda (n=37; 7.8%) and Xitsonga (n=36; 7.6%) being the mother tongue language for some of the respondents included in this study. In addition, the IsiXhosa and IsiNdebele language speakers were equally represented by at least 35 sample members in each language group, comprising 7.4 percent of the sample. Nevertheless, of the remaining minority, the respondents indicated that their mother tongue was either SiSwati (n=13; 2.7%), English (n=7; 1.5%) or some other non-official language (n=2; 0.4%).

4.4.1.5 Marital status

Figure 4.5 reports on the respondents' marital status (A5).

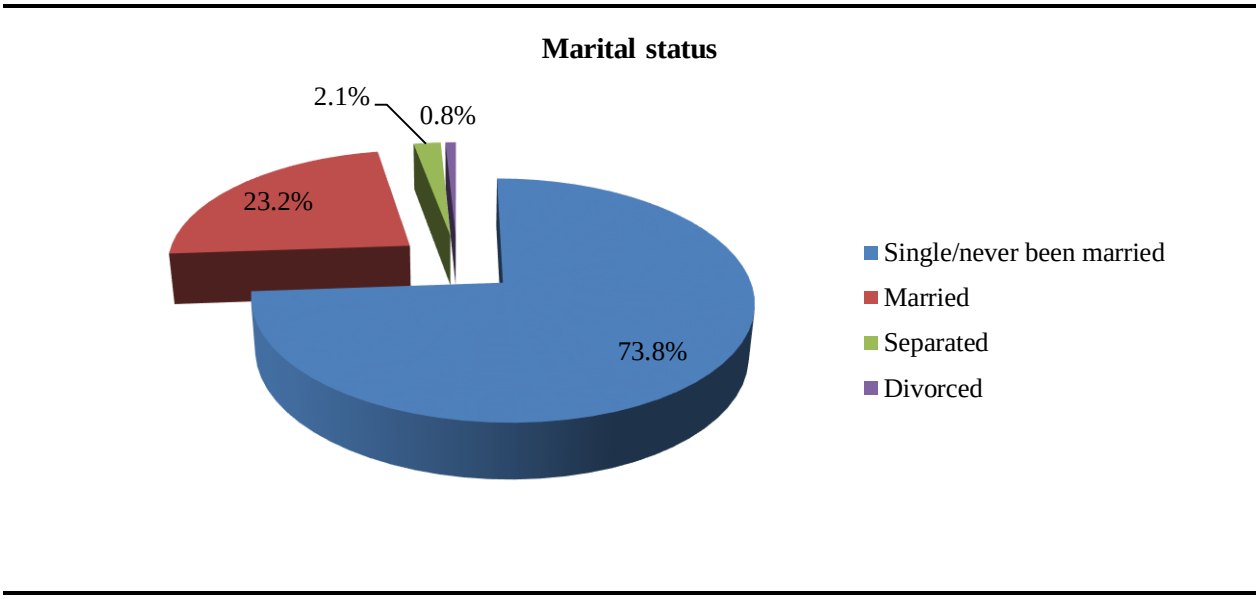


Figure 4.5: The respondents' marital status

From the survey, a majority of the respondents attested that they were not married (n=350; 73.8%), while married respondents comprised the second largest group of the sample (n=110; 23.2%). Separated respondents comprised 2.1 percent of the sample (n=10) while the smallest category was represented by respondents who indicated that they were legally divorced (n=4; 0.8%) represented.

4.4.1.6 Highest educational qualification

Figure 4.6 represents the respondents' highest education qualification (A6).

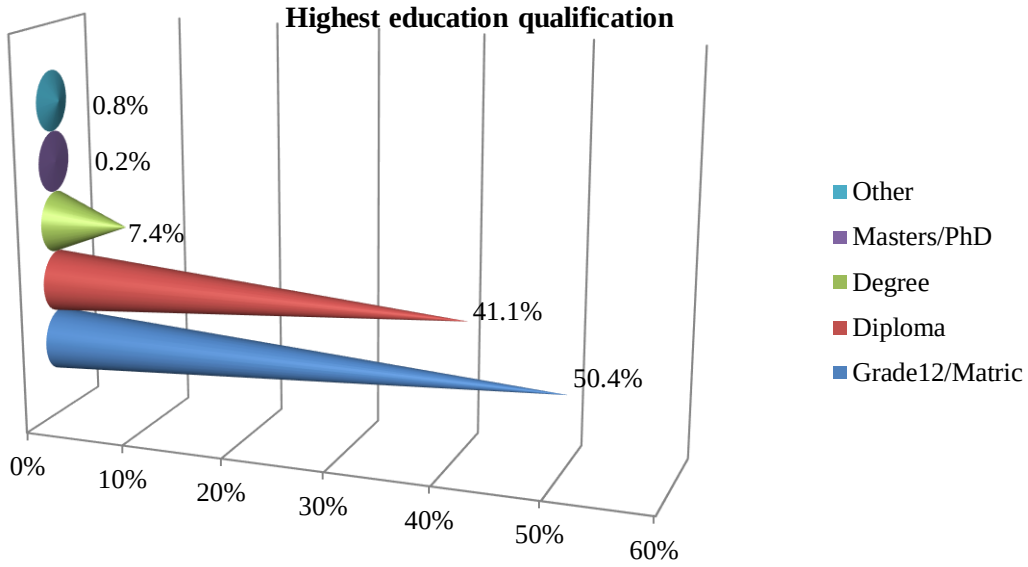


Figure 4.6: The respondents' highest education qualification

In terms of level of educational qualifications, Figure 4.6 shows that the majority of respondents (n=239; 50.4%) were in possession of Grade12/Matric certificate, followed by 41.1 percent of the respondents (n=195) who attested to being holders of a college or university diploma as their highest qualification. Approximately 7.4 percent (n=35) of the respondents reported that they were holders of a university degree as their highest qualification. Nonetheless, a minority of the respondents comprise respondents within the 'other' category (n=4; 0.8%) whereby the respondents reported to have trades and artisan qualifications. In addition, the study comprised only one respondent who attested to having acquired a Masters or PhD qualification (n=1; 0.2%).

4.4.1.7 Monthly income

Figure 4.7 reports on the respondents' monthly income (A7).

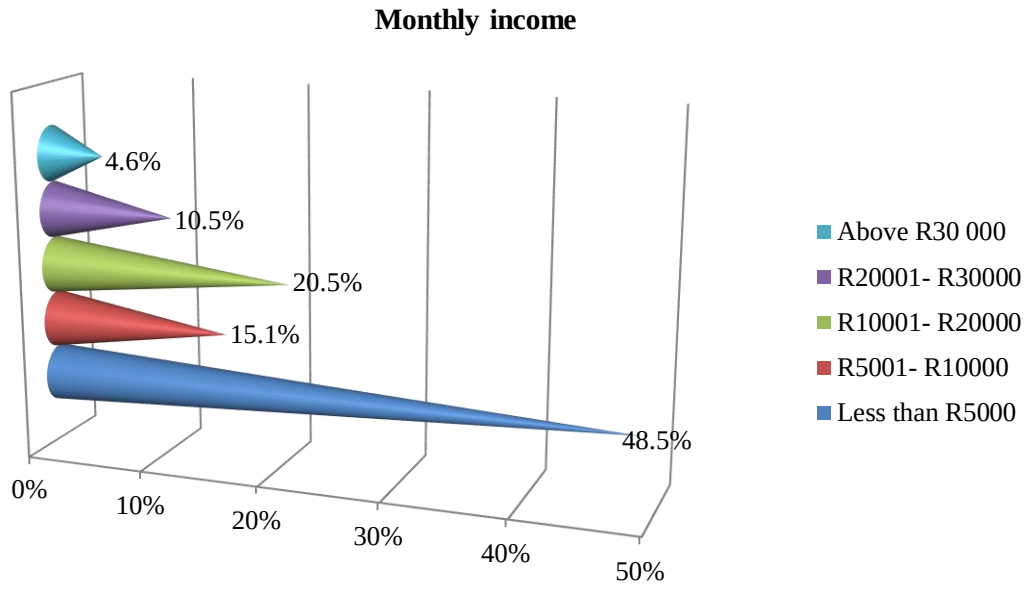


Figure 4.7: The respondents' monthly income

Figure 4.7 presents a breakdown of the respondents' monthly income. The majority of the respondents (n=230; 48.5%) reported that they earned a monthly income below R5 000, which is the lowest category in the continuum used in this study. This was followed by respondents within the R10 001 and R20 000income category (n=97; 20.5%) while respondents earning between R5 001 to R10 000 (n=75; 15.1%) were also represented in this study. Respondents earning between R20 001 and R30 000 constitute 10.5 percent of the sample (n=50) while the minority respondents attested to earning above R30 000 per month (n=22; 4.6%).

4.4.2 M-payment usage information

In addition to demographic questions, the questionnaire included five questions (A8-A12) designed to determine the respondents' usage of m-payments and related services. This comprised questions relating to completion of m-payment transactions, frequency of m-payment transactions, average cost of a single completed m-payment transaction, type of m-payment service used as well as the respondents' most preferred m-payment service.

4.4.2.1 Completed m-payment transactions

Initially, the respondents were requested to indicate whether they had completed an m-payment transaction within a year, from the period when the survey was conducted (A8). This served the intended purpose to validate whether the snowballed respondents had truly completed m-payment transactions within a short period of 12 months prior to the survey, of which the transaction encounter could be easily remembered. As such, this study comprised only the South African

consumer who has at least 12 months minimum experience with conducting payment transactions using mobile devices (n=474; 100%). Consistently, the data set used in this study comprised only those respondents who had asserted that they have completed m-payment transactions before.

4.4.2.2 Frequency of m-payment usage

Figure 4.8 illustrates the results regarding the frequency with which respondents' conduct m-payment transactions (A9).

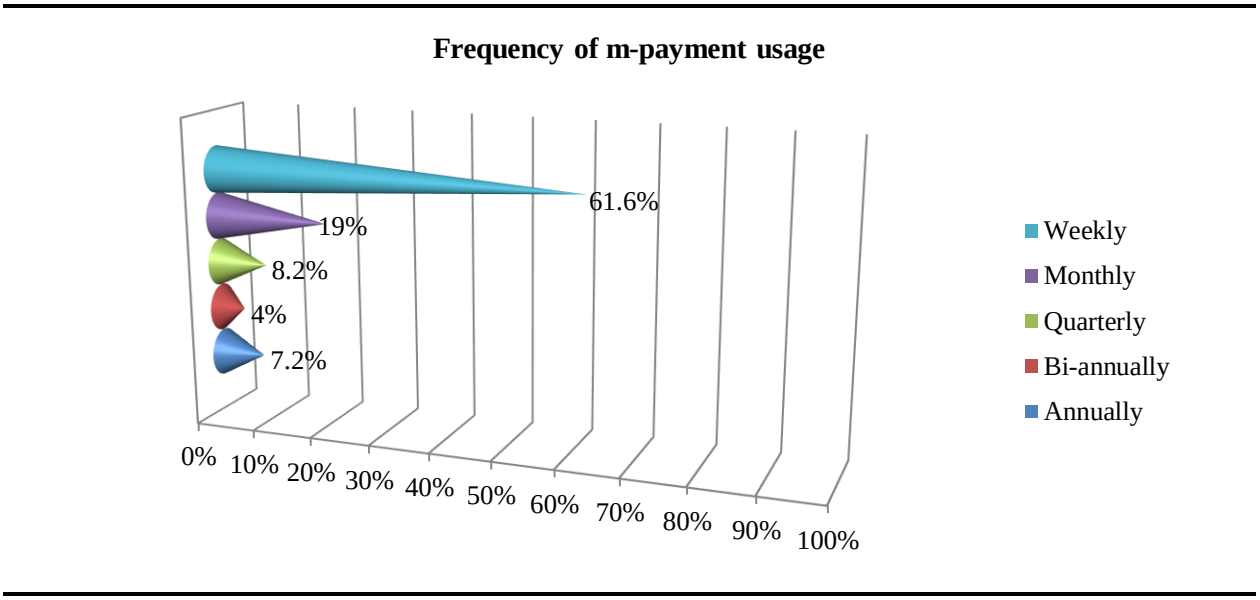


Figure 4.8: Frequency of m-payment usage

Figure 4.8 reports on the frequency with which respondents use m-payment services in South Africa. Approximately 61.6 percent of the respondents (n= 292) conduct m-payment transactions on a weekly basis. This result indicates that conducting m-payments is a regular practise that is infused in the weekly activities of the respondents. Nonetheless, this result is followed by only 19 percent of the respondents (n= 90) who utilise m-payment services on a monthly basis. A minority of respondents reported that they utilise m-payments infrequently as represented by 8.2 percent of the sample (n=39), who attested that they conduct m-payment transactions at least four times a year while 7.2 percent (n=34) and 4 percent (n=19) of the sample, conduct m-payments either twice a year or only once a year, respectively.

4.4.2.3 Average expenditure on a single m-payment transaction

Figure 4.9 report on the average expenditure on a single m-payment transaction (A10).

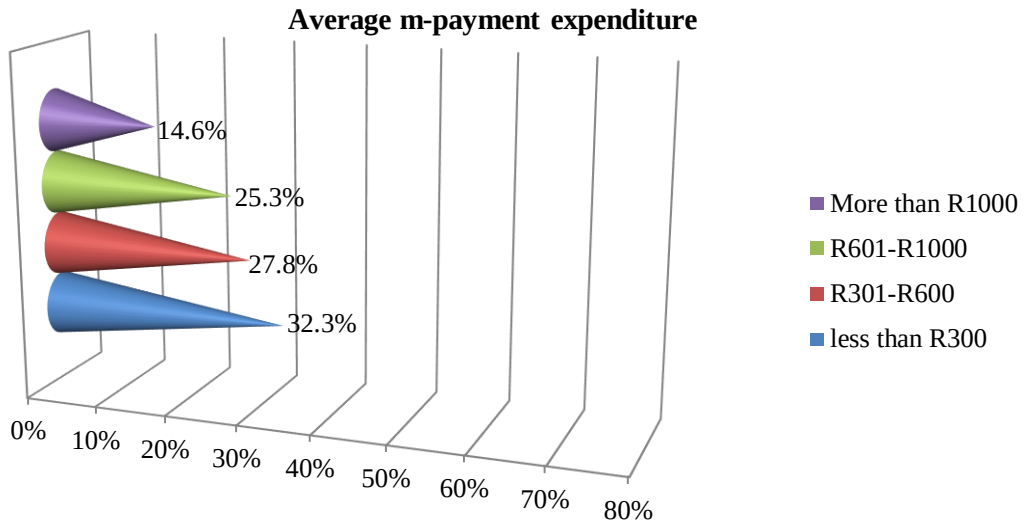


Figure 4.9: Average expenditure on a single m-payment transaction

Regarding the average amount of money that respondents are willing to spend on a single m-payment transaction, the results of this study revealed that a majority of consumers are cautious as they spend less than R300 per transaction (n=153; 32.3%), whereas 27.8 percent of the respondents' (n=132) spend between R301 and R600 on a single m-payment transaction. Relatedly, 25.3 percent of respondents (n=120) spend between R601-R1 000, while a minority of the surveyed respondents (n=69; 14.6%) have spent more than R1 000 on m-payment transactions.

4.4.2.4 Previously used m-payment services

Figure 4.10 reports on the forms of m-payment services that have been previously used by respondents (A11).

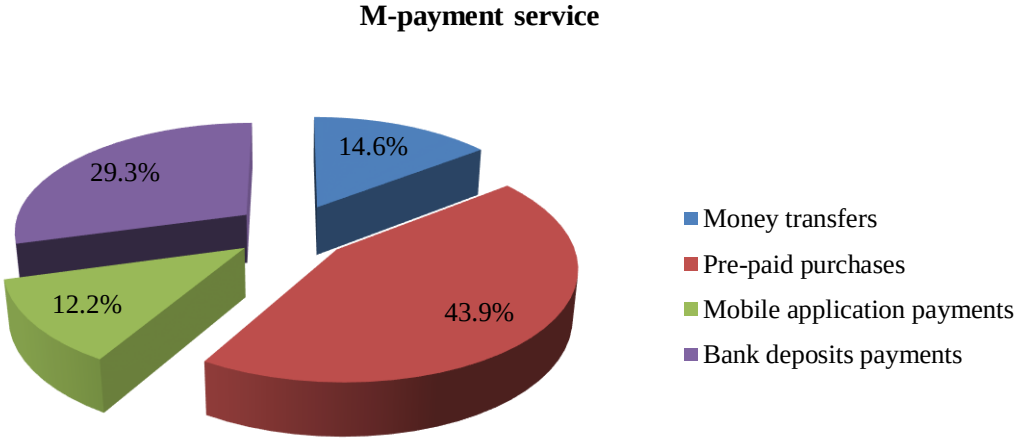


Figure 4.10: Type of m-payment services

Figure 4.10 indicates that the most commonly used m-payment service by the surveyed respondents relates to prepaid purchases such as airtime, electricity and lotto (n=208; 43.9%). This result is moderately followed by bank deposit services (n=139; 29.3%), money transfers (n=69; 14.6%) as well as mobile application payment services (n=58; 12.2%).

4.4.2.5 Most preferred m-payment service

Figure 4.11 reports on the respondents' most preferred m-payment service (A12).

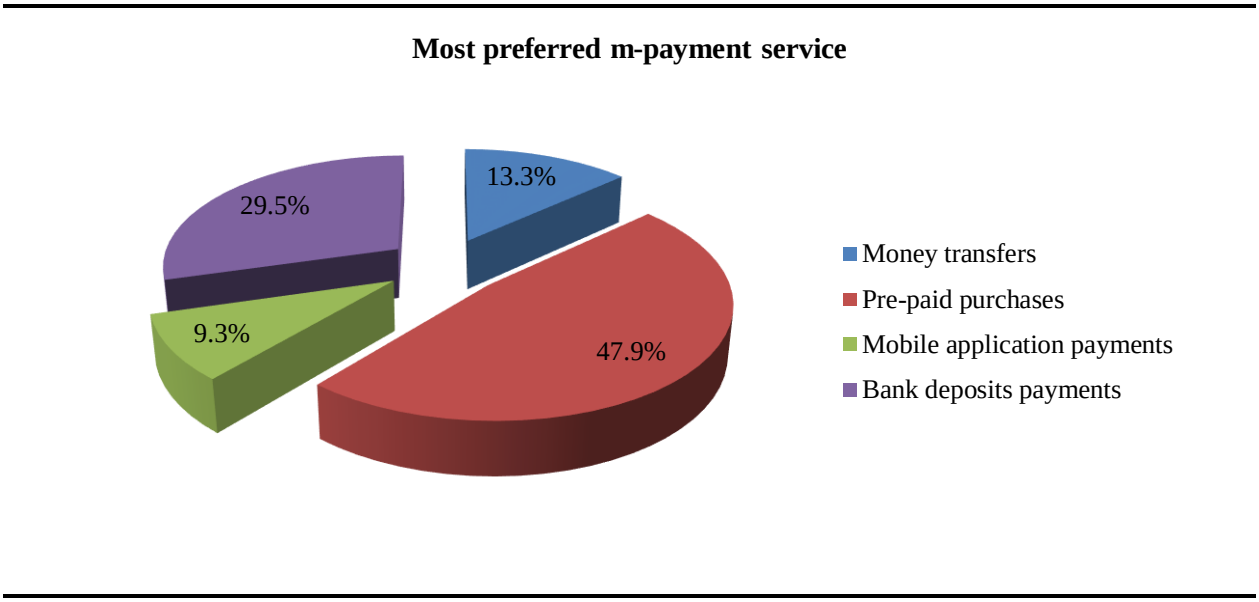


Figure 4.11: Respondents' most preferred m-payment service

In order to consolidate the response of the sample members in line with a memorable m-payment service, the questionnaire requested the respondents to nominate their most preferred m-payment service. From the results, prepaid purchase services (n=227; 47.9%), bank deposit payments (n=140; 29.5%), money transfers (n=63; 13.3%) and mobile application payment services (n=44; 9.3%) were nominated as the first, second, third and fourth preferred m-payment service, in that order. The responses provided under sections B, C and D of the questionnaire related to the consumers' choice decisions regarding the m-payment service that the respondents prefer to use.

While progressing from the demographic analysis of the categorical data, it is very important to assess the degree or the extent to which the items that make up the measuring scale are reliable. In the following section, the reliability results of the scaled responses are discussed.

4.5 INTERNAL CONCISTENCY RELIABILITY ANALYSIS

In order to check the reliability of the measures used in this study, the Cronbach's alpha coefficient values were computed in this study. Table 4.4 presents the reliability results for this study.

Table 4.4: Internal consistency reliability measures

Construct	Items	Cronbach's alpha coefficient (α)	Average inter-item correlation	Corrected item-total correlation	Cronbach's alpha coefficient if item is deleted
Perceived usefulness	B1	0.804	0.498	0.676	0.844
	B2			0.819	0.824
	B3			0.732	0.847
	B4			**0.257**	**0.848**
	B5			**0.288**	**0.850**
Perceived ease of use	B6	0.799	0.436	**0.240**	**0.847**
	B7			0.500	0.783
	B8			0.680	0.748
	B9			0.740	0.775
	B10			0.720	0.788
Perceived security	B11	0.881	0.525	0.712	0.857
	B12			0.663	0.865
	B13			**0.269**	**0.934**
	B14			**0.242**	**0.939**
Attitude towards m-payment services	C1	0.942	0.312	0.855	0.900
	C2			0.784	0.897
	C3			0.893	0.906
	C4			0.865	0.855
	C5			0.826	0.903
Future intentions towards m-payment services	D1	0.932	0.409	0.782	0.922
	D2			0.794	0.920
	D3			0.844	0.916
	D4			0.689	0.921
	D5			0.772	0.923
	D6			0.803	0.920
	D7			0.804	0.920

Initially, the item-to-total correlation coefficient scores were examined. Field (2009:678) advises that items with item to total correlations that fall below 0.30 should be deleted as they do not provide any meaningful value towards the internal consistency of the scale. In addition, the average inter-item correlation coefficient values where computed whereby the rule of thumb is to have values falling within the range of 0.15 and 0.50 (Clark & Watson 1995:316). Moreover, an iterative examination of the scale items was conducted with a view to determine the improvement in the reliability statistic if they were deleted, but care was taken to ensure that in every case, enough items were retained to ensure validity and adequacy for structural equation analysis.

The perceived usefulness scale showed satisfactory initial item consistency with a reported Cronbach's alpha coefficient value of 0.804 along the five items (B1 to B5) as shown on Table 4.4. In addition, the average inter-item correlation value was reported at 0.498, which is within the recommended threshold. However, an observation of the 'Cronbach's alpha coefficient if item deleted' column suggests that deletion of B4 and B5 could considerably lead to an increase in the Cronbach's alpha coefficient value for that scale. In addition, items B4 and B5 demonstrated item to total correlations of 0.257 and 0.288, respectively, which is below the recommended threshold of 0.30. Therefore, an improvement was considered essential given the achievement of a revised reliability statistic. This was accomplished by deleting items B4 and B5, sequentially. Consequently, this modification led to a tentative definition of the best set of items for the scale, whereas the revised three-item perceived usefulness scale retained a good Cronbach's alpha coefficient value of 0.850 as reported on Table 4.4 of this study. Therefore, based on these findings and the scale improvements, a three-item based perceived usefulness construct was considered admissible for further analysis using SEM.

With regard to the perceived ease of use scale, satisfactory initial item consistency was reported with a reported Cronbach's alpha coefficient value of 0.799 along the five items (B6 to B10) as shown on Table 4.4. In addition, the average inter-item correlation value was reported at 0.436, which is within the recommended threshold. However, item B6 proved problematic with regard to falling below the recommended corrected item-to-total correlation value of 0.30. This item reported a corrected item-to-total correlation value of 0.240, which is too low when compared to other variables. Moreover, the Cronbach's alpha coefficient value was estimated to increase to 0.847, after deletion of this item. Based on these findings, a four-item based perceived ease of use scale was retained for subsequent statistical analysis.

In terms of the perceived security scale, a Cronbach's alpha coefficient value of 0.881 was reported along the four items (B11 to B14), which corroborated the sufficiency of the scale in terms of the internal consistency among items. However, the average inter-item correlation value for this scale was reported at 0.525, which was considered slightly above the recommended threshold implying that there could be some items that are too closely related semantically, along this scale. As such, a closer examination of items B13 and B14 revealed that both items reported low corrected item-to-total correlation values of 0.269 and 0.242, respectively. Moreover, the Cronbach's alpha coefficient was estimated to increase to a maximum value of 0.939, after deletion of the two items. Based on these findings, a two-item based perceived security scale was retained for subsequent statistical analysis.

With regard to the attitude towards m-payment services scale, satisfactory initial item consistency was reported with a reported Cronbach's alpha coefficient value of 0.942 along the five items (C1 to C5). In addition, the average inter-item correlation value was reported at 0.312, which is within the recommended threshold. No item deletion was shown to lead to improvements in the reliability statistic and therefore, no item was deleted on this basis. As such, drawing from the remarkable Cronbach's alpha coefficient value and the corresponding average inter-item correlation value, the five-item attitude towards m-payment services sub-scale was retained as is, for further statistical testing.

The Cronbach's alpha coefficient value for the future intentions towards m-payment services scale (D1 to D7) was reported at 0.932, denoting good internal consistency among the scale items. In addition, the average inter-item correlation was reported at 0.409 suggesting convergence among the scale items. Moreover, observation of the 'Cronbach's alpha coefficient if item deleted' column suggests that no apparent deletions could potentially help to improve the reliability statistic any further. Based on these findings, the seven-item intentions scale was considered admissible for further statistical analysis and was therefore, retained without modifications.

Drawing from the aforementioned sequential deletion process, items B4, B5, B6, B13 and B14 were excluded from further analysis.

4.6 DESCRIPTIVE STATISTICAL ANALYSIS

The descriptive statistics of the sample of m-payment consumers who participated in this study are set out in Table 4.5.

Table 4.5: Descriptive statistical analysis results

Scale	N	Minimum	Maximum	Mean	Standard deviation	Skewness	Kurtosis
Perceived usefulness				**4.239**	**1.084**	**-0.840**	**1.539**
B1	474	1	5	4.283	1.073		
B2	474	1	5	4.192	1.063		
B3	474	1	5	4.254	1.058		
Perceived ease of use				**4.131**	**1.091**	**-1.379**	**1.640**
B7	474	1	5	4.182	1.042		
B8	474	1	5	3.943	1.231		
B9	474	1	5	4.211	1.113		
B10	474	1	5	4.202	1.111		

Table 4.5: Descriptive statistical analysis results (continued …)

Scale	N	Minimum	Maximum	Mean	Standard deviation	Skewness	Kurtosis
Perceived security				**3.728**	**0.946**	**-0.196**	**0.427**
B11	474	1	5	3.704	0.992		
B12	474	1	5	3.752	0.997		
Attitude towards m-payment services				**4.505**	**1.049**	**-0.755**	**0.554**
C1	474	1	5	4.582	1.056		
C2	474	1	5	4.454	1.082		
C3	474	1	5	4.481	1.098		
C4	474	1	5	4.470	1.087		
C5	474	1	5	4.543	1.096		
Future intentions towards m-payment services				**4.543**	**0.918**	**-0.777**	**0.385**
D1	474	1	5	4.533	0.992		
D2	474	1	5	4.510	0.948		
D3	474	1	5	4.584	0.947		
D4	474	1	5	4.553	1.016		
D5	474	1	5	4.501	1.008		
D6	474	1	5	4.522	1.102		
D7	474	1	5	4.614	1.014		

Valid N (Listwise) =474
Items deleted during reliability assessment (B4, B5, B6, B13 and B14)

Descriptive statistics provide researchers with a tool to summarise and describe the basic characteristics of large sets of data received from a sample of participants (Hair *et al.*, 2009:471; Malhotra 2010:486). As indicated in Chapter 3 of this study, descriptive statistics typically include measures of central tendency, dispersion and shape (Pallant 2010:53). Moreover, a five-point Likert scale was used in this study to measure the scaled responses, which ranged from 1= strongly disagree to 5= strongly agree. Mean values were computed as the measures of central tendency for this study. Therefore, higher mean values are desirable in this study since they are associated with scale agreement.

The future intentions towards m-payment services scale (D1-D7) had the highest mean score of 4.543, followed by the attitude towards m-payment services scale (C1-C5) with a mean rating of 4.505. On the other hand, the perceived security scale had the lowest mean rating of 3.728, although this result was considered acceptable since it was higher than the pre-determinable mean value of 3.0 as calculated under section 3.10.5 of this study. Relatedly, mean values of 4.239 and 4.131 were computed on the perceived usefulness and perceived ease of use scales, respectively.

As such, the higher mean values indicated on Table 4.5 reflect greater agreement by participants with regard to the perceived usefulness, perceived ease of use, perceived security, attitude and future intention towards m-payment services acceptance. These findings support the assertion promulgated by industry analysts that South African consumers are taking an increased interest in the positive evaluation and/or usage of m-payment services (Accenture 2014:3).

In terms of the computed individual item mean values, items B1-B3 on the perceived usefulness scale reported mean values ranging between 4.192 and 4.283 whereas items B7 to B10 on the perceived ease of use scale reported mean values ranging between 3.943 and 4.211. In addition, the two items computed on the perceived security scale, namely B11 ($\bar{x}$=3.704) and B12 ($\bar{x}$=3.752) also reported acceptable mean values higher than 3.0. Items C1 to C5 reported mean values ranging between 4.454 and 4.582, along the attitude towards m-payment services scale. On the other hand, items D1 to D7 measuring future intentions towards m-payment services reported mean values ranging between 4.510 and 4.614. The scale items are included in the annexed questionnaire (refer to appendix A) explaining the nature of survey questions used in this study.

In terms of the measures of variability, standard deviation values were computed to measure the variance of responses on each variable. Table 4.5 reveals that the perceived ease of use scale had the highest standard deviation value reported at 1.091 indicating a greater dispersion with regard to the distance of interpretations from the measurement of the arithmetic mean, for that variable. This was followed closely by the perceived usefulness (Std. Dev=1.084) as well as the attitude towards m-payment (Std. Dev=1.049) scales. In addition, the perceived security scale as well as the future intentions towards m-payments scale reported standard deviation values of 0.946 and 0.918, respectively. The reported sample standard deviation provides an acceptable measure of the tolerable variation in responses along the Likert-scale based responses.

Measures of dispersion were calculated using the skewness and kurtosis statistics. The results demonstrate computed skewness statistics ranging between -0.196 and -1.379 while the kurtosis statistics range between 0.385 and 1.640 as shown on Table 4.5. The reported skewness and kurtosis statistics in this study suggest that the data for this study appears to be distributed normally since none of the skewness values fell outside the -2 to +2 range. Moreover, the reported kurtosis values suggest that the data set is relatively flat. The skewness and kurtosis values were a useful observation with regard to supporting evidence of data normality in this research. This was a very important consideration since SEM was to be applied on the dataset.

The next section presents the correlation analysis results and multicollinearity testing.

4.7 CORRELATION ANALYSIS AND MULTICOLLINEARITY TESTING

In accordance with study objectives outlined in Chapter 1, it was imperative to examine the relationships between perceived usefulness, perceived ease of use, perceived security, attitude and future intentions towards m-payment services. Therefore, it was considered necessary to employ correlation analysis among the aforementioned constructs to determine the strength and direction of the underlying relationships. The Pearson correlation coefficient (*r*) was used to measure the degree of linear association between the variables as proposed by Malhotra (2010:562). The correlation analysis matrix is presented in Table 4.6.

Table 4.6: Correlation analysis results

Construct	Perceived Usefulness	Perceived Ease of use	Perceived Security	Attitude towards m-payment services	Future intentions towards m-payment services
Perceived usefulness	1				
Perceived ease of use	0.304**	1			
Perceived security	0.197**	0.494**	1		
Attitude towards m-payment services	0.256**	0.230**	0.258**		
Future intentions towards m-payment services	0.264**	0.142**	0.161**	0.689**	1

****Correlation is significant at the 0.01 level (2-tailed)**

It is evident from Table 4.6 that the results of the Pearson correlation coefficients suggest a strong, positive linear relationship between attitude and future intentions towards m-payment services (*r*=0.689) at the 0.01 level of significance, indicating that positive attitudinal evaluations of m-payment services ultimately affect consumers' future intent to patronise the payment services using their mobile devices. While following the rule of thumb proposed by Cohen (1988:79), this linear relationship reported the highest correlation coefficient size in this study, thereby implying that the relationship between attitude and future intentions towards m-payment services is strong.

Moderate, positive correlation coefficients were observed between perceived usefulness with perceived ease of use (*r*=0.304) and between perceived security with perceived ease of use (*r*=0.494), at the 0.01 level of significance. This indicates that positive consumer perceptions regarding the usefulness and security of m-payment services will invariably lead to favourable

perceptions regarding the simplicity and ease with which m-payment transactions can be conducted.

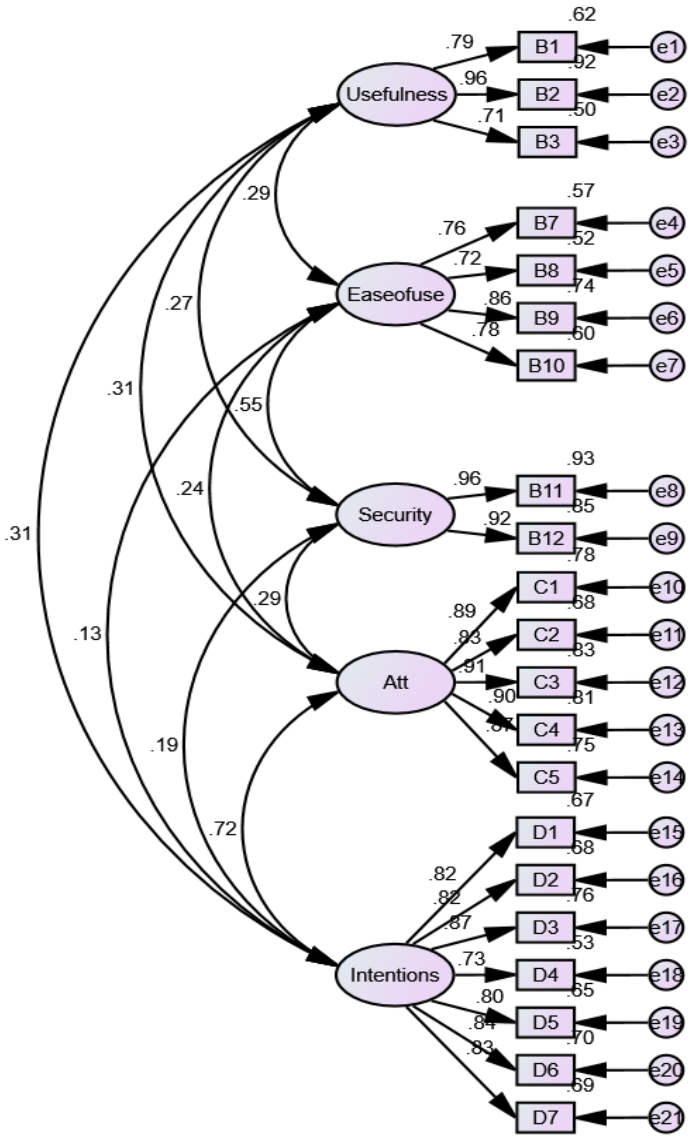
Weak, positive correlation coefficients were observed between future intentions towards m-payment services with perceived ease of use (r=0.142), at the 0.01 level of significance. In addition, a weak, positive correlation coefficient result was reported between perceived security and perceived usefulness (r=0.197) as well as between perceived security and future intentions towards m-payment services (r=0.161) at the 0.01 level of significance. Similarly, weak, positive correlation coefficients were reported between the three determinants of m-payment services acceptance, namely, perceived usefulness (r=0.256), perceived ease of use (r=0.230) and perceived security (r=0.258) with attitude towards m-payment services, at the 0.01 level of significance.

As a preliminary procedure, the correlation matrix was examined for the existence of multicollinearity. In particular, correlation coefficient values that are greater than 0.90 are considered undesirable as they imply that the constructs are too closely related to possess any semantic uniqueness. Nevertheless, Costello and Osborne (2005:6) also point out that even those correlation coefficient values (r) higher than 0.70 can signal potential problems with multicollinearity. Drawing upon the aforementioned thresholds, no multicollinearity problems were established in this study. Specifically, the maximum correlation coefficient value was reported between attitude and future intentions towards m-payment services (r=0.689; p<0.001). Furthermore, the inter-correlation coefficient values for all paired latent variables are less than one and significant across all pairs of constructs, consistent with the rule of thumb suggested by Hair *et al.* (2013:317), thereby inferring nomological validity.

The next section delves into the first component of SEM, namely measurement model analysis.

4.8 MEASUREMENT MODEL ANALYSIS

The first step in SEM is to specify the measurement model and conduct a CFA procedure. In accordance with the theoretic-based constructs discussed in chapter 2, the measurement model for this study was specified. The model includes five latent or unobserved variables, with terminology shortened as, usefulness (F1) (3 indicators), ease of use (F2) (4 indicators), security (F3) (2 indicators), attitude (F4) (5 indicators) and future intentions (F5) (7 indicators). The measurement model is thus, specified in Figure 4.12.



Shortened terminology for SEM analysis:
Usefulness *= Perceived usefulness (F1);* ***Ease of use*** *= Perceived ease of use (F2);* ***Security*** *= Perceived security (F3);* ***Att*** *= Attitude towards m-payment services (F4);* ***Intentions*** *= Future intentions towards m-payment services (F5).*

Figure 4.12: Measurement model

Specification of the measurement model led to the testing of the first hypotheses that were specified in sections 1.4.3 and 2.13 of this study:

H_o1: *M-payment future intentions is not a five-variable structure comprising usefulness, ease of use, security, attitude and future intentions.*

H_a1: *M-payment future intentions is a five-variable structure comprising usefulness, ease of use, security, attitude and future intentions.*

Figure 4.12 is a diagrammatic representation of the measurement model for this study. Latent variables are signified by the circular or oval shape while observed variables (scale indicators) are represented by the rectangular shapes. Adjacent to the observed variables are measurement error values, which are represented by circular shapes as well. The bi-directional arrows connote the relationships between latent variables.

For model identification purposes, the first loading on each of the factors was set at 1.0. Consequently, there are 253 distinct sample moments, and 59 parameters to be estimated, resulting in 194 degrees of freedom based on an over-identified model, and a chi-square value of 440.768 with a probability level equal to 0.000.

After the model identification and specification procedure with Amos (Version 23.0), the assessment of the proposed conceptual model proceeded using the same dataset. Model fit assessment was conducted for determining how well the measurement model is represented by the sampled data. Model fit indices, CFA results and statistical accuracy measures are the three categories of observations that were made during the model assessment.

4.8.1 Fit indices for the measurement model

The measurement model was assessed for model fit using the indices explained under Table 3.4 of this study, namely the chi-square, the IFI, the TLI, the CFI, the SRMR and the RMSEA. Table 4.7 summarises the measurement model fit indices that were computed for this study, including their recommended thresholds.

Table 4.7: Measurement model fit indices

Measure	Recommended level	Default model value	Decision
Chi Square	Low values	440.768	Accept
Chi Square/DF	$2.0 \leq \chi 2/df \leq 5.0$ is tolerable yet values less than 3.0 are ideal	2.272	Accept
NFI	≥0.90	0.900	Accept
IFI	≥0.90	0.940	Accept
TLI	≥0.90	0.928	Accept
CFI	≥0.90	0.939	Accept
SRMR	≤0.05	0.050	Accept
RMSEA	≤0.05	0.048	Accept

Although the model's significant chi-square value of 440.768 is an indication of questionable model fit, typically this value cannot be used as a conclusive result to suggest that a model should not be accepted since they are sensitive to large sample sizes (Byrne 2010:76). Chi-Square statistic

is in essence, a statistical significance test that is sensitive to sample size, which means that the Chi-square statistic nearly always rejects the model when large samples are used (Jöreskog & Sörbom 1993:45). On the other hand, where small samples are used, the Chi-square statistic lacks power and because of this, may not discriminate between good fitting models and poor fitting models.

Owing to the restrictiveness of the model Chi-square, researchers have sought alternative indices to assess model fit. One example of a statistic that minimises the impact of sample sizes on the model Chi-square is Wheaton *et al.*'s (1977:89) normed chi-square ($\chi 2/df$) which was reported at 2.272 in this study. As such, the chi square test should therefore, not be used in isolation to quantify the degree of measurement model fit due to its sensitivity to sample size. In addition, the other fit indices, namely IFI=0.940, TLI=0.928, CFI=0.939, SRMR=0.0503 and RMSEA=0.048, demonstrate a close fit between the measurement model and the data.

4.8.2 CFA results for the measurement model

Since the empirical data in this research were normally distributed (refer to section 4.6), it was then possible to apply a multivariate normality based method of estimation. In particular, MLE was used as it is the most common estimation procedure in both CFA and path modelling since it permits an internally consistent set of significance tests and is relatively unbiased (Weston & Gore 2006:738). Prior to testing the research hypotheses, CFA is performed to confirm accuracy of the multiple-item measures as suggested by Anderson and Gerbing (1988:7). Following the advice of Hair *et al*. (2010:706), the specified measurement model was evaluated for any problematic estimates during the CFA procedure. Common problems include negative error variances, Heywood cases (standardised factor loadings greater than 1.0 or below -1.0) as well as low factor loadings (≤ 0.50). As is evident from Table 4.8, no problematic estimates were reported on the specified measurement model.

Table 4.8: Standardised coefficients of the measurement model

Latent variable	Construct	Indicator	Factor loadings	Error variance
F1	Usefulness	B1	0.786	0.228 (+)
		B2	0.959	0.032 (+)
		B3	0.709	0.168 (+)
F2	Ease of use	B7	0.758	0.189 (+)
		B8	0.721	0.380 (+)
		B9	0.859	0.102 (+)
		B10	0.777	0.171 (+)

Table 4.8: Standardised coefficients of the measurement model (Continued …)

Latent variable	Construct	Indicator	Factor loadings	Error variance
F3	Security	B11	0.962	0.058 (+)
		B12	0.920	0.112 (+)
F4	Attitude	C1	0.885	0.067 (+)
		C2	0.826	0.124 (+)
		C3	0.914	0.055 (+)
		C4	0.898	0.066 (+)
		C5	0.866	0.085 (+)
F5	Intentions	D1	0.819	0.113 (+)
		D2	0.823	0.124 (+)
		D3	0.873	0.086 (+)
		D4	0.728	0.190 (+)
		D5	0.805	0.143 (+)
		D6	0.838	0.132 (+)
		D7	0.832	0.092 (+)

All factor loadings reported for the measurement model were statistically significant and higher than 0.70 even, which Malhotra (2010:734) considers to be ideal. Since the results exhibited on Table 4.8 convey no item that falls below 0.70, this means that all measurement items are loading well on their respective variables and that, they are measuring at least 70 percent of their respective variables. In addition, Heywood cases were not identified in this study, since all error variances were positive (+) and none of the factor loadings was above 1.0 or below -1.0. Based on the CFA results, initial specification suggests that no deletions should be made since all the items factored into the measurement model infer an acceptable fit and scale accuracy.

In the following section, the measurement model is assessed by evaluating various statistics that confer the measurement model's reliability and validity.

4.8.3 Measures of the statistical accuracy of the measurement model

Table 4.9 reports on the composite reliability (CR) values, average variance extracted (AVE) values, square root of the AVE values, SV values and the correlation coefficient values computed in this study.

Table 4.9: Statistical accuracy measures for the measurement model

Construct	Cronbach's alpha coefficient	CR	AVE	√AVE	SV	Correlation constructs				
						Usefulness	Ease of use	Security	Attitude	Intentions
Usefulness	**0.850**	**0.911**	**0.673**	**0.820**	**0.159**	1				
Ease of use	**0.847**	**0.905**	**0.656**	**0.810**	**0.260**	0.304**	1			
Security	**0.939**	**0.911**	**0.631**	**0.794**	**0.124**	0.197**	0.494	1		
Attitude	**0.942**	**0.957**	**0.815**	**0.903**	**0.268**	0.256**	0.230**	0.258**	1	
Intentions	**0.932**	**0.946**	**0.715**	**0.846**	**0.477**	0.264**	0.142**	0.161**	0.689**	1

**** Correlation is significant at the 0.01 level (2-tailed).**
CR: Composite reliability
AVE: Average Variance Extracted
√AVE: Square root of AVE
SV: Shared Variance

In order to assess internal-consistency reliability of the measurement model, a composite reliability (CR) test was conducted.

4.8.3.1 Reliability assessment of the measurement model

The formulae that was applied in calculating CR is presented in Section 3.11.1 of this study.

Malhotra (2010:734) denotes that a measurement model can be deemed reliable when the CR values for each of the latent factors exceed 0.70. It is apparent from Table 4.9 that the CR results which pertain to all the research constructs, namely usefulness (CR=0.911), ease of use (CR=0.905), security (CR=0.911), attitude (CR=0.957) and intentions (CR=0.946) exceeded the accepted threshold value of 0.70. In addition, the Cronbach's alpha coefficient values that were computed ranged between 0.847 and 0.942. Both the CR and Cronbach's alpha coefficient values validate the reliability of the measurement model that was specified in this study.

As far as a model could be reliable, it remains questionable unless tested for validity (Hair *et al.*, 2009:283). Construct validity of this study was assessed by examining the convergent, discriminant and nomological validity of the measurement model.

4.8.3.2 Convergent validity assessment of the measurement model

Three statistical techniques were applied to ascertain the convergent validity of the measurement model, namely the corrected item-to-total correlation coefficient estimates, standardised factor loadings as well as AVE values.

Drawing from the preliminary purification procedure that was conducted in Section 4.5, only the items exceeding the 0.30 cut-off level on the corrected item-to-total correlation values were retained, as recommended by Field (2009:678). Items B4, B5, B6, B13 and B14 presented very low item-to-total correlations (below 0.30), implying that they were not contributing effectively to the validity of their respective constructs. A decision was therefore taken to exclude these five items from the measurement model as shown on Figure 4.12.

The CFA results on Table 4.8 show that the factor loadings for the indicators that were incorporated in the measurement model exceeded the 0.50 cut-off point, implying that the indicators are converging well on the constructs that they intend to measure. Items on the usefulness construct reported factor loadings between 0.709 and 0.959. Ease of use reported factor loadings between 0.721 and 0.859 while the factor loadings under the security construct ranged between 0.920 and 0.962. Moreover, the factor loadings for the attitude construct ranged between 0.826 and 0.914 while the loadings for the intentions construct ranged between 0.728 and 0.873.

The formulae that was applied in calculating AVE is presented in Section 3.11.1 of this study. According to Chen (2009:314) and Malhotra (2010:734), AVE values of 0.50 and greater are considered acceptable when assessing the convergent validity of a study. This means that the variance explained by indicators along each latent construct exceeds the variance explained by the error term. The AVE values for this study range between 0.631 and 0.815 implying that more than 50 percent of each item's variance (AVE≥0.50) was shared with its respective construct, thereby portraying an acceptable level of convergent validity on the measurement model.

4.8.3.3 Discriminant validity assessment of the measurement model

The Pearson correlation matrix was the first method used to check the discriminant validity of the constructs used in the measurement model. This was done by assessing whether the component correlation matrix among the construct was less than 1.0. As indicated in Table 4.9, the inter-correlation values for all paired latent variables are less than 1.0 and therefore, indicate the existence of discriminant validity in the measurement model.

Secondly, Fornell and Larcker's (1981:46) criterion of assessing discriminant validity was applied by examining the size of the correlation coefficients *vis a vis* the square roots of the respective AVE values. Discriminant validity is achieved if the square root estimates of the computed AVE values are larger than the highest computed correlation coefficient. Table 4.9 shows that the minimum computed square root of the AVE values is 0.794, which is greater than the highest inter-construct correlation coefficient in the matrix, established between attitude and intentions (r=0.689).

Thirdly, according to Bearden *et al.* (2011:8) and Deepen (2007:194), all computed AVE values in a model should be larger than all the computed SV values. As indicated in Table 4.9, the SV values for all the research constructs range between 0.124 and 0.477, which is lower than the size of all the computed AVE values. This, therefore, confirms that the constructs included in the measurement model have discriminant validity.

4.8.3.4 Nomological validity assessment of the measurement model

With regard to nomological validity of the measurement model, latent variables were correlated against each along the Pearson's product moment correlation matrix. The rule of thumb by Hair *et al*. (2010:710) is to have correlation coefficients of less than 0.70 between the research constructs. The reported statistics in this study yielded positive, significant correlation coefficients ranging between 0.177 and 0.691, which is considered acceptable evidence of discriminant uniqueness of each construct in the measurement model.

Since acceptable measurement model fit was secured, including the validation of the reliability and validity of the measurement model, there is insufficient evidence to reject H_a1, which infers that m-payment future intentions is a five-variable structure. Therefore, the decision was made to:

reject the null hypothesis (H_o1) and conclude the alternative hypothesis (H_a1), instead which stipulates that m-payment future intentions is a five-variable structure comprising usefulness, ease of use, security, attitude and future intentions.

In the following section, the study proceeds to the next stages of conducting the structural (path) model analysis and subsequent testing of hypotheses.

4.9 STRUCTURAL MODEL ANALYSIS

In accordance with the hypotheses presented in Chapter 1.5 and repeated in Section 2.13, Figure 4.13 specifies Structural model A, which suggests that usefulness (F1), ease of use (F2) and security (F3) directly influence attitude (F4). In turn, attitude is expected to positively influence future intentions towards using m-payment services (F5) as evidenced in the conceptual model developed for testing (Refer to Figure 2.11 of this study).

For visual comprehension purposes, the structural model figures presented in this chapter exclude the covariance lines, indicators and residuals. The detailed structural models are provided under Appendix B and C of this dissertation.

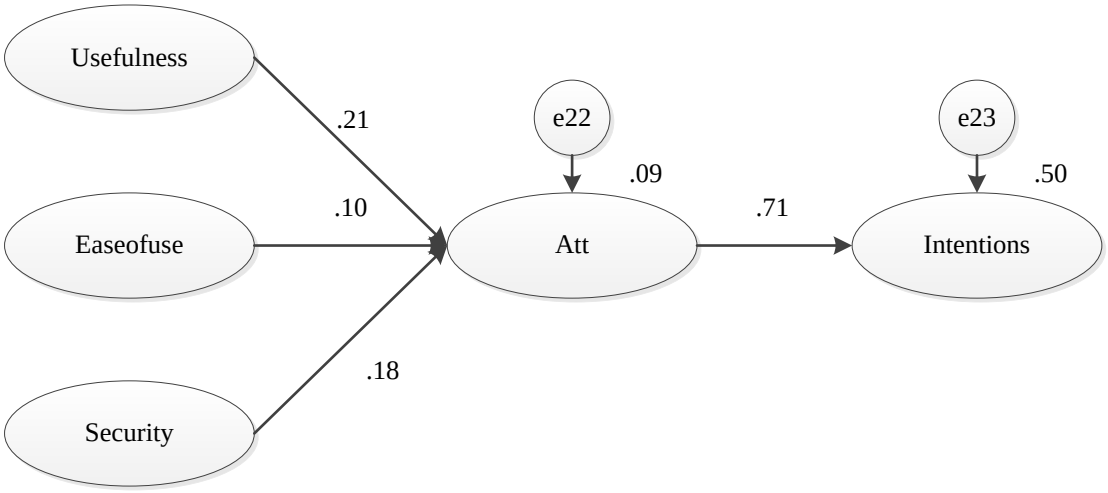


Figure 4.13: Structural model A

The indices thresholds expressed under CFA (refer to Table 4.7) which pertain to respective model fit indices apply to the structural model as well. The normed Chi-square value (χ^2/df=2.052) that was computed for the structural model fell below 3.0, thus confirming that there is acceptable it. In addition, the acceptable levels of model fit were met across other indices including chi-square=412.45 (df=201), IFI=0.912 (above 0.90), TLI=0.931(above 0.90). However, an evaluation of the RMSEA= 0.051(greater than 0.050), NFI= 0.894 (below 0.90) and CFI= 0.899 (below 0.90) values continued to indicate poor model fit. Moreover, the SRMR (0.059) fell above the recommended level (greater than 0.050) thereby denoting that the structural model did not have acceptable fit.

4.9.1 Summary of the hypotheses testing results

Table 4.10 summarises the fit indices for the structural model as well as the decisions that were taken regarding the hypotheses that were tested in this study.

Table 4.10: Structural Model A fit indices and hypotheses testing results

Causal path	Path coefficient	Sig (*p*-value)	Decision
Attitude ← Usefulness	(+) 0.214	0.000***	H_o2 Rejected H_a2 Concluded
Attitude ← Ease of use	(+) 0.103	$0.062^{n/s}$	H_o3 cannot be rejected
Attitude ← Security	(+) 0.176	0.000***	H_o4 Rejected H_a4 Concluded
Intentions ← Attitude	(+) 0.710	0.000***	H_o5 Rejected H_a5 Concluded

***** = p<0.0001; n/s = not significant**
Structural model fit results:
Chi-square=412.45, df=201, χ^2/df = 2.052, IFI=0.912, TLI=0.931, CFI=0.899, NFI=0.894, SRMR=0.059, RMSEA=0.051.

According to Figure 4.13, usefulness (F1) (path estimate=0.214, p<0.001) and security (F3) (path estimate=0.176, p<0.001) are the two factors that were found to have a significant and positive influence on attitude (F4). In turn, the strongest hypothesised path relationship was demonstrated in this study by a significant and positive influence of attitude (F4) on future intentions (F5) (path estimate=0.710, p<0.001) towards m-payment services. This infers that the null hypotheses H_o2, H_o4 and H_o5 be rejected while their alternative hypotheses H_a2, H_a4 and H_a5 are concluded since the latter are supported by the data.

The path between ease of use (F1) and attitude (F4) (path estimate=0.103, p<0.001) was not significant (p>0.05) under Structural model A. As such, there is insufficient evidence to reject H_o3.

Drawing from the inadequate structural model results presented in Table 4.10, it was decided to test an alternative model based on the initial measurement model. Nonetheless, theory had to be consulted in order to assist the procedure for re-specifying a competing structural model. In addition, it is suggested that when comparing two or more model, the AIC and CAIC measures be considered. Essentially, smaller values are indicative of better fit (Byrne 2010:82). These values are reported as AIC=2040.042 and CAIC=2082.691 for Structural model A.

4.10 TESTING A COMPETING MODEL

It is possible to improve the model fit of Structural model A somewhat, if the relationship between ease of use and attitude is either relaxed or altered, completely. For example, the study by Chandra, Srivastava and Theng (2010:571) confirms the existence of a path relationship between ease of

use to attitude, through the usefulness variable. In addition, ease of use was proved to have a positive influence on usefulness in the TAM (Davis *et al.*, 1989:985). In other words, if m-payment services are considered easy to use, consumers might generally find more use and beneficial value for them thereby attracting positive attitudinal evaluations. As such, the hypothesised model was revised to include a path from ease of use to usefulness of which, this path was found significant under Structural model B.

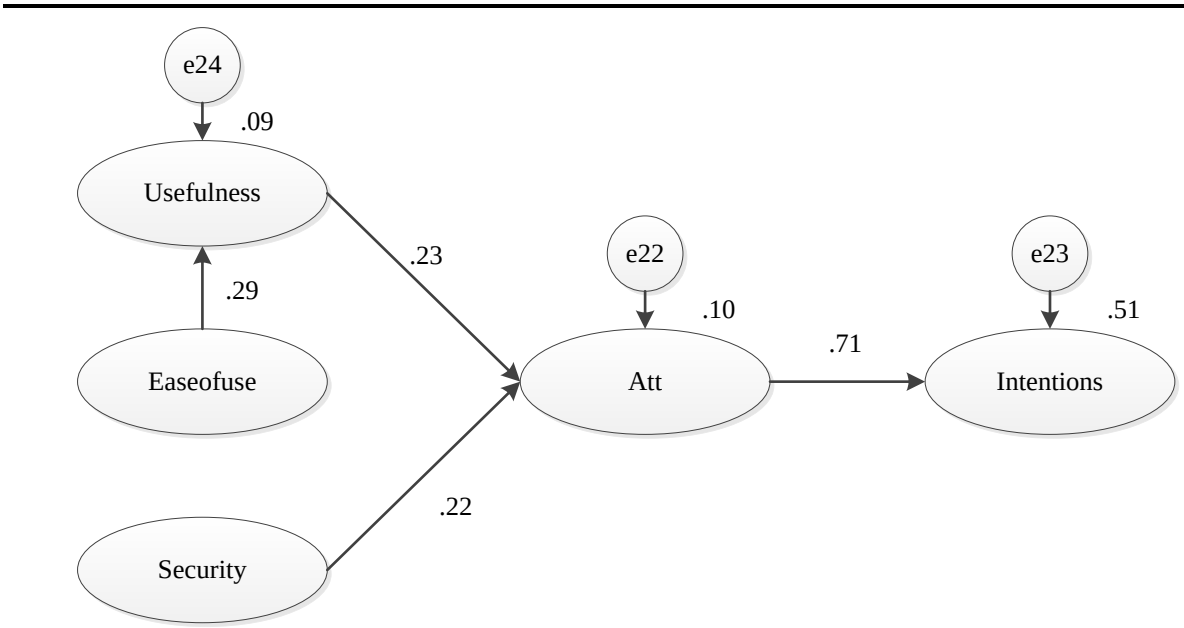


Figure 4.14: Structural model B

The results of the competing structural model (Structural Model B) confirmed the causal relationships among constructs derived from TAM, implying that it is suitable to adopt TAM in the m-payment context. Concerning model fit, the revised model, Structural Model B exhibits better fit than Model A, with all acceptable fit indices; chi-square=344.15 (df=201), χ^2/df = 1.712 (≤3.0), IFI=0.948 (≥0.90), TLI=0.943 (≥0.90), CFI=0.952 (≥0.90), NFI=0.911 (≥0.90), SRMR=0.048 (≤0.05), RMSEA=0.049. This means that after this modification, no additional improvements are justified for this study since all the model fit measures for Structural model B are optimal.

In order, to investigate the robustness of an `ultimate model', Jöreskog and Sörbom (1993:26) suggest a cross-validation procedure. Considering the relatively small sample size in this study, a sub-division of the sample would lead to an increased overall error and unstable results. To deal with this problem, Browne and Cudeck (1993:19) suggest the use of single sample cross-validation indices that reveal parsimony of the ultimate model, such as the AIC and the CAIC. The results on Table 4.11 reveal that the AIC and CAIC values of Structural Model B were smaller compared

with similar index values on the originally tested Structural model A. These findings additionally support the final model (Structural Model B) as the ultimate model for this study.

Table 4.11: Comparison of competing structural Models A and B

Measures	Recommended value	Model A	Model B
X^2	Low value	412.45	344.15
DF	Low value	201	201
$X^2_{/DF}$	$2.0 \leq \chi^2/df \leq 5.0$ is tolerable yet values less than 3.0 are ideal	2.052	1.712
NFI	≥0.90	**0.894**	0.911
IFI	≥0.90	0.912	0.948
TLI	≥0.90	0.931	0.943
CFI	≥0.90	**0.899**	0.952
SRMR	≤0.05	**0.059**	0.048
RMSEA	≤0.05	**0.051**	0.049
AIC	Small positive values	2040.042	2020.804
CAIC	Small positive values	2082.691	2025.194
Overall Decision		**Reject model**	**Accept as ultimate model for the study**

Under Structural Model B, ease of use (F2) was the only variable that was found to have a significant ($p<0.001$) and positive (path estimate=0.292, $p<0.001$) influence on usefulness (F1). In this study, ease of use was found being less important than usefulness in affecting consumer attitudes towards m-payment services. This finding is consistent with results in the IT system research literature (Davis *et al.,* 1989:989). The possible explanation is that only experienced m-payment users were included in this study and all of the respondents in this study had at least one year of experience in using m-payment services, indicating that most of them were already familiar with the operation. Another plausible reason for the insignificant results could be that the majority of the respondents in this research are males (59.10%). As such, the effects of ease of use on attitude generally declines as users become more familiar with the m-payment system. Therefore, in this case ease of use may not be the most important concern in terms of altering the attitudinal evaluations of South African users of m-payment services. These results are consistent with past studies such as those conducted by Shin and Lee (2014:1622) as well as Chandra *et al.* (2010:571). Therefore, the impact of ease of use on attitude is not as significant as usefulness since ease of use was found to have a direct positive effect on usefulness.

The level of explained variance provided for the significant path outcome between ease of use and usefulness as measured by the squared multiple correlation (SMC) coefficient value with

usefulness as the endogenous variable is 0.085, which indicates that ease of use explains at least 9 percent of the variance in South African consumers' perceptions of the usefulness of m-payment services.

Perceived usefulness of the m-payment system seems to play a pivotal role in the model since it affected attitudes towards system use. Figure 4.14 indicates that usefulness (F1) has a significant and positive (path estimate=0.230, $p<0.001$) influence on attitude (F4). This significant path relationship is supported by the findings of Li (2013:112) and Erasmus, Rothmann and Eeden (2015:9). The scholars attest that usefulness refers to the tendency that a customer will conduct m-payments, depending on the extent that they believe the system will assist to process tasks well. The inference in this hypothesis is that when consumers find m-payment services to be valuable and beneficial for their everyday needs then they are likely to develop positive cognitive and affective evaluations towards the payment solution. Therefore, since users pay great attention to the usefulness of m-payment systems, service providers should devote much effort to improving efficiency, effectiveness and the user-friendliness of their m-payment systems and should disseminate the benefits of using m-payment systems to keep their current users.

Security (F3) was also found to have a significant and positive (path estimate=0.220, $p<0.001$) influence on attitude (F4). This hypothesised relationship is consistent with the finding of Meharia (2012:104) as well as Wang and Idertsog's (2015:446) research on m-payments. This study established that South African consumers are interested in knowing that their billing information and details of financial transactions will be kept private and confidential by the merchants and service providers. In addition, the consumers' affinity for secure payments is further affirmed when m-payment service providers are mandated to request for clients' approval before processing a payment. With m-payment services being a new technology, consumers' perceptions of the security of this novel technology are an important determinant of ultimate adoption (Meharia 2012:102). Notwithstanding this, consumers view m-payments with a relatively high-loss potential in regards to abuse of their banking information details, identity verification and pin numbers.

Put together, the level of explained variance provided for the two significant outcomes as measured by the SMC coefficient value with attitude as an endogenous variable is 0.101, indicating that both usefulness and security explain 10 percent of the variance in South African consumers' attitude evaluations of m-payment services.

Attitude (F4) was found to have a significant and positive (path estimate=0.713, $p<0.001$) influence on intentions (F5). This hypothesised relationship is consistent with the studies of Choi

et al. (2014:226) and Kim *et al*. (2009:4). This research established that South African consumers that demonstrate positive attitudinal evaluations towards m-payment services are likely to be positively inclined towards conducting m-payment transactions in future encounters. The findings of this study contradict those of Erasmus *et al.* (2015:8) who found that attitude towards system use did not play an important role in affecting behavioural intentions to use enterprise resource systems. Although in their study, perceived usefulness of the information system strongly affected attitudes, the relation of attitudes to behavioural intention to use was insignificant. The discrepancy could be because their study was basd on an organisational system, rather than a commercialised B2C service such as is the case with m-payment. The level of explained variance provided for this significant path outcome as measured by the SMC coefficient value with intentions as an endogenous variable is 0.509, which indicates that attitude explains 51 percent of the variance in South African consumers' future intentions towards m-payment services.

4.11 SYNOPSIS

There is an abundance of the literature dealing with factors influencing m-payment acceptance. The findings of this study attempt to add to the body of knowledge by determining which of the identified factors are paramount towards the attitude evaluations and purchase decision making by South African consumers' to embrace m-payment services. The objective of this chapter was to report on the empirical findings of the study. The results from the pilot test revealed that the items on the measuring instrument had high internal-consistency reliability with Cronbach's alpha coefficient value falling above the recommended value of 0.70. Once the data was collected for the main survey, a preliminary data analysis procedure was conducted for the purpose of coding, cleaning and tabulating the data. This was followed by a discussion of the sample description, their choice of preferred m-payment services as well as the average amount of money spent on each m-payment transaction. Nonetheless, while the results from the sample were only meant to describe the characteristics of the participants used in this research, these results could not be used sufficiently to draw inferences as statistical significance values were not computed from them. As such, inferential statistical analytical techniques were applied to the data set.

The internal consistency reliability and initial construct validity of the factors used in this study were assessed by computing the Cronbach's alpha coefficient values, average inter-item correlation values as well as the corrected item-to-total correlation values. Drawing from this analysis, 5 items did not meet the required item-to-total correlation threshold of 0.30 and were sequentially deleted upon considering that their omission would help to increase the Cronbach's alpha coefficient values of their respective scales. In addition, computation of the descriptive

statistics revealed mean values above 3.0 on the five-point Likert scale, which suggests that South African consumers are influenced by the usefulness, ease of use and security of m-payment services. Moreover, they appear to have strong positive attitudinal evaluations and positive future intent towards m-payment services as reflected by the reported high mean values (above 3.0). Moreover, the Pearson's Product-Moment correlation analysis that was carried out ascertained that there were positive and significant relationships cross all pairs of constructs in this study.

Once it had been established that the proposed measurement model exhibited nomological validity as reported by the results of the correlation matrix, a measurement model comprising five latent factors was specified using AMOS (Version 23.0). Model fit indices and CFA was conducted to validate the measurement model. In addition, reliability of the measurement model was established by the computed Cronbach's alpha coefficient values and CR values, which were established above the 0.70 level. Construct validity of the measurement model was ascertained using factor loadings, AVE values, correlation coefficient values as well as SV values, thereby validating the statistical accuracy of the specified measurement model. Thereafter, a structural model was specified for the study, wherein the hypotheses were tested. Only one hypothesis from the original specified hypotheses could not be supported in this research thereby leading to the need to specify an alternative model, Structural model B, which was tested ad confirmed as the ultimate model for adoption in this research. It should be noted that the hypotheses put forward were proven correct and supported at the 0.01 level of significance.

The findings reported in this chapter offer interesting insight into the antecedents of m-payment acceptance and their influence on the future intentions of consumers towards m-payment solutions. These findings, together with the literature reviewed in Chapter 2 inform the conclusions and recommendations presented in the following chapter, Chapter 5. Moreover, the next chapter discusses the attainment of the research objectives, including the limitations and implications for further research.

CHAPTER 5
CONCLUSIONS AND RECOMMENDATIONS FOR THE STUDY

5.1 INTRODUCTION

The rapid adoption of mobile technology is facilitating the burgeoning commercialisation of mobile services (Mekovec & Hutinski 2012:1885). Drawing from this, a positive effect on the general economic growth of developed countries is witnessed. However, there is still very limited research conducted particularly with regard to emerging economies such as South Africa. Nevertheless, with the development of wireless and mobile technologies, m-payment transactions are likely to make a significant impact on the business landscape (Mishra 2014:1). This being said, m-payment solutions play an integral role as a driver of global investments for various markets such as banks, mobile network operators, m-payment service providers and merchants.

This study was envisioned at investigating the antecedents of m-payment service acceptance. Therefore, several essential contributing elements including usefulness, ease of use, security, attitude and future intentions were taken into account.

The previous chapter reported on the results and analysis of the empirical findings of this study. The objective of this final chapter is to furnish the reader with the understanding of how the research objectives that were formulated at the beginning of the study were actually achieved. Chapter 5 progresses to outline the significance of this research, drawing from the key findings. Additionally, this chapter puts forward several recommendations emanating from the findings and considers the limitation and implications for future research possibilities. This chapter closes by delivering concluding remarks.

5.2 ACHIEVEMENT OF THE RESEARCH OBJECTIVES

The objectives of the study formulated in Chapter 1 of this study were stated as follows:

5.2.1 Primary objective

The main purpose of this study was to determine the influence of selected antecedents of m-payment service acceptance and their relationship with attitude and future intentions.

5.2.2 Theoretical objectives

The following theoretical objectives were formulated at the beginning of the study (Section 1.4.2):

- to conduct a comprehensive literature review on m-payments.
- To review the literature on the growth and development of m-payments.
- to review the underlying theories that influence m-payment technology acceptance.
- to conduct a literature study on the determinants of m-payment technology acceptance.
- to theoretically establish the influence of perceived usefulness, perceived ease of use, perceived security and attitude on consumers' future intentions to use m-payment services.

In order to achieve the first theoretical objective**,** different textbooks, journal articles and other literature sources were useful in conducting a literature review on m-payments. This was achieved by conceptualising the definition of m-payment by aligning the perspectives from different scholars culminating in the development of an operational definition for this research in Section 2.2. Specific devices and applications used in m-payments were also discussed. Section 2.3 elaborated on the complex m-payment service provider frameworks while the m-payment formats were outlined in Section 2.4. To proceed in further achieving this objective, m-payment features as well as m-payment process were outlined in Section 2.5 and 2.6. This provided an in-depth understanding of what comprises m-payment and how it is operated.

The second theoretical objective intended to review the literature on the growth and development of m-payments. This was specifically addressed under section 2.7, where specialist media report were consulted regarding the widespread acceptance of m-payments across different markets. In this regard global mobile 3G subscription rates and penetration rates were analysed as the underlying indices providing evidence of m-payment development, globally. In addition, MPRI was also evaluated in this section, whereby South Africa was ranked in fourth place among its African counterparts. While the positioning of South Africa could be considered to be in the infancy phase of m-payment development, it was considered noteworthy to allude to the benefits of m-payments in Section 2.8 of this study. Moreover, the study did not shy away from discussing some possible challenge and constraints experienced by m-payment users in Section 2.9.

The third theoretical objective, which relates to various underlying theories that influence m-payment technology acceptance was addressed in Section 2.10 of this study. Different technology acceptance theories were examined including Rogers' diffusion of innovation theory, TRA, TPB and the UTAUT. However, this study adopted the TAM as the underlying theory as the TAM is considered concise enough to detail the external factors influencing m-payments, namely,

perceived usefulness, perceived ease of use on internal beliefs, attitudes and intentions of technology users (Davis *et al.*,1989:985).

The fourth theoretical objective that relates to conducting a literature study on the antecedents of m-payment technology acceptance was achieved on Section 2.11 and Section 2.12 of this study. It was discovered that usefulness and ease of use are the essential factors that exert a fundamental influence on consumer attitude and ultimately, intentions towards using technological innovations (Davis 1989:321). Additionally, security was identified as a prominent factor, which poses an indelible influence towards the acceptance of m-payments by consumers.

The fifth theoretical objective sought to theoretically establish the influence of perceived usefulness, perceived ease of use, perceived security and attitude on consumers' future intentions to use m-payment services. In this vein, Section 2.13 provided a thorough discussion of the hypotheses and conceptual model that was developed and tested in this study.

5.2.3 Empirical objectives

This study set out to test the determinants of the consumer acceptance of m-payment services. Therefore, the empirical objectives listed below were drawn from the primary objective of this study and were directly translated towards the formulation of the research model, SEM analysis and eventual hypotheses testing. The research model was developed from earlier research and was tested using several hypotheses after specifying the antecedents in the acceptance of m-payments. In this study, six empirical objectives were formulated and their achievement is elaborated on next.

- **To determine the perceived usefulness of m-payment services**

The first empirical objective aimed to determine the perceived usefulness of m-payment services. In order to achieve this objective, a reliability analysis procedure was conducted (Section 4.5) in order to ascertain the internal consistency of the usefulness variable. In addition, descriptive analysis (Section 4.6) was conducted on the empirical data set whereby mean values greater than 3.0 suggested that the consumers' are in agreement that usefulness is an important aspect in m-payment acceptance. On the other hand, the correlation analysis results reported on Section 4.7 indicate that usefulness has a positive and significant correlation with related constructs, such as perceived ease of use (r=0.304; p<0.001), security (r=0.197; p<0.001), attitude (r=0.256; p<0.001) and future intentions (r=0.264; p<0.001). The results of the CFA and measurement model presented in Section 4.8 further corroborate the sufficiency of usefulness as a pertinent construct in the model of m-payment acceptance.

- **To determine the perceived ease of using m-payment services**

The second empirical objective aimed to determine the perceived ease of using m-payment services. In order to achieve this objective, a reliability analysis procedure was conducted (Section 4.5) in order to ascertain the internal consistency of the ease of use variable. In addition, mean values ranging between 3.943 and 4.211 were reported along the ease of use variable on the descriptive statistical analysis (Section 4.6). This result indirectly supported the level of agreement by m-payment users that ease of use is a salient variable that cannot be underestimated in m-payment acceptance research. Furthermore, the correlation analysis results reported on Section 4.7 indicate the existence of positive and significant correlation relationships between ease of use and security (r=0.494; p<0.001), usefulness (r=0.304; p<0.001), attitude (r=0.230; p<0.001) and future intentions (r=0.142; p<0.001). The results of the CFA and measurement model presented in Section 4.8 further corroborate the sufficiency of ease of use as a pertinent construct comprising four indicators in the model of m-payment acceptance.

- **To determine the perceived security of using m-payment services**

The third empirical objective aimed to determine the perceived security of using m-payment services. The reported reliability analysis results (Section 4.5) as well as the descriptive analysis results (Section 4.6) ascertained the internal consistency of the security variable as it was confirmed by the sample of m-payment users. In addition, mean values greater than 3.0 along the security variable suggested that the consumers' are in agreement that their perceptions of security are an important aspect in m-payment acceptance. On the other hand, the correlation analysis results reported on Section 4.7 indicate that security reported weak to moderate, yet positive and significant correlations with related constructs. Moreover, the results of the CFA and measurement model presented in Section 4.8 validated the sufficiency of security as a pertinent construct in the model of m-payment acceptance.

- **To determine consumers' attitude towards using m-payment services**

The fourth empirical objective aimed to determine consumers' attitude towards using m-payment services. In order to achieve this objective, a reliability analysis procedure was conducted (Section 4.5) with a view to ascertain the internal consistency of items within the attitude variable. In addition, descriptive analysis (Section 4.6) was conducted on the empirical data set whereby mean values greater than 3.0 suggested that the consumers' are in agreement that attitude is an important moderator towards m-payment acceptance. Interestingly, attitude reported the strongest, positive correlation result when correlated against future intentions (r=0.689; p<0.001) in Section 4.7 of this study. Furthermore, in keeping with the achievement of this objective, the first step in the

SEM analysis reported the CFA and measurement model results in Section 4.8 whereby attitude was validated as a five-indicator based construct based on factor loadings greater than 0.70. The statistical accuracy checks on reliability and validity (Section 4.8.3) of this construct further corroborated the sufficiency of attitude as a pertinent construct in the model of m-payment acceptance.

- **To determine consumers' intentions towards using m-payments in the future**

The fifth empirical objective aimed to determine consumers' future intentions towards using m-payments. In order to achieve this objective, a reliability analysis procedure was conducted (Section 4.5) in order to ascertain the internal consistency of the future intentions variable. In addition, descriptive analysis (Section 4.6) was conducted on the empirical data set whereby mean values ranging between 4.501 and 4.614 suggested that the consumers' were in agreement that future intentions is an important aspect in the usage of m-payments in the long-run. On the other hand, the correlation analysis results reported on Section 4.7 indicate that future intentions have a positive and significant correlation with related constructs such as perceived usefulness (r=0.264; p<0.001), ease of use (r=0.142; p<0.001), security (r=0.161; p<0.001) and attitude (r=0.689; p<0.001). The results of the CFA and measurement model presented in Section 4.8 further corroborate the sufficiency of future intentions as a pertinent construct in the model of m-payment acceptance among South African consumers.

- **To test, empirically a structural model of usefulness, ease of use, security and attitude as antecedents of future intentions to use m-payment services.**

The sixth empirical objective aimed to test empirically, a structural model of usefulness, ease of use, security and attitude as antecedents of future intentions to use m-payment services. This was achieved by successfully applying the two-step approach in SEM analysis whereby the measurement model was analysed first, in Section 4.8. The measurement model demonstrated satisfactory fit indices, composite reliability and construct validity, thereby inferring that the model is a five-factor structure as originally postulated in Section 2.13 of this study. This implied that the hypothesis H_o1 should be rejected, while H_a1 is concluded in this study.

Having established that the specified model was suitable for path analysis, the initial structural model (Structural model A) was specified in Section 4.9, which was then rejected on the basis of inadequate model-fit and weak path coefficient results. Structural model A revealed that usefulness has a positive influence on attitude (path estimate=0.214; p<0.001) leading to the decision to reject H_o2 and conclude the alternative, H_a2 instead. However, in the case of the path between ease of use and attitude (path estimate=0.103; p=0.232) an insignificant result was

established. This meant that there was insufficient evidence in the sample data to reject H_o3. Therefore, the alternative hypothesis (H_a3) could not be concluded in this instance. An analysis of Structural model A further revealed that security has a positive influence on attitude (path estimate=0.176; $p<0.001$) leading to the decision to reject H_o4 and conclude H_a4 instead. In the case of the path between attitude and future intentions, Structural model A revealed that attitude has a positive influence on future intentions (path estimate=0.710; $p<0.001$) leading to the decision to reject H_o5 while H_a5 is concluded.

The results of Structural Model A led to the null hypotheses H_o2, H_o4 and H_o5 being rejected and their alternatives being concluded. However, the relationships between ease of use and attitude was not significant and therefore, alternative hypothesis H_a3 could not be supported in this study leading to the need to specify a subsequent competing model (Structural Model B), which was introduced and found valid and acceptable in Section 4.10 of this study.

The results of Structural Model B led to the decision to accept the competing model as the ultimate model for this research since the model presents complete evidence of path weights that are greater than 0.20, which Chin (1998:13) interprets as evidence for significant path outcomes. In addition, the path coefficients for Structural model B were much higher and significant across all the tested hypotheses. In particular, the three paths between usefulness and attitude (path estimate=0.23; $p<0.001$), security and attitude (path estimate=0.22, $p<0.001$) as well as attitude and future intentions (path estimate=0.71; $p<0.001$) were confirmed. However, the path between ease of use and attitude was altered since it was not found to be significant under Structural model A. Instead, under Structural Model B, perceived usefulness is used as both a dependent and an independent variable since it is predicted by perceived ease of use (path estimate=0.29; $p<0.001$) and in turn predicts attitude towards using and behavioural intention to use simultaneously (Davis *et al.*, 1989:986). As such, an enhanced perceived ease of use contributes to better performance, thus having a direct influence on perceived usefulness.

In Structural Model B, ease of use explains 9 percent ($R^2=0.09$) of South African consumers' perceptions of the usefulness of m-payment services. In addition, both usefulness and security explain 10 percent ($R^2=0.10$) of consumer attitude, while attitude itself contributes approximately 51 percent ($R^2=0.51$) of consumers' future intentions towards using m-payments.

The findings from Structural Model B suggest that consumers' perceptions of the ease of using m-payment services positively influences the usefulness of the payment solutions to South African consumers. In turn, those m-payment services that are considered to be useful and beneficial will undoubtedly influence the attitude evaluations of South African consumers in a positive manner.

In addition, evidence of functional security systems along m-payment solutions will positively influence consumers' attitude towards m-payment services while the latter, influences consumers' future intentions towards m-payment services in a positive way.

5.3 SIGNIFICANCE OF THE STUDY

This study makes a small contribution towards the larger body of knowledge exploring m-payment acceptance across different markets. In terms of theory, the significance of this study lies in the utilisation of theories and frameworks from technology adoption and behavioural intentions, in particular Davis's (1989) TAM. Hence, the study built upon previous research. However, the results of this study could be relevant to businesses, consumers and researchers.

As a contribution to the broader technology acceptance debate, the current study provides the leverage to understand the antecedents of m-payment acceptance and offers insights into strategy formulation for marketers that operate in today's open and fragmented markets. In particular, the model that was empirically tested in this research depicts the causal relationships between South African consumers' predispositions (usefulness, ease of use and security) with attitude and future behavioural intent towards m-payment services. Based on the findings, it is inferred that m-payment acceptance is a five-variable based model that denotes that consumers'perceptions of m-payments usefulness, ease of use and security are responsible for predicting attitudinal change among consumers, whereas the latter positively influences future intentions. This notion is fully supported by the literature reviewed in Chapter 2 that signals the growth and development of mobile phones as a payment instrument in South Africa.

5.4 RECOMMENDATIONS FOR THE STUDY

Based on the analysis of the literature and more specifically on the findings of the empirical research the following recommendations are put forward:

5.4.1 Emphasise usability of m-payment services

M-payment technology represents the future of online commerce because it meets a fundamental consumer need to transact simply, safely and quickly. Not only are today's digital consumers seeking easier, more secure payment options on their mobile devices, they have proven willing to seek out and favour brands that provide seamless payment experiences. Amazon's recent online success and the positive impact of a one-click payment, as well as the success of Starbucks' partnership with Square are evidence of this trend. Therefore, a prudent mix of technologies incorporating features that run seamlessly in a manner that is compatible with the lifestyles of

consumers could be the best opportunity of clocking m-payment growth rates of over 200 percent in 2017. Service providers are urged to develop one-stop digital wallet solutions emanating from collaborations with merchants. Similar models such as Google Wallet and Square Wallet are applauded for making inroads in this regard.

5.4.2 Emphasise user-friendly elements along m-payments

Implementing user-friendly m-payment solutions could assist consumers to understand the processes involved in conducting transactions using mobile phones. Generally, consumers that opt for m-payments lead a busy lifestyle and therefore they need a system that could save them time and effort. In order to satisfy this need, service providers could introduce an m-payment system that requires a limited number of entries and steps before getting to the completion of a transaction. In addition, auto-completed form fields could assist in ensuring that consumers do not have to re-enter their information every time they conduct a m-payment transaction.

5.4.3 Prioritise security features on m-payments

Security concerns such as identity theft and data-breach seem to be some of the contributing factors toward the non-acceptance of m-payment (Lin 2011:256). This means that service providers need to create an assuring environment that addresses consumers' concerns and fears (Yousafzai *et al.*, 2009:595). Therefore, in attempting to eliminate consumers' fears and concerns, service providers may adopt the use of biometric identifiers. Biometric technology allows for the use of physical characteristics such as facial features, fingerprints, or iris scans. Once consumers' biometric information is securely stored in a database, service providers are able to match the consumers' legitimate identity against that of anyone who might try to impersonate them. It is also worth noting that the challenge with security is not only security deficiency from the technological point of view but rather a security concern as it is perceived by consumers (Liu & Zhuo 2012:34).

5.4.4 Promote policies that encourage m-payment development

Government could play a significant role in nurturing the development of the country's m-payment systems through the implementation of policies that promote opportunities for facilitation, interaction and investment in m-payment technologies. Additionally, South Africa could introduce a clear legal and regulatory framework that is flexible enough to create a conducive environment for enhanced innovation by different players within the m-payment sector. Similar concepts such as the Anti-Money Laundering and Combating the Financing of Terrorism (AML/CFT), which have been applied within the banking industry could be re-modelled thoroughly and aligned to govern the operations of m-payment service providers.

5.4.5 Re-define value propositions according to segmented cohorts of m-payment users

Marketing organisations need to re-define their position among their customers by focusing on the elements of usability, user-friendliness and security in order to boost sales and payments achieved through mobile phones and related instruments as they have been positioned as the fastest and most efficient payment instrument for bother users and service providers. Although in the present study future intentions towards conducting m-payments has been moderated by attitude, which is an internal moderating variable, it is advisable to consider the external influential variables that modify the consumer environment during technology acceptance since their behaviour will depend on this. As such, this study recommends that marketing organisations segment their customer groups based on the level of experience with m-payments (e.g. no experience, moderate experience and heavy experience) and thereby provide differentiaed value propositions that deliver usability, security and user-friendly features on m-payment platforms in accordance with the consumers' affinity towards the related services. In this way, strategies could be developed targeting the specific consumer cohorts. There is also the opportunity, quite promising, to focus the work with the same model proposed on the segment of individuals without banking accounts for comparison.

5.5 LIMITATIONS AND IMPLICATIONS FOR FUTURE RESEARCH

Although the present study offers valuable insights pertaining to the antecedents of m-payment acceptance among South African consumers, it is prone to limitations that offer avenues for future research. First, this study placed emphasis on Davis's (1989) TAM as a foundation, consistent with previous researches in technology acceptance. While this was a movement toward a better understanding of consumers' perceptions regarding m-payments in South Africa, the relevance of the theory is limited to the initial stages of technology adoption. In other words, the scale applied in this dissertation can be used during the initial phases when a technology is introduced to the market and is relatively unknown. However, other contemporary theories that emphasise post-adoption and continuance intentions should be considered with a view to assess the long-term effectiveness of m-payments.

Secondly, owing to the inability to obtain an accurate sampling frame, a non-probability sampling procedure was utilised in this research. In particular, the snowball sampling technique was used to identify the relevant target population elements for this research. The study also employed a self-reporting method of data collection that involved the use of questionnaires. This increased the

chances of the study being susceptible to contamination through sampling and social desirability bias. This is because there is an undiscounted possibility that the snowballed respondents might have communicated with each other about the survey. Therefore, caution needs to be exercised when interpreting the study's findings since snowball samples generally suffer from in-breeding. Future research efforts could employ probability sampling procedure and multiple data collection methods to enhance the external validity of the findings.

Thirdly, data collection for this research was conducted over a 3-months period on a single-cross-section of 474 respondents. With the concern for rapid changes in South Africa's economic growth and development, the result may only represent respondents' present perceptions and not those for the near future. In addition to or instead of adoption intention, the concept of acceptance should be elaborated to better represent real-life payment scenarios. In particular, the use of m-payment services is often one option among many. Choices that include the variance for payments at the points of sale in stores, shops, kiosks and NFC technologies can be investigated more thoroughly. Data collection should be done at different points of time to capture events such as rush hours and quiet hours and long to short queues at the points of sale. Future longitudinal researches could be conducted to monitor the development of m-payments over time.

The theoretical basis of this research can be extended by looking at the psychology of payments, behavioural and mental action theories, economic theories involving theories of money, the history of payment instrument usage in South Africa and the pricing of payment instruments. Practitioners and researchers will benefit from a framework, in which payment instruments with their attributes and payment scenarios with their attributes are integrated. Finally, the most important recommendation is to investigate the simultaneous adoption of m-payments by several groups, termed 'multi-sided adoption research' where researchers in eco-systems and technology adoption can work together to complement one another's views.

5.6 CONCLUDING REMARKS

This study and its recommendations do not only support the technological innovation of m-payment in South Africa, but could also play a significant role in understanding the factors to consider in the dispensation of m-payment globally and most importantly in developing countries. The conclusion drawn from this study is that from a consumer perspective, the demand for m-payment services will rise, particularly in South Africa. In this vein, the anticipated tipping point

will be reached when mobile payment service providers are inclusive in serving the needs of their markets. Therefore, any m-payment platform should seek to adapt and exceed consumers' needs and expectations at a localised level, while continuing to serve as a precedent for future m-payment development projects.

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APPENDIX A - QUESTIONNAIRE

SELECTED ANTECEDENTS TOWARDS THE ACCEPTANCE OF M-PAYMENT SERVICES AND THE RELATIONSHIP WITH ATTITUDE AND FUTURE INTENTIONS

Dear participant

I am currently working towards completing my dissertation as part of the requirements for completing the Masters Degree in Marketing at the Vaal University of Technology (Vanderbijlpark Campus) under the supervision of Dr. Dlodlo. The purpose of my study is to establish the influence of selected antecedents towards the acceptance of m-payment services. As such, the study aims to ascertain consumers' attitude and future intentions towards making any mobile based payment transactions. The study therefore, categorically alludes to existing users of m-payment services in South Africa.

Consumers who have previously completed an assortment of payment transactions in 2016 by using their mobile phone are encouraged to participate in this study, as their contributions are considered valuable for the completion of this work. Kindly assist by completing the attached questionnaire. The questionnaire is user-friendly and should take, approximately 10 minutes to complete. All responses are confidential and the results will only be used for research purposes, outlined in the form of statistical data.

Thank you – your assistance and contribution is highly appreciated.

Isaac Makokoe (makokoe614@webmail.co.za / tel: 011 480 6376)

Department of Marketing

Vaal University of Technology (Vanderbijlpark Campus)

SECTION A: DEMOGRAPHIC AND M-PAYMENT USAGE INFORMATION
Please answer the questions in this Section by crossing the relevant answer box with (X).

A1	**Gender:**	Male	Female

A2	**Age:**	18-20 years	21-30 years	31-40 years	41-50 years	Over 50 years

A3	**Ethnicity:**	Black African	Coloured	Indian/Asian	White
	Other (Please specify)				

A4	**Please indicate your mother tongue:**			Afrikaans	English
	IsiNdebele	IsiXhosa	IsiZulu	SePedi	SeSotho
	SeTswana	SiSwati	Tshivenda	XiTsonga	Other

A5	**Marital status:**	Single/Never been married	Married	Separated	Divorced	Widowed
	Other (specify):					

A6	**Please indicate your highest qualification:**		
	Grade 12 / Matric	Diploma	Degree
	Masters/PhD	Other (specify):	

A7	**Please indicate your monthly income (before tax):**				
	Less than R5000	R5000 – R10 000	R10 001 – R20 000	R20 001 – R30 000	Above R30 000

A8	**Have you completed a m-payment transaction within the past 12 months?**	Yes	No

A9	**How many times do you make m-payment transactions on average per year?**				
	Once a year (annually)	At least twice a year (bi-annually)	At least four times a year (quarterly)	At least 12 times a year (monthly)	At least 52 times a year (weekly)

A10	**What is the average expenditure amount that you spend on a single m-payment transaction?**			
	Less than R300	R301 – R600	R601 – R1000	More than R1000

A11	**Which m-payment service have you used in the past 12 months?**				
	Money transfers	Prepaid purchases	Mobile application payments	Bank deposits and payments	Other (Please specify)…….

A12	**Which is your most preferred m-payment service?**				
	Money transfers	Prepaid purchases	Mobile application payments	Bank deposits and payments	Other (Please specify)…….

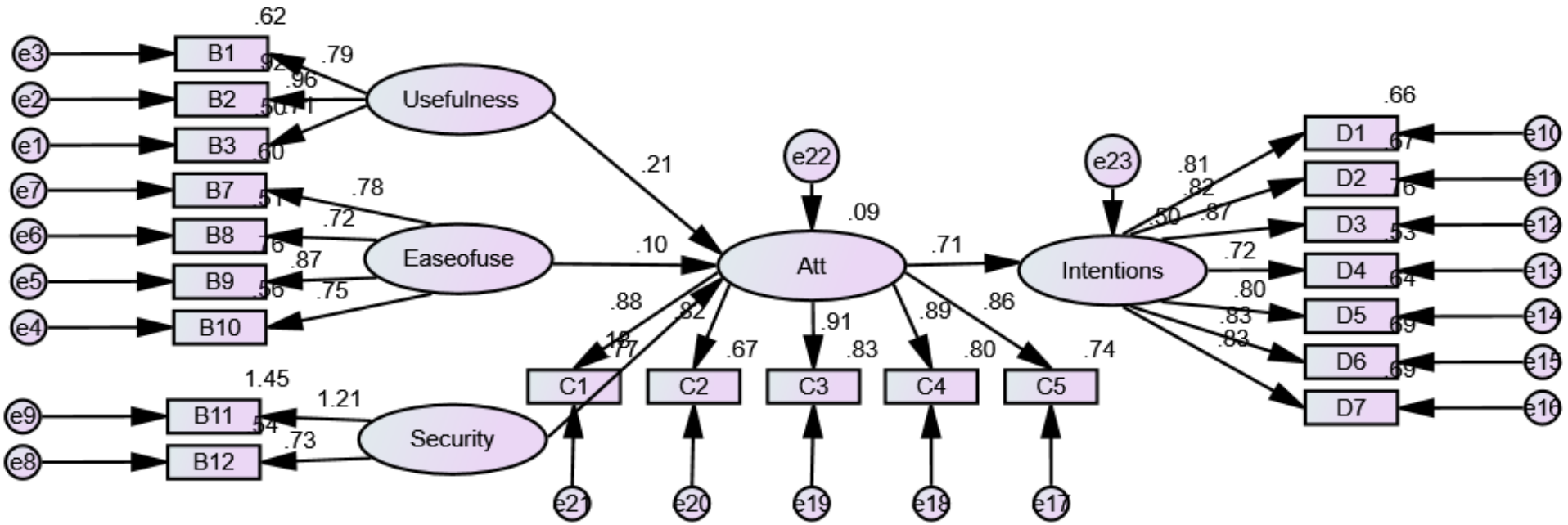
SECTION B: CONSUMERS' PERCEPTIONS OF M-PAYMENT ACCEPTANCE								
The purpose of this section is to measure your perceptions regarding m-payment services. The scale is anchored along; Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4) and Strongly Agree (5). Please indicate to what extent you agree/disagree with each statement by crossing the relevant answer box with (X).								
B1	Using m-payment services makes it easier for me to pay	Strongly disagree	1	2	3	4	5	Strongly agree
B2	Using m-payment services makes it easier for me to conduct transactions	Strongly disagree	1	2	3	4	5	Strongly agree
B3	I find m-payment a useful possibility for paying	Strongly disagree	1	2	3	4	5	Strongly agree
B4*	By using m-payment services, my flexibility is improved	Strongly disagree	1	2	3	4	5	Strongly agree
B5*	By using m-payment services, my transacting speed is improved	Strongly disagree	1	2	3	4	5	Strongly agree
B6*	Using m-payment services is easy for me	Strongly disagree	1	2	3	4	5	Strongly agree
B7	It is easy to perform financial transactions using m-payment	Strongly disagree	1	2	3	4	5	Strongly agree
B8	Using m-payment services does not require mental effort	Strongly disagree	1	2	3	4	5	Strongly agree
B9	It is easy to perform the steps required to conduct m-payment transactions	Strongly disagree	1	2	3	4	5	Strongly agree
B10	Overall, I believe that m-payment is easy to use	Strongly disagree	1	2	3	4	5	Strongly agree
B11	While conducting a m-payment, the security system confirms my identity before disclosing account information	Strongly disagree	1	2	3	4	5	Strongly agree
B12	While conducting a m-payment, the security system requests my approval before processing transactions	Strongly disagree	1	2	3	4	5	Strongly agree
B13*	My user information is not abused during the m-payment transaction (payment amount, names, contact details etc.)	Strongly disagree	1	2	3	4	5	Strongly agree
B14*	My billing information is not abused during the m-payment transaction (credit card number, CVV number, bank account data etc.)	Strongly disagree	1	2	3	4	5	Strongly agree

SECTION C: CONSUMERS' ATTITUDE TOWARDS M-PAYMENT SERVICES								
The purpose of this section is to measure your attitude evaluations towards m-payment services. The scale is anchored along; Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4) and Strongly Agree (5). Please indicate to what extent you agree/disagree with each statement by crossing the relevant answer box with (X).								
C1	Using m-payment services is a good idea to me	Strongly disagree	1	2	3	4	5	Strongly agree
C2	Using m-payment services is wise	Strongly disagree	1	2	3	4	5	Strongly agree
C3	Using m-payment services is beneficial to me	Strongly disagree	1	2	3	4	5	Strongly agree
C4	Using m-payment services is pleasant to me	Strongly disagree	1	2	3	4	5	Strongly agree
C5	Using m-payment services is interesting to me	Strongly disagree	1	2	3	4	5	Strongly agree
SECTION D: CONSUMERS' FUTURE INTENTIONS TOWARDS M-PAYMENT SERVICES								
The purpose of this section is to measure your future intentions towards using m-payment services. The scale is anchored along; Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4) and Strongly Agree (5). Please indicate to what extent you agree/disagree with each statement by crossing the relevant answer box with (X).								
D1	Assuming that I could use a m-payment procedure, I intend to use it	Strongly disagree	1	2	3	4	5	Strongly agree
D2	Given that I could use a m-payment procedure, I predict that I would use it	Strongly disagree	1	2	3	4	5	Strongly agree
D3	I plan to conduct m-payment in the future	Strongly disagree	1	2	3	4	5	Strongly agree
D4	I am very likely to conduct m-payments in the near future	Strongly disagree	1	2	3	4	5	Strongly agree
D5	I think I will conduct m-payments instead of an alternative payment method	Strongly disagree	1	2	3	4	5	Strongly agree
D6	I think I will encourage my friends and relatives to conduct m-payments	Strongly disagree	1	2	3	4	5	Strongly agree
D7	I believe it is worthwhile for me to conduct m-payments	Strongly disagree	1	2	3	4	5	Strongly agree

Thank you for your time and co-operation

NB: *Items B4, B5, B6, B13 and B14 were deleted and excluded from the SEM analysis

APPENDIX B – STRUCTURAL MODEL A


.62
e3
B1
.79
Usefulness
e2
B2
.96
e1
B3
.60
e7
B7
.78
e6
B8
.72
Easeofuse
e5
B9
.87
.75
e4
B10
.21
e22
.09
.10
Att
.71
e23
.81
.82
.87
.72
.80
.83
.83
Intentions
.66
D1
D2
D3
D4
D5
D6
D7
e10
e11
e12
e13
e14
e15
e16
.88
.82
.91
.89
.86
.67
.83
.80
.74
C1
C2
C3
C4
C5
1.45
1.21
e9
B11
e8
B12
.73
Security
e21
e20
e19
e18
e17

Structural model A

Model Fit Summary (Structural model A)

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	73	412.45	201	.000	2.052
Saturated model	252	.000	0		
Independence model	42	9161.911	210	.000	43.628

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.894	.900	.912	.931	.899
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.852	.687	.701
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Default model	1594.818	1463.472	1733.580
Saturated model	.000	.000	.000
Independence model	8951.911	8642.009	9268.139

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	3.750	3.372	3.094	3.665
Saturated model	.000	.000	.000	.000
Independence model	19.370	18.926	18.271	19.594

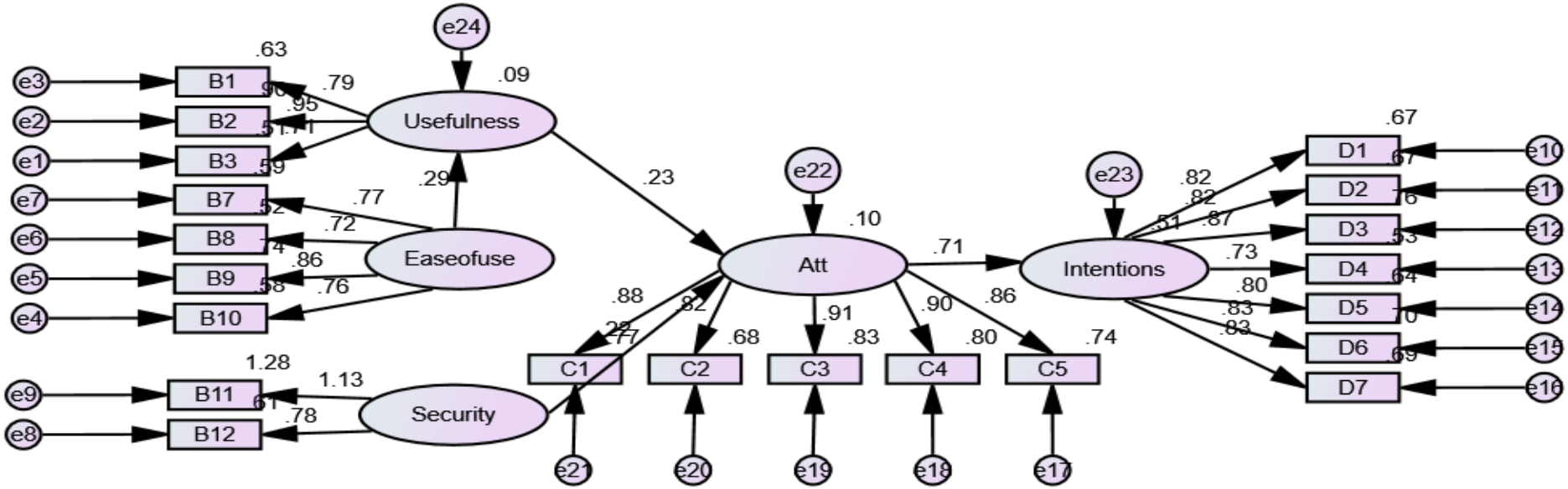
RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.051	.059	.143	.059
Independence model	.300	.295	.305	.059

AIC

Model	AIC	BCC	BIC	CAIC
Default model	2040.042	2282.691		
Saturated model	504.000	528.585		
Independence model	9245.911	9250.008		

APPENDIX C – STRUCTURAL MODEL B


e24
.63
e3
B1
.79
.09
Usefulness
e2
B2
.95
e1
B3
e7
B7
.77
.29
.23
e22
.10
e23
.82
.67
D1
e10
e6
B8
.72
Easeofuse
Att
.71
Intentions
.82
.87
D2
e11
e5
B9
.86
.73
D3
e12
e4
B10
.76
.88
.82
.91
.90
.86
.80
D4
e13
.83
D5
e14
.83
D6
e15
1.28
1.13
e9
B11
.78
Security
C1
C2
.68
C3
.83
C4
.80
C5
.74
D7
e16
e8
B12
e21
e20
e19
e18
e17

Structural Model B

Model Fit Summary

CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	73	344.15	201	.000	1.712
Saturated model	252	.000	0		
Independence model	42	9161.911	210	.000	43.628

Baseline Comparisons

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.911	.904	.948	.943	.952
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Parsimony-Adjusted Measures

Model	PRATIO	PNFI	PCFI
Default model	.852	.887	.801
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

NCP

Model	NCP	LO 90	HI 90
Default model	1594.818	1463.472	1733.580
Saturated model	.000	.000	.000
Independence model	8951.911	8642.009	9268.139

FMIN

Model	FMIN	F0	LO 90	HI 90
Default model	3.750	3.372	3.094	3.665
Saturated model	.000	.000	.000	.000
Independence model	19.370	18.926	18.271	19.594

RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.049	.048	.143	.063
Independence model	.300	.295	.305	.061

AIC

Model	AIC	BCC	BIC	CAIC
Default model	2020.804	2025.194		
Saturated model	504.000	528.585		
Independence model	9245.911	9250.008		