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University of the Witwatersrand

School of Economic and Business Sciences

Mobile Point of Sale Adoption by Small Medium Enterprise Merchants in South Africa

Research Report: MCom (Coursework) INFO7012

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Ethics Protocol Number: CINFO/1128

Submission Date: 15 September 2017

Declaration of Originality

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Thank you.

Dedications

This is dedicated to my father and mother Norman and Joyce Nyawo, who love studying but did not have the opportunity to study further their life. They worked very hard to ensure that all their children had the opportunity to go to school and follow their dreams.

Abstract

The purpose of this study was to identify and test the factors that affect mobile Point of Sale (mPOS) adoption in Johannesburg, South Africa. The adoption of mPOS technology by merchants has not been as widespread compared to developed countries, which begs the question as to what is hindering the adoption in this context.

By using a positivist approach, the study tested adoption factors using the Technology-Organisational-Environment (TOE) framework. The framework looked at seven adoption factors that could potentially influence merchant level adoption of mPOS in Johannesburg, South Africa by Small Medium Enterprises. This relational study used researcher administered face-to-face questionnaires to collect data from one hundred SMEs based in Johannesburg, South Africa. Results of this study were used to answer the question as to what the adoption factors are and the extent to which these factors have affected mPOS adoption in Johannesburg, South Africa.

The results of the study showed that, mPOS technology has not been widely adopted by SMEs in Johannesburg. The study also revealed that of the seven adoption factors that were anticipated to affect mPOS adoption, perceived value proposition and size of the firm had a significant impact on mPOS adoption. Furthermore, the study also uncovered significant associations between perceived value proposition, perceived competition, industry regulation and perceived security.

Keywords: mPOS adoption; merchant adoption; Technology Organisation Framework (TOE) framework; mobile payments; Small Medium Enterprises (SME)

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1. Chapter 1: Introduction

1.1. Background

1.1.1. Payments Evolution

The payments landscape in Africa has evolved and developed into a mobile integrated payments landscape that is driven and facilitated by mobile technology (Stepcic & Kabanda 2016). As mobile technology adoption spreads throughout the African continent, firms are considering innovative ways to leverage off this technology. Payments in Africa remain largely cash driven (Kshetri & Acharya 2012; FinScope 2014), however, the last five years has seen a substantial increase in the use of mobile payments technologies by firms (Maduku, Mpinganjira & Dhu 2016). South Africa, like the rest of the world, is a cash driven economy that still relies heavily on cash to fulfil financial transactions. This statistic is slowly evolving as the use of mobile technology to make payments is increasing. Statistics in Europe show that the value of mobile payments are ever growing (Meijer & Bye 2011; Mallat & Tuunainen 2014). This highlights the confidence that the market has for the technology and this perceived business value, that mobile payments technology should provide, has contributed to the rapid investment in the technology. A Mobile Point of Sale (mPOS) is a merchant mobile payment solution that uses a hand-held card reader linked to a smartphone (see *Figure 1*) or tablet to perform a financial transaction (Mallat & Tuunainen 2008; Au & Kauffman 2008; Dahlberg, Guo & Ondrus 2015; Liu, Kauffman & Dan 2015). From a Southern African Development Community (SADC) perspective, South Africa has 14000 Point of Sale (POS) devices per million people compared to the second ranked country, Mauritius, which has 4000 POS devices per million people (Gillis & Pillay 2012). South Africa is by far the most advanced and best positioned to make use of mPOS technology given the current use and deployment of traditional POS technology in Africa (Flood, West & Wheadon 2013; Barrett, Davidson, Prabhu & Vargo 2015).

The evolution of payments and the increased dominance of the use of mobile technologies has been prevalent given some of the inherent properties of the technology. Mobile phones (particularly smartphones) have provided universality and standardisation (Tacchi 2008). This standardisation is important to facilitate inter-operability across multiple payments service providers. Mobile phones are also well equipped from a security perspective and are better suited to facilitate financial transactions than traditional payment mechanisms (Staykova & Damsgaard 2015). Given the stringent security requirements in order to complete a financial transaction on a device, smartphones need to be equipped with the necessary hardware elements (Dahlberg, Mallat, Ondrus & Zmijewska 2008). Smartphones can access multiple communication streams during transaction processing. This ability to facilitate two-way communication is important as the device can receive parameters and/or complete financial transactions. These properties have arguably supported the transformation and evolution of the smartphone into a fully functional mobile transactional device.

Given the statistics that show the growth of smartphone use and increased mobile payments penetration, mPOS technology would seem poised to be readily adopted. However, there are some challenges faced by mobile payments that need to be overcome for the payments evolution to be complete. The payments ecosystem is complex as there are numerous role players, for example, network operators, device manufacturers and application and solution providers (Hedman & Henningsson 2015). Given the lucrative nature of the ecosystem, there is still lack of clarity and governance regarding the payment model. This lack of clarity impacts the ability of the

technology to mature quickly as there are continuous debates regarding revenue sharing which hinders the technology to progress. Given the complexity of the ecosystem, there is a negotiation cost of the parties involved as they need to agree on standards and specifications to make the ecosystem work. Most firms have invested significantly in their payments infrastructure, that potentially could be integrated into their Line of Business (LOB) applications i.e. accounting applications (Crowe, Rysman & Stavins 2010). Integration into LOB is important as it helps firms streamline their business operation and realise IT efficiencies. The mobile payments technology has required additional capital investment which has had an impact on the evolution of the mobile payments. However, once these mobile payments 'rail-ways' or foundation are in place, evolution and adoption to mobile technologies like mPOS should be easier.



Figure 1: mPOS image (Mosambee 2016)

1.1.2. SME Overview

The South African Small Business Act 102 of 1996 classifies firms into four categories namely; micro enterprises, very small enterprises, small enterprises and medium enterprises (Smit & Watkins 2012). The main differentiator across the various classifications is the number of employees. According to the National Small Business Act of South Africa, a small firm is one that usually employs not more than 50 full-time paid employees (Acts Online 2015), and a medium enterprise employs between 51 to 200 employees (ACTS Online 2015). From a turnover perspective a SMEs annual turnover lies between two million rand to ten million rand per annum. SMEs are important to any economy as they form a critical role by providing employment of part of the work force. In South Africa, SMEs are estimated to make up 91% of the formal business entities and they contribute between 52% and 57% to GDP, and provide 61% employment (Abor & Quartey 2010). SMEs also contributed 8.5% of total investment by firms in 2012 (Davis TaxCommittee 2014). Therefore, SMEs are a significant enough focus group

to investigate from the South African economic perspective. This study will primarily focus on this segment (small and medium) of the market from a South African context given the significant role that SMEs play in the South African economy.

From a technology design perspective, the main target markets for mPOS solutions are firms that need to readily accept mobile card payments for the provision of goods or in exchange for a service (Lai & Chuah 2010). For example, business owners that provide mobile services such as plumbers, satellite television installers and restaurants with delivery services are potential adopters. South Africa has a population of 57,73 million people in 2018 and 90% of them owned a mobile phone (Statistics South Africa 2018). This widespread phone use is arguably ideal for mobile payments to thrive. This enhanced technology reach has provided SME merchants the technological capability and reach they never had before.

SMEs operate in the same markets as larger firms, however, the difference is that these SMEs have limited resources to work with. They therefore have to ensure that any capital investment will have a positive impact on their business (Smit & Watkins 2012). Their difference in size and resources has a direct impact on flexibility and their ability to adapt to changes in the market and technology trends (Neneh 2012). SMEs have less complex organisational and bureaucratic structures which tend to obstruct technology adoption in large firms. Decisions regarding technology choice are usually dependent on a small management team which can make decisions faster (Abebe 2014). However, compared to large firms, SMEs have fewer financial resources and lower technical expertise and limited management skills (Ward & Caldeira 2002). Therefore, even though SMEs can make decisions more quickly than large firms, given the limited expertise and skill levels, the technical decisions made may not necessarily be the correct ones for the firm. Technology adoption by SMEs is characterised by lack of technical expertise, inadequacy of capital and planning and high dependence on business partners (Duan, Deng & Corbitt 2012). These characteristics support the necessity to use a complete model/framework to understand the technology adoption.

SMEs compete with large firms from a business perspective and in order to remain competitive, there is a need for them to deploy competitive strategies and tools (Abebe 2014). Mobile payment is one such example of a tool that could benefit SMEs. Mobile payments and e-commerce have become integral for businesses to be able to service their customers. SMEs should be able to adapt and remain up-to-date with the various payment methods/offerings that are available. mPOS is one of the payment options that firms have at their disposal, and this research study will investigate what drives SMEs in South Africa to adopt this payment option. While there have been numerous articles published on the adoption of e-commerce in developing countries, however, little or no research has been carried out on the mPOS adoption in South Africa by SMEs.

1.1.3. mPOS Technology Overview

A Mobile Point of Sale (mPOS) is a merchant mobile payment solution that uses a hand-held card reader linked to a smartphone or tablet to perform a financial transaction (Mallat & Tuunainen 2008; Au & Kauffman 2008; Dahlberg, Guo & Ondrus 2015; Liu et al. 2015). Europay, MasterCard and Visa Cooperation (EMVCo) describe an mPOS as comprising of five key components, namely a mobile device (smartphone or tablet), a card reader, an application that supports the payment function on the smart device, server side software and Card Verification

Method (CVM) mechanism (EMVCo 2015). The mobile device is usually the component where the payment application resides. The user will activate the payment application through the mobile device to initiate a payment transaction. The payment application will communicate with the server side software to process the transaction. The payment application will finally prompt the user to swipe, insert or tap the card into the card reader and enter a Personal Identification Number (PIN) if required to finalise the transaction.

The Committee on Payments and Market Infrastructures reported a 13% decrease in the use of banknotes and a 34% increase in the number of Point of Sale terminals in South Africa from 2010 to 2014 (CPMI 2015). There has been a rapid growth of mobile phones in South Africa, which has seen a significant portion of the South Africa population acquire mobile phones. The numbers grew from less than 2% in 2000 to more than 90% in 2016 (Bornman 2016). These mobile phone uptake statistics arguably support the notion that there should be an increase in the use of alternative payment methods in South Africa. These projections have been used by businesses and academics alike to support the business case and the notion that mPOS technologies in South Africa should be well adopted. Contradictory to the predictions, mPOS adoption has not been as well received as anticipated (Gannamaneni, Ondrus & Lyytinen 2015). This has given rise to uncertainty in the market around the viability of mPOS as the merchant adoption has not been as expected in the South African market (PaymentsAfrika 2014). This contradictory market response is where the research study tries to answer the question of what these factors of merchant adoption are, and the extent to which they affect merchant adoption on South African SMEs.

Since 2007, the payments industry has seen the expansion of the mobile commerce era in the global business community (Yang, Lu, Gupta & Zhang 2012; Flatraaker 2013). This is arguably due to the increase in mobile technology capabilities and innovations (Dahlberg, Mallat, Ondrus & Zmijewska 2008; Gannamaneni, Ondrus, Lyytinen 2015). This increase in mobile technology use has supported the extensive use of smartphones to perform mobile banking functions which historically could not be handled by a mobile phone (Hedman & Henningsson 2015). This expansion of mobile technology into the mobile payment arena has facilitated the development of mPOS technology. mPOS as a technology, and an area of study from an innovation perspective has received attention from academics (Pavlou & Fygenson 2006; Schierz, Schilke, Wirtz 2010; Hedman & Henningsson 2015; Staykova & Damsgaard 2015). This attention is driven by the potential benefits that the technology could have to firms, and the perceived value it could provide.

Mobile payments can be classified into two classes, namely, proximity-based mobile payments and remote-trigger mobile payments. A proximity payment is one in which the payment is triggered by the technologies being in close proximity (Lai & Chuah 2010). For example, a contactless transaction is initiated when a contactless card comes into proximity of a device (mobile phone or Point-of-Sale device) with a Near Field Communication (NFC) reader. mPOS is a form of proximity based mobile payments as it requires that the card be present or near to complete the transaction. The other type of mobile payment is a remote-triggered mobile payment. This is where customers can purchase the goods and services through an application using a mobile phone, tablet or smart device (Lai & Chuah 2010). An example of this would be purchasing goods on a website and completing an e-commerce transaction on a smartphone to facilitate the payment. This study will investigate mPOS as a proximity-based payment mechanism.

From an organisational adoption perspective, SMEs should weigh up the advantages and disadvantages that the mPOS technology presents before they decide on whether they will adopt this technology. For instance, mPOS technology is advantageous as it eliminates the need for traditional retail hardware to accept card payments for firms that have mobile businesses. This is beneficial for delivery based or service oriented firms that require an ability to accept financial payments in locations other than their office or site (BizTech 2015). The technology relies on the use of compatible smartphones and given the extensive penetration of smartphones, merchants already have part of the solution to be able to make use of the mPOS technology. However, one of the drawbacks is that there is need to synchronise (via Bluetooth or phone audio jack) a mobile phone with a mPOS device in order to fulfil and complete the transaction (Valcourt, Robert & Beaulieu 2005). This synchronisation does not function optimally as some of the mPOS applications are better suited for certain smartphone models for example, Android or iOS.

From a mPOS adoption perspective, even though there are the necessary underlying infrastructure support structures in the South African technology landscape, the market is still in its infancy regarding mPOS adoption, especially by SMEs (The Marketing Site 2015). Currently in South Africa, there are numerous mPOS providers or financial institutions that have recently established an mPOS offering, for example, Pebble (ABSA), PocketPOS (Nedbank), BluMobi (Standard Bank), Yoco (Independent FinTech), iKhokha (Independent FinTech) and ZipZap (Independent FinTech).

1.2. Problem Statement

A Systematic Literature Review (SLR) performed by Dahlberg et al. (2015) revealed that mobile payments research has been focused on the end user (customer) adoption and that merchant adoption has been neglected. The merchant is critical in the payments ecosystem as they are the business owners that have the decision-making power to decide whether their firm will adopt the mPOS technology. End users are a relatively simple population group to survey or investigate as there is a plethora of potential end users. Merchants on the other hand are not as widespread when compared to end users which makes it significantly harder for academics to engage the few that are there, which potentially would cause research to gravitate to end users. Therefore, this study will investigate the merchant adoption, given the identified gap.

POS technology has been the preferred dominant payment acceptance method (Kshetri & Acharya 2012) especially in developing countries. Merchants have been using this payment acceptance method for years to the extent that any other payment acceptance method seems foreign. mPOS technology as an academic research topic has not received attention from scholars as the technology is relatively new in both the academic and business domain. Most of the mobile payments research in the past six years has been focused on e-Commerce adoption, Mobile Wallets adoption, Near Field Communication (NFC) adoption, Money Transfers adoption and Reference Payments adoption i.e. Quick Reference (QR) codes. mPOS technology is one of the newest alternative payment channels that have emerged since 2014, hence the limited amount of academic research that has gone into the technology. Dalberg et al. (2015) also suggested that, from a scope perspective, many of these studies were conducted in developed countries as this is where there are numerous mPOS solutions. Consumption of new technology is better received in developed countries as the technology landscape is better equipped to adopt the technology. Developing countries are usually latecomers in adoption of technology, as they usually wait for a

technology to be well used or received in the developed countries (Fong 2009). This finding also presents another opportunity for the research to look at adoption in a developing country i.e. South African context. Given the maturity of the payments landscape in Johannesburg, Johannesburg was selected to be a fair representation of South Africa.

Besides the statistic which highlights the fact that SME firms form the majority of firms in South Africa (91%) (Abor & Quartey 2010), it would seem that the technology is better suited for small and medium firms. mPOS as a technology offering has been primarily targeted at small businesses that require a simple, cheap and effective standalone card acceptance solution. Larger firms with multiple till points require an integrated payment solution that allows for complex reconciliation across the store. Therefore, mPOS technology is not particularly suited for large firms. The adoption of the technology would therefore be better investigated in SMEs as they should be more receptive to the technology.

Even though mPOS technology was assumed to be the future of payments given its diverse range of possibilities and applications, the technology has not been adopted to the extent that the payments industry thought it would. There seemed to be significant support by merchants of the technology as it offered more innovative opportunities from a payments perspective and supported the integration of mobile phone and traditional card readers. Current studies have not sufficiently covered why the adoption has not been as good as predicted, as most studies have not investigated the merchant adoption factors.

The problem statement therefore for this research to investigate and understand why mPOS adoption in South Africa has not been as widespread as initially predicted.

1.3. Purpose of the Study and Research Questions

The purpose of this study is to use the TOE framework to identify and test the factors that affect the adoption of mPOS by SME merchants in Johannesburg, South Africa. This research study will attempt to answer two research questions. Firstly, the research will attempt to provide answers to the following research question:

RQ1: What are the factors that affect mPOS adoption by SMEs in Johannesburg?

To answer this research question, three research objectives need to be achieved. Firstly, an in-depth literature review will be conducted on the problem domain. Identification of the existing payments challenges that mPOS technology could potentially solve as highlighted in the literature review will be used to frame the adoption drivers. These challenges will help frame the mPOS technology adoption question. Firms tend to adopt technologies that will solve current organisational inefficiencies (Fong 2009), hence it is important to understand the challenges. By making use of these challenges, the second objective is then to identify the factors that affect mPOS adoption from academic literature. By using the TOE framework as a lens to focus the research, the third objective is to provide a theoretical contextualisation for the research.

The second Research Question attempts to answer the question:

RQ2: To what extent do these adoption factors affect mPOS adoption by SMEs in Johannesburg?

To answer this research question, three research objectives will be investigated. Firstly, the relationship between the factors that affect mPOS adoption will be tested using quantitative research techniques. The research will also determine the significance of the factors, and the extent to which they affect mPOS adoption. The outcome of this testing will serve as proof regarding the accuracy of the model. The last objective is to discuss the results and provide recommendations for both theory and practice regarding the findings and the results. Table 1 summarises the research questions and the objectives that will be investigated as part of this study.

Statement of Purpose: The purpose of this study is to use the TOE framework to identify and test the factors that affect the adoption of mPOS by SME merchants in Johannesburg, South Africa.	
Research Question 1 (RQ1): What are the factors that affect mPOS adoption by SMEs in Johannesburg?	**Research Question 2 (RQ2):** To what extent do these factors affect mPOS adoption by SMEs in Johannesburg?
Research Objective (RO1): Conduct a literature review on mPOS.	**Research Objective (RO4):** Test the relationships between the factors that are envisaged to affect the adoption of mPOS.
Research Objective (RO2): Identify the factors that affect mPOS adoption from academic literature.	**Research Objective (RO5):** Determine the extent to which these factors affect the adoption of mPOS.
Research Objective (RO3): Adapt and contextualise a model for mPOS adoption using TOE as an underpinning theoretical framework.	**Research Objective (RO6):** Discuss conclusions and provide recommendations on future work.

Table 1: Research Questions and Objectives Summary

1.4. Intended Contribution of the Study

1.4.1. Contribution to Theory

From an academic research and discussion perspective, mPOS adoption has not received significant attention. This lack of research is across both developed and developing countries. The research focus has primarily been on other mobile payments mechanisms and channels i.e. e-Commerce, NFC payments and Mobile Wallets (Google Wallet and Apple Pay). This industry research is primarily driven by the main mobile phone firms, for example Samsung (Google Wallet) and Apple (Apple Pay), that stand to gain significantly from the technology developing on their hardware platforms (Saxena, Sloan, Godbole, Cai, Georgescu, Harper, Schwebel 2015). Academic research seems to be significantly limited with regards to the mPOS content. This could be an indicator showing that the technology firms which are involved with mPOS all want to be seen as market leaders and do not want to give up any competitive advantage they think they have.

Given that these new technologies are mostly available in developed countries, for example USA, UK, Australia, Japan and Canada, related research has predominately been focused in these countries. There is therefore an opportunity for this research to add to the limited body of mPOS knowledge and present a foundation for other researchers to take forward. More specifically, from a South African perspective, responses to these research objectives may provide a contextualised framework that can be used to explain adoption of mPOS in South Africa

by SMEs from an organisational perspective. By addressing the defined research objectives, the expectation is to contribute to the academic discussion around merchant adoption in a South African context, which is lacking.

Academic research when it comes to mobile payments has been one sided and it has been predominately customer focused (Wang, Lin & Luarn 2006, Dahlberg et al. 2015). The research has primarily investigated end-user adoption and making use of Technology Acceptance Model as a lens. This has resulted in merchant adoption not receiving significant attention (Hayashi & Bradford 2014). Therefore, there is an opportunity to investigate adoption of mPOS technology using an institutional framework as a theoretical lens as the merchant perspective is important when investigating mPOS adoption.

There is also an opportunity to improve and add to the data that exists around mPOS technology research. Given how recent the technology is, empirical data is difficult to come across as the phenomenon is still emerging. The little existing empirical research that has been published was based on merchants or firms that arguably did not have a strong understanding of mPOS. Merchants now have a better understanding of the technology; therefore, better quality data can be obtained. Five years ago, there was limited secondary data, however, there now is more research regarding mobile payments which will allow for rich data sources that will be used for this research.

1.4.2. Contribution to Practice

The Technology Acceptance Model has been used in mobile payments studies. Most of the studies have been customer focused and have centred around usability from a customer perspective (Dahlberg et al. 2015, Schierz et al. 2010). This study will explore the merchant perspective which is uncommon as most research has been focused on the end-user adoption. This merchant lens can be used in future mPOS adoption studies and the results of the study can provide a foundation for future mPOS studies. In addition, by understanding what the merchants think about mPOS technology, this will provide technology suppliers and financial institutions valuable insight into how their product offerings should be tailored. There is a need to strengthen the empirical data regarding mobile payments, specifically real life payment scenarios, and merchants that use the technology (Schierz et al. 2010). Given the limited quantitative research that has been conducted in the mPOS space, there is an opportunity to obtain valuable merchant responses. This research investigated the use of mPOS technology across a variety of different industry sectors, for example retail and restaurants, and surveyed different types of businesses, for example stores, shops and kiosks.

Payment Card Industry (PCI) security and compliance is currently a trending topic in South Africa and given the increase in security breaches (caused by non-compliance) that have occurred at some of the more reputable retailers there has been an increased focus on PCI (Sabric 2015). The massive data breach at Heartland Payments Systems has caused the payments industry as a whole to become more conscious regarding compliance and security (Fitzgerald 2010). Compliance is commonly neglected by merchants given the ever rising costs to obtain and maintain it. This research sheds light on the importance of regulation and compliance, particularly PCI compliance. In 2015 over 83 million transactions were processed via mPOS devices with the number of mPOS devices estimated at 13 million in circulation worldwide (Loury 2016). These statistics highlight the need for compliance as there is significant exposure and risk. The research could provide insight as to how important merchants view compliance and regulation considering some of the significant breaches that have occurred across

the industry. The research also probed the price that SME merchants in SA would be willing to pay for an mPOS offering. This price that merchants are willing to pay would be useful when comparing it to what mPOS vendors or service providers are currently offering the technology at SME firms in SA.

1.5. Delimitations of the Study

The term mobile payment can be used as a summary description for several different types of transactions. Any financial transaction that is facilitated by a smartphone or tablet can be described as a mobile payment. Staykova & Damsgaard (2015) define a mobile payment as a payment service operated under financial regulation that makes use of a mobile device. Hayashi (2012) further unpacks mobile payments into three components. Firstly, there are Person-to-Person (P2P) payments whereby people can send or transfer money or funds between themselves i.e. Geo-payment services or e-wallet services. These transactions are usually non-commercial in the sense that they are completed without any goods or services being passed between the people involved. The second type and probably the most common type of mobile payment is Internet payments using a mobile phone. The third type of mobile payment is the one that makes use of a Point-of-Sale (POS) device to complete the transaction. There are two types of POS devices, namely a traditional POS (tPOS) device and a mobile POS (mPOS). The tPOS is a standalone device that does not require a smartphone to complete a financial transaction (Hayashi & Bradford 2014). A mPOS on the other hand requires a smartphone to initiate and complete a financial transaction. This research from a scope perspective will be investigating the adoption of mobile payments using mPOS technology from a merchant perspective. The other form of mobile payments i.e. P2P transfers, internet payments and payments using a tPOS will be out of scope for this research.

2. Chapter 2: Literature Review

2.1. mPOS Technology Hype

Technology 'hype' has been used to describe the high expectations and technological possibilities that usually drive new technology innovations (Van Lente, Spitters & Peine 2013). These technology innovations could have numerous business applications that could attract interest from financial backers. Hypes usually start off with significant momentum which is fuelled by business intrigue, they then peak early and then are followed by steep disappointment amidst high expectation only to stabilise and plateau well below the initial projections (Van Lente et al. 2013). mPOS technology has been described as a hype (see *Figure 2* below) as the interest that was generated from the technology when the concept was initially presented at a business level was significant (Loury 2016). The payments industry had been searching for a low-cost payments device that would target SMEs, and mPOS seemed to fulfil this requirement. Like all technology hypes, mPOS had a peak of very optimistic and exaggerated expectations. The Gartner Hype Cycle refers to this peak as the 'Peak of Inflated Expectations'. This peak is the highest point of buy-in for industry and business. mPOS technology went through this phase early on in 2013 (Miller & Salazar 2013). From a South African perspective, there was widespread interest in the technology from all the major banks. In 2014, three of the four significant banks in South Africa had an mPOS offering for their merchants. However, contrary to the market projections and market research, the mPOS technology was not as well received/adopted as anticipated. This negative difference between the original expectations and the actual technology is referred to as the 'Trough of Disillusionment" (Van Lente et al. 2013). This describes the phase when firms come to the realisation that they may have overestimated how well the technology will be received by the market. Thereafter, firms then adjust their perceptions and the market stabilises on realistic adoption numbers. From a South Africa perspective, mPOS technology is now in this enlightenment phase whereby firms have realised that the current mPOS technology solution is limited and they are trying to adjust accordingly.

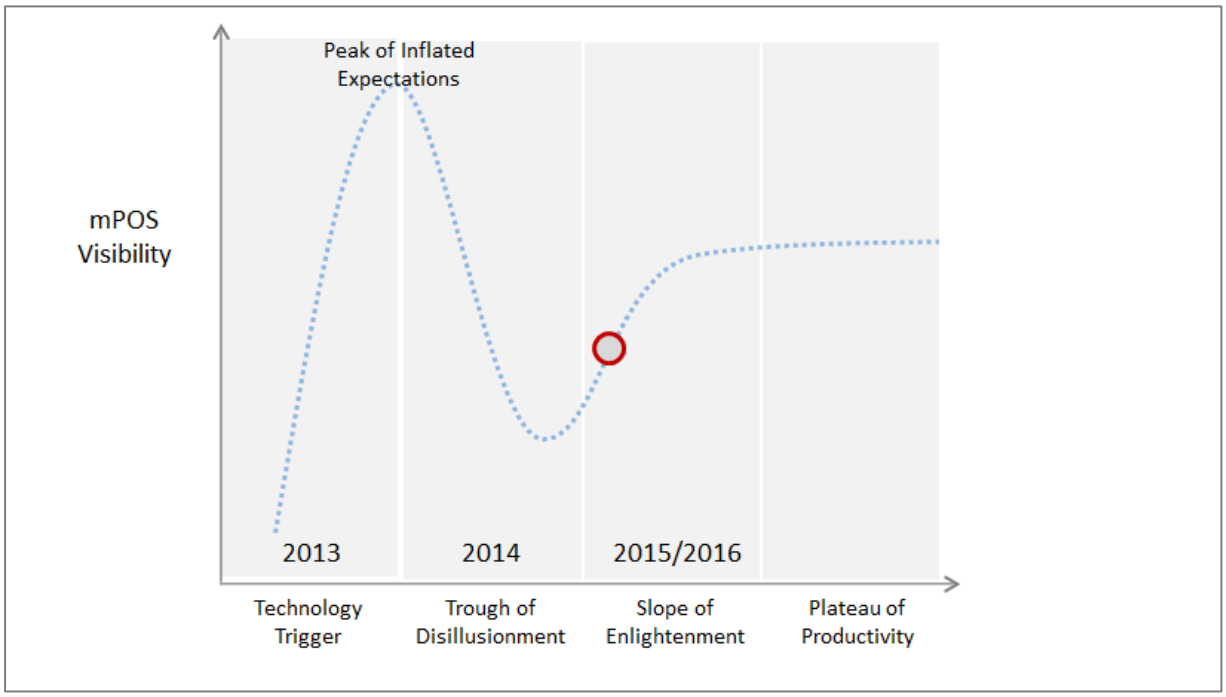


Figure 2: mPOS Hype Cycle (Loury 2016)

The mobile payments hype started as early as the 1990s at the beginning of the 'dotcom' era (Karnouskos, Kauffman, Lawrence & Pousttchi 2008). As with any technology innovation domain, mPOS has not been exempt from numerous tried and failed solutions (Dahlberg et al. 2008; Gannamaneni et al. 2015). This has resulted in the continuous improvement and evolution of mPOS technology. Electronic commerce has continued to live up to the promise of being the channel that facilitates inter-organisational businesses, innovation and providing ever growing opportunities and this has been facilitated by mobile payments (Chong & Pervan 2007). Mobile payments have been at the centre of this growth and maturity of the channel over the years. The main reason for this is that, globally, the number of mobile phones from a point of access perspective is more than any other technical device that is used to market, sell, produce, or deliver products to customers. This can be seen by the ease at which firms adopt new technological innovations regarding mobile payments (Ondrus, Lyytinen & Pigneur 2009; Flatraaker 2013). However, the rate of adoption differs, as the appetite for innovation and the organisational ability to take on new mobile payment innovations usually varies per country (Au & Kauffman 2008; Carton et al. 2012).

Globally, the mPOS technology availability is increasing, whilst the adoption varies per country (Crowe, Rysman & Stavins 2010; The Marketing Site 2015). This trend is arguably contradictory to the potential value that mPOS technology can bring to firms in streamlining their payments system landscape. This behaviour of firms not adopting the technology presents a gap that can be filled by research especially in the South African context. Some academics have tried to explain this behaviour as the 'chicken and egg' dilemma (Dahlberg et al. 2008) which tries to explain the low penetration rate for mobile payments in firms. This dilemma is brought about by the question regarding which side of the payments 'platform' is brought on board first, the merchant or the customer. Both are essential to the payment process, hence the dilemma. Gannamaneni et al. (2015) also discusses mobile payments failures in developed countries. Their article investigates high profile mobile payments failures at Paybox (Germany), MobiPay (Spain), Postfinance (Switzerland) and Moneta (South Korea). This highlights the important note that mobile payments adoption has not been as well received in both developed and developing countries as initially envisaged.

For firms to adopt the technology there is need for other firms in the market to use the technology. This is how the appeal for the mPOS technology can be built and, once enough credibility is built, other firms will want to start using the technology. This phenomenon is termed 'herd behaviour', which explains the influence that other organisational behaviour has on firms in the same business landscape (Sun 2013). Most firms do not want to be slow adopters especially in this era where technology is supposed to provide a competitive edge.

The last five years has seen the era of 'uberfication'. The concept of 'uberfication' has added enormous pressure on firms to show that they are keeping up with technology and can provide 'on-demand' services at the click of a few buttons on a mobile application (Digital Intelligence Today 2014). mPOS provides firms the ability to provide this on-demand service. Given that the technology is heavily reliant on the mobile phone and mobile applications, firms can use this technology to fill the requirement of 'uberfication'. This will allow firms to keep up with the ever-growing technology demands of their customers. There is an opportunity for firms to leverage off this uberfication hype to grow their payments landscape. The continued growth and adoption of mobile payments has been driven and fuelled by the diminishing need for cash (Mallat & Tuunainen 2008). Carrying cash is perceived to be risky especially in the African context, and merchants therefore tend to prefer to accept card payments. This

has driven the propagation of mobile payment instruments, and the need to have 'on-demand card acceptance' once the merchant delivers the goods or services that were requested.

2.2. mPOS Ecosystem

In business terms, an ecosystem refers to an economic system that is supported by organisations and individuals operating together to produce goods and services of value to a customer (Moore 1996). The roles and capabilities of the organisations and individuals in this ecosystem co-evolve over time to align with one another. To investigate the factors that affect mPOS adoption, it is important to understand the mPOS ecosystem. Information technology (IT) business ecosystems can be defined as interdependent financial and technology components working together to operate and produce a financial service (Liu et al. 2015; Adomavicius, Bockstedt, Gupta & Kauffman 2008). Understanding the ecosystem view is important as the traditional POS landscape exhibits the traits of an environment dominated by few technology suppliers (Hedman & Henningsson 2015). Firms struggle with the prediction of how much to invest into IT technologies. Given the complexity of mPOS environments, it is important to look at the ecosystem in order to understand what drives the merchant adoption which is part of this ecosystem (Adomavicius et al. 2008; Liu et al. 2015). For example, most research in mobile payments studies focuses on the consumer and consequently on designing an application that is appealing to the end-user (Dahlberg et al. 2015). IS research struggles in striking a balance between focusing on technology or the social perspectives that impact the technology (Bostrom, Gupta & Thomas 2009). By acknowledging this conundrum, it is therefore important to investigate this merchant adoption phenomenon, from a holistic ecosystem view. The consumer is the one end of the spectrum and there is need to understand that all the mPOS components (technology and social) form part of the ecosystem and contribute to mPOS landscape.

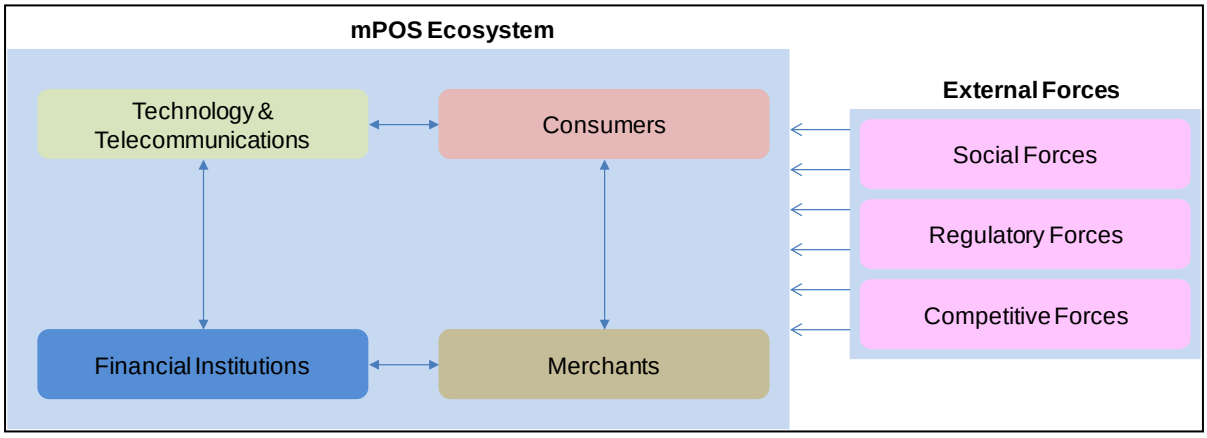


Figure 3: mPOS Ecosystem

The mPOS ecosystem *(Figure 3 adapted from (Liu et al. 2015; Hedman & Henningsson 2015; Dahlberg et al. 2008))* comprises four main components, namely consumers, merchants, financial institutions and telecommunications for vendors (Liu et al. 2015). The consumer is the end user that has the need to perform a financial transaction in exchange for goods or services. The consumer perspective or component has been the subject of numerous mobile payments research topics. Most of these studies (Maduku et al. 2016) make use of the Technology Acceptance Model (TAM) to investigate what drives customer adoption. The customer-centric research that has been conducted in this space has provided some important insights. For instance, the perceived

risk of using mobile payments is not as significant as anticipated (Schierz et al. 2010). Therefore, the customer risk concerns related to launching new mobile payment technologies are not as significant as customers have become more trusting of technologies as they understand the technology more.

The financial institution is usually the bank that acquires and routes the financial transaction to a local (e.g. BankServ South Africa) or an international switch (Visa/MasterCard). For mPOS technology to thrive, there is need for financial institutions to collaborate with the relevant partners i.e. hardware suppliers, technology service providers and other interconnected entities (Carton et al. 2012). Financial institutions do no operate in isolation and depend on an understanding with these other interconnected entities to ensure that the mPOS technology offering is relevant and is integrated accordingly. mPOS technology requires integration into Android, iOS and mobile Windows platforms. Therefore, there is a certain amount of collaboration that is required between financial institutions and these hardware providers to ensure that the technology can function across the various hardware platforms. This collaboration has seen the agreement of standards between banks and these interconnected entities to promote the integration. For example, the Mobey Forum which is a bank-backed consortium that works with financial institutions, hardware vendors and Mobile Network Operators (MNOs) to promote open technology standards (Meijer & Bye 2011). This type of collaboration however has been limited.

The technology and telecommunications vendors are the Mobile Network Operators (MNOs), for example Vodacom or Mobile Device Manufacturers (MDNs), for example Verifone, that facilitate the technology. MDNs are responsible for ensuring that the mPOS devices have correct and compliant hardware components which enable secure execution of financial transactions (Liu et al. 2015). MNOs own the network infrastructure that serve as the 'payment rails' that are used by acquiring service providers. MNOs and MDNs are significantly influential in the ecosystem as they foster innovation and evolution of the hardware and infrastructure. There usually is competition between MNOs and financial institutions regarding the ownership of the customer (Staykova & Damsgaard 2015). This competition exists as some MNOs provide mobile payment solutions and the financial intuitions perceive this as encroaching into their domain (Ondrus & Lyytinen 2011). This competition has affected the progression of the technology as the level of collaboration between MNOs and financial institutions has been limited.

The merchant is the owner of the mPOS solution that the consumer makes use of to make a payment. Mobile payments provide the merchants with the ability to facilitate payments in remote locations. This proposition has been strengthened by the level of mobile telecommunication maturity in most countries (Mallat & Tuunainen 2005). Merchants are more inclined to adopt a technology that is cost effective but still provides basic electronic payment acceptance. In developing countries, cash is still prevalent and the number of unbanked customers is high so one of the largest barriers to entry for mobile payments is cash. In most African countries, nearly 40% of the population are unemployed or work in the informal sector and receive their salary in cash (Ondiege 2010). Therefore, even though mobile payments are supposed to reduce the cost of handling cash, some merchants might not see the need for adopting the technology as the majority of their customers use cash.

Apart from the four elements that make up the mPOS ecosystem, this ecosystem is also affected by external pressures (social, regulatory and competitive) that can either have a positive or negative impact. Social influences could potentially impact the merchant behaviour and decisions they will make when adopting technologies (Yang

et al. 2012). Majority of studies investigated how social influences affect customer use of mobile technology. There is an opportunity to investigate how these social forces affect merchants. There is significant regulation throughout the payments industry worldwide (Mai et al. 2010). This has been brought about by the increase in credit card fraud throughout the industry. In South Africa, the gross card fraud in 2015 was R252 000 000 (Sabric 2015). This highlights the volume of card fraud, which resulted in the Payments Association of South Africa (PASA) enforcing PCI DSS on all merchants (Sabric 2015). SMEs are usually in direct competition with one another and there is pressure to keep up with what other firms use from a technology perspective. These competitive pressures can spur innovation as firms will always be looking for new and innovative ways of making payments acceptance more efficient. The ecosystem model (*Figure 3*) will be used to guide the research model.

2.3. Factors Affecting Adoption of mPOS

Even though there is limited empirical research on adoption of mPOS technology by firms, there has been substantial research conducted on mobile payments adoption. Lin & Lin (2008) investigated the notion that firms with sophisticated IT resources (technical competency) were better inclined to implement and adopt the technology effectively. Firms that have these expert resources can make use of the technology appropriately and realise the benefit that should facilitate the adoption process. With most technology that require some sort of hardware, firms will always have to evaluate the cost-benefit question that the technology will provide them. Mallat & Tuunainen (2008) uncovered that most firms believe that unless the technology proves to be financially viable most firms would not be willing to adopt it. mPOS devices on average are cheaper than the traditional point of sale device (Saxena et al. 2015) which should attract merchants to this technology. Yang et al. (2012) introduced the concept of negative utility in relation to cost. This negative utility relates to how firms should pay for the technology and equipment access cost and transaction fees and at the same time bear the uncertainty of the adoption decision.

Firms operate in highly competitive environments that require continuous innovation on how to remain relevant to their customers. There is consistent pressure to identify different ways in which technology can benefit the business (Liu et al. 2015). Adoption of innovative technology can be influenced by a firm's direct or indirect competition. This is supported by Lai & Chuah (2010) who noticed that competition among retailers drives mobile payments adoption, for example, if one retailer begins to use mobile payment, other retailers followed suit. However, there are some technologies that will be adopted by firms even though their competitors are not using them (Hedman & Henningsson 2015). In the mPOS ecosystem, consumers can impact on the technology adoption. Modern consumers are arguably adept in payments technology and are very aware of the various payment mechanisms that are available to them (Schierz et al. 2010). In South Africa, specifically, consumers can make payments using an array of mobile payment options, namely, SnapScan, Zapper, FlickPay, MasterPass and VCPay. Most consumers will be aware of at least one payment method which creates pressure on firms to acquire a mobile payment offering. mPOS technology is interoperable meaning it can be used to acquire any Visa, MasterCard or China Union Pay card without the need for any registration. This interoperability makes it compatible with all firms, as opposed to SnapScan or Zapper that are not interoperable. Lin & Lin (2008) discuss how organisational compatibility has an impact on the initial adoption.

Mobile payments technology is technically designed to thrive in industry sectors where there is a need to achieve end-to-end selling services over one single portable device (Lai & Chuah 2010). For example, in the hospitality sector, firms need to be able to provide a variety of payment services to consumers who might not necessarily be on their premises. Chain operated restaurants and service oriented businesses i.e. plumbers are likely to have a higher adoption rate for mPOS adoption given that they often do deliveries or provide services away from their main business premise.

2.4. Theoretical Background and Research Model

Modern firms are operating in a highly competitive, globalised and highly innovative period. In order for firms to remain competitive, there is an expectation that they should keep up with innovation, new business strategies and defend against competitive pressures (Wu et al. 2015). Mobile payments have evolved and mPOS technology has emerged as a technology that can help facilitate financial transactions for firms that need a relatively cost-effective payment capability. IT use and adoption can have a positive effect on the productivity of firms (Oliveira & Martins 2011b). For firms to realise the benefits of IT, there is a need for the technology to be adopted across the organisation. It is therefore important to understand what drives IT adoption in firms. IS research has numerous theories that are used to explain IS phenomena (Adomavicius et al. 2008) , however, this study will focus on technology adoption at a firm level.

The TOE framework (Figure 1) is one of the most widely used IS theories that focuses on the firm level. This framework provides a useful analytical framework that can be used to study adoption of IT innovation or technology. Oliveira & Martins (2011a) performed a systematic literature review on IT adoption models at a firm level. Their conclusion was that the Diffusion of Innovations (DOI) theory and the TOE framework were the most dominant theories when investigating firm level adoption. The TOE framework has a solid theoretical basis and consistent empirical support and there have been numerous applications of the theory. The TOE framework was the preferred framework as it aligned closely with the variables that were being studied. The DOI theory does not include the environmental context and for this research, the environmental impact are hypothesised to be important. It is for reason that the TOE framework was selected over the DOI theory. Therefore, this study will make use of this theory to investigate the IT adoption question of mPOS.

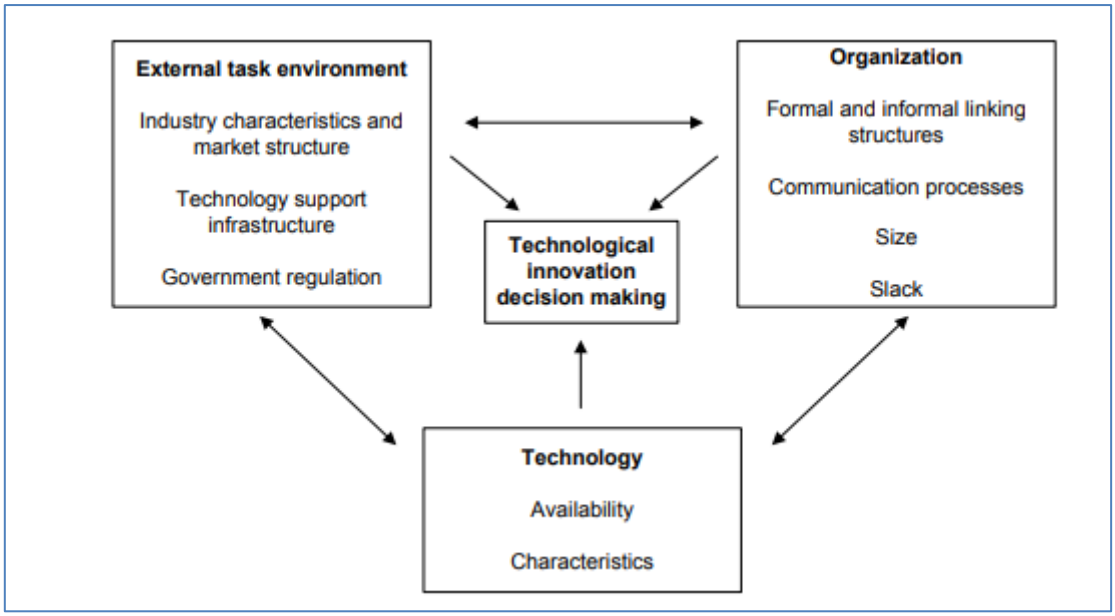


Figure 4: Technology, Organisation and Environment (Tornatzky and Fleischer 1990)

The TOE framework brings to the forefront the notion of the environmental context as a significant area that needs to be included when investigating firm level adoption (Tornatzky & Fleischer 1990). The TOE framework investigates three contextual factors that affect a firm's adoption and implementation of technological innovation (Tornatzky & Fleischer 1990). The TOE framework focuses on the technological context, organisational context and environmental context (Zhu et al. 2006). The technology context investigates the internal and external technologies that could affect the firm's adoption. This context looks at both new technologies, and existing technologies relevant to the organisation (Cao, Jones, & Sheng 2014). The most common technology factors that are often discussed as critical for adoption are complexity and compatibility with existing infrastructure (Oliveira & Martins 2011b). The organisational context investigates how the firm's characteristics affect adoption, for example scope, size of the firm and structures within the firm. Lastly, the environmental context focuses on the firm's business arena in which it operates i.e. competition and government regulation (Tornatzky & Fleischer 1990).

The use of the TOE framework to determine the drivers of IT adoption in firms can be seen in existing IS research (Lin & Lin 2008; Duan et al. 2012 and Cao et al. 2014). For example Duan et al (2012) apply the TOE framework to investigate determinants of the adoption of e-market in Australian SMEs. This model was tested across a sample size of 212 Australian SMEs and further validated in Lin & Lin (2008) on a much larger sample size of 732 Taiwanese firms. The importance of considering the technology, organisation and environmental determinants when researching technology adoption in SMEs is shown in these research papers. These studies all demonstrated the application of the TOE framework by SME firms to adopt some sort of IT technology. However, there are no empirical studies yet that investigate the adoption of mPOS and use the TOE framework. mPOS as a technology was developed and evolved from mobile payments therefore, the research around mobile payments adoption in SMEs can be extended to mPOS adoption given the close alignment.

While some organisations have started to make use of mPOS and are reaping the benefits of the technology, there have been some issues such as compatibility and cost that have deterred the adoption of the technology. Given the rapid expansion of mPOS technology, there is a growing need for academics and practitioners to identify the factors affecting mPOS adoption. This study will focus particularly on the adoption of mPOS at a firm level in South Africa by SMEs in Johannesburg. To better understand how mPOS adoption will be received in the South African SME segment, a framework for mPOS adoption will be developed that uses the TOE framework as a theoretical underpinning. The propositions that will be developed reflect adaptations to and contextualisations to the TOE framework, which was developed to study the various aspects of a firm's context that can influence the process by which technology innovation is adopted (Zhu, Kraemer & Derrick 2004). The early works of Tornatzky and Fleischer focused on the primary constructs of the TOE framework, namely the technological context, organisational context and environmental context (Tornatzky & Fleischer 1990). Since their seminal publication over twenty years ago, further research has gone into the adoption of technology innovations by firms which will be taken into consideration for this study. Most research around mPOS and mobile payments has been one-sided and has predominantly been focused on the customer adoption (Dahlberg et al. 2015). This has presented an opportunity to investigate firm level adoption.

Firms usually have limited influence on the external environmental factors as these are largely out of their control. Technology and organisational factors are more within the reach of the firm, and top management can usually plan or react to these influences. Based on the discussions above, the TOE framework is arguably best equipped to provide insight and serve as a framework as to what affects mPOS adoption by SMEs in a South African context.

2.5. Hypotheses

Through a review of the literature on the adoption of mobile payments and mPOS, a conceptual model has been developed. This uses the TOE framework to underpin the investigation of the adoption of mPOS by SMEs in Johannesburg. Figure 4 below illustrates this adapted model with the three dimensions, technology, organisation and environment.

The hypotheses are all influenced by the original TOE framework. All seven of these adoption factors are proposed to have an impact on the mPOS adoption. The dependent variable in this study is the adoption of mPOS by the merchant. This can be can be defined as the likelihood that a merchant will adopt the mPOS technology as an acquiring solution (Mallat & Tuunainen 2005). According to the literature that was reviewed, the main antecedent envisaged to be a key mediator or influencer to merchant adoption is value proposition (Au & Kauffman 2008; Mallat & Tuunainen 2005; Ondrus & Lyytinen 2011; Mallat & Tuunainen 2008). Value proposition in the mPOS context can be defined as the unique service and the perceived value that merchants will expect from the product (Ondrus & Lyytinen 2011). The hypothesis is that merchants will be enticed to adopt a technology if they perceive that their firm will benefit financially from the value that the technology will introduce to their business.

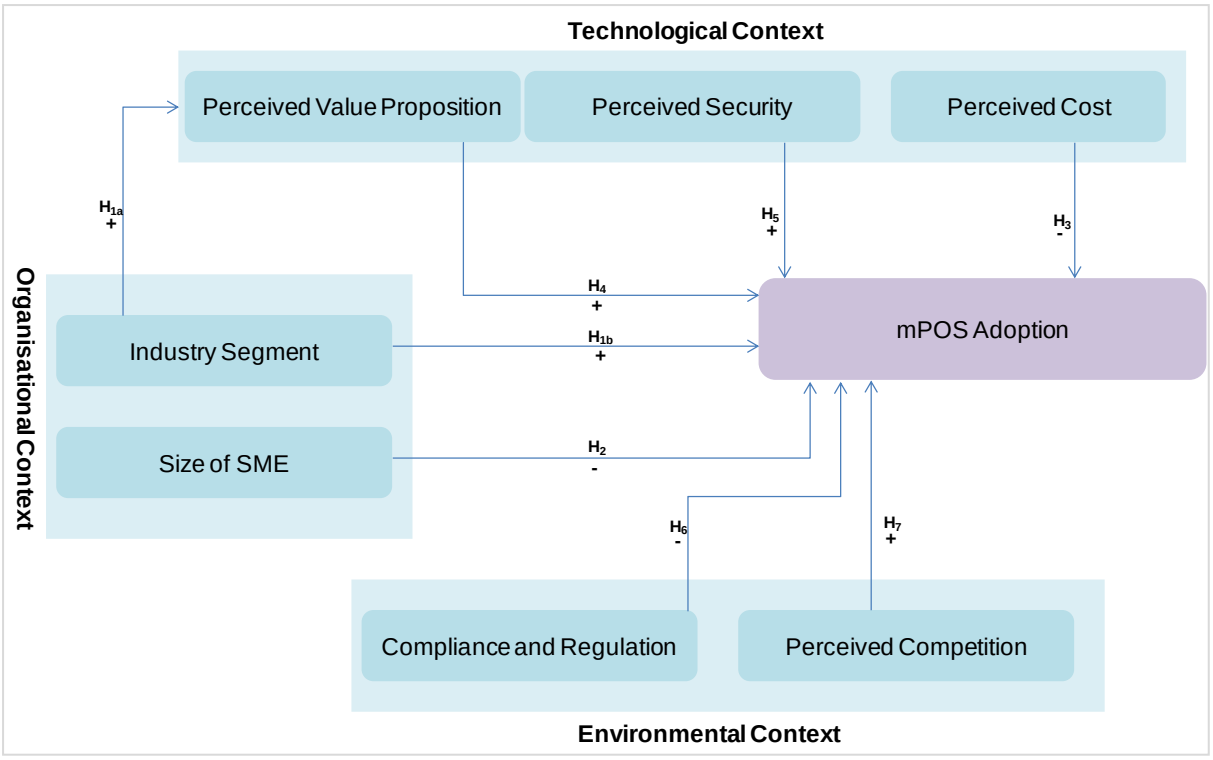


Figure 5: mPOS Adoption Framework

2.5.1. Organisational Context

The organisational context can be described using a number of measures, namely the type and quality of resources that are employed by the firm, the complexity of the managerial structures that are in place, the size of the firm and the amount of slack resources that a firm has at its disposal (Zhu & Kraemer 2005). The organisational context focuses on the internal firm structures that may drive adoption (Oliveira & Martins 2011b). Therefore, the ability of a firm to adopt technology is affected by its internal resource capability. The firm's organisational context is moulded by the industry segment that it operates in. For example, firms that operate in the construction industry require specific type of unique resources such as mechanical and civil engineers. Therefore, the industry segment will directly impact the type and quality of resources at a firm. Firms are dynamic organisms that are unique in their structure as they are a result of continuous adaptation and evolution (Oliveira & Martins 2010).

2.5.1.1. Industry Segment

The term industry segment can be used to describe a grouping of similar types of businesses, for example retail, fuel, hospitality, healthcare or restaurant (Business Dictionary 2015). The characteristics of the industry segment are contributory factors to the adoption of technology by SME firms (Brown & Jayakody 2008).The industry segment and value proposition that a technology provides to the firm are directly related. Innovation and value of a technology is supported by the industry that the firm operates in. For example, in the healthcare segment, the innovation is focused on how to optimise the integration of the healthcare providers and the medical schemes to facilitate transactions.

There are specific industry segments where mPOS technology should work well as a result of the manner in which the merchant needs to receive the payment (Mallat & Tuunainen 2008). This technology fit with the industry

segment is facilitated by the value proposition that the technology provides the firm. The proposition is that SMEs need to receive payments remotely using a mobile mechanism that is better suited to adopting mPOS devices (Ondiege 2010; Yang et al. 2012; Lai & Chuah 2010). For example, a SME that has a delivery service has a greater need to accept card payments on an mPOS solution as compared to a SME that does not provide delivery or remote services. The mPOS technology, however, needs to have the services or features that will add value to that SME. Hence:

H_{1a}: There is a positive relationship between the industry segment the merchant operates in and the perceived value proposition that the mPOS provides.

H_{1b}: There is a positive relationship between the industry segment the merchant operates in and the mPOS adoption.

2.5.1.2. Size of SME

This is one of the most common and well-studied factors of technology adoption (Zhu et al. 2004; Zhu et al. 2006; Aboelmaged 2014). The main schools of thought regarding size of the firm relate to agility and availability of resources (financial and non-financial). The more available funds a firm has at its disposal, the more quickly the firm should be able to realise economies of scale. The size of the firm is an internal organisational factor that can vary depending on the make-up of the firm (Chong & Pervan 2007). The management structures in an SME can drive this, as any decision they make regarding resourcing and their technology artefacts will drive this. Smaller firms are seen to be more agile and can easily adopt technology innovations quickly given their less complex environments (Zhu & Kraemer 2005; Mallat & Tuunainen 2014).

In the mPOS context, smaller SMEs should require a payments solution that is easy to set up and requires little to no integration into their systems. Large firms usually have complex integrated payments systems and integration of a payment device into this can be difficult. Hence:

H_2: There is a negative relationship between the size of the SME and mPOS adoption.

2.5.2. Technological Context

The technology context can be defined as the technology infrastructure and IT skills that a firm has at its disposal (Oliveira & Martins 2010). The technology infrastructure provides the foundation on which the platform is built and the IT skills provide the capability that enable development of the technology (Oliveira & Martins 2011a). Technology is not cheap and resources with the correct IT skills to use the technology are even harder to find and usually come at a premium cost (Duan et al. 2012). Firms invest in technology integration, which helps to streamline their business operations and improve customer service. However, this integration is costly and requires the correct IT resources and skills. Most firms are concerned about the customer value proposition that they should offer their customers. Customer value proposition has become critical to firms as the markets in which they operate have been extremely competitive and there is pressure to differentiate themselves from their competition.

As highlighted above, the payments industry is ever evolving and as mobile technological options increase, mPOS payments options also increase (Mohammadi & Jahanshahi 2008). The ability of a firm to envisage the capabilities that a technology can provide to its business will determine whether they will adopt the technology.

2.5.2.1. Perceived Cost

From a technology adoption perspective, perceived cost of technology is a factor that most SME merchants will consider before they adopt an mPOS solution (Mallat & Tuunainen 2008; Yang et al. 2012). The perceived cost of the solution consists of the physical hardware cost and any once-off or monthly fees that merchants must pay to the solution provider. In most cases, the solution provider is a financial institution. mPOS payments technologies were 'hyped' as they were supposed to provide low cost payments solutions to the bottom tier segments that financial institutions historically did not offer solutions for (Yang et al. 2012). Therefore, these unbanked merchants provided a lucrative business case for financial institutions that required justification in investing heavily in the technology and the underlying infrastructure required. From a pure financial motivation perspective, it therefore stands that the cheaper the mPOS solution, the more likely merchants would be enticed to acquire it. This gives rise to the third hypothesis:

H_3: There is a negative relationship between the perceived cost of an mPOS offering and mPOS adoption.

2.5.2.2. Perceived Value Proposition

The perceived value proposition can be defined as the unique feature or differentiator that will drive a firm to acquire the technology innovation (Ondrus & Lyytinen 2011). The perceived value proposition explains how the technology or innovation will solve a unique business problem and provide significant financial or operational improvement to the existing product or service (Au & Kauffman 2008). Given the diverse range of mobile payments methods that are available to firms, if an mPOS technology is to be widely accepted, it must be able to accommodate all the various payments methods. For example, regarding the cards accepted, it must be able to accept Online chip and (PIN), offline PIN support, signature and NFC (contactless) card payments in order to provide value to a business (Mallat & Tuunainen 2005). Hence:

H_4: There is a positive relationship between the perceived value proposition an mPOS solution offers and mPOS adoption.

2.5.2.3. Perceived Security

Security is arguably the biggest threat to SMEs when analysing their mobile payments environments (Dahlberg et al. 2008; Dahlberg et al. 2015; Schierz et al. 2010). This can either be in the form of perceived security by the merchant or the actual security that the mPOS offering provides to the merchant payment environment. Adoption of mPOS by merchants is largely driven by the perception of how secure the technology is (Mallat & Tuunainen 2008; Mallat & Tuunainen 2014). Perceived security can be driven by leading security assessment firms in the payments industry, for example Foregenix and Trustwave. If a firm perceives an mPOS technology to be insecure, the chances of that firm procuring that technological innovation will be severely diminished. Since 2013, the industry has seen an increase in focus on security and the need for additional mechanisms to be built into the mPOS in order to make the device more secure (Duncombe & Boateng 2009). This has seen the rise of secure encryption techniques, for example Derived Unique Key per Transaction (DUKPT) key management scheme, which has been made mandatory by the Payments Association of South Africa (PASA). This leads to the fifth hypothesis:

H_5: There is a positive relationship between the perceived security an mPOS provides and mPOS adoption.

2.5.3. Environmental Context

The environmental context focuses on the firm's business arena and external forces that can impact the adoption (Mallat & Tuunainen 2008). These external forces are usually in form of competitive pressures, regulatory and compliance forces. Since 2014, there has been an increase in the number of Financial Technology companies that are offering various payment technologies (Hillemeyer 2016). The payments industry is heavily monitored and regulated by various external institutions and regulatory boards, for example the Payment Card Industry Security Standards Council (PCI SSC). This regulation has increased over the years to help control the numerous payment innovations that are coming out in the market.

2.5.3.1. Industry Compliance and Regulation

Compliance and regulation has always been a key requirement in the payments industry (Lai & Chuah 2010). The onerous regulatory requirements that are required have contributed to the oligopolistic nature of the industry (Liu et al. 2015). There are numerous compliance and regulation bodies that regulate the South African payments industry as whole. Currently, the main regulatory board in the payment industry is the PCI SSC, which regulates the minimum requirements which firms need for them to use payment technologies (PCI Security Standards, 2015). This regulation comes at a cost as firms are required to be compliant with various security mechanisms and require annual subscriptions to maintain compliance. The cost of establishing and maintaining this compliant status can be expensive for the smaller firms and this could prove a barrier for adopting the technology. Firms that undergo these audits annually with the PCI SSC are paying an average of $222 000 each year (NetworkWorld 2010). Hence:

H_6: There is a negative relationship between the compliance and regulation around an mPOS offering and mPOS adoption.

2.5.3.2. Perceived Competition

Firms operate in highly competitive environments. This competition is referred to as competition intensity (Zhu et al. 2006). The question of whether perceived competition detracts or spurs adoption is a point of contention among academics (Liu et al. 2015; Hedman & Henningsson 2015). The context in which competition is being investigated will determine whether it has a negative or positive impact. From a merchant perspective, firms that operate in highly competitive environments, tend to adopt technology innovations that can give them a competitive edge (Ondrus et al. 2009; Liu et al. 2015). Mobile payments have the potential to be well adopted in Africa as more than 60% of the population does not have access to traditional banking structures (Ondiege 2010; CPMI 2015). This has provided a compelling business case for mPOS implementation in Africa. The increased competitive nature of the market fuels the information and knowledge that is available to merchants that can result in increased adoption. Therefore:

H_7: There is a positive relationship between perceived competition and mPOS adoption.

The table below (*Table 1*) summarises the hypotheses discussed above:

Construct	Research Hypotheses		Reference
Organisational context	Industry Segment	**H_{1a}**: There is a positive relationship between the industry segment the merchant operates in and the perceived value proposition that the mPOS provides.	(Yang et al. 2012) (Lai & Chuah 2010)
		H_{1b}: There is a positive relationship between the industry segment the merchant operates in and mPOS adoption.	(Lai & Chuah 2010) (Yang et al. 2012)
	Size of the SME	**H_2**: There is a negative relationship between the size of the SME and mPOS adoption.	(Zhu et al. 2006) (Mallat & Tuunainen 2008) (Mallat & Tuunainen 2014)
Technological context	Perceived Cost	**H_3**: There is a negative relationship between the perceived cost of an mPOS offering and mPOS adoption.	(Mallat & Tuunainen 2008) (Yang et al. 2012)
	Perceived Value Proposition	**H_4**: There is a positive relationship between the perceived value proposition an mPOS solution offers and mPOS adoption.	(Au & Kauffman 2008) (Carton et al. 2012) (Mallat & Tuunainen 2005) (Ondrus & Lyytinen 2011) (Mallat & Tuunainen 2008)
	Perceived Security	**H_5**: There is a positive relationship between the perceived security an mPOS provides and mPOS adoption.	(Au & Kauffman 2008) (Lai & Chuah 2010) (Schierz et al. 2010) (Mallat & Tuunainen 2005) (Mohammadi & Jahanshahi 2008) (Mallat & Tuunainen 2008)
Environmental context	Compliance and Regulation	**H_6**: There is a negative relationship between the compliance and regulation around an mPOS offering and mPOS adoption.	(Liu et al. 2015) (Lai & Chuah 2010) (Zhu et al. 2006)
	Perceived Competition	**H_7**: There is a positive relationship between perceived competition and mPOS adoption.	(Lai & Chuah 2010) (Mallat & Tuunainen 2008) (Liu et al. 2015)

Table 2: Constructs and Research Hypotheses

3. Chapter 3: Methodology

3.1. Research Paradigm and Approach

A research paradigm can be defined as a belief or practice that guides the viewpoint or provides a lens through which a phenomenon can be investigated (Wynn & Williams 2012). Therefore, to understand the research approach that was taken and subsequent research methods employed, it is useful to understand the paradigm that frames the context of the research. The study was informed by a positivist research paradigm. The positivist approach stems from a philosophy known as logical positivism, which is based on very rigid rules of truth, logic, prediction and deduction (Weaver & Olson 2006). Therefore, positivist research can be described as logical and methodical inquisition that hone in on the research phenomena through a 'scientific lens' (Weber 2004). Positivist research tends to predict and explain expected behaviour. This research used observable measurements and made provision for the objective interactions and did not interfere with the findings. The study was organised in this manner and used definite deductive techniques to quantitatively investigate the mPOS adoption by firms in South Africa.

This research paradigm is arguably appropriate as it tested the factors that had been predicted to affect the adoption of mPOS by firms. The research used replicable, systematic procedures to test these factors of mPOS adoption and determined the significance and impact that they each have. In addition, the positivist paradigm is further appropriate as it ensured that the model that was developed could be tested and that the predicted relationships between the adoption factors could be compared against the observed relationships. Deductive research involves the use of theory and hypotheses to develop and test the research phenomenon (Mills, Abdulla & Cribbie 2010). The process of deduction starts with theory (i.e. the TOE framework) being identified for the topic of interest (mPOS adoption). From the theory, hypotheses were derived that served as predictions (Trochim 2006). Finally, the hypotheses were then tested using the data collected during the study to confirm that each hypothesis stated is true or false.

3.2. Research Design and Methodology

Research design can be defined as the guidelines or structures that ensure that the evidence uncovered by the research process enables the researcher to answer the research question as clearly as possible (Vaus 2001). Therefore, for a suitable research design to be selected, there was a need to understand the research question and the type of evidence needed to answer the question. The research design is the blueprint and the research method is the technique that will be used to execute the blueprint to collect the data. Thereby, if an unsuitable research design had been chosen, this could have had an impact on the method chosen which would have ultimately affected the ability to collect data.

This study used an explanatory research design. Explanatory research design is used to explain the nature of relationships, behaviours or problems of the phenomenon in question (De Vaus 2001). This type of research is usually depicted by trying to answer the 'what' and 'how' questions (Bhattacherjee 2012). This type of research is valuable to practitioners as it provides justifiable answers around why the adoption factors behave or relate to each other in the manner they do. The degree of uncertainty regarding the research problem will determine the research methodology to be employed (Bhattacherjee 2012). In this instance, the research problem was well

defined and there is a good understanding of the key variables and the key relationships between these variables. Therefore, explanatory research design was ideal for the investigation as the research problem was clear in trying to identify what the mPOS adoption factors are in South Africa and how these factors relate to each other. Additionally explanatory research can be used to test, explain and build theory (Trochim 2006), this study also aimed to test the framework that was developed in an attempt to explain the adoption factors of the mPOS technology in South Africa.

Quantitative research approaches involve theory testing (Bhattacherjee 2012). As mentioned above, this study tested the theory that has been put forward using the TOE framework as a lens and the observations that were made during the data collection process were used to test the 'worth' of the theory and the validity of the results observed. Quantitative research also entails using deductive reasoning to derive a set of propositions (De Vaus 2001). For the study, seven hypotheses were put forward from theory and they were tested to verify that the theory is consistent with the observation. This process of testing the theory is important to the research process as this is what was used to determine whether the hypotheses need to be accepted or rejected.

The research methodology can be described as a systematic way to solve a problem (Creswell 2003). From a research methodology perspective, this study used a cross-sectional field study to investigate the adoption of mPOS in South Africa. Cross-sectional studies take a portion or cross-section of the phenomenon at a moment in time (Bhattacherjee 2012). This was achieved by using a survey to collect the data from the identified sample population. In this study, the independent and dependent variables were measured at the same time using a questionnaire. To understand what drives adoption of mPOS in South Africa, a sample cross-section was taken from SMEs in Johannesburg that formed part of the sample that was used to test the hypothesis. This methodology was appropriate as given the resource constraints (time, scope and money), it was impossible to involve all SMEs in South Africa; hence a cross-sectional field study was employed.

3.3. Data Collection and Sampling

The unit of analysis for this research is the firm and the key informant will be the owner of the business that represents the firm from a juristic perspective. Data collection can be defined as the process of how to observe, what to observe and what to record when observing (Creswell 2003). The study's intention was to study the adoption of mPOS by South African SMEs. Given the maturity of the payments landscape in Johannesburg, Johannesburg was selected to be a fair representation of South Africa. When trying to survey a large population, online instruments can be used to access geographically distributed populations. The issue with this technique is that it does not guarantee accurate feedback from respondents as most respondents might perceive the emails as 'spam' (Glasow 2005). Additionally, given that the study is investigating a specific technology that is relatively new to the industry, there potentially could be a high probability of bias whereby the respondents would consult others when completing the survey. There was therefore a high chance that majority of the respondents would not actually be making use of the technology. There was also a probability of some of the questions not being answered. These weaknesses in written surveys all supported the decision to use a researcher administered survey.

3.3.1. Sampling Technique

Sampling is the process of selecting the members or firms that will form part of the research and represent the population (Steyn, Smit, Du Toit & Strasheim 2003). Non-probability sampling was used to select the sample that was chosen to participate in the research. More specifically a snowball sampling technique was used to access and locate the subset of SMEs that were required for the study. In an ideal scenario, the research study would have used public SME databases and random sampling employed to pick merchants to participate in the study. However, these SME public databases are often outdated and the merchant contact information listed there is hardly correct which would result in a very low response rate. To get useful and adequate responses, significant time, cost and effort would be required to be invested into the data collection process. Given the time limitations in place to complete the study, a snowballing technique was selected to choose the research participants. This technique is usually used to measure 'hidden' or 'unregistered' populations (Dragan & Isaic-Maniu 2013). Given that the SME databases proved to be inefficient and difficult to source correct details, this merchant population can be classified as 'hidden'.

3.3.2. Sampling Frame

The study sampled 100 merchants. Merchants with or without mPOS devices were included in the sampling process. There are very few merchants that have mPOS devices therefore it was important to include merchants that do not have mPOS devices. Of the 100 respondents that were included in the research, only 7 of them had a mPOS device. A snowball technique was used to locate additional respondents and with this approach, the sampled merchants nominated other potential candidates for the study.

3.4. Instrument Development

This research involved the use of face-to-face researcher-administered survey of research participants in the Johannesburg area in South Africa. The data collected from these researcher-administered surveys provided values for the indicators that had been identified as the constructs. The questionnaire was predefined and all the participants were asked the same questions to ensure that there is no 'cherry picking' of questions and to ensure that there is no bias in the process. A face-to-face survey was selected as the main data collection method as it can provide new insights into the research (Westat 2002). The structured questionnaire employed made use of a multi-item 5-point Likert-type scales (1= Strongly Disagree to 5=Strongly Agree) to measure each of the model's independent variables. Operationalisation is the process of defining the indicators that will be measured by the theoretical constructs (Bhattacherjee 2012). This is important as some of the constructs are difficult to observe or are subjective in nature. Therefore, the constructs that were defined in the theoretical discussion section, including size of the firm, perceived security and value proposition are difficult to observe directly in the field. For these constructs to be measured, indicators will be will defined and assigned which allow for the assessment of the indicators. The indicators when looked at in combination give rise to variables. The variables are measured on a scale using the value of the attributes that make up the construct (De Vaus 2001). The measurement items that were used in the questionnaire were extracted from previous instruments from mobile payments and mPOS IS

literature. Making use of this literature as the basis for operationalising scales ensured that the questionnaire's content validity was upheld. The table below indicates how the constructs in the research will be measured using a questionnaire.

TOE Context	Variable	Measurement Item	Reference
Technological Context	Value proposition	▪ I believe my selection of an mPOS would/is based on the value proposition it provides. ▪ I believe an mPOS would/does complement my firm's operations. ▪ Using an mPOS would/does assist me in attracting customers to my firm. ▪ I believe an mPOS would/does assist in retaining my customers. ▪ My firm would/does make use of value added services provided by mPOS.	(Ondrus & Lyytinen 2011) (Carton et al. 2012) (Mallat & Tuunainen 2005) (Mallat & Tuunainen 2008)
	Security	▪ I believe my customers are sceptical of using alternative payment methods like mPOS ▪ I am sceptical of adopting mPOS for my firm. ▪ I believe mPOS fraud could be/is a reality for my firm. ▪ I believe mPOS is more secure than cash. ▪ I believe mPOS solutions are more secure than other card payment methods.	(Au & Kauffman 2008) (Lai & Chuah 2010) (Schierz et al. 2010) (Mallat & Tuunainen 2005) (Mohammadi & Jahanshahi 2008) (Mallat & Tuunainen 2008)
	Cost	▪ I believe an mPOS would/will reduce my firm's costs. ▪ I believe an mPOS is costlier compared to alternative payment methods. ▪ How much do you think an mPOS solution should cost (once-off)?	(Carton et al. 2012) (Mallat & Tuunainen 2008) (Oliveira & Martins 2011b)
Organisational Context	Industry Segment	▪ I believe mPOS is better suited for firms with delivery services.	(Yang et al. 2012)

		▪ I often need to accept payments away from my store. ▪ What type of industry would you say your firm operates in? ▪ Does your firm offer delivery services?	(Lai & Chuah 2010)
	Size of SME	▪ I believe my firm's IT infrastructure/architecture is complex. ▪ How many employees do you have? ▪ How many outlets do you have? ▪ What is your annual turnover?	(Mallat & Tuunainen 2008) (Mallat & Tuunainen 2014)
Environmental Context	Compliance and Regulation	▪ I believe the industry regulation and compliance surrounding mPOS would deter me from adopting it. ▪ I am aware of the compliance and regulation required to own an mPOS. ▪ I believe my firm finds the industry regulation and compliance regarding mPOS difficult to comply with.	(Liu et al. 2015) (Lai & Chuah 2010)
	Competition	▪ I am aware of who my competitors are. ▪ My competitors have adopted mPOS. ▪ I believe mPOS adoption would be/is driven by what my competitors are using. ▪ I am aware of the payment solutions my competitors use.	(Liu et al. 2015) (Lai & Chuah 2010) (Mallat & Tuunainen 2008)
	Merchant Adoption	▪ I am aware of mPOS solutions available in the market. ▪ Rank the following in order of importance when considering an mPOS solution (1 is highest priority and 5 is the lowest priority). ▪ How Long Have You Had a Mobile Point of Sale (mPOS)?	(Liu et al. 2015) (Yang et al. 2012) (Mallat & Tuunainen 2014) (Carton et al. 2012) (Mallat & Tuunainen 2008)

Table 3: Survey Measurement Summary

3.4.1. Limitations and Threats to Internal and External Validity

Internal and external validity is important to measure as this verifies the extent to which the study's independent variables are truly responsible for the observed variation in the dependent variable (Reid 2014). Threats to internal

validity compromise the ability to trust the relationship between the variables and threats to external validity compromise the ability to infer that the study results can be used for another group (Westat 2002). Internal validity is concerned with the causality of the study evidence and the observation being closely aligned (Trochim 2006). Merchants that form part of the pre-test did not form part of the survey as their involvement would jeopardise the internal validity of the research. The research instrument was administered by the same individual in order not to affect the outcomes (Bhattacherjee 2012). However, given that non-probability sampling that was used, the selection of the sample was not purely random and not all Johannesburg merchants were presented with the chance to form part of the survey. By conducting an extensive literature review on the mPOS and mobile payments landscape and formulating an mPOS adoption model that is based on literature, this assisted in meeting the test of validity.

External validity is concerned with the degree to which the findings in the study hold true for the remaining population (Lohr 1999). The fact that non-random sampling method was employed was an unavoidable limitation to the study given the time and resources available. The subjects of the research were only given one treatment of the instrument and any merchants involved in the pre-test were not be involved in the final study. The key terms used in the questionnaire are widely agreed upon to reduce any ambiguity that might affect the external validity of the responses.

3.4.2. Demographic Data

Respondents were required to provide some demographic data to provide additional information that was key to understanding the nature and maturity of their firm. Respondents were required to provide the following:

- Number of employees
- Number of outlets
- Annual turnover

In addition, the respondents were also requested to provide the type of industry segment, for example retail and restaurant.. that they think their business operates in. Visa and MasterCard define over 900 industry sectors that merchants can potentially fall into. Given the vast options that exist regarding the industry segment field, this section was left blank for the respondents to best describe the industry sector they fall into. The location of the firm was also obtained for reporting and analysis purposes.

3.5. Pre-Testing

The study made use of a pre-test to enhance face validity. Five respondents were selected for the pre-testing. These respondents were made up of a mixture of staff from University of the Witwatersrand and work colleagues that are in the payments industry. The staff from University of the Witwatersrand were selected to participate in the pre-test as they are specialist in question construction and can easily pick up issues in the way the questions are being asked. Minor changes were made to the question design and structure following the pre-test exercise that was carried out.

3.6. Pilot Testing

Merchants that were used for the pilot testing were not allowed to participate in the final survey. Pilot testing was used to determine whether the questions made sense to the participants, and to validate whether the options provided for the Likert scale questions were sufficient to cover the research variables being measured. The instrument was pilot tested with four respondents who were work colleagues that had extensive knowledge with mPOS, and had small firms they own. By using these types of respondents for the pilot test, this ensured that any weaknesses in the questions were identified and eliminated. This multiple phased approach of instrument development was important as it provided a significant degree of refinement and restructuring of the survey instrument (Bhattacherjee 2012). The pilot test was established to get feedback from respondents on the following items:

- Were the questions clear and well structured?
- Were there any terms that are too complex to understand for the average merchant?
- Was the questionnaire too long or too short?
- Based on the variables that the research is trying to investigate, are there other questions that could be included?

Table 4 summaries the changes that were made to the instrument following the pilot test, and the final questionnaire is presented in Appendix A.

Pre-Pilot Test	Post Pilot Test	Change Made
I believe an mPOS is more cost than alternative payment methods	I believe an mPOS is more costly than alternative payment methods	Reworded cost to costly
How long have you had a Mobile Point of Sale (mPOS)? ▪ Less than 1 year ▪ More than 1 year ▪ More than 2 years ▪ Don't have one yet	How long have you had a Mobile Point of Sale (mPOS)? ▪ Don't have one yet ▪ Less than 1 year ▪ More than 1 year ▪ More than 2 years	Included an option of 'Don't have one yet'
I believe mPOS fraud could be/is be a reality for my firm	I believe mPOS fraud could be/is a reality for my firm	Removed the word 'be'

Table 4:Pilot Test Summary of Changes

3.7. Administration of the Instrument

Once the pilot test was done, the final survey was administered via face-to-face researcher administered as planned. The survey was conducted over the course of twenty weeks through visiting firms in Johannesburg from December 2016 through March 2017. During this period, all 100 respondents were visited for a face-to-face researcher administered survey. This process ensured that only respondents that qualified for the research were asked to participate in the survey. This eliminated the chance of rogue responses as participants that did not fit the entry criteria were eliminated from the onset. The survey was intended for SME merchants that wanted to take part in the survey. The survey had to be completed by the owner of the business as some of the questions that were asked could only be answered by the owner of the firm, for example, annual turnover. There was also a high

probability that the firm's staff did not understand the concept of mPOS and would never have been involved during the decision-making process when selecting the payment technology that the firm would make use of. The respondents had the option of either completing the survey themselves or dictating the answers to me. This process allowed the respondents to ask questions where they wanted clarity on a question and also catered for the older merchants that would not normally have access to electronic channels of communication (Krosnick & Chang 2010).

In instances where the owner of the firm was not available, the firm was visited on another day when the owner of the firm was available to take part in the survey. To prevent respondent pressure if the owner of the firm was busy at the time they were asked to take part in the survey, the owner of the firm could advise on a more appropriate time or day. A copy of the physical instrument was captured in electronic format once the survey was complete.

Given this ability to identify participants that qualified for the survey, all 100 questionnaires were ultimately utilised for analysis.

3.8. Data Analysis Strategy

The data was analysed using a combination of Microsoft Excel 2016 and IBM statistical software package SPSS (version of software). A combination of descriptive and inferential statistics was used to analyse the data collected. Descriptive statistics was used to provide summary data on the sample and establish any patterns (Lohr 1999). The demographic data collected was used to provide a brief descriptive coefficient to summarise the population. Inferential statistics were used for hypothesis testing (Steyn et al. 2003). After the data was collected, it was analysed to establish the significance of the results. Validity and reliability are essential elements of this evaluation process. Validity is concerned with the extent to which the instrument represents the construct it was supposed to measure. Reliability can be defined as the extent to which the measure of this construct is consistent (Tavakol & Dennick 2011). An instrument cannot be valid unless it is reliable, however the reliability of an instrument is not dependent on the validity (Bhattacherjee 2012).

A correlational matrix was used to estimate the relationships between the variables in the study. The correlational matrix was ideal as it is used where there are multiple relationships between the measures and where the level of measure is ordinal (Steyn et al. 2003). Validity of the constructs in the study were measured by using convergent and discriminant validity. Convergent validity refers to the extent to which the instrument relates to the construct it is supposed to measure, and discriminant validity is the extent to which the instrument does not measure other constructs it is not supposed to measure (Bhattacherjee 2012). Bivariate correlational analysis was used to compute the correlations between these constructs to demonstrate the convergent and discriminant validity. For example, for this mPOS adoption study, bivariate correlation was used to compute a two-item measure for external perceived security and a two-item measure for market competition.

The research used Cronbach's alpha, which is the most common measure of reliability of an instrument (Tavakol & Dennick 2011). Cronbach's alpha was used to measure the internal consistency of the survey and was expressed

as a number between 0 and 1. Therefore, this reliability estimate was used to show the measurement error applicable to the research. The higher the value of the Cronbach's alpha, the more highly the items in the test are correlated, i.e. the higher the internal consistency. Multiple regression was used to analyse and describe the relationships between the dependent and independent variables. Hierarchical regression is a statistical technique that can be used to show how much of the Dependent Variable (DV) is influenced by variables that are being investigated (Abebe 2014). Hierarchical regression was used to investigate these relationships. The variables that are thought to have a significant impact were entered incrementally to create models that can be used to make inferences on the proposed model (Jonsson & Svingby 2007). The measure for R-square checks how close the data is to the fitted regression line (Yang et al. 2012). This value is measured as a percentage and the higher the value, the more likely the model explains the variability of the response data. The R-square value was calculated and used to evaluate how much predictive power was added to the model by the addition of the independent variables in the steps.

Hypothesis testing was used to systematically test the claims for the selected population. This can be used by using the *p*-value. The *p*-value is a test to determine statistical significance in a hypothesis test (Han & Mithas 2013). The *p*-value can be used to evaluate whether the sample data supports that the null hypothesis is true. The null hypothesis is a measure used to describe a lack of difference between the effect or groups that are being tested in a study (Chang & Gurbaxani 2012). The null hypothesis is used to determine whether some observed behaviour of the sample population was true for the entire population. For example, if we wanted to measure the claim that the adoption for mPOS diminishes with the annual turnover that a firm brings in. By calculating the probability value (p-value), the null hypothesis can be retained or rejected (Reid 2014).

3.9. Ethical Considerations

The study was conducted using the standard ethical processes as prescribed by the University of the Witwatersrand. The study was approved by the School of Economic and Business Sciences with protocol number CINFO/1128 (refer to Appendix D). Prior to administering the questionnaire, the researcher informed participants that participation was completely voluntary. Furthermore, to address anonymity and confidentiality concerns, the researcher informed participants prior to administering the questionnaire that anonymity and confidentiality will be maintained. This was also stipulated in the letter of informed consent that participants had to sign before participating in the study. This letter authorised the researcher to make use of the data collected in the questionnaire.

By adhering to the ethics rules, the results of the study are honest and reflective of the situation investigated. The right to privacy is one of the most important rights when it comes to conducting research. This has legal implications in South Africa if abused, and this study will ensure that this right is adhered to (Chatterjee et al. 2015). All participants did not come into harm (social, physical or emotional) by participating in this study. At any point during the survey process, participants were provided with the option to withdraw their involvement (before, during or after). By completing and signing the consent form, the participant gave the researcher the right to use his/her responses. The results of this study will only be disclosed to external parties once the examination process is complete and at no time prior to that.

4. Chapter 4: Presentation of Results

4.1. Data Screening

A total of 100 participants voluntarily took part in the survey over 20 weeks of data collection. Given that this was a face-to-face researcher administered survey, the researcher could identify participants that qualified for the research, therefore only respondents that qualified were engaged. All 100 participants that took part in the survey formed part of the final data pool.

4.1.1. Missing Data

All the responses that were collected were completed correctly and there was no missing data or errors in the completion of the survey. This was primarily due to the nature of the survey technique (face-to-face researcher administered survey) that was employed. With this technique, if any questions were missed, the researcher would point out the missed questions and the respondent addressed the question immediately. This resulted in all the survey questions being addressed completely and correctly.

4.1.2. Outlier Detection

A standardised z score was used to identify how many standard deviations were above or below the mean occurring in the normal distribution of the data. Standardised z-scores were computed for each item. To ensure that none of the items were too far away from the mean score, items were removed if they had a standardised z-score that was greater than 3 or less than -3 on more than one questionnaire item. This would mean that the item score was within three standard deviations from the mean. No items were greater than 3 or less than -3 on more than one questionnaire item therefore there were no items that were removed from the 100 responses that were captured.

4.2. Demographic Analysis

To measure and determine the heterogeneity of the responses that were collected, the demographic data was analysed. Demographic data from the responses was analysed to ascertain dimensions and dynamics of the population that formed part of the study. The demographic data was used to inform the type of SMEs that were involved in the study as this has a bearing on the observations that were seen during analysis. From a theoretical viewpoint, mPOS adoption has not been well received in South Africa. This can be supported by the data analysis that was conducted where 93% of the SMEs that took part in the research did not currently have an mPOS device. The SMEs that were involved in the study were aware of the technology, however, they had chosen not to adopt the technology. The table below highlights the SMEs that formed part of the research, and the length of period they have had an mPOS (if they had one).

Does SME have mPOS	Frequency	Valid Percent
Don't have one yet	93	93
Less than a year	4	4
More than 1 year	3	3
Total	**100**	**100**

Table 5: Current mPOS Adoption

Of the 100 respondents, the SMEs were spread out across eighteen industry segments. The respondents were classified into categories based on the industry segment they operated in. It was observed that only four industry segments had SMEs with mPOS, namely Florists, Hospitality, Restaurants and Retail. Most respondents were in the Retail industry segment, as 54% of the responses were obtained from Retail industry segment. The table below highlights the industry segment distribution of the respondents that formed part of the research.

Industry Sector	Frequency	Percent	Cumulative Percent
Bar	1	1	2
Beauty	6	5.9	7.9
Butchery	2	2	9.9
Florist	3	3	12.9
Fuel	1	1	13.9
Gym	2	2	15.8
Hospitality	7	6.9	22.8
Information Technology	2	2	24.8
Laundry	1	1	25.7
Medical	4	4	29.7
Motor Workshop	2	2	31.7
Optometry	2	2	33.7
Photography	1	1	34.7
Restaurant	9	8.9	43.6
Retail	54	53.5	97
Salon	1	1	98
Toy Shop	1	1	99
Veterinary	1	1	100
Total	**100**	**100**	

Table 6: Industry Sector Distribution Summary

From a turnover perspective, 60% of the SMEs that took part in the research have an annual turnover of two to four million rands. The SMEs were split up into four turnover groupings. The turnover that a firm makes can be used to distinguish the relative size of the firm. The table below highlights the turnover distribution of the respondents that formed part of the research.

Annual Turnover (Rands)	Frequency	Percent
<200 000	20	20
2-4 mil	60	60
4-40mil	19	19
40-60mil	1	1
Total	**100**	**100**

Table 7: Turnover Distribution Summary

The SMEs were split up into three categories regarding the number of employees that it has. The staff complement that a firm has can also be used to distinguish the relative size of the firm. 78% of the SMEs that took part in the research have less than ten employees and only 13% had more than twenty employees. The table above highlights the frequency distribution for the annual turnover for the businesses that formed part of the research.

Number of Employees	Frequency	Percent
Less than 10	78	78
More than 10	9	9
More than 20	13	13
Total	**100**	**100**

Table 8: Number of Employees Distribution Summary

The SMEs were also grouped by the number of outlets that the firm had. The number of outlets that a firm has can also be used to determine the size of the firm. 91% of the SMEs that took part in the research had fewer than two outlets, and only 1% of the firms had more than seven outlets. The table above highlights the outlets distribution of the respondents that formed part of the research.

Number of Outlets	Frequency	Percent
Less than 2	91	91
More than 2	5	5
More than 5	3	3
More than 7	1	1
Total	**100**	**100**

Table 9: Number of Outlets Distribution Summary

From an academic viewpoint, firms that offer delivery services should have a greater need for mPOS as the technology is suited for firms that have delivery services (Flatraaker 2013). 50% of the SMEs that took part in the research offer delivery services. Therefore, there was a fair representation of merchants that offer delivery services. The table below highlights the SMEs that offer delivery services of the respondents that formed part of the research.

Delivery Services Offered	Frequency	Valid Percent	Cumulative Percent
Yes	50	50	50
No	50	50	100
Total	**100**	**100**	

Table 10: Delivery Services Offered Summary

4.3. Factors that Affect Adoption of mPOS

Respondents were asked to rank by importance the variables that they thought would affect their adoption of mPOS technology. The variable that was ranked first was the most important variable when it came to considering mPOS adoption. The mode (most frequent response) was calculated per response provided by the respondents to determine the ordinal ranking. The study results showed that of the majority of, respondents valued cost and security as the most important variables when ranking the adoption variables. Competitive advantage and compliance and regulation were the least important. Table 11 summarises the responses that were collected regarding the ranking, and Table 12 provides the final ordinal ranking of the variables that were investigated in the question.

Ordinal Ranking	Cost	Security	Value Proposition	Competitive Advantage	Compliance and Regulation
1	44	34	10	7	5
2	25	44	14	8	7
3	16	14	35	26	9
4	7	6	28	34	25
5	8	2	13	25	54
Total	**100**	**100**	**100**	**100**	**100**

Table 11: Adoption Driver Results

Variable	Modal Ordinal Ranking
Cost	1
Security	2
Value Proposition	3
Competitive Advantage	4
Compliance and Regulation	5

Table 12: Adoption Driver Ranking

Respondents were asked how much they were willing to spend for a mPOS. This cost was then compared with the average cost of an mPOS in South Africa. 41% respondents confirmed that they are not willing to pay more than R500. Figure 5 depicts the cost that SMEs were willing to pay for an mPOS.

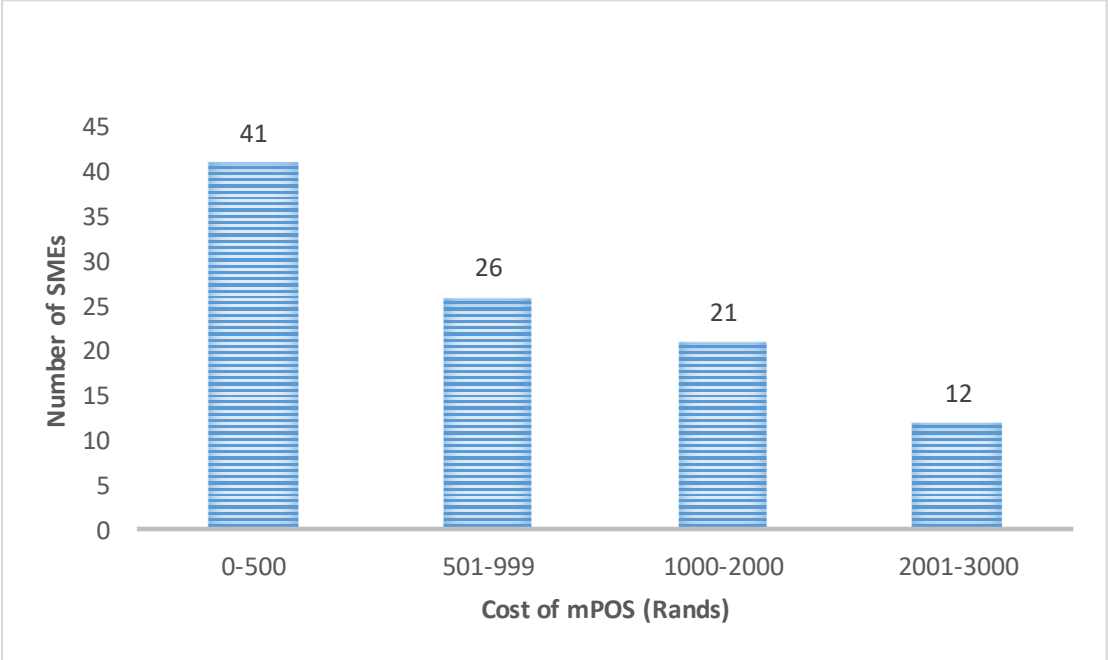


Figure 6: Cost SMEs Willing to Pay for mPOS

4.4. Validity and Reliability

The reliability and validity of the scales that were used to measure the mPOS adoption factors had to be determined first before the model could be assessed. Factor analysis was used to assess the structure of data by investigating the correlations between the variables. This was achieved by compressing the variables into smaller variables. Before factor analysis was performed on the data, the Kaiser-Meyer-Oklin (KMO) test was first run on the variables to be studied. This test was performed to ensure that the sample size was sufficient for factor analysis. The calculated KMO value was 0.617 (Table 13), therefore the data could be used for factor analysis as previous research has shown that significant KMO values are those greater than 0.600 (Jonsson & Svingby 2007),

Bartlett's test was also run on the data to determine the homogeneity of the variances. In order to run correlation analysis on the data, there must be some level of correlation between the variables, and Bartlett's test aims to identify this (Jonsson & Svingby 2007). By using SPSS, the value for Bartlett's test (Table 13) was determined and for this study it was significant i.e. $p < 0.001$ (Leech, Barrett & Morgan. 2005), therefore, using factor analysis was deemed appropriate for this study.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.627
Bartlett's Test of Sphericity	**Approx. Chi-Square**	861.281
	df	276
	Sig.	0

Table 13: KMO and Bartlett's Test Results

Principal axis factor analysis with Varimax rotation was conducted to assess the underlying structure for the 24 items of the mPOS adoption questionnaire. The assumption of independent sampling was met (Costello &

Osborne 2005). The assumptions of normality, linear relationships between pairs of variables, and the variables being correlated at a moderate level were checked.

Eight factors were requested because the items were designed to index eight constructs, namely Value Proposition, Security, Cost, Competition, Size of SME, Industry Segment, Compliance & Regulation and Merchant Adoption. After rotation, the first factor accounted for 8.435% of the variance, the second factor accounted for 7.242%, the third factor accounted for 7.241%, the fourth accounted for 7.175%, the fifth accounted for 6.831%, the sixth accounted for accounted for 6.055%, the seventh accounted for accounted for 5.413%, and finally the eighth accounted for 4.82% of the variance.

Total Variance Explained						
Factor	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.476	18.651	18.651	2.024	8.435	8.435
2	3.067	12.78	31.431	1.738	7.242	15.677
3	2.426	10.108	41.539	1.738	7.241	22.918
4	1.594	6.642	48.181	1.722	7.175	30.093
5	1.427	5.945	54.126	1.64	6.831	36.924
6	1.225	5.103	59.229	1.453	6.055	42.979
7	1.144	4.768	63.997	1.299	5.413	48.392
8	0.973	4.054	68.051	1.157	4.82	53.212
9	0.921	3.837	71.888			
10	0.792	3.301	75.189			
11	0.785	3.27	78.459			
12	0.679	2.827	81.286			
13	0.645	2.686	83.973			
14	0.621	2.589	86.562			
15	0.553	2.305	88.867			
16	0.53	2.207	91.073			
17	0.397	1.653	92.726			
18	0.375	1.563	94.29			
19	0.347	1.446	95.736			
20	0.292	1.218	96.954			
21	0.241	1.002	97.957			
22	0.205	0.856	98.813			
23	0.152	0.634	99.447			
24	0.133	0.553	100			

Extraction Method: Principal Axis Factoring.

Table 14:Principal Axis Factor Analysis

Table 15 below presents the Factor Loadings from Principal Axis Factor Analysis with Varimax Rotation for an Eight-Factor Solution for mPOS adoption questions (N =100) with loadings less than 0.3 omitted to improve clarity. The first factor, value proposition, had strong loadings on the first three items. These three items were all from the same construct, which indicates a relationship with the constructs. The mPOS adoption item loaded with the cost items which highlights the significance of cost in relation to the analysis. As depicted in Table 15 below, most of the items had high loading with the related constructs, which indicates a significant level of correlation between the items and the constructs that they were trying to measure.

Rotated Factor Matrix[a]								
	Factor							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
ValueProp3	0.773						0.328	
ValueProp4	0.74					0.362		
ValueProp5	0.583	0.402						
Security4		0.632						
IndustryReg2		0.509						
Competition5		0.462						
Security1			0.819					
Security2			0.639					
Security3			0.475					
mPOS Adoption				0.809				
Cost2				-0.556				
Cost1				0.395		0.392		
IndustrySeg1								
IndustryReg3					0.692			
IndustryReg1			0.325		0.628			
Size1				-0.408	0.429			
Competition2					0.405			
Security5	0.368	0.316				0.603		
IndustrySeg2		0.314				0.51		
Competion3						0.491		
ValueProp2	0.355						0.773	
ValueProp1							0.563	
Competition1								0.73
Competition4								0.609

Extraction Method: Principal Axis Factoring.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 13 iterations.

Table 15: Rotated Factor Matrix

The internal consistency (reliability) of the measurement scales were assessed through the Cronbach's alpha (α) coefficient. Data is deemed reliable and acceptable if the computed Cronbach's alpha is 0.70 or higher (Jonsson & Svingby 2007). The reliability statistics value was produced using SPSS for all the 24 items and had a value of 0.737. This indicates a reliable level of internal consistency for the scale. Table 16 below illustrates this measure.

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.737	0.732	24

Table 16: Reliability Statistics: Cronbach's Alpha

An Item-Total Statistics table was also executed to validate the Cronbach's alpha if that item was deleted from the scale. By looking at the Corrected Item-Total Correlation, there is one item that has a negative item-total correlation (Comp1: -0.017). This item also has the largest impact to Cronbach's alpha if that item was deleted (0.750). Therefore, this item (Comp1) was discarded. Table 17 below presents Item-Total Statistics.

Item-Total Statistics					
Item	**Scale Mean if Item Deleted**	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Squared Multiple Correlation**	**Cronbach's Alpha if Item Deleted**
MPA	75.6	76.687	0.053	0.526	0.738
VP1	71.88	70.349	0.328	0.391	0.725
VP2	71.96	69.594	0.356	0.509	0.722
VP3	72.25	67.179	0.547	0.747	0.708
VP4	72.24	66.972	0.533	0.756	0.709
VP5	72.35	68.129	0.451	0.592	0.715
Sec1	72.4	72.909	0.14	0.576	0.74
Sec2	72.76	75.74	0.008	0.503	0.749
Sec3	72.46	75.079	0.045	0.44	0.746
Sec4	71.64	72.495	0.262	0.532	0.729
Sec5	72.56	68.471	0.553	0.62	0.711
Cos1	72.25	72.977	0.267	0.392	0.729
Cos2	72.79	75.663	0.063	0.53	0.74
IndSeg1	71.83	75.658	0.02	0.3	0.746
IndSeg2	72.72	66.931	0.385	0.516	0.719
Comp1	71.86	76.243	-0.017	0.49	0.750
Comp2	72.6	70.747	0.341	0.546	0.724
Comp3	72.64	68.98	0.439	0.483	0.717

Comp4	72.1	72.293	0.258	0.427	0.73
Comp5	72.35	69.624	0.356	0.271	0.722
IndReg1	72.7	71.081	0.324	0.475	0.725
IndReg2	72.59	70.002	0.388	0.458	0.721
IndReg3	72.81	73.731	0.185	0.483	0.734
Siz1	73.07	68.894	0.357	0.543	0.722

Table 17: Reliability Statistics: Cronbach's alpha (Item Total Statistics)

4.5. Control Variables

The sizes of SME and industry segment were examined for their effects on the study to determine whether they should be controlled for. Out of the 18 industry segments that formed part of the population, only four of the industry segments had an mPOS, namely Florist, Hospitality, Restaurant and Retail industry segments. Out of those four segments, only seven of those SMEs had an mPOS.

SMEs Industry Segment with mPOS			
Industry Segment	**No**	**Yes**	**Total**
Bar	1		1
Beauty	6		6
Butchery	2		2
Florist	1	2	3
Fuel	1		1
Gym	2		2
Hospitality	5	2	7
Information Technology	2		2
Laundry	1		1
Medical	4		4
Motor Workshop	2		2
Optometry	2		2
Photography	1		1
Restaurant	8	1	9
Retail	52	2	54
Salon	1		1
Toy Shop	1		1
Vetenary	1		1
Total	**93**	**7**	**100**

Table 18: mPOS Adoption by Industry Segment

One-way between groups ANOVA tests were conducted to compare the effects of the demographic variables, namely industry segment and size of SME on mPOS adoption. This is highlighted in Table 19 and Table 20 below.

As highlighted in Table 19, the industry segment significance value is 0.091 (i.e. p=0.091), which is more than 0.05 and therefore there is no statistical significant effect of the industry segment. The size of firm significance value is 0.789 (i.e. p=0.789), which is more than 0.05 therefore there is no statistical significance effect of the size of the firm. Therefore, size of firm and industry segment were not included as control variables on later tests of the research model.

ANOVA (Industry Segment)					
	Sum of Squares	**Df**	**Mean Square**	**F**	**Sig.**
Between Groups	1.6	17	0.094	1.572	0.091
Within Groups	4.91	82	0.06		
Total	6.51	99			

Table 19: One Way ANOVA (Industry Segment)

ANOVA (Size of Firm)					
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	0.071	3	0.024	0.35	0.789
Within Groups	6.439	96	0.067		
Total	6.51	99			

Table 20: One Way ANOVA (Size of Firm)

4.6. Impact on Model

Based on the analysis conducted above, there was one item that was excluded from the final analysis. The item that was removed was determined by looking at the Corrected Item-Total Correlation value (Table 17). The item when corrected, that had the largest impact to Cronbach's alpha was excluded. This item (Comp1), was therefore removed from the "Competition" construct. There were still other items in this construct that could be used. Therefore, there was no impact to the model as all the constructs that were proposed were included in the final model:

H1a: There is a positive relationship between the industry segment the merchant operates in and the perceived value proposition that the mPOS provides.
H1b: There is a positive relationship between the industry segment the merchant operates in and mPOS adoption.
H2: There is a negative relationship between the size of the SME and mPOS adoption.
H3: There is a negative relationship between the perceived cost of an mPOS offering and mPOS adoption.
H4: There is a positive relationship between the perceived value proposition an mPOS solution offers and mPOS adoption.
H5: There is a positive relationship between the perceived security an mPOS provides and mPOS adoption.

H6: There is a negative relationship between the compliance and regulation around an mPOS offering and mPOS adoption.

H7: There is a positive relationship between perceived competition and mPOS adoption.

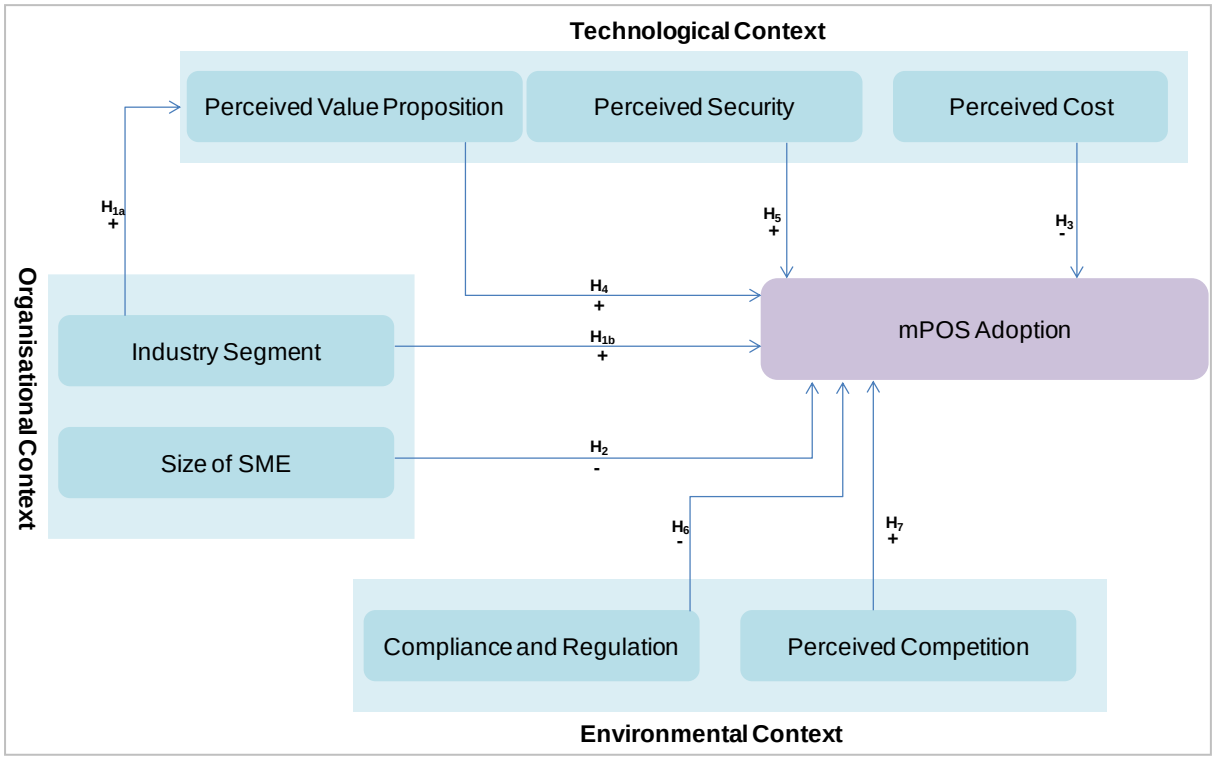


Figure 7: mPOS Model

4.7. Correlational Analysis

Composite scores were calculated for Value Proposition, Security, Cost, Industry Segment, Competition, Industry Regulation and Size variables. The table below presents the descriptive statistics for the composite variables that were used for the next level of data analysis.

	N	Min	Max	Mean	Std. Deviation	Variance	Skewness		Kurtosis	
							Statistic	Std. Error	Statistic	Std. Error
Composite VP	100	1	5	3.534	0.76702	0.588	-0.33	0.241	0.192	0.478
Composite Sec	100	2.2	4.8	3.306	0.50409	0.254	0.273	0.241	0.449	0.478
Composite Cos	100	2	5	3.15	0.45227	0.205	1.12	0.241	3.207	0.478
Composite IndSeg	100	1	5	3.395	0.8913	0.794	0.062	0.241	-0.21	0.478
Composite Comp	100	1.75	5	3.2475	0.57789	0.334	0.408	0.241	0.753	0.478
Composite IndReg	100	2	5	2.97	0.63404	0.402	0.653	0.241	0.68	0.478
Composite Siz	100	1	5	2.6	1.14592	1.313	0.592	0.241	-0.474	0.478

Table 21: Descriptive Statistics for Composite Variables

Following the Factor Analysis, the remaining items that made it through the analysis were used as input for the Pearson's product-moment correlation coefficient. This statistical technique is used in order to understand the strengths of relations between variables (Murray 2013).

	VP	Sec	Cost	IndSeg	Comp	IndReg	Size	MPA
VP	1							
Sec	.239*	1						
Cost	0.096	0.036	1					
IndSeg	.319**	0.061	.209*	1				
Comp	.419**	0.136	.378**	.284**	1			
IndReg	0.035	.453**	.233*	0.015	.436**	1		
Size	0.057	.340**	.322**	-0.022	.330**	.502**	1	
MPA	.239*	0.02	-0.091	0.187	-0.016	-0.09	-.351**	1

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

Table 22: Correlation Matrix on Composite Scores

Hypothesis 1a:

The relationship between Industry Segment (M=3.395; SD=0.8913) and Perceived Value Proposition (M=3.534; SD=0.76702) was examined. The correlation between these variables yielded a sample correlation coefficient of 0.319, which is statistically significant at the 0.01 level ($r=0.319$, $p<0.01$). This provides support for Hypothesis 1 that Industry Segment and Value Proposition are positively and significantly related. Therefore, in this context the value proposition that merchants perceive from mPOS is dependent on the industry segment that firm operates in.

Hypothesis 1b:

The relationship between Industry Segment (M=3.395; SD=0.8913) and mPOS adoption (M=0.07; SD=0.256) was examined. The correlation between these variables yielded a sample correlation coefficient of 0.187, which is statistically insignificant at the 0.05 level ($r=0.187$, $p<0.05$). However, a linear association between Industry Segment and mPOS adoption is not statistically significantly different from zero. Therefore, the Industry Segment cannot be associated with mPOS adoption in this context.

Hypothesis 2:

The relationship between Size (M=2.6; SD=1.14592) and mPOS adoption (M=0.07; SD=0.256) was examined. The correlation between these variables yielded a sample correlation coefficient of -0.351, which is statistically insignificant at the 0.01 level ($r=-0.351$, $p<0.05$). This does not provide sufficient support for Hypothesis 2, that Size of the SME and mPOS adoption are negatively and significantly related.

Hypothesis 3:

The relationship between Perceived Cost (M=3.15; SD=0.45227) and mPOS adoption (M=0.07; SD=0.256) was examined. The correlation between these variables yielded a sample correlation coefficient of -0.091, which is statistically insignificant at the 0.05 level ($r=-0.091$, $p<0.05$). A linear association between Perceived Cost and mPOS adoption is not statistically significantly different from zero. Therefore, the Perceived Cost cannot be associated with mPOS adoption in this context.

Hypothesis 4:

The relationship between Perceived Value Proposition (M=3.534; SD=0.76702) and mPOS adoption (M=0.07; SD=0.256) was examined. The correlation between these variables yielded a sample correlation coefficient of 0.239, which is statistically insignificant at the 0.05 level ($r=0.239$, $p<0.05$). This does not provide sufficient support for Hypothesis 4, that Perceived Value Proposition and mPOS adoption are positively and significantly related.

Hypothesis 5:

The relationship between Perceived Security (M=3.306; SD=0.50409) and mPOS adoption (M=0.07; SD=0.256) was examined. The correlation between these variables yielded a sample correlation coefficient of -0.02, which is statistically insignificant at the 0.05 level ($r=0.02$, $p<0.05$). A linear association between Perceived Security and mPOS adoption is not statistically significantly different from zero. Therefore, the Perceived Security cannot be associated with mPOS adoption in this context.

Hypothesis 6:

The relationship between Compliance and Regulation (M=2.97; SD=0.63404) and mPOS adoption (M=0.07; SD=0.256) was examined. The correlation between these variables yielded a sample correlation coefficient of -0.09, which is statistically insignificant at the 0.05 level ($r=-0.09$, $p<0.05$). A linear association between Compliance and Regulation and mPOS adoption is not statistically significantly different from zero. Therefore, the Compliance and Regulation cannot be associated with mPOS adoption in this context.

Hypothesis 7:

The relationship between Perceived Competition (M=3.2475; SD=0.57789) and mPOS adoption (M=0.07; SD=0.256) was examined. The correlation between these variables yielded a sample correlation coefficient of -0.016, which is statistically insignificant at the 0.05 level ($r=-0.016$, $p<0.05$). A linear association between Perceived Competition and mPOS adoption is not statistically significantly different from zero. Therefore, the Perceived Competition cannot be associated with mPOS adoption in this context.

4.8. Multiple Regression Analysis

Hierarchical regression was used to test the impact of the TOE factors on mPOS adoption. Model 1 considers the effects of the environmental variables (Perceived Competition and Industry Regulation and Compliance) on mPOS adoption. These variables were entered into the first block in the first step. The R^2 is 0.10, suggesting that this model explains 10% of the variability in mPOS adoption.

Model 2 considers the effects of the organisational factors on mPOS adoption. mPOS adoption was regressed on the environmental variables and organisational factors (Industry Segment and Size of Firm) in block 2. The R^2 is 0.165, suggesting that the model explains 16.5% of the variability in mPOS adoption. The change in R^2 (ΔR^2) is 0.155. This indicates that the increase in the predictive power of the model is 15.5% given the environmental variables already in the model. This is significant at the 0.001 level (ΔF=8.822, p <0.001).

Model 3 considers the effects of the technology factors on mPOS adoption. mPOS adoption was regressed on the environmental variables, organisational factors and technology factors (Perceived Value Proposition, Perceived Security and Perceived Cost) in block 3. The R^2 is 0.222, suggesting that the model explains 22.2% of the variability in mPOS adoption. The change in R^2 (ΔR^2) is 0.057. This indicates that the increase in the predictive power of the model is 5.7% given the environmental variables already in the model. This is significant at the 0.001 level (ΔF=2.245, p <0.001).

Model Summary									
					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
1	.099[a]	.010	-.011	.258	.010	.475	2	97	.623
2	.406[b]	.165	.130	.239	.155	8.822	2	95	.000
3	.471[c]	.222	.163	.235	.057	2.245	3	92	.088
a. Predictors: (Constant), TotalComp, TotalIndReg									
b. Predictors: (Constant), TotalComp, TotalIndReg, TotalIndSegm, Siz1									
c. Predictors: (Constant), TotalComp, TotalIndReg, TotalIndSegm, Siz1, TotalVP, TotalCos, TotalSec									

Table 23: Results of Hierarchical Regression Analysis (Model Summary)

The results of the ANOVA that were completed as part of the regression show that for the initial model, the F ratio is 0.475. This highlights that it is unlikely that this would have happened by chance ($p < 0.001$). For the second model, the F ratio is 4.687, which is also significant. For the third model, the F ratio is 3.746, which also indicates a high level of significance as $p < 0.001$. Therefore, this shows that the final model improves the ability to predict the outcome variable.

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.063	2	.032	.475	.623[b]
	Residual	6.447	97	.066		
	Total	6.510	99			
2	Regression	1.073	4	.268	4.687	.002[c]

	Residual	5.437	95	.057		
	Total	6.510	99			
3	Regression	1.444	7	.206	3.746	.001[d]
	Residual	5.066	92	.055		
	Total	6.510	99			
a. Dependent Variable: MPA						
b. Predictors: (Constant), TotalComp, TotalIndReg						
c. Predictors: (Constant), TotalComp, TotalIndReg, TotalIndSegm, Siz1						
d. Predictors: (Constant), TotalComp, TotalIndReg, TotalIndSegm, Siz1, TotalVP, TotalCos, TotalSec						

Table 24: ANOVA Results for Hierarchical Regression Analysis

5. Chapter 5: Discussion

This chapter discusses the findings for each research question. The first section recaps the research questions and provides a summary of the literature review findings. The next section looks more closely at the results presented in the previous chapter regarding the factors that affect mPOS adoption. The findings are then related back to the TOE framework to determine whether the findings confirm or deviate from what was proposed. The researcher's interpretations of the findings are then given.

5.1. mPOS Adoption Factors

The first research question that the study aimed to answer was: What are the factors that affect mPOS adoption by SMEs in Johannesburg? This research question was answered by an extensive literature review that investigated the factors that affect mPOS adoption focusing on developing countries like South Africa. The review focused on the mPOS ecosystem to understand the various components that make up the mPOS business environment. An understanding of the components that make up this ecosystem provides insights into the factors that affect adoption. In order for the ecosystem to run efficiently, there has to be a fine balance that is maintained across the key components (Hedman & Henningsson 2015). The literature review uncovered that mPOS was extremely hyped when it was initially introduced in the payments landscape (Loury 2016). The hype of the product inflated the demand in the industry initially. Therefore, in the first few years, there was massive production of mPOS devices with the anticipation or perception that the market would readily consume this product. However, firms and financial institutions did not adopt the product as per the projections by the MNOs. From the data that was analysed in the previous section, only 7% of the sampled population had adopted mPOS. The firms that did not adopt mPOS were aware of the technology, however, they had opted to stick with traditional acquiring/payment solutions and not use mPOS.

The literature review identified seven factors that could affect mPOS adoption namely: Perceived Value Proposition, Perceived Security, Perceived Cost, Perceived Competition, Industry Segment, Size of Firm, and Compliance and Regulation. These seven factors were all hypothesised to have an impact on the adoption of mPOS by SMEs. The second research question that the study aimed to answer was: To what extent do these factors affect mPOS adoption by SMEs in Johannesburg? To answer this question, quantitative techniques were used to perform data analysis on the population segment. The statistical analysis confirmed that Industry Segment, Perceived Value Proposition and Size of the firm all had a significant impact. The statistical analysis also confirmed that the other adoption factors did not have a significant effect on the adoption of mPOS.

5.2. Effects of Organisational Factors on mPOS Adoption

5.2.1. Industry Segment

The study investigated the impact that the industry segment has on the adoption of mPOS. The literature review had proposed that the industry segment has an impact on the perceived value proposition. The subsequent analysis supported this hypothesis and there was a very strong correlation between the industry segment that a firm operates in, and the perceived value proposition.

Therefore, firms in a specific industry segment will derive value from the benefits that mPOS technology presents. For example, firms that are in the service industry segment that often need to visit a customer to perform the service will tend to want to accept payment away from their office or place of business. Thus, the value proposition that mPOS provides will be realised and enhanced depending on the industry segment that the firm operates. Different industry segments will value different artefacts of mPOS technology. Using the example above, service industry firms will value the remote capability that the technology provides. A technology firm on the other hand could value the interoperability that the technology provides and the relative ease of integration the technology has into existing business processes. This proposition was supported in studies by Yang et al (2012), who found that industry segment that a firm operates in has an impact on the perceived value proposition that they derive. However, the research also revealed that the relationship between Industry and mPOS adoption was statistically insignificant, therefore, the Industry Segment cannot be associated with mPOS adoption in this context.

5.2.2. Size of SME

The study hypothesised that there is a negative relationship between the size of a firm and the mPOS adoption. This was supported by studies by Mallat & Tuunainen (2014), who found that larger firms tend to be more complex, therefore, they require customised payment systems that fit their complex business operations. The results of the study supported this notion and the data provided evidence that the negative relationship was significant. There are limited mPOS product offerings in South Africa, namely: Yoco, PocketPos, Pebble and BluMobi. These offerings are mostly targeted at small firms, as the service that they offer is standalone and off-the-shelf, that will work relatively easily for small firms that do not have any complex payment structures or instruments that they support. A smaller firm's requirements, involves the ability to accept payment, and the ability to verify that settlement has occurred into their account the following day. They also tend to have limited reporting requirements that are fulfilled by mPOS. Therefore, for these smaller firms, mPOS technology will satisfy their requirements.

Larger firms, on the other hand, have more complex requirements when it comes to payment solutions. For example, they will require detailed report extracts that usually require customisation for them to be used for their daily operations such as chargeback and dispute management. Larger firms also require direct integration into a payment interface to improve business operations and better the service delivery that they provide customers. For example, in a large retail environment, the preference is to integrate the till system into the payment technology. This integration removes the need for a till operator to enter the amount that has been scanned by pre-populating this amount on the payment instrument, it removes the chance of fraud, and reduces the amount of time that customers should stand in queues. Given that the current mPOS technology does not support this level of integration yet, this hypothesis will remain.

5.3. Effects of Technological Factors on mPOS Adoption

5.3.1. Perceived Value Proposition

The study proposed that the perceived value proposition has a positive impact on the adoption of mPOS. The data analysis supported this notion, as there was a positive correlation between the independent and dependent variable.

Firms will therefore adopt mPOS technology if they perceive the technology to add value to their business operations, this is supported by the findings of Carton et al. 2012. There are various types of value propositions that could be offered by mPOS and the perceived value would be different based on the industry segment. Financial institutions or technology providers will usually create a Customer Value Proposition (CVP) that is tailored per industry segment. This is important as the various industry segments value different offerings (Ondrus & Lyytinen 2011). For example, a coffee shop could find value in having the ability to sell prepaid offerings such as prepaid airtime or electricity from their mPOS solution to their clients. This value proposition would increase the likelihood of customers visiting their firms as it could attract potential clients and provide additional services that could prove useful to their clients. Value propositions can be tangible, for example customised reporting capability via an online interface, or they can be intangible, for example, mPOS device insurance if the device is lost or damaged. The data analysis also highlighted a significant relationship between perceived value proposition and competition. Although the hypothesised model had not highlighted this relationship, the results are significant and present an opportunity for future studies. It could be argued that highly competitive firms would be more inclined to be attracted to technology products that would increase their competitive edge.

5.3.2. Perceived Security

The study proposed that the more secure firms perceive the mPOS to be, the greater the likelihood that firms would adopt the technology. Security is a fundamental issue in the payments industry as there have been numerous published breaches that have occurred to major firms across the world that have tried to implement new mobile payment instruments (Luftman et al. 2013). This has arguably fuelled the perception that new innovative payment technologies are unsafe, and merchants are very sceptical regarding new payment technologies. This proposition was supported with consistent findings by Schierz et al. (2010) that highlight that securing financial transactions is a key component that should be taken into consideration. The correlational analysis performed found the perceived security was not statistically significant. However, when respondents were asked to rank the mPOS adoption factors by importance, they selected security as the second most crucial factor that would influence their adoption. This result highlights the significance of perceived security. The perceived security of the mPOS technology might therefore be an important adoption factor.

In addition, the data analysis did show a very strong correlation between industry regulation and perceived security. The industry regulation regarding PCI DSS is aligned to international security standards, therefore, firms that value the industry regulation and understand it will have an appreciation for the security that this brings to their environment. This link between industry regulation and perceived security was not hypothesised and the literature review did not highlight this, therefore this is an area for potential future study and research.

5.3.3. Perceived Cost

The study hypothesised that the less costly firms perceive the mPOS to be, the greater the likelihood that the firms would adopt the technology. Most firms especially the SMEs make small margins in their business therefore, there is a need to adopt and make use of cost effective technology (Yang et al. 2012). Smaller firms do not have the ability to benefit from leveraging on economies of scale, as they do not have this opportunity; hence, they are very cost conscious. The correlation analysis that was performed did reveal that the relationship between cost and

mPOS adoption is negative, however the correlation was not significant with the population that was sampled. Respondents were asked to rank the factors that affect mPOS adoption by importance, and they selected cost as the most important factor that would influence their adoption. From the population that was involved in the research, 93% of the respondents that were sampled did not have an mPOS device; hence, they could have had an impact on the correlation results. There are very few firms that are using the technology, hence the results were affected as ideally an equitable number of firms with mPOS and those without would have been selected. As mentioned in earlier chapters, this technology is still very new and emerging and one of the objectives was to find out why firms are not adopting the technology. From the results collected, 41% of the firms confirmed that they would not be willing to pay more than R500 for the once-off purchase of the technology. The average price of the mPOS technology in South Africa is currently estimated at R1500. This therefore represents a significant mismatch in the price firms are willing to pay, and that the MTO are offering the technology. This statistic is important as this could explain the reason for the bad adoption rates (7%) that were uncovered by the research. The cost of the mPOS technology might therefore be an important adoption factor.

5.4. Effects of Environmental Factors on mPOS Adoption

5.4.1. Perceived Competition

The study proposed that firms that operate in competitive environments would more likely adopt mPOS. This was supported by previous research findings in the mobile payments arena that found that firms that operate in highly competitive environments, tend to adopt technology innovations that can give them a competitive edge (Ondrus et al. 2009; Liu et al. 2015). The competitive environments will foster and drive this behaviour, as firms will not want to be perceived as being left behind by their peers. The correlation analysis, however, revealed that firms are not significantly affected by competition in their environments when it relates to mPOS adoption. Respondents were asked to rank the factors that affect mPOS adoption by importance and they selected competition as the second least important factor that would influence their adoption. This can be attributed to the likelihood that SMEs do not currently perceive mPOS as contributing to their competitive edge. Therefore, the payment method may not necessarily provide the firm with a competitive advantage so firms are less likely to adopt it. The study did reveal a strong correlation between industry segment and competition. This finding supports the notion that firms in specific industry sectors may realise the competitive edge, for example, firms in the restaurant industry sector will benefit from the mobile capabilities that mPOS provides, which adds to the firm's competitive advantage.

5.4.2. Compliance and Regulation

The study hypothesised that the more compliance and regulation firms need to comply with, the less likely that the firms would be driven to adopt mPOS. The payments industry is heavily regulated by various institutions, for example MasterCard, Visa and Payments Association of South Africa. This onerous compliance and regulation was predicted to deter firms from adopting the technology. However, the correlation analysis revealed that the compliance and regulation factor was not significantly related to mPOS adoption. The analysis did affirm that the relationship between the two variables is negative, however the strength of the relationship was not as strong and significant as expected. Firms usually spend money in order to remain compliant, and with the introduction of

PCI DSS, merchants have an obligation to ensure that they maintain the integrity of their environment (Liu et al. 2015). This correlation between the cost and compliance and regulation was supported by the data analysis. This periodic maintenance of the merchant environment is usually outsourced to the financial institutions or service providers known as Qualified Security Assessors (QSA). Firms do not usually want to be involved with the onerous activities that is required to be secure, therefore they outsource the activities or pay their bank to ensure that they are compliant. Respondents were also asked to rank by importance the factors that affect mPOS adoption and they selected compliance as the least important factor that would influence their adoption. Fifty-Four Percent (54%) of the respondents agreed with this finding, which is very significant.

6. Chapter 6: Conclusion

6.1. Summary of Findings

This research aimed to answer two research questions. The first objective was to identify the factors that affect mPOS adoption by SMEs in Johannesburg. The study investigated seven factors that were hypothesised to affect mPOS adoption. These factors were identified from a literature review of seminal mPOS articles that provided theoretical support for the selection of the adoption factors. The study investigated the model fit using a R squared test which deduced that the model explained a significant variability in mPOS adoption.

A researcher administered survey was then conducted, to test the mPOS adoption factors. One hundred SME merchants were interviewed over a twenty-week period in Johannesburg. SMEs from various industry segments took part in the research. The survey was conducted to address the second research question which aimed to understand the extent the adoption factors affected mPOS adoption by SMEs in Johannesburg. This was achieved by testing the relationship between the factors using quantitative research techniques. The quantitative research also determined the significance of the factors and the extent to which the factors affect mPOS adoption.

The outcome of this testing was used to evaluate the proof and accuracy of the model. The research observed that the size of the firm and perceived value proposition had a statistically significant impact on mPOS adoption. The research also confirmed the proposition that the relationship between the industry segment and perceived value proposition is significant in this context. The results of the research were impacted severely by the lack of merchants that currently make use of the technology. Ninety-Three Percent (93 %) of the SMEs that took part in the research had not adopted the technology. This statistic also supports the notion that was discussed in the initial chapters of the study that mPOS technology has been over hyped by financial institutions that invested heavily in the technology. The South African payments industry is still in its infancy when compared to other developed payment landscapes in first world countries, for example Australia and France. This, in turn, could have an impact on the adoption levels that were exhibited and presented in the study. As the payment landscape matures, the other proposed adoption factors that were seen to not have a significant impact, could potentially have an impact.

6.2. Implications for Academia

The TOE framework was employed to investigate the problem domain. Adoption factors were derived from supporting academic literature using the TOE model as a theoretical lens. The findings highlighted that in the current South African context, value proposition and size of the firm have a significant impact on mPOS adoption. This finding is useful to academics that would want to investigate mPOS adoption as this study could be used as a benchmark for future frameworks to start from. The literature review highlighted that there is very limited research that has been conducted by academics.

The literature review also uncovered that the past research that has gone into this field has been fragmented and lacked a holistic ecosystem view on the mPOS payments ecosystem. What previous research studies lacked was an integrated view on how the payment ecosystems affect the adoption of the technology. This study provides this unique perspective and could potentially fill the gap. From a payments perspective, each market is unique i.e.

government regulation, economic culture and technology maturity that could affect the adoption. There are some underlying similarities that cut across countries, especially in Africa, however, there was a need to look at each country in isolation. This research arguably can contribute to the payments body of knowledge by providing an ecosystem view that is relevant to a South African context.

The adoption numbers for mPOS are still significantly low and this statistic has a significant impact on the responses that merchants were providing to the research instrument. There is an opportunity for future research to perform the study or a similar type study once the adoption numbers have significantly increased. By using this study as a baseline, future research will build upon the current study and explore some of the findings that were uncovered during the data analysis. For example, the analysis revealed that there is a signification correlation between perceived value proposition and competition. The analysis also revealed that industry regulation and perceived security were significantly related. This finding could serve as input in future research models and future studies can investigate these relationships in further detail.

6.3. Implications for Practice

More practically, the research uncovered that 41% of the respondents were not willing to pay more that R500 for an mPOS device. At the time of the writing, the average cost of the mPOS device is just over R1500 in South Africa hence this finding will be useful for organisations that want to offer the mPOS device offering.

Merchant adoption has been neglected as most research has been primarily focused on the customer adoption (Dahlberg et al. 2015). This research arguably provided a unique perspective on mPOS adoption by investigating the merchant side and provided insights as to what may influence their adoption. Merchant adoption of mPOS in South Africa by SMEs should extend the payment acceptance capability of SMEs. The adoption of mPOS is expected to reduce the costs of facilitating electronic card acceptance (Mallat 2008), therefore these SME organisations and business owners should embrace the technology. The literature and the data analysis, however, identified that mPOS adoption has not been as high as expected. All indicators highlight that the technology was extensively hyped (Van Lente et al. 2013) as there was significant investment in the technology. This investment fuelled the amount of marketing that went into the technology and in turn added to the hype. This study can therefore be used as a caution to MNOs and MTOs in the payments industry to exercise extreme caution before investing heavily in payment technologies.

The adapted TOE framework can also be useful for firms that are considering making use of mPOS technology. Consideration of this adapted framework when planning an mPOS implementation may result in a higher likelihood of adoption of the mPOS solution by firms. This framework could be useful to these firms as it takes into consideration technology adoption drivers that would be relevant from a firm perspective. Firms usually go through some sort of a Request for Information (RFI) process when researching potential solution providers and the factors in this study can be used as the key questions that can be asked in that RFI. SMEs are usually more careful regarding where they invest their money especially regarding their technology capabilities (Au & Kauffman 2008). Given the sheer number of mPOS technologies that are available in the market (for example Yoco, Square, Thumbzup, Leaf, PaySimple, Emerge, Bluebird, Verifone, Ingenico, PAX, Estel, FLYPOS,

SureSwipe etc) (MPOS W.I.S.E 2015), firms may try to match the value proposition a solution provides and how it fits with their overall strategic plan (Ondrus & Lyytinen 2011).

Future research can also address more encompassing case studies in other business configurations. These studies should include the integration of mPOS with traditional Point of Sale (POS) services, and how value can be derived from the technology. mPOS development and technology offerings have focused on the mPOS technology being used as a standalone device. A standalone model is one where the POS device does not integrate with the retail till system (Crowe et al. 2010). Much of these till systems are custom developed per firm, therefore they do not follow any set standards. With the emergence of mPOS there potentially will be an increased need to integrate into the retail till systems and this research can be useful within this integrated context.

6.4. Limitations

The study had several limitations that should be highlighted. First, when the literature review was conducted, the research phenomenon was still very much in the infancy stages in South Africa so there were limited academic articles from South Africa. To mitigate this, articles that had investigated the problem domain in countries that were similar to South Africa from a payments maturity perspective were also utilised. To find the literature, lower impact factor journals and conference proceedings were also used. However, this is not to say that there was no selection process to consider articles that were used for the literature review.

Secondly, the researcher administered sampling technique that was used limited the number of SMEs that could form part of the research. This in turn could potentially limit the generalisability of the findings. Third, the researcher-administered study could be subject to interview evaluation apprehension. This is when the research participants are not entirely truthful in their responses, as they fear ridicule or judgement from the researcher (Bhattacherjee 2012). Fourth, given that the snowball technique was used to collect the data, it is very difficult to reduce the sampling error. This is primarily because with the snowball technique, it is still possible that the subjects are not representative of the population. Fifth, the study focused on SMEs in the Johannesburg region. However, most of the merchants were from the North of Johannesburg. Johannesburg is a large city and the lack of dispersion across the entire Johannesburg city could limit the generalisability of the findings.

The study initially set out to investigate the adoption of mPOS in South Africa. However, given the time limitations to complete the research, the focus was on Johannesburg. Johannesburg is the economic hub of South Africa and has most mature payments ecosystem in South Africa and it can be therefore be seen as a fair representation for the research.

6.5. Future Research

The research also uncovered other significant relationships between variables that were not hypothesised that could be considered in future models. The size of the firm and industry regulation exhibited a very strong correlation. Larger firms will tend to have more industry regulation to comply with as the larger organisations have larger exposure and they have a greater need to secure their environments. The additional relationships that were uncovered could be explored in future research.

Fifty-Two Percent (52%) of the SMEs that were involved in the research were all in the retail industry segment. There is an opportunity therefore for future research to investigate other industry segments in more detail as the study did show that the industry segment significantly affects the perceived value proposition that has a significant effect on mPOS adoption. Future research should also perform the study once mPOS adoption increases as the current adoption dispersion of the technology could have an impact on the results. It is also recommended for a qualitative study to unpack the "why" type research questions regarding mPOS adoption in further detail. Given that the quantitative study addresses the "what" and "how" type research questions, there is an opportunity to understand this phenomenon in greater detail and further unpack some of the findings.

Given the limitation that was mentioned above where the study focused on Johannesburg participants as a representation for South Africa, future studies can extend this research to other parts of the country to get a more extensive sample. There also is an opportunity to focus more on businesses that have adopted the technology the sample population is county wide.

Finally, mPOS technology is evolving as the payments industry has realised that these devices cannot run over Bluetooth technology as this causes too many issues when trying to initiate the transaction. This flaw in the technology could potentially deter SMEs from making use of the technology. The technology is now changing these devices to be standalone devices that work off a SIM and do not require Bluetooth. Once the newer 'second version' of mPOS starts to be used by SMEs, there is an opportunity for future studies to investigate how the newer version of mPOS will be adopted.

6.6. Conclusion

This study has contributed to existing mPOS literature by identifying the factors that affect mPOS adoption. The identification of adoption factors was done largely through a literature review of academic journals. A model was proposed that incorporated the adoption factors that were identified from the literature review. Quantitative techniques were then employed to test and determine the extent to which the adoption factors were related and whether they had a significant impact on the proposed model. By making use of these quantitative empirical techniques, it was shown that technological factors (value proposition) and organisational factors (size of firm) emerged as the most important factors for adoption. The study also confirmed the proposition that the industry segment and value proposition are extensively related. The study also uncovered some significant relationships that had not been proposed, for example industry regulation and size, as well as perceived competition and size of the firm.

By using the TOE framework, the study further contributed to mPOS literature by addressing a research gap that indicated the merchant perspective has largely been omitted when studying mPOS adoption in the South African context. Most studies had previously focused on the consumer side adoption of the technology and used TAM as a lens to investigate the adoption of mPOS and mobile payments. This study therefore provided a unique opportunity to investigate the merchant adoption and uncover why the adoption numbers in South Africa were not as the market had initially anticipated. The technology is still evolving and the South African merchant landscape has not reached the maturity level where it can easily consume such technology at the pace that more developed countries have exhibited.

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Appendix A: Final Research Instrument

mPOS Adoption Questionnaire			
Research Administration Questions			
Date:		**Time**:	
Location:			
General Demographic Questions			
Number of Employees:	☐ Less than 10 ☐ More than 10 ☐ More than 20	**Number of outlets:**	☐ 1 to 2 ☐ 3 to 4 ☐ 5 to 7 ☐ 8-10
Annual Turnover:	☐ < R200 000 ☐ R200 001 - R4 000 000 ☐ R4 000 001 - R40 000 000 ☐ R40 000 001 - R60 000 000		
Type of Industry Segment:			
Does Your Firm Offer Delivery Services?	☐ Yes ☐ No		

How Long Have You Had a Mobile Point Of Sale (mPOS)?	☐ Don't have one yet ☐ Less than 1 year ☐ More than 1 year ☐ More than 2 years

Merchant mPOS Adoption Questions	**Please select the number that best represents how you feel about the statement**				
	Strongly Disagree	**Disagree**	**Undecided**	**Agree**	**Strongly Agree**
1. I believe my selection of an mPOS would be/is based on the value proposition it provides.	1	2	3	4	5
2. I believe an mPOS would/does complement my firm's operations.	1	2	3	4	5
3. Using an mPOS would/does assist me in attracting customers to my firm.	1	2	3	4	5
4. I believe an mPOS would/does assist in retaining my customers.	1	2	3	4	5
5. My firm would/does make use of value added services provided by mPOS.	1	2	3	4	5
6. I believe my customers are sceptical of using alternative payment methods like mPOS.	1	2	3	4	5
7. I am sceptical of adopting mPOS for my firm.	1	2	3	4	5
8. I believe mPOS fraud could be/is a reality for my firm.	1	2	3	4	5

9. I believe mPOS is more secure than cash.	1	2	3	4	5
10. I believe mPOS solutions are more secure than other card payment methods.	1	2	3	4	5
11. I believe an mPOS would/will reduce my firm's costs.	1	2	3	4	5
12. I believe an mPOS is more costly than alternative payment methods.	1	2	3	4	5
13. How much do you think an mPOS solution should cost (once-off)?	☐ R0 – R500 ☐ R501 - R999 ☐ R1000 - R2000 ☐ R2001 - R3000				
Merchant mPOS Adoption Questions	**Strongly Disagree**	**Disagree**	**Undecided**	**Agree**	**Strongly Agree**
14. I believe mPOS is better suited for firms with delivery services.	1	2	3	4	5
15. I often need to accept payments away from my store.	1	2	3	4	5
16. I am aware of who my competitors are.	1	2	3	4	5
17. My competitors have adopted mPOS.	1	2	3	4	5
18. I believe mPOS adoption would be/is driven by what my competitors are using.	1	2	3	4	5
19. I am aware of the payment solutions my competitors use.	1	2	3	4	5
20. I am aware of mPOS solutions available in the market.	1	2	3	4	5
21. I believe the industry regulation and compliance surrounding mPOS would deter me from adopting it.	1	2	3	4	5

22. I am aware of the compliance and regulation required to own an mPOS.	1	2	3	4	5
23. I believe my firm finds the industry regulation and compliance regarding mPOS difficult to comply with.	1	2	3	4	5
24. I believe my firm's IT infrastructure/architecture is complex.	1	2	3	4	5

	Adoption Factor	**Ranking**
25. Rank the following in order of importance when considering an mPOS solution (1 is highest priority and 5 is the lowest priority).	Cost	
	Security	
	Value Proposition	
	Competitive Advantage	
	Compliance and Regulation	

Appendix B: Participant Letter

Date: 1 December 2016

Good Day,

My name is Norman Nyawo and I am a Masters student in the Information Systems Division at the University of the Witwatersrand, Johannesburg. I am conducting research on the adoption of Mobile Point of Sale (mPOS) by SME merchants in South Africa.

As a merchant who could look to adopting mPOS technology, you are **invited** to take part in this survey. The purpose of this survey is to find out what drives merchant adoption of mPOS technology.

Your response is important and there are no right or wrong answers. This survey is both confidential and anonymous. Anonymity and confidentiality are guaranteed by not needing to enter your name on the questionnaire. Your participation is completely voluntary and involves no risk, penalty, or loss of benefits whether or not you participate. You may withdraw from the survey at any stage.

The first part of the survey captures some demographic data. Please tick whichever boxes are applicable. The second part of the survey comprises 25 statements. Please indicate the extent to which you agree with each statement, by ticking in the appropriate box. The entire survey should take between 10 to 15 minutes to complete. The survey was approved by the SEBS Ethics Committee (Non-Medical), Protocol Number: CINFO/1128.

Thank you for considering participating. Should you have any questions, or should you wish to obtain a copy of the results of the survey, please contact me via email or my cell. Details provided below:

My contact details: normannyawo@gmail.com – Cell number: 072 845 2506

My supervisor's name and email are: Mitchell Hughes – Mitchell.Hughes@wits.ac.za (011 717 8157)



Kind regards

Norman Nyawo

Masters Student: Division of Information Systems

School of Economic and Business Sciences

University of the Witwatersrand, Johannesburg

Appendix C: Consent Form

Title of research project: Mobile Point of Sale Adoption by Small Medium Enterprise Merchants in South Africa

Name of principal researcher: Norman Nyawo

Department: Division of Information Systems, School of Economic and Business Sciences, University of the Witwatersrand, Johannesburg

Telephone: 072 845 2506
Email: normannyawo@gmail.com

Name of participant:
Nature of the research: Survey response required
Participant's involvement: Respond to survey

Dear participant, please note that your participation is voluntary and you may withdraw from the process at any point without penalty. Please note that you will remain anonymous throughout the process and that all the data will only be reported on an aggregated basis. By completing the survey, you as the respondent, agree to participate in this research.
By signing this document, you confirm that:

- You have read this consent form and the information it contains and had the opportunity to ask questions about them.
- I agree to my responses being used for education and research on condition that my privacy is respected, subject to the following:
    - I understand that my personal details will not / may be included in the research / will be used in aggregate form only, so that I will not be personally identifiable (delete as applicable.)
    - I understand that I am under no obligation to take part in this project.
    - I understand I have the right to withdraw from this project at any stage.

This research does not pose any risk to the research participants.
Signature of Participant:

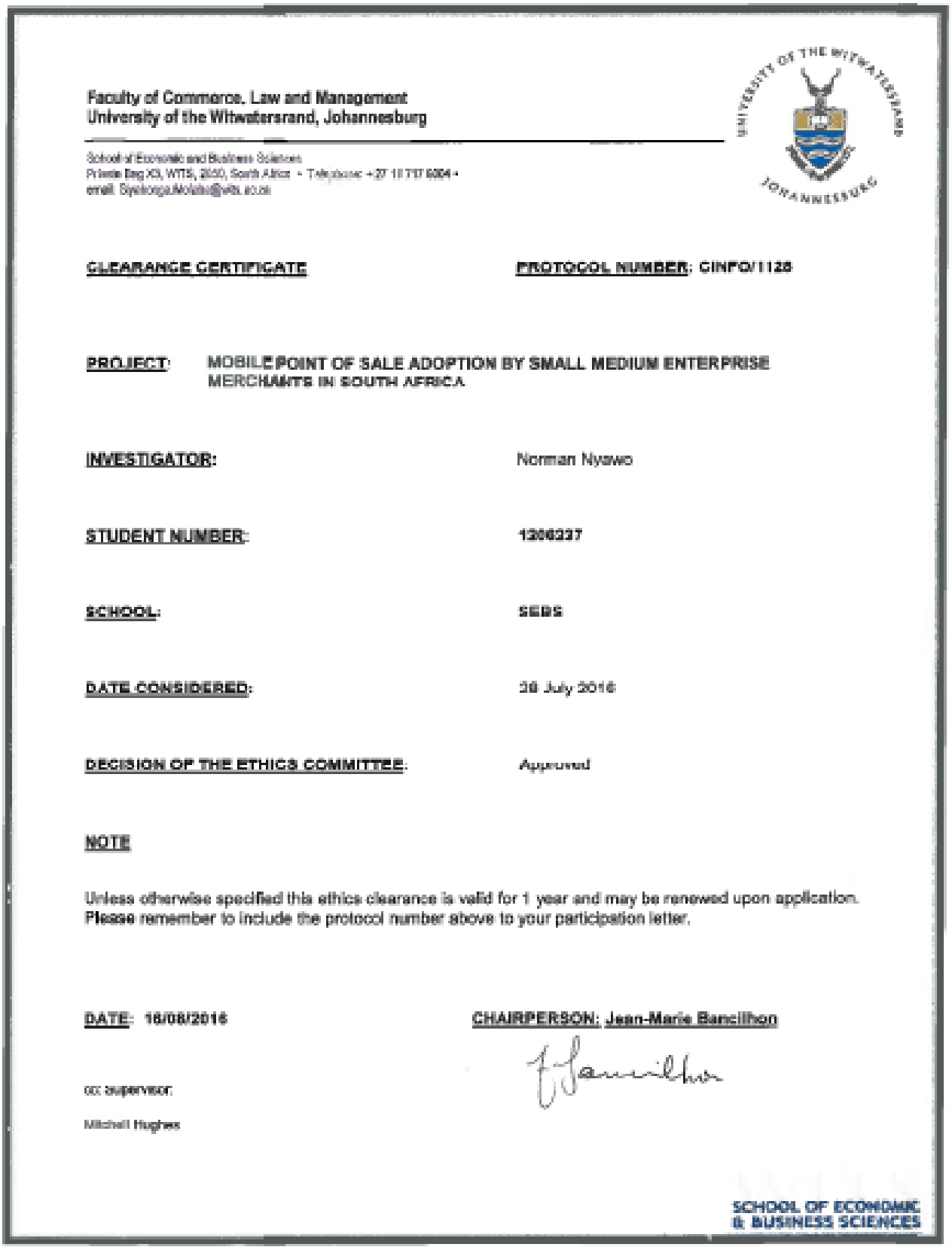
Name of Participant:

Signature of person who sought consent:



Name of person who sought consent: Norman Nyawo
Date: 1 December 2016

Appendix D: Ethics Certificate



Faculty of Commerce, Law and Management
University of the Witwatersrand, Johannesburg

School of Economic and Business Sciences
Private Bag X3, WITS, 2050, South Africa • Telephone: +27 11 717 8004 •
email: Siyatonga.Mofutsa@wits.ac.za

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

CLEARANCE CERTIFICATE **PROTOCOL NUMBER:** GINFO/1128

PROJECT: MOBILE POINT OF SALE ADOPTION BY SMALL MEDIUM ENTERPRISE MERCHANTS IN SOUTH AFRICA

INVESTIGATOR: Norman Nyawo

STUDENT NUMBER: 1206237

SCHOOL: SEBS

DATE CONSIDERED: 28 July 2016

DECISION OF THE ETHICS COMMITTEE: Approved

NOTE

Unless otherwise specified this ethics clearance is valid for 1 year and may be renewed upon application.
Please remember to include the protocol number above to your participation letter.

DATE: 16/08/2016 **CHAIRPERSON:** Jean-Marie Bancilhon

cc supervisor:

Mitchell Hughes

SCHOOL OF ECONOMIC & BUSINESS SCIENCES

Appendix E: Questionnaire Item Means

Descriptive Statistics						
	N	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
Delivery Services Offered	100	1	2	1.50	.050	.503
MPA	100	1	2	1.07	.026	.256
VP1	100	1	5	3.79	.102	1.018
VP2	100	1	5	3.71	.106	1.057
VP3	100	1	5	3.42	.099	.987
VP4	100	1	5	3.43	.103	1.027
VP5	100	1	5	3.32	.104	1.043
Sec1	100	1	5	3.27	.115	1.153
Sec2	100	1	5	2.91	.106	1.055
Sec3	100	1	5	3.21	.105	1.047
Sec4	100	1	5	4.03	.085	.846
Sec5	100	1	5	3.11	.085	.852
Cos1	100	2	5	3.42	.075	.755
Cos2	100	1	5	2.88	.073	.729
IndSeg1	100	1	5	3.84	.099	.992
IndSeg2	100	1	5	2.95	.132	1.321
Comp1	100	1	5	3.81	.102	1.022
Comp2	100	1	5	3.07	.093	.935
Comp3	100	1	5	3.03	.097	.969
Comp4	100	1	5	3.57	.089	.891
Comp5	100	1	5	3.32	.105	1.053
IndReg1	100	1	5	2.97	.093	.926
IndReg2	100	1	5	3.08	.094	.939
IndReg3	100	1	5	2.86	.082	.817
Siz1	100	1	5	2.60	.115	1.146
Valid N (listwise)	100					

Appendix F: Multiple Regression Coefficients

Coefficients[a]													
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	1.228	.178		6.883	.000	.874	1.582					
	TotalIndReg	-.031	.043	-.076	-.711	.479	-.117	.055	-.090	-.072	-.072	.884	1.131
	TotalComp	-.020	.051	-.041	-.385	.701	-.121	.082	-.067	-.039	-.039	.884	1.131
2	(Constant)	1.033	.179		5.777	.000	.678	1.388					
	TotalIndReg	.047	.045	.117	1.044	.299	-.042	.137	-.090	.107	.098	.705	1.418
	TotalComp	-.015	.049	-.032	-.313	.755	-.113	.082	-.067	-.032	-.029	.824	1.214
	TotalIndSegm	.053	.028	.183	1.906	.060	-.002	.108	.187	.192	.179	.949	1.054
	Siz1	-.089	.025	-.396	-3.608	.000	-.137	-.040	-.351	-.347	-.338	.730	1.371
3	(Constant)	.848	.250		3.390	.001	.351	1.346					
	TotalIndReg	.049	.049	.121	1.004	.318	-.048	.145	-.090	.104	.092	.585	1.710
	TotalComp	-.053	.055	-.112	-.976	.331	-.162	.055	-.067	-.101	-.090	.645	1.551
	TotalIndSegm	.033	.029	.116	1.163	.248	-.024	.090	.187	.120	.107	.852	1.174
	Siz1	-.091	.025	-.408	-3.624	.000	-.141	-.041	-.351	-.353	-.333	.668	1.497
	TotalVP	.084	.036	.251	2.320	.023	.012	.156	.239	.235	.213	.723	1.383
	TotalSec	.023	.057	.044	.398	.692	-.090	.135	.020	.041	.037	.682	1.465
	TotalCos	.003	.059	.005	.047	.963	-.115	.121	-.091	.005	.004	.768	1.302
a. Dependent Variable: MPA													

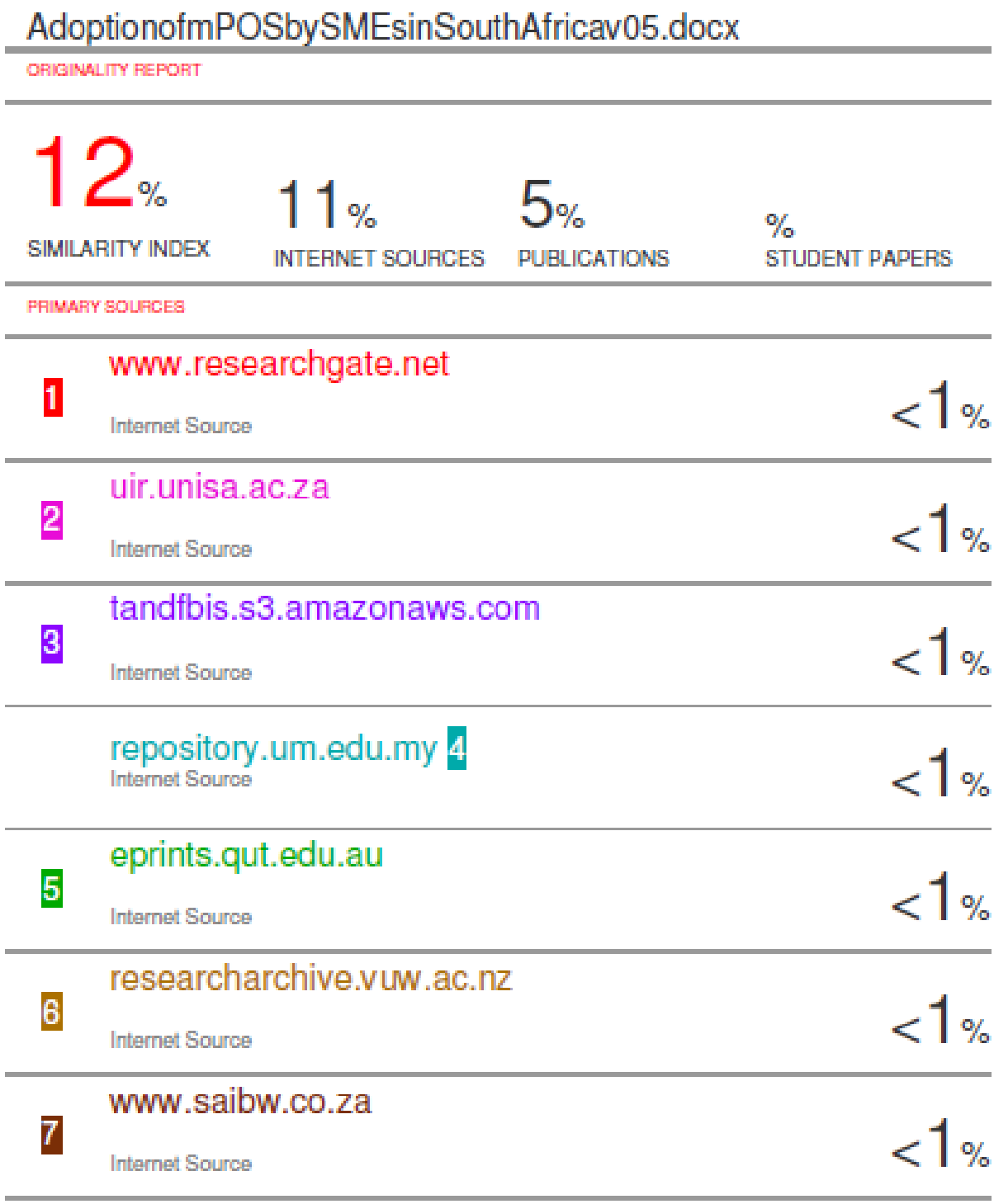
Appendix G: Multiple Regression Collinearity Diagnostic

Collinearity Diagnostics[a]											
				Variance Proportions							
Model	Dimension	Eigenvalue	Condition Index	(Constant)	TotalIndReg	TotalComp	TotalIndSegm	Siz1	TotalVP	TotalSec	TotalCos
1	1	2.962	1.000	.00	.00	.00					
	2	.026	10.740	.11	.99	.16					
	3	.012	15.443	.88	.00	.83					
2	1	4.794	1.000	.00	.00	.00	.00	.00			
	2	.130	6.079	.01	.00	.00	.11	.63			
	3	.044	10.454	.03	.16	.03	.72	.27			
	4	.021	15.152	.07	.78	.31	.15	.06			
	5	.012	20.084	.89	.05	.65	.02	.03			
3	1	7.716	1.000	.00	.00	.00	.00	.00	.00	.00	.00
	2	.141	7.408	.00	.00	.00	.05	.57	.01	.00	.00
	3	.048	12.742	.01	.08	.01	.67	.24	.00	.03	.00
	4	.035	14.922	.00	.12	.00	.19	.06	.61	.00	.01
	5	.026	17.321	.01	.12	.14	.07	.00	.04	.15	.19
	6	.019	20.110	.06	.41	.16	.01	.03	.05	.20	.07
	7	.011	26.948	.02	.24	.57	.01	.01	.28	.14	.43
	8	.006	35.399	.91	.03	.12	.00	.08	.01	.48	.28
a. Dependent Variable: MPA											

Appendix H: Multiple Regression Excluded Variables

Excluded Variables[a]								
						Collinearity Statistics		
	Model	Beta In	t	Sig.	Partial Correlation	Tolerance	VIF	Minimum Tolerance
1	TotalIndSegm	.207[b]	2.028	.045	.203	.953	1.049	.843
	Siz1	-.410[b]	-3.692	.000	-.353	.733	1.365	.705
	TotalVP	.299[b]	2.841	.005	.278	.860	1.162	.762
	TotalSec	.073[b]	.639	.524	.065	.786	1.272	.698
	TotalCos	-.069[b]	-.621	.536	-.063	.839	1.192	.785
2	TotalVP	.264[c]	2.590	.011	.258	.801	1.249	.700
	TotalSec	.123[c]	1.140	.257	.117	.758	1.320	.609
	TotalCos	-.022[c]	-.205	.838	-.021	.779	1.283	.693
a. Dependent Variable: MPA								
b. Predictors in the Model: (Constant), TotalComp, TotalIndReg								
c. Predictors in the Model: (Constant), TotalComp, TotalIndReg, TotalIndSegm, Siz1								

Appendix I: TurnItIn Report



AdoptionofmPOSbySMEsinSouthAfricav05.docx

ORIGINALITY REPORT

12%	11%	5%	%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

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