Factors impacting the adoption of an electronic payment solution in the South African taxi industry: A study of taxi owners in the Johannesburg metropolitan area

Student name: Asanda Tshambula

Supervisor name: Diran Soumonni

A research report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Management specialising in Entrepreneurship and New Venture Creation

Johannesburg, 2017

(VERSION APRIL 2017)

ABSTRACT

Resistance to technological innovation by its end users is a crucial indicator which highlights information which could be utilised for a successful implementation of an innovation. The adoption of a technological innovation puts in jeopardy the internal environment, culture, identity and traditional practices of an industry. End-users have been known to be receptive to innovations as long as they do not change industry practices and help improve industry performance.

This research seeks to address how an industry in the second economy characterised by high poverty, less education and minimum skills adopts and diffuse technological innovations. A survey was conducted and responses from 182 taxi owners was analysed.

The research has identified that education, technology experience, relative advantage and trialability influence the probability of adoption. The results indicated that due to the nature of a social system there are different results about innovation attributes and different adopter categories can be identified in different social systems. Education and knowledge need to be addressed in order to formalise and modernise the taxi industry not just taxi owners but for taxi drivers and other members of the social system. The results have indicated that most taxi owners have positive attitudes about the electronic fare collection system.

This research can contribute to the actual adoption and diffusion of the electronic payment system in the south African taxi industry. The electronic fare collection system needs to be sold for its commercial benefit to the taxi industry instead of being presented as a regulatory case for change.

DECLARATION

I, Asanda Ongeziwe Tshambula, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Management in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Asanda Ongeziwe Tshambula

Signed at ……

On the …… day of …… 2017

ACKNOWLEDGEMENTS

I would like to thank my supervisor for his assistance and support in completing this research and SA Taxi Finance in assisting me in the data collection.

Table of Contents

LIST OF TABLES

LIST OF FIGURES

.

1 CHAPTER 1: INTRODUCTION

1.1 Purpose of the study

There has been a great demand for new means of payment driven by the diminishing use of cash (Mallat & Tuunainen, 2015). Technology advances in the payment of public transport environment have created opportunities for addressing the public transport challenges in support of the South African National Government Transport policy (Joubert, 2010). The purpose of this research is to evaluate factors affecting the adoption of the electronic payment solution in the South African taxi industry. A number of theories have been proposed that describe the process of adopting technological innovations (Ratten, 2015). The common denominator amongst these theories is the ability of the users and adopters to evaluate and acquire knowledge about the innovation. The aim of this study is to evaluate how adopter categories, innovation attributes and attitudes towards an innovation affect the probability of adoption in the South African taxi industry.

1.2 Context of the study

An end user's adoption of a new technology varies depending on the context within which it was encountered (Plouffe, Hulland & Vandenbosch, 2001). The diffusion of technology within an industry produces different reactions from end users (Schiavone, 2012) who often do not recognise the advantages of an innovation in an equal manner to crucial decision makers (Ellen, Bearden & Sharma, 1991). Resistance to technological innovation by its end users is a crucial indicator which highlights information which could be utilised for a successful implementation of an innovation (Ellen, Bearden & Sharma, 1991). In technology adoption, resistance is often viewed as a barrier that needs to be removed while others see it as discomfort with a system that might be flawed (Lapointe & Rivard, 2005). Ellen, Bearden & Sharma (1991) state that in the face of technology adoption, it is often not the innovation that encounters rejection but the variation brought about by the innovation and as such, resistance to the

innovation is not just a characteristic of the rejecter but a reaction to a change in the environment.

The adoption of a technological innovation puts in jeopardy the internal environment, culture, identity and traditional practices of an industry (Schiavone, 2012). End-users have been known to be receptive to innovations as long as they do not change industry practices and help improve industry performance (Schiavone, 2012). According to Lapointe & Rivard (2005), a group of end users assess a technology against the initial state and make predictions about the consequences of its use. If the group of users believes it will support their position of power, they will adopt it and if the interests of the group of end users and key decision makers are similar, resistance rarely occurs (Lapointe & Rivard, 2005).

According to Accelerated and Shared Growth Initiative South Africa (AsgSA) GDP growth is unsustainable without intermediations aimed at directly addressing and lessening South Africa's past inequalities and further identifies the idea of dualism in South Africa characterised by the first and second economies (Hirsch, 2006). Valodia & Devey (2013) explain the secondary economy as being categorised by underdevelopment, barely contributes to the growth of the economy, comprises of the majority of the population, has the most disadvantaged of the population, is separated from both the first and the global world and does not have the means to grow its own economy. The first economy is well regulated with legally enforceable rights and remedies while the second economy is regulated by society self-imposed standards or self-proclaimed officials and is based on small untaxed money operations (Woolf & Joubert, 2013). The two economies are as a result of racial segregation and are highly influenced by race, ethnicity and class (Woolf & Joubert, 2014).

The taxi industry is one of the biggest contributors to the second economy and transports around 65% of all commuters in South Africa (Walters, 2013). The taxi industry is a cheap and convenient form of transport for relatively poor communities in South Africa (Schmidt, 2014).

The taxi industry has faced significant challenges such as inadequate enforcement of regulations which lead to overtrading in routes, compromised

efficiency and profitability. This has resulted in poor vehicle maintenance, bad driving and poor skills and training in the sector (Schmidt, 2014).

Government wants to bridge the gap between the first and second economy and ultimately eliminate the second economy (Hirsch, 2006). In order to address the state of the taxi industry, governmental interventions have been identified, the most visible being the taxi recapitalisation programme which began in 2006 (Walters, 2013) to replace ageing and unroadworthy taxis and provide an electronic payment system that will record fares, income and help the South African Revenue Service (SARS) collect taxes (Barrett, 2003).

There below were components to be added to the electronic payment system:

- Electronic fare collection system using smart card technology;
- Monitoring and control system to provide information on loading, speeding and other driving data; and
- Vehicle tracking and recovery system.

The taxi recapitalisation aimed to incentivise and replace old and unroadworthy vehicles, as well as to improve service quality and legal compliance within the industry (Schmidt, 2014). Schmidt (2014) states that there is an economic logic for the taxi industry to evolve and modernise, however it struggles with resistance to change and innovation. He further states that there is little interest in modernising and formalising the industry due to low levels of skills and trust.

Joubert (2010) states that for the electronic payment solution to be successful it needs to benefit everyone in the value chain. Taxi owners will benefit from easier revenue management and operational control. Taxi owners can monitor the productivity and security of their vehicles while also tracking route compliance. The electronic payment solution will provide full financial transparency and visibility. Taxi commuters will benefit through not having to carry or handle cash and the payment cards can also be used as debit cards to purchase goods at retailers (Joubert, 2010).

The benefits of the payment system for taxi drivers includes managing the risk of holding cash payments, and being able to provide the required cash change to commuters (Woolf & Joubert, 2013). The introduction of an electronic payment system will make taxi drivers more accountable for compliance and give taxi owners greater transparency into earnings of the vehicle (Schmidt, 2014).

Drivers constitute the majority of workers in the taxi industry and most are working for taxi owners who, based on their preferences, will reward them through one of the following (Barrett, 2003):

- Get no standard wage, but taxi owners give them a fixed share of a week's earnings while keeping the remainder as their own revenue;
- The driver receives a standard salary and gives the taxi owner a share of the earnings stipulated by the owner and whatever remains, he keeps;
- All the earnings are given to the taxi owner while the driver earns a standard salary, this however is fairly uncommon; and
- All the earnings are handed over to the taxi owner except the earnings of a certain day of the week.

The current cash check in amounts required by taxi owners from taxi drivers has been identified as a factor contributing to the reckless driving behaviour by taxi drivers in the industry (Woolf & Joubert, 2009). Taxi drivers incur higher costs per km while competing against each other for a fixed pool of passengers, Schmidt, (2014) states that the operating costs of driving within the speed limit are lower per kilometre than speeding in order to do an additional trip.

The taxi owner's view is that the current cash payment allows taxi drivers' opportunities to steal from them as they cannot accurately identify how much money taxi driver can make (Ndebele, 2011) and so the electronic fare payment system will allow for minimum wages as stipulated by the department of labour.

Table 1: Minimum wages for employees in the Taxi Sector						
Job Categories	Minimum rate for the period 1 July 2015 to 30 June 2016			Minimum rate for the period 1 August 2016 to 30 June 2017		
	Monthly	Weekly	Hourly	Monthly	Weekly	Hourly
Drivers	R 3,030.67	R 697.13	R 14.51	R 3,218.57	R 742.80	R 15.47
Admin Workers	R 3,020.67	R 697.13	R 14.51	R 3,218.57	R 742.80	R 15.47
Rank marshals	R 2,414.63	R 557.26	R 11.60	R 2,564.33	R 591.81	R 12.32
Workers not specified	R 2,112.81	R 487.60	R 10.15	R 2,243.80	R 517.83	R 10.78
	Minimum waged increased by CPI (excluding owners equivalent rent) as released by STATSSA six weeks prior to the increment date (4.6%) plus 1.5% add to the total of 6.1%			Minimum waged increased by CPI (excluding owners equivalent rent) as released by STATSSA six weeks prior to the increment date 6.2%		

Figure 1: *Minimum wages for employees in the South African taxi sector.* Reprinted from Sectorial determination, in the Department of Labour (2016). Retrieved from http://www.labour.gov.za/DOL/legislation/sectoral-determinations/sectoral-determination-11-taxi-sector Copyright (2016). Adapted with permission.

As seen in Figure 1.2 the monthly remuneration for a taxi driver is R3 030.67. The taxi industry wages are low and uncertain and even though minimum wages are set they are not enforceable.

South African commuters use different tickets for the different modes of transport. Cash is used for taxis, EMV cards for Rea vaya and a contactless smart card on the gautrain (Schmidt, 2014). The DoT's Public Transport Strategy calls for an integrated transport payment solution encompassing all modes of transport which can be achieved through an electronic payment solution which uses smartcards. Schmidt (2014) states that fare integration will make transport more affordable and reliable for poor people. 65% of all South African commuters use taxis and therefore an adoption of the electronic payment solution in the industry will be a positive step towards ticket integration.

The introduction of an electronic payment system will also limit the challenges posed by the current cash payment system by providing transparency within the industry. For the electronic payment system to be successful it needs to be

adopted by taxi owners and used by taxi drivers and commuters. The taxi industry does not only provide transportation for the low and middle class but has created jobs for many poor people in urban areas who have remained relegated from access to job opportunities (Fobosi, 2013). These employees are marginalised within the society as they are typically poorer, less educated, and they lack the minimum skills demanded by the labour market (Fobosi, 2013). For an electronic payment system to be adopted and diffused within the industry there needs to be an understanding of how it works and how it will benefit the industry.

1.3 Problem statement

1.3.1 Main problem

How does an industry in the second economy characterised by high poverty, less education and minimum skills adopt and diffuse technological innovations?

1.3.2 Sub-problems

Sub-problem 1

- Measure how human capital impacts technology adoption amongst taxi owners in the South African taxi industry.

Sub-problem 2

- Measure how innovation attributes as perceived by the members in the social system affects the probability of adoption.

Sub-problem 3

- Measure how attitudes affect the probability of adoption.

1.4 Significance of the study

Lack of knowledge and understanding of the benefits and challenges of an innovation could hinder the successful implementation and diffusion of that

innovation. This research seeks to identify to what extent the low levels of human capital hinder knowledge transfer and analysis in the industry. This research will give an indication of the willingness and readiness of taxi owners to adopt the innovation.

1.5 Delimitations of the study

The South African taxi industry is made up of taxi owners, taxi drivers, rank marshals, conductors and taxi commuters. To implement the electronic payment solution participation is required from government, the taxi industry and a bank which will serve as a clearing house. This research only focuses on adoption from a taxi owner's perspective and does not take into account taxi drivers, taxi commuters and government.

1.6 Assumptions

No assumptions were made in this research paper.

2 CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Chapter one provided an overview of the South African taxi industry and how it operates. Chapter 2 will look into the theory behind factors affecting the adoption of the electronic payment solution in the taxi industry. Theoretical models will be used to explain the probability of adoption.

2.2 Innovation

An innovation is an idea or practice that is new to members of a social system (Straub, 2009; Rogers, 2003; Nordin, Noor & bin Md Saad, 2014; Rogers, 1995; Dickerson & Gentry, 1983). The electronic payment solution is a technological innovation and is both a product and a process innovation. Product innovations reflect when a new product is introduced into the market to provide goods or services while process innovations introduce new methods of doing things (Tavassoli& Karlsson, 2015; Chang, Bai & Li, 2015; Hullova, Trott & Simms, 2016; Pan& Li, 2016; Padilha & Gomes, 2016). The electronic payment solution is a product innovation as it is an introduction of a new product in the taxi industry. It is also a process innovation as the introduction of the solution will bring about a change from a cash payment to electronic payments system, this will change the manner in which business is conducted in the industry.

Dickerson & Gentry (1983) identify three types of innovations, namely, continuous innovations, dynamically continuous innovation and discontinuous innovation. Continuous innovations arise from the introduction of modified products and cause little change in social norms while dynamically continuous innovations cause changes in social norms but does don't significantly alter them (Dickerson & Gentry, 1983; Bessant, Stamm, Moeslein & Neyer, 2010; Brentani & Reid, 2012; Reid & Brentani, 2004; Corso & Pellegrini, 2007). The electronic payment solution would also be described as a discontinuous innovation, which is an innovation that requires the establishment of new behavioural patterns (Dickerson & Gentry, 1983).

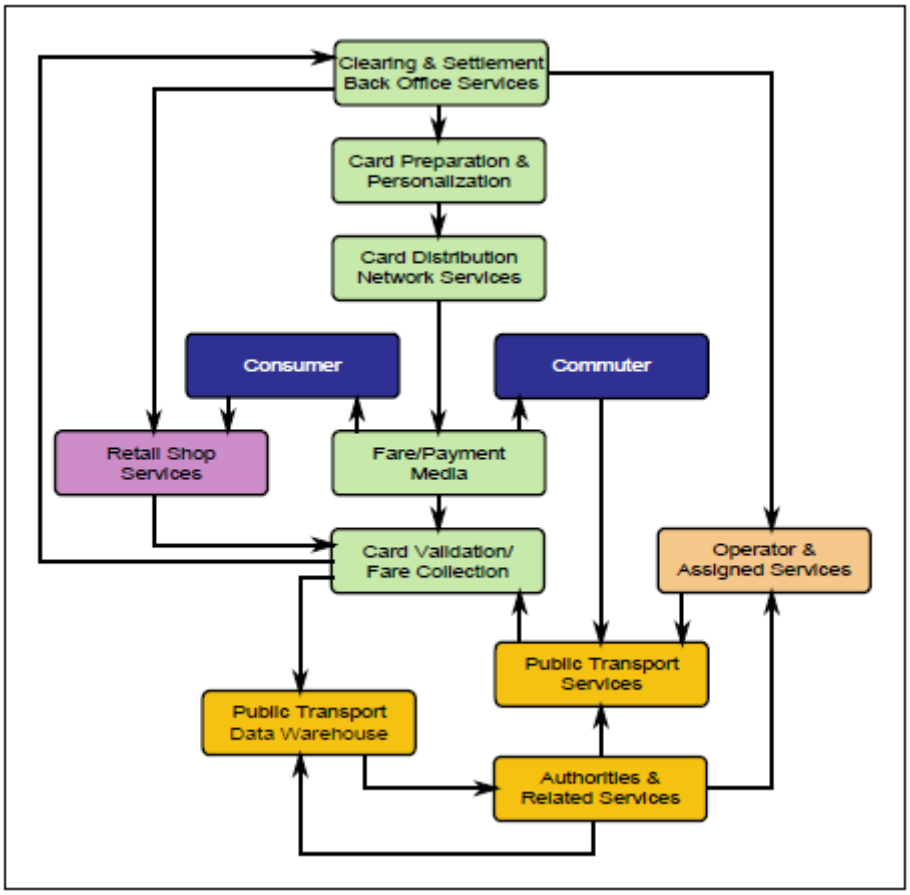


Figure 2: *Generic Electronic Fare Collection System*. Reprinted from “Electronic fare collection: convergence of payment and fare media in South Africa” by D. Joubert, 2010. Adapted with permission.

The introduction of the system will bring about change in behavioural patterns and social norms in the industry as shown. Figure 2.2 depicts the relationship between the different entities involved and further elaborates the complexity in relation to the current cash payment method. Where the current cash payment method only includes taxi drivers, commuters and taxi owners, the electronic payment system will have to include as demonstrated in Figure 2.2 a bank for clearing and settlements, a card distributor and the Department of Transport.

This will result in the change in the way taxi owners collect fares, how taxi drivers are remunerated and how taxi commuters pay for their taxi trips. Taxi commuters, taxi owners and taxi drivers will have to change the way they operate to adjust to the change.

Taxi drivers will benefit from having an electronic record of income, which will give them access to the formal economy. Taxi drivers will be able to eliminate the risk of holding cash payments, and being able to provide the required cash change to commuters (Woolf & Joubert, 2013). The system will also be disciplinary. Taxi owners claim that taxi drivers pocket approximately 35% of their income, while commuters complain about overloading, speeding and reckless driving (Moore, 2016). The system will improve driver behaviour and the safety of the commuters' as the mini bus taxis will be installed with a GPS to monitor the speed and the location of the vehicle. The system will be able to monitor and keep records of speeding, harsh acceleration and braking. Taxi drivers will also no longer be able to pocket additional income for themselves.

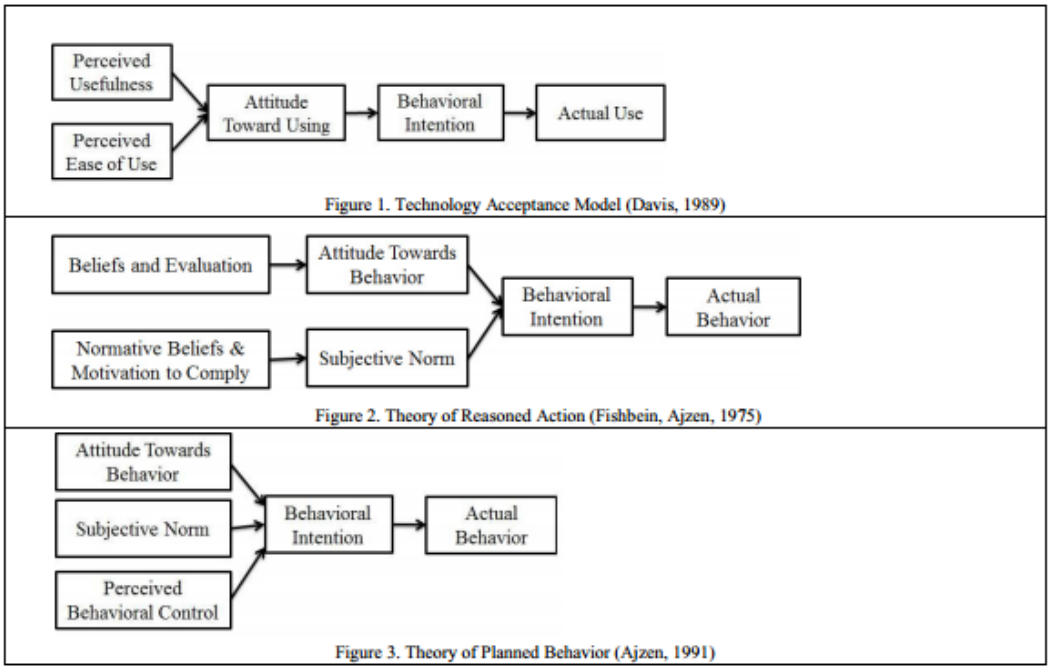
The innovation will also assist taxi owners with moving towards the formal economy by having automated book keeping and improved compliance. This system will help the South African Revenue Services collect tax from the taxi industry. Schmidt (2014) states that the system needs to be structured as a commercial benefit instead of being presented as a regulatory and punitive case for change.

2.3 Theoretical models for technology adoption

Theoretical models have been established to determine an individual's reaction to technological innovations. The Theory of Reasoned Action (TRA) by Fishbein & Ajzen (1975) and The Theory of Planned Behaviour (TPB) by Ajzen (1991) are wildy researched and proven models to determine and explain a user's intention to adopt a technology. The Technology acceptance model (TAM) by Davis (1989) is an adaptation of TRA and has been used to predict user adoption decisions (Yousafzai, Foxall & Pallister, 2010). There is also the Innovation diffusion theory (IDT) which provides an explanation of how innovations spread through the social system over time (Rogers, 1995).

The TAM model is explained by the TRA and the TPB (Tura, Tunç & Zehir, 2015). Venkatesh, Morris, Davis & Davis (2003) integrated these models and named it the Unified Theory of Acceptance.

Table 1: Evaluation of Unified Theory of Acceptance and Use of Technology



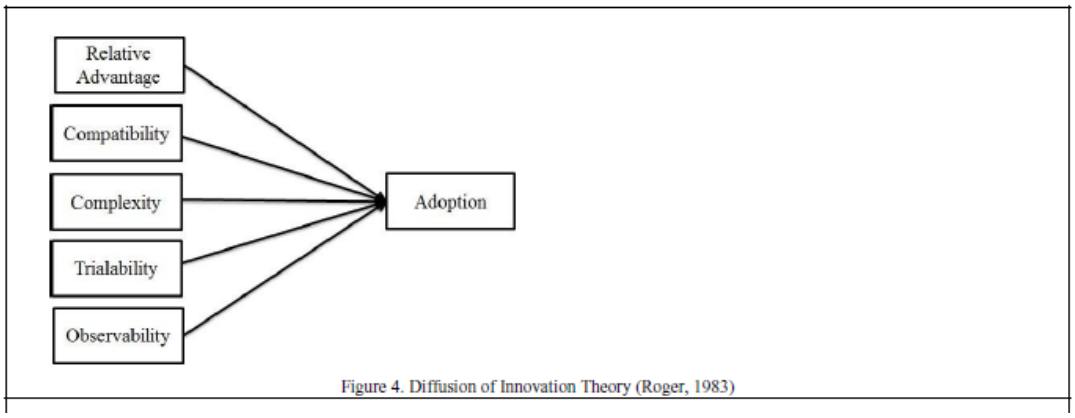


Figure 3: *Unified Theory of Acceptance and Use of Technology*. Reprinted from "A Theoretical Model Proposal: Personal Innovativeness and User Involvement as Antecedents of Unified Theory of Acceptance and Use of Technology" by A. Turan, A. Tunç & C. Zehir, 2015, *Procedia-Social and Behavioral Sciences, 210, 43-51*. Adapted with permission.

Four theories have been proposed for measuring technology adoption, namely the TAM, TRA, IDT and TPB. There are however other theories outside the four mentioned which were not covered in this paper. This research will focus on the Innovation Diffusion Theory in explaining technology adoption in the South African taxi industry.

2.4 Theory of Reasonable Action (TRA)

The TRA is a social psychology model which evaluates the determinants of intended behaviours amongst adopters by assuming their predictability (Yousafzai, Foxall & Pallister, 2010; Turan et al.,2015; Saricam, 2014).

The Theory of reasoned Action predicts that behavioural intentions are a function of our attitudes and subjective norms (Madden, Ellen & Ajzen, 1992; ; Saricam, 2014). Behavioural beliefs are predicted to influence an individual's attitude towards performing a certain behaviour and normative beliefs influence the subjective norm about performing a behaviour (Madden, Ellen & Ajzen, 1992).

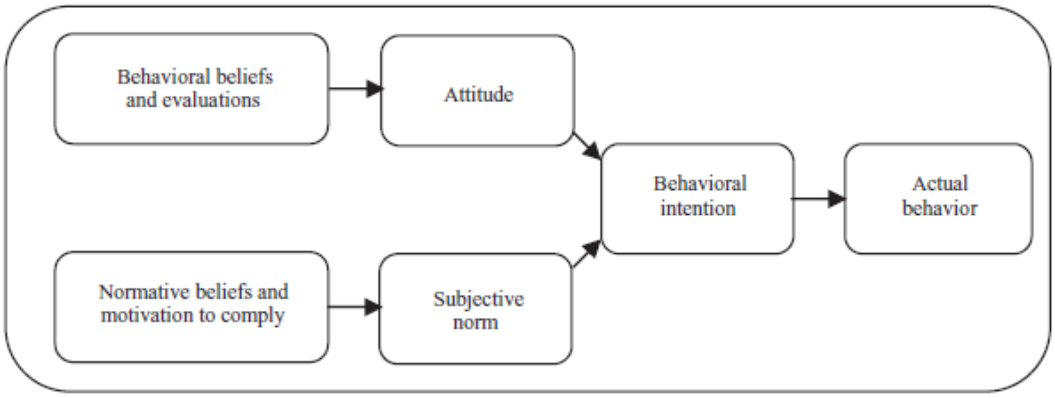


Figure 4: *The Theory of Reasonable Action*. Reprinted from "Explaining Internet Banking Behavior: Theory of Reasoned Action, Theory of Planned Behavior, or Technology Acceptance Model" by S. Yousafzai, G. Foxall & G. Pallister, 2010, *Journal of Applied Social Psychology*, 40*, 5, pp. 1172–1202.* Copyright (2010) by Wiley Periodicals. Adapted with permission.

2.5 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) is considered the most widely used technology adoption model in information systems literature (Plouffe et.al 2001; Ramayah, Rouibah, Gopi & Tangel, 2009; Turan et al.,2015). The TAM is drawn

from the TRA, Expectancy Theory and Self-Efficacy Theory (Plouffe et.al 2001; Lee, 2008; Saricam, 2014).

The TAM states that an individual's acceptance of a technology is determined by their intention to use that technology, the TAM further states that intention is influenced by attitudes which are formed from an individual's perception of the technologies usefulness and ease of use (Yousafzai, Fox all & Pallister, 2010; Ramayah, Rouibah, Gopi & Tangel, 2009, Hye-Young, Lee, Mun & Johnson, 2016; Turan et al.,2015; Saricam, 2014). TAM suggest that two belief constructs (perceived usefulness and perceived ease of use) are important to a potential adopter's adoption decision (Plouffe et.al 2001; Lee, 2008).

As demonstrated in Figure 1, the ease of use affects usefulness and attitudes towards use, which influences adoption decisions (Mathieson, 1991). Usefulness is measured as the probability of the technology increasing job performance while ease of use measures the extent to which a technology is expected to be effortless (Liao, Palvia & Chen, 2009). Attitude and behavioural intention directly affect user behaviour.

The goal of the TAM model is to explain the factors affecting technology acceptance by locating the influence of external factors on internal beliefs, attitudes and intentions (Phillips, Calantone & Lee, 1994). The determinants of technology adoption for TAM are described below in Figure 1 (Igbaria & Livari, 1995).

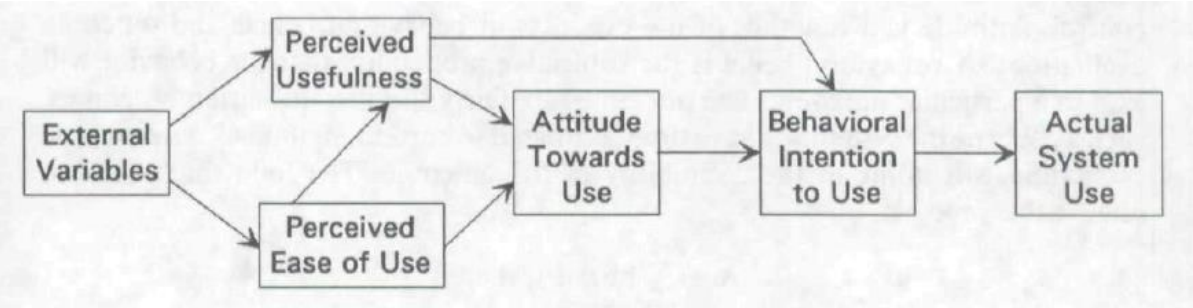


Figure 5: *The Technology Acceptance Model*. Reprinted from "Predicting user intentions: comparing the technology acceptance model with the theory of planned behavior" by k. Mathieson, 1991, *Information systems research*, *2(3)*, p.

173-191. Copyright (1991) by the *Information systems research*. Adapted with permission.

Unlike the TRA and TPB the TAM measures beliefs about the use of a technology instead of the technology itself as individuals might hold positive views about a technology without the intention to use it (Yousafzai, Foxall & Pallister, 2010).

2.6 Theory of Planned Behaviour (TPB)

The Theory of Planned Behaviour (TPB) expands on the TAM to include additional constructs. According to Mathieson (1991), the TPB as demonstrated in Figure 2 argues that behaviour is established by the intent to act out that behaviour, while the intention is predicted by attitude, subjective norm, and perceived behavioural control.

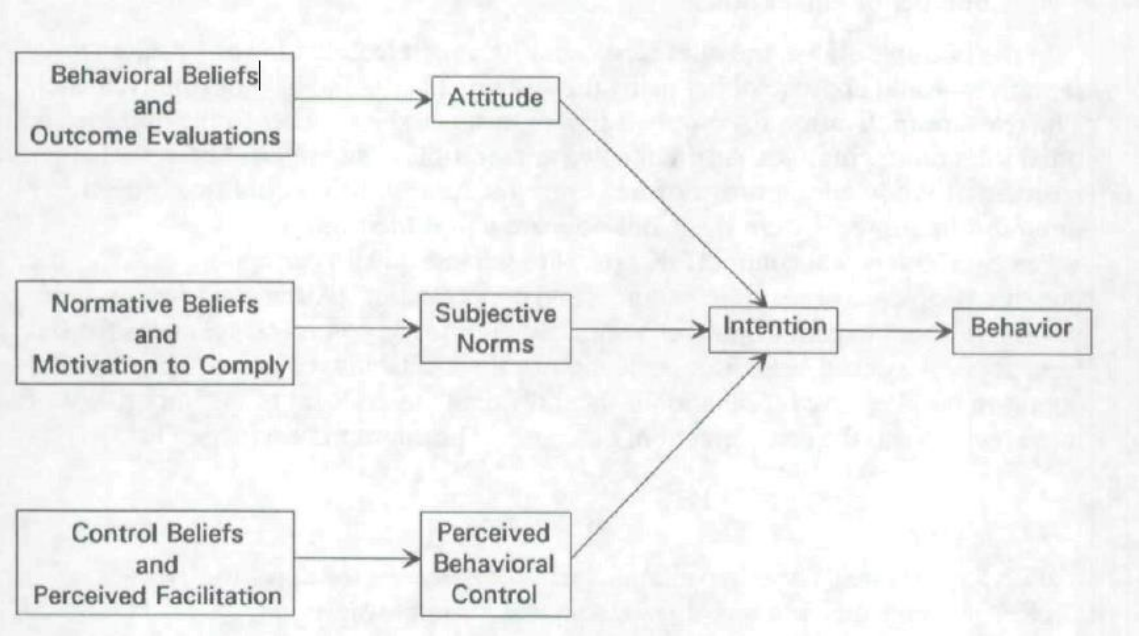


Figure 6: *Theory of planned behaviour*. Reprinted from "Predicting user intentions: comparing the technology acceptance model with the theory of planned behavior" by k. Mathieson, 1991, *Information systems research*, *2(3)*, p. 173-191. Copyright (1991) by the *Information systems research*. Adapted with permission.

Attitude and intention in TPB are stated as in TAM model. The subjective norm is the individual's perception of a social compulsion to perform the behaviour and perceived behavioural control is the individual's perception of their control over performance of the behaviour (Mathieson, 1991; Turan et al.,2015; Saricam, 2014).

Innovations provide novel ways of solving obstacles and exploiting opportunities (Brancheau & Wetherbe, 1990). According to Weigel et al., (1990) the Innovation Diffusion Theory and TPB are often quoted together as they give innovation adoption decisions a richer understanding. Understanding the social factors underlying technology diffusion is important for effective management of the adoption process.

2.7 Innovation Diffusion Theory (IDT)

The Innovation diffusion theory (IDT) provides an explanation of how innovations spread through the social system over time (Rogers, 1995). Rogers (1995) described innovation diffusion as the process through which an innovation is communicated through channels over time among members of a social system. Rogers stated that diffusion occurs through a five-stage process which he described as an innovation decision process. The innovation decision process is described by Rogers as a process through which a potential adopter passes from knowing about an innovation to forming an attitude toward the innovation, from a decision to adopt or reject the innovation, to implementation of the innovation and confirming this decision (Rogers, 1995; Rogers, 2010; Sahin, 2006).

Individual adoption is conceptualised as a six-stage process which involves prior conditions, knowledge, persuasion, decision, implementation and confirmation (Rogers, 1995; Rogers, 2010; Sahin, 2006). The first stage evaluates prior conditions, which is the conditions prior the innovation. The following three stages involve information gathering and attitude formation, and are antecedent to the adoption decision. The fifth stage involves procurement and other activities necessary for putting the innovation to work (Brancheau & Wetherbe, 1990).

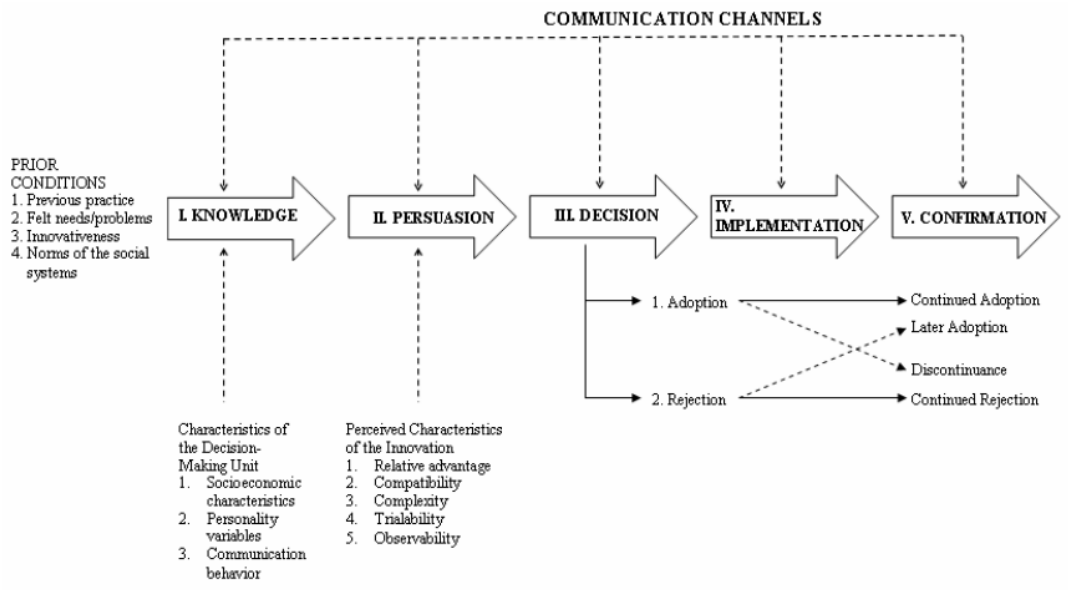


Figure 7: *A model of stages in the innovation decision process*. Reprinted from *Diffusion of innovations* (p. 187) by E. M. Rogers, 2010, New York: Simon and Schuster. Copyright 2008 by The Free Press. Adapted with permission.

2.8 Prior conditions

Prior conditions in the taxi industry will be evaluated by understanding previous practice, problems encountered through the cash payment method, the innovativeness of the taxi industry and norms within the industry.

2.8.1 Previous practice

Prior to the potential adoption of the electronic payment solution, the taxi industry worked on a cash payment basis. The taxi drivers are remunerated using cash and taxi owners operate on a cash basis.

2.8.2 Needs/ problems

Below is a list of needs and problems currently faced by the industry:

- SARS cannot collect taxes from the taxi industry;
- Taxi drivers and commuters are at risk of holding cash payments (Woolf & Joubert, 2013);

- Taxi drivers struggle with providing the required cash change to commuters (Woolf & Joubert, 2013);
- No electronic record of income for taxi owners and taxi drivers;
- Inadequate enforcement of regulations which lead to overtrading in routes, compromised efficiency and profitability. This has resulted in poor vehicle maintenance, bad driving and poor skills and training in the sector (Schmidt, 2014);
- The lack of vehicle maintenance, poor driving and low skills and training in the sector (Schmidt, 2014).
- The current cash check in amounts required by taxi owners from taxi drivers has been identified as a factor contributing to the reckless driving behaviour by taxi drivers in the industry (Woolf & Joubert, 2009)

2.8.3 Innovativeness

Innovativeness is the extent to which a group of individuals adopt innovations earlier than other members of a social system (Rogers, 2003). Schmidt (2014) states that there is an economic logic for the taxi industry to evolve and modernise, however it struggles with resistance to change and innovation. He further states that there is little interest in modernising and formalising the industry due to low levels of skills and trust. Past attempts to introduce the electronic payment solution in the industry were met strong resistance (Schmidt, 2014).

2.8.4 Norms of the social system

- The taxi industry is highly unregulated and has poor safety, security and traffic law compliance (Schmidt, 2014).
- Ingle (2009) found that most taxi drivers are not taxi owners and the taxi industry is not their first choice for employment.
- The total value of the South African taxi industry is not known because most taxi owners are not registered tax payers and their income is not recorded (Barret, 2003).

2.9 The knowledge stage

The knowledge stage occurs when a potential adopter becomes aware of an innovation and how it would benefit them (Rogers, 2010; Miranda, Farias, de Araújo Schwartz & de Almeida, 2016). According to Rogers (1995), members of a social system actively seek out information about innovations until they know of their existence. Even though innovations present potential adopters with new ways of solving problems and exploiting opportunities, it is often not known whether the innovation will be superior to existing methods and to cope with the uncertainty potential adopters are motivated to seek additional information (Brancheau & Wetherbe, 1990). With imperfect information and uncertainty, adoption decisions will differ and adopters will reach different decisions based on their interpretation of the information available to them (Wozniak, 1984).

Rogers (1995) identified that the characteristics of adopters in a social system affects knowledge accumulation and innovation adoption in that social system. Rogers defined adopter categories as the classification of adopters in a social system based on their innovativeness (Rogers, 1995; Rogers, 2010). Innovativeness measures the extent to which potential adopters adopt an innovation earlier than other members in their social system (Rogers, 1995; Rogers, 2010; Sahin, 2006).

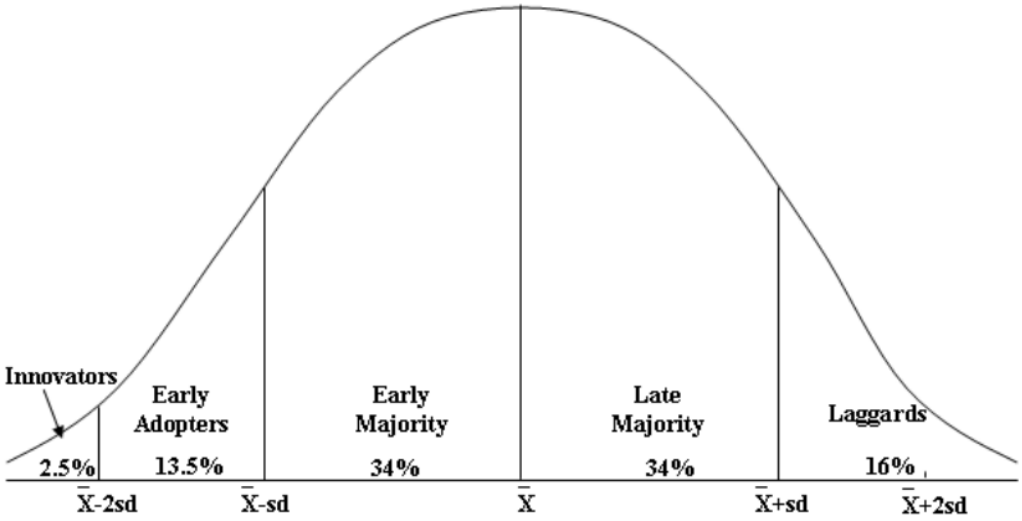


Figure 8: Adopter categories based on innovativeness. Reprinted from *Diffusion of innovations* (p. 257) by E. M. Rogers, 2010, New York: Simon and Schuster. Copyright 2008 by The Free Press. Adapted with permission.

Various authors have found innovators and early adopters to be younger, more educated, more attuned to mass media and more involved in interpersonal communication (Brancheau & Wetherbe, 1990; Rogers, 1995; Stafford, 2003; Dickerson & Gentry, 1983). Rogers (1995) categorised innovators by socioeconomic characteristics, personality variables and communication behaviour.

2.9.1 Socioeconomic characteristics

Research has found that individuals' differences play a major role in the adoption of innovations. Demographic, cognitive and communication behaviour of potential adopters are significant predictors of the adoption of innovations (Rogers, 1995; Souranta, 2003; Dickerson & Gentry, 1983).

Age

Rogers (1995; 2003) generalised that adopters are not different from non-adopters in terms of age as there was inconsistent evidence about the relationship between age and adoption. Stafford (2003) found that adopters tend to be older and have higher incomes and therefore can afford costs associated with technological innovations. This could be evident in the taxi industry as taxi owners who are older are more likely to have been in the industry longer and have acquired multiple taxis and generate higher revenues. Dickenson & Gentry (1983) also found that complex innovations that involve financial risk are more likely to be adopted by individuals who are older and have larger incomes but adopters are younger for innovations such as bank cards and solar energy systems. There is literature that argues that ageing resulted in a decline in intellectual ability or intelligence (Morris & Venkatesh, 2000). Karjaluoto, Mattila & Pento (2002) argue that older consumers struggle with new technology and are more likely to have negative attitudes towards change, however they state that

an individual’s perception of new technology is greater than just age. Research indicates that adopters differ depending on the nature of innovation.

Survey by Ingle (2009) found the taxi industry was male dominated with 98% of the drivers being males. 63% of the respondents were younger than 35 years old.

Education

Kim & Lee (2011) modelled the impact of adopter categories on technology and innovation adoption using the concepts of width and depth of human capital. They explained the width of human capital as the number of knowledge points that are contained in human capital, and they further explained that the knowledge point helps to decode and accept an innovation (Kim & Lee, 2011). The width of human capital is explained by the number of years at school or level of education while the depth of human capital determines the skills that help manoeuvre the new technology to be adopted (Kim & Lee, 2011).

Wozniak (1984) found that the adoption of a technological innovation is positively correlated to the degree of human capital intensity i.e., level of education obtained. He further stated that the adoption or rejection of an innovation depends on innovative ability. Innovative ability is the ability of the adopter to search for, collect, interpret, and evaluate information efficiently in making innovative decisions which is correlated to education, experience and information (Wozniak, 1984; Lin, 1991).

According to Wozniak (1984) and Lin (1991) education:

- Improves allocative decision making and contributes to the productive capabilities required to make innovative decisions by augmenting a person's capacity to think systematically and creatively about techniques;
- Enhances the ability to conceptualise the results of actions being contemplated and comprehend the effects of adopting technological innovations; and
- Enables one's ability to receive, analyse, and understand information relevant to making innovative decision.

Research found that adopters with higher levels of education are more likely to be adopters and potential adopters with technology related expertise are more likely to adopt technology compared to potential adopters with no-specific technology related expertise (Kim & Lee, 2011; Dickerson & Gentry, 1983; Wozniak, 1984; Mukoyama, 2004).

Fobosi (2013) states that the South African taxi industry consists of individuals who are typically poorer, less educated, and lack the minimum skills demanded by the labour market. Banerjee et al., (2008) conducted research on the unemployment rate in South Africa and found that higher education is correlated to better employment opportunities and greater labour market participation as demonstrated in Figure 6. This indicates that individuals who do not have tertiary education are not normally absorbed within the formal sector and end up in the informal economy.

Year	Less than matric			matric		
	Participation	Employment	Unemployment	Participation	Employment	Unemployment
1995	44.8	36.6	18.4	63.7	54.0	15.2
1997	41.3	30.8	25.4	62.5	48.7	21.9
1999	47.8	34.6	27.7	68.8	50.4	26.7
2001	51.8	34.4	33.6	73.3	49.7	32.3
2003	48.4	33.1	31.6	71.2	49.2	30.9
2005	49.2	34.2	30.4	69.2	49.7	28.2
Year	Post-matric			College		
	Participation	Employment	Unemployment	Participation	Employment	Unemployment
1995	80.6	76.8	4.6	85.8	84.0	2.1
1997	80.0	73.7	7.9	83.6	80.4	3.9
1999	85.0	74.3	12.6	87.4	82.2	6.0
2001	85.9	72.4	15.7	90.1	83.2	7.7
2003	89.1	76.1	14.6	89.7	85.6	4.6
2005	86.2	76.1	11.7	88.5	85.6	3.3

Notes: All statistics are for population 16 to 64 years old. ILO definitions adopted. Matric are those individuals with grade 12/standard 10/form 5/matric. Post-matric education includes those with: certificate with grade 12/std 10 and diploma with grade 12/std 10. College includes all individuals with: bachelors degree, bachelors degree and diploma, honors degree and higher degree. This classification eliminates around 0.3% of the sample with vocational degrees.
Source: Authors calculations using the October Household Survey and the September wave of the Labor Force Survey.

Figure 9: Participation, employment and unemployment by educational level. Reprinted from Why has unemployment risen in the new South Africa? by Banerjee, A., Galiani, S., Levinsohn, J., McLaren, Z., & Woolard, I. (2008). *Economics of Transition*, *16*(4), 715-740. Adapted with permission.

As demonstrated by Figure 6 unemployment is higher for individuals with matric or less education. These individuals are absorbed within the informal economy.

Sauri (2006) found that no qualification was required to operate in the taxi industry and the highest level of education was high school. A survey conducted by mark Ingle in 2009 indicated that taxi drivers and owners were more likely to have lower levels of education as less than a third had a matric certificate. The study also found an indirect relationship between age and level of education.

Experience

Dickerson & Gentry (1983) state that experience with a product class leads to a higher likelihood of adopting innovations in that product class. Early adopters are users of products which exhibit similar behaviour to the innovation they adopt, as the familiarity with the new innovation reduces the efforts required (Dickerson & Gentry, 1983; Au & Enderwick, 2000). Stafford (2003) states that experience with technology which comes about from the usage of technology leads to increased adoption of technological innovations. Stafford (2003) further states that the usage rate is a strong indicator of the probability of adoption. Wozniak (1984; 1987; 1993) found that the effect of experience on innovative ability is equivalent to that of education.

Experience can be accumulated through technical knowledge from working relationships with the product (Au & Enderwick, 2000). Familiarity with the electronic payment solutions will be evaluated using prior experiences with electronic banking and the usage of computer products. Prior experience with technology or technology related products refers to an individual's experience related to different technologies such as ATM, online banking and prior computer experience refers to the use of computers, internet and email. Literature states that these impacts a potential adopter's attitude and beliefs about new technological innovations (Karjaluoto, Mattila & Pento, 2002). Munnukka (2007) states that previous experience using similar products influences adoption behaviour, as experience and use minimise the risk of uncertainty.

Greater scales of production

Wozniak (1984; 1987; 1993) and Faria, Fenn & Bruce (2001) found that adopters with greater scales of production or greater size of activity derive greater economic benefits from being aware of innovations and are more likely to adopt than producers with smaller scales of production. In the taxi industry, greater scale of production would indicate a larger number of employees and having a fleet of taxis. It is currently estimated that the ratio of taxis to employees in the taxi industry is 1:1.5 (Barrett, 2003). The majority of taxis are not driven by the owners as most owners own more than one but less than ten taxis (Barrett, 2003).

We therefore hypothesise that Taxi owners who have greater scales of production are more likely to adopt technology innovations than taxi owners with one taxi.

2.9.2 Personality variables

According to Rogers (1995) personality variables are difficult to measure in field interviews. There has been relatively little literature on personality variables and how they influence technology adoption and Wejnert (2002) found that psychologically strong individuals adopt innovations based on the information they gather from the media, while psychologically weak individuals depend on the opinions of stronger individuals who gather media information. Media is covered in communication behaviour which is in the following section and will therefore not be measured in this research.

2.9.3 Communication behaviour

Communication is a way through which information is transferred from one individual to another (Alkhateeb, Khanfar &Loudon, 2010; Lee, Lee & Schumann, 2002; Vishwanath & Goldhaber, 2003). Wozniak (1984; 1987; 1993) stated that information improves the efficiency in making innovation adoption decisions. Two types of communication channels exist, one being interpersonal or word of mouth communication and mass media exposure (Alkhateeb et.al, 2010; Lee et.al,

2002). Mass media communications refers to communications media through the use of television, radio, magazines and internet.

For a taxi owner to operate in a route they have to be a member of the association that operates in that route. Only one association is permitted per route to reduce violent conflicts between associations who have to compete for the same route (Beg et.al, 2014). Therefore, operators working on a route will have the same association which therefore becomes the communication channels for all taxis operating in that route.

Mass media gets information to a large number of people quicker (Alkhateeb et.al, 2010). Early adopters are influenced only by mass media communication whereas late adopters are influenced by word-of-mouth communication (Lee et al., 2002; Straub, 2009; Sahin, 2006; Zolait & Sulaiman, 2008; Haggman, 2009). Interpersonal communication is more effective in forming and altering attitudes towards innovations (Alkhateeb et.al, 2010). Wejnert (2002) states that information obtained from peers holds significant weight in comparison to information obtained from the media. The taxi industry due to the way it operates has strong interpersonal communication between its members and leaders.

Information enhances the efficiency of adopting innovations (Wozniak 1984; Lee et.al, 2002). Wozniak (1984; 1993) hypothesised that agents who obtained more information specific, making technology acceptance decisions were more likely to adopt than those who acquire less information. Therefore, adopters who have a greater mass media exposure are more likely to adopt than taxi drivers who do not have media exposure.

2.9.4 Hypothesis

Hypothesis 1a. Taxi owners who are older in age are more likely to adopt technology than younger taxi owners.

Hypothesis 1b. Taxi owners with technology-related expertise are more likely to adopt technology than taxi owners with no-specific technology related expertise.

Hypothesis 1c. Taxi owners with more education are more likely to be adopters of technological innovations.

Hypothesis 1d. Taxi owners who have a greater mass media exposure are more likely to adopt technological innovations than taxi drivers who do not have media exposure.

Hypothesis 1e. Taxi owners who have a fleet of taxis are more likely to adopt technological innovations than taxi owners with one taxi.

2.9.5 Summary of literature

Authors	Title	Sample	Hypothesis	Main findings
Dickerson & Gentry (1983)	Characteristics of adopters and non-adopters of home computers.	639 respondents	* Purchasers of home computers are more likely to be middle aged , own their residence, have more education and have higher incomes. ***** Owners of home computers will have had more experience with the general product class of computer related products and services than non-owners.	Adopters were found to be more likely to be home owners, have more education and have higher incomes. Adopters were also found to be older than non-adopters. The research alsofound that adopters of home computers have had more experience with a variety of technical products and services than non-adopters.
Mukoyama (2004)	Diffusion and innovation of new technologies under skill heterogeneity	Model of innovation diffusion	* The level of technology adopted is higher when the level of education is higher.	The research found that diffusion is faster when the skills distribution has less dispersion. Larger dispersions of skills delay innovation diffusion.
Karjaluoto, Mattila & Pento (2002)	Factors underlying attitude formation towards online banking in Finland	1167 respondents	*Prior experience of computers impacts consumer beliefs and attitudes towards related systems.	The research found that prior experience with computers and technology influence actual online banking behaviour. The results also found that an online banking user is relatively young, well educated with a high level of income.
Lee, Lee & Schumann (2002)	The influence of communication source and mode on consumer adoption of technological innovations	1000 respondents	*Receiving information through various communications will be positively correlated to adoption.	Adopters received the most communication from all communication categories. The average adopter was younger than a non-adopter, had more education and income.
Zolait & Sulaiman (2008)	Incorporating the innovation attributes introduced by Rogers' theory into theory of reasoned action: An examination of Internet banking adoption in Yemen	369 respondents	* Individual's intention to use Internet banking increases as Individual's interaction through mass media increases	Mass media channels positively affect an individual's intention to adpot internet banking.
Au & Enderwick (2000)	A cognitive model on attitude towards technology adoption	298 respondents	* The adoptive experience of a prospective adopter has a positive impact on the attitude towards adoption	cognitive processes which determine the attitude towards adoption was found to be affected by adoptive experiences.
Wozniak (1984) and (1987)	The adoption of interrelated innovations: A human capital approach.	Innovative ability model	*Producers with more education, experience, scale of production and information are more likely to be adopters than operators with less education, experience, scale of production and information.	The study found that the adoption of new technology was influed by a producers level of education and experience. The availability of information was found to be necessary to make innovative decisions. The study also found that producers with larger scales of production were more likely to adopt current innovations than producers with smaller scales of production.

Authors	Title	Sample	Hypothesis	Main findings
Vishwanath & Goldhaber (2003)	An examination of the factors contributing to adoption decisions among late-diffused technology products	611 respondents	* Media use, media ownership and contact with change agents will have a significant direct effect on adoptive intentions.	Media ownership largely contributed to an indirect impact on attitudes and intentions. The research found that late adopters relied heavily on experience with technology when forming perceptions and that age, income and occupation significantly influenced adoptive intent.
Lin, Chiu &Lim (2011)	Factors affecting the adoption of social network sites: examining four adopter categories of Singapore's working adults.	222 respondents	*Social networks(SNS) adopters are likely to be younger than non adopters. * SNS adopters are likely to have higher educational qualifications than non-adopters * SNS adopters are likely to use more technologies that are functionally similar to SNS than non-adopters.	Age was found to be the most significant predictor of the adoption of SNSs. Adopter were more likely to use similar technologies.
Kim & Lee (2011)	Technological change, human capital structure, and multiple growth paths	Human capital model	*Model the impact of adopter categories on technology and innovation adoption using the concepts of width and depth of human capital. The width of human capital is explained by the number of years at school or level of education while the depth of human capital determines the skills that help manoeuvre the new technology to be adopted	Research found that adopters with higher levels of education are more likely to be adopters and potential adopters with technology related expertise are more likely to adopt technology compared to potential adopters with no-specific technology related expertise

2.10 Persuasion Stage

Knowledge about an innovation is not enough to encourage adoption of the innovation unless individuals deem it relevant and potentially useful to their situations (Rogers, 2010; Miranda et.al, 2016). In the persuasion stage, an individual forms an attitude about the innovation and the attributes of an innovation play a significant role in forming the attitude. Rogers acknowledged five innovation elements that influence technology acceptance decisions. Rogers (1995) states that anywhere from 49 percent to 87 percent of the variation in innovation adoption is explained by the five attributes. Benbasat & Moore (1991) states that the behaviour of potential adopters is predicted by their perceptions of the innovation.

2.10.1 Innovation Attributes

Relative advantage

This measures the extent to which innovations are better than the state they supersede (Rogers, 1995; Rogers, 2010; Norskov, Chrysochou & Milenkova, 2015; Sahin, 2006; Zolait & Sulaiman, 2008; Haggman, 2009; Souranta, 2003; Vishwanath & Goldhaber, 2003; Lin, Chiu &Lim, 2011; Straub, 2009; Lin, 2011; Martins, Steil & Todesco, 2004). Relative advantage can be measures through economic gains, social prestige, time saving, time to reap the benefits and decreased discomfort (Souranta, 2003). Research found that the perceived relative advantage of an innovation is positively correlated to the probability of its adoption (Rogers, 1995; Rogers, 2010; Sahin, 2006; Zolait & Sulaiman, 2008; Haggman, 2009; Souranta, 2003; Martins, Steil & Todesco, 2004).

Compatibility

This measures whether innovations are consistent with current values, experience and needs of users (Rogers, 1995; Rogers, 2010; Sahin, 2006;

Alkhateeb et.al, 2010; Zolait & Sulaiman, 2008; Haggman, 2009; Souranta, 2003; Norskov, Chrysochou & Milenkova, 2015; Vishwanath & Goldhaber, 2003; Lin, Chiu &Lim, 2011; Straub, 2009; Lin, 2011; Martins, Steil & Todesco, 2004). Compatibility is linked to a potential adopter's work style and previous experience (Alkhateeb et.al, 2010). Research found that the higher the perceived compatibility of the innovation, the higher its probability of adoption (Rogers, 1995; Rogers, 2010; Sahin, 2006; Alkhateeb et.al, 2010; Zolait & Sulaiman, 2008; Haggman, 2009; Souranta, 2003; Martins, Steil & Todesco, 2004).

Complexity

This measures whether innovations are perceived as easy to use (Rogers, 1995; Rogers, 2010; Sahin, 2006 Haggman, 2009; Norskov, Chrysochou & Milenkova, 2015 Norskov, Chrysochou & Milenkova, 2015; Vishwanath & Goldhaber, 2003; Lin, Chiu &Lim, 2011; Straub, 2009; Martins, Steil & Todesco, 2004). Research has found that complex innovations require greater skill and effort to adopt (Souranta, 2003). Complexity is subjective and can be viewed differently by different individuals (Souranta, 2003). Rogers (1995) argued that complexity is inversely correlated to innovation adoption. Research found that the lower the perceived complexity of an innovation the higher the probability of adoption (Rogers, 1995; Rogers, 2010; Sahin, 2006; Haggman, 2009; Alkhateeb et.al, 2010; Zolait & Sulaiman, 2008; Souranta, 2003; Martins, Steil & Todesco, 2004).

Trialability

This measures whether an innovation can be experimented with (Rogers, 1995; Rogers, 2010; Norskov, Chrysochou & Milenkova, 2015; Sahin, 2006; Haggman, 2009; Alkhateeb et.al, 2010; Zolait & Sulaiman, 2008; Souranta, 2003; Norskov, Chrysochou & Milenkova, 2015; Vishwanath & Goldhaber, 2003; Lin, Chiu &Lim, 2011; Straub, 2009; Martins, Steil & Todesco, 2004). Rogers (2010) argued that potential adopters who are allowed to experiment with an innovation are more likely to be comfortable with the innovation and will be more likely to adopt it. Souranta (2003) stated that trialability reduces fears and gives confidence for using the innovation. Research found that that the more trialable the innovation the higher its probability of adoption (Rogers, 1995; Rogers, 2010; Sahin, 2006;

Haggman, 2009; Alkhateeb et.al, 2010; Zolait & Sulaiman, 2008; Souranta, 2003; Martins, Steil & Todesco, 2004).

Observability

This measures whether the outcomes of an innovation are visible to others and how easy it is to observe and communicate the benefits (Rogers, 1995; Rogers, 2010; Sahin, 2006; Haggman, 2009; Alkhateeb et.al, 2010; Zolait & Sulaiman, 2008; Souranta, 2003; Norskov, Chrysochou & Milenkova, 2015; Vishwanath & Goldhaber, 2003; Lin, Chiu &Lim, 2011; Straub, 2009; Martins, Steil & Todesco, 2004). The clearer potential adopters see and understand the innovation, the more likely they are to adopt it (Alkhateeb et.al, 2010). Research has found that the more observable the innovation the higher its probability of adoption (Rogers, 1995; Rogers, 2010; Sahin, 2006; Alkhateeb et.al, 2010; Zolait & Sulaiman, 2008 Haggman, 2009; Souranta, 2003; Martins, Steil & Todesco, 2004).

2.10.2 Attitudes

Attitude is the extent to which an individual has negative and positive perceptions of a certain behaviour (Venkatesh, Morris & Ackerman, 2000; Vishwanath & Goldhaber, 2003). Venkatesh & Morris (2000) state that perceived usefulness is an important belief in an adopter's attitude towards an innovation. Rogers (2010) states that an individual may know about an innovation but not adopt it because he/she doesn't regard it as being relevant to their current state. Hence, only in the persuasion stage does the potential adopter form an attitude towards the innovation. The Innovation Diffusion Theory states that attitudes indicate the potential adoption of an innovation. Attitude is a prediction of behaviour and influences the intention to adopt innovations (Zolait & Sulaiman, 2008). Attitude has been used by the Theory of Reasoned Action (TRA) and Theory of Planned Behaviour (TPB) to examine user adoption of technological innovations (Zolait & Sulaiman, 2008). Venkatesh, Morris & Ackerman (2000) further state that attitudes towards an adoption is determined by the individuals perceived benefits and consequences of the technology.

We will therefore hypothesise that an individual's attitudes towards the innovation are related to the probability of adopting the innovation.

2.10.3 Hypothesis

Hypothesis 2a. A taxi owner's perception of relative advantages of an innovation is positively correlated to the probability of its adoption.

Hypothesis 2b. The higher the taxi owners perceived compatibility of the innovation, the higher its probability of adoption.

Hypothesis 2c. The lower the perceived complexity of the electronic payment solution, the higher the probability of adoption.

Hypothesis 2d. The higher the perceived trialability of the electronic payment system the higher its probability of adoption.

Hypothesis 2e. The more observable the electronic payment system is, the higher its probability of adoption.

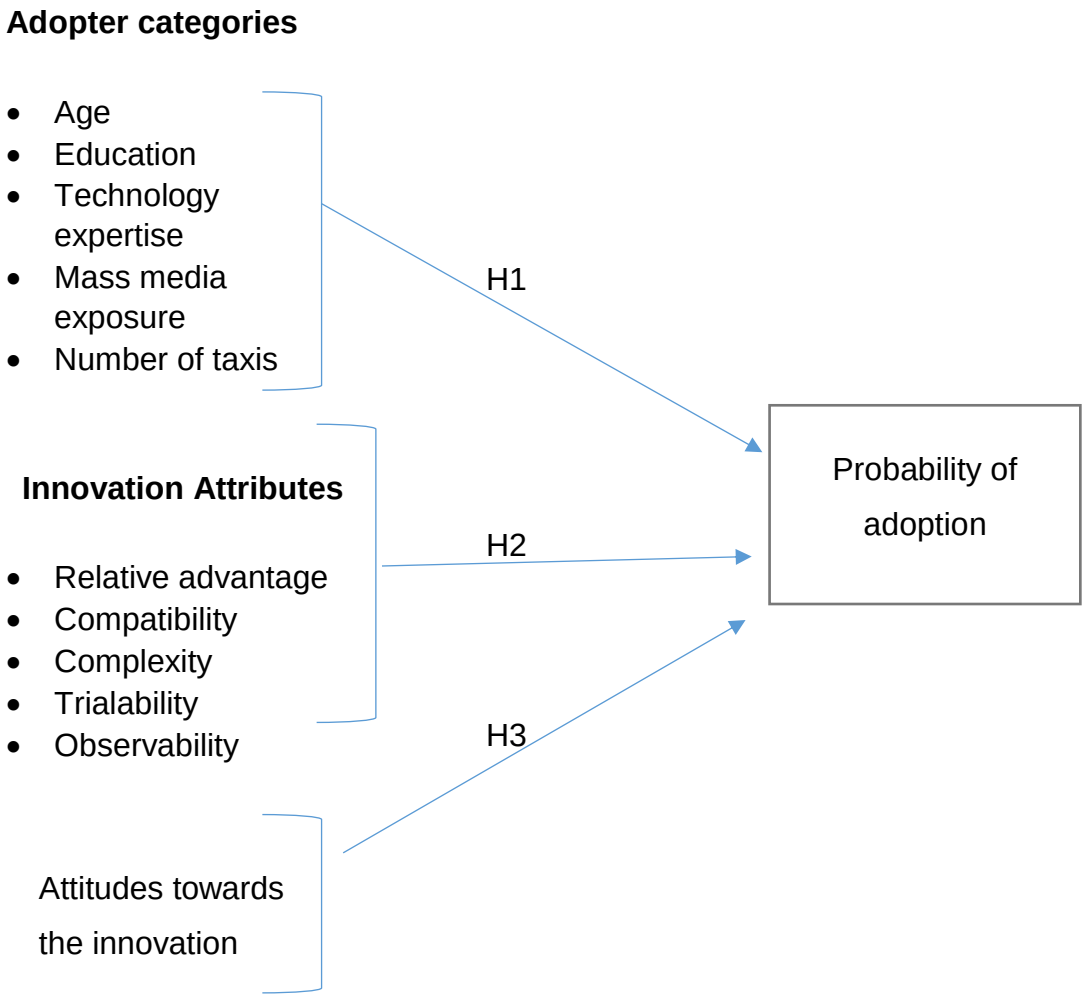
Hypothesis 3. Taxi owner's attitudes towards the innovation are highly correlated to the probability of adopting the innovation.

2.10.4 Summary of literature

Authors	Title	Sample	Hypothesis	Main findings
Karjaluoto, Mattila & Pento (2002)	Factors underlying attitude formation towards online banking in Finland	1167 respondents	*A more favourable attitude towards computers will result in online banking use.	The research found that attitude towards computers influence actual online banking behaviour.
Zolait & Sulaiman (2008)	Incorporating the innovation attributes introduced by Rogers' theory into theory of reasoned action: An examination of Internet banking adoption in Yemen	369 respondents	* Individual's intention to use Internet banking increases as Individual's perception on relative advantage/compatibility/ trialability/ observability increases.	Attributes from Rogers' theory of innovation can be linked to an individual's intention to adopt internet banking
Zolait & Sulaiman (2008)	Incorporating the innovation attributes introduced by Rogers' theory into theory of reasoned action: An examination of Internet banking adoption in Yemen	369 respondents	*Individual's intention to use Internet banking increases as Individual's attitude on internet banking increases.	Attitude influences the intention to adopt internet banking.
Au & Enderwick (2000)	A cognitive model on attitude towards technology adoption	298 respondents	*The perceived compatibility of the technology will positively affect attitude towards the adoption	cognitive processes which determine the attitude towards adoption was found to be affected by perceived compatibility.
Vishwanath & Goldhaber (2003)	An examination of the factors contributing to adoption decisions among late-diffused technology products	611 respondents	*Attitude towards the adoption decision will mediate the relationship between beliefs about the innovation and behavioural intent.	Attitude had a significant, direct impact on adoption intention.
Vishwanath & Goldhaber (2003)	An examination of the factors contributing to adoption decisions among late-diffused technology products	611 respondents	*Perceived complexity, relative disadvantage, incompatibility and lack of observability will have a significant direct affect on attitudes towards technology.	Perceived incompatibility and perceived lack ofobservability influenced adoption intention. Relative disadvantage and perceived complexity did not have a significant impact on attitude or the intention to adopt
Lin (2011)	The effect of innovation attributes and knowledge-based trust	177 respondents	*Perceived relative advantage has a positive effect on attitude toward adopting mobile banking. *Perceived compatibility has a positive effect on attitude towards adopting mobile banking.	Customers who have more positive beliefs about the perceived relative advantage and compatibility of mobile banking, formed favourable attitudes towards mobile banking.
Lin, Chiu &Lim (2011)	Factors affecting the adoption of social network sites: examining four adopter categories of Singapore's working adults.	222 respondents	*Adoption of Social networks(SNS) is positively correlated to perceived relative advantage, compatibility and trialability but negatively related to perceived complexity.	Relative advantage, compatibility and complexity were found to be influential in an individuals adoption decision.
Martins, Steil & Todesco, 2004	Factors influencing the adoption of the Internet as a teaching tool at foreign language schools.	79 respondents	*Adoption rate is positively correlated to perceived relative advantage, compatibility and trialability but negatively related to perceived complexity.	Relative advantage, compatibility, complexity, observability and trialability are the variables that affect an innovation adoption rate. Observability and trialability are the two variables that appeared as the two most significant ones, while relative advantage and complexity exerted little influence.

2.11 Hypothesised model

The probability of adoption is the dependent variable and will measure the relative likelihood that taxi owners will adopt the electronic payment solution. The independent variables are adopter categories, innovation attributes and attitudes toward the innovation.



2.12 Conclusion of Literature Review

Using adopter categories and innovation attributes by Rogers, this research project seeks to identify factors impacting the adoption of the electronic payment

solution in the South African taxi industry. Understanding adopter categories aids in understanding whether the low levels of human capital affect technology adoption in the industry. Rogers found that 49 percent to 87 percent of the variation in innovation adoption is explained by relative advantage, compatibility, complexity, trialability and observability.

The probability of adoption is the dependent variable and will measure the relative likelihood that taxi owners will adopt the electronic payment solution. The independent variables are adopter categories, innovation attributes and attitudes toward the innovation

2.12.1 Hypothesis

Hypothesis 1a. Taxi owners who are older in age are more likely to adopt technology than younger taxi owners.

Hypothesis 1b. Taxi owners with technology-related expertise are more likely to adopt technology than taxi owners with no-specific technology related expertise.

Hypothesis 1c. Taxi owners with more education are more likely to be adopters of technological innovations.

Hypothesis 1d. Taxi owners who have a greater mass media exposure are more likely to adopt technological innovations than taxi drivers who do not have media exposure.

Hypothesis 1e. Taxi owners who have a fleet of taxis are more likely to adopt technological innovations than taxi owners with one taxi.

2.12.2 Hypothesis

Hypothesis 2a. A taxi owner's perception of relative advantages of an innovation is positively correlated to the probability of its adoption.

Hypothesis 2b. The higher the taxi owners perceived compatibility of the innovation, the higher its probability of adoption.

Hypothesis 2c. The lower the perceived complexity of the electronic payment solution, the higher the probability of adoption.

Hypothesis 2d. The higher the perceived trialability of the electronic payment system the higher its probability of adoption.

Hypothesis 2e. The more observable the electronic payment system is, the higher its probability of adoption.

Hypothesis 3. Taxi owner's attitudes towards the innovation are highly correlated to the probability of adopting the innovation.

3 CHAPTER 3: RESEARCH METHODOLOGY

This chapter describes the research design, approach, and data collection methods that were used to determine the factors affecting the adoption of the electronic payment system in the South African taxi industry. The chapter also outlines the research objectives that guided the research, the sample and sampling methods, data collection methods and data analysis methods.

3.1 Research methodology

A number of pilot studies have been implemented in the taxi industry without solid success and implementation. Numerous factors have been identified which inhibit the successful implementation of system. However, to our knowledge, little research has been done to measure the quantitative impact of these factors to the adoption of the solution.

The research approach employed in this project is quantitative. The quantitative methodology will measure or quantify the extent to which individual attributes, attitudes and innovation attributes influence the probability of adoption. The theory of innovation adoption was studied and hypotheses were formulated using the theory. A survey was conducted on taxi owners in the taxi industry to test the hypotheses and data will be analysed and presented based on the findings.

3.2 Research Design

A quantitative approach is one in which the researcher uses experiments and surveys to collect data on predetermined instruments that yield statistical data (Creswell, 1994). Pinsonneault & Kraemer (1993) state that surveys produce quantitative descriptions of a population and assist in identifying relationships between variables. In order to empirically test the hypotheses, a survey will be used.

The survey was cross-sectional, and used a questionnaire for data collection, in order to generalise from a sample to a population (Creswell, 1994). One of the advantages of quantitative research is its ability to use smaller groups of people

to make inferences about the population that would otherwise be too expensive to measure (Bartlett, Kotrlik & Higgins, 2001). It would be almost impossible to collect all the data in the taxi industry, but selecting a sample helped us to be able to generalise about the whole population. Primary data was gathered from the sample and analysed. No secondary numerical data was used in the analysis.

3.3 Population and sample

3.3.1 Population

A population is a collection of all the individuals, subjects or affiliates that represent a set of conditions (Barhyte, Redman & Neill, 1990). The target population for a survey are the individuals for which the survey data are to be used to make inferences (Lavrakas, 2008). The target population includes taxi owners of all sexes, age groups, education status and socio-economic status in the Johannesburg metropolitan area.

3.3.2 Sample and sampling method

Sampling approach	A non-probability sampling approach has been used which is a sampling technique that does not estimate the probability of each item from the population being accounted for in the sample (Kothari, pg.59:2004). Convenience sampling was used which is a sample consisting of readily available taxi owners (Mbokane, 2009).
Sample size	Within quantitative surveys it is essential to determine sample size and determine non-response bias (Bartlett, Kotrlik & Higgins, 2001). In order to perform factor analysis there must be between 5 and 10 respondents per scale, therefore the number of scales multiplied by 5 indicates the minimum responses for the research. To calculate the minimum acceptable sample size for regression analysis, a sample size

	of 50 plus 8 times the number of predictors is needed. The minimum surveys to collect for regression is 100.
Profile of respondents	The profiles of the respondents could not be identified as the sampling method was convenient and based on availability. However, the following criteria was used as it relates to a specific region: • Male and female taxi owners; and • Taxi owners with vehicles operating in the Johannesburg metropolitan area.

3.4 The research instrument

Questionnaires can be designed and used to collect quantities of data from different respondents and an effective questionnaire is one that allows the transmission of valuable and accurate data from the respondent to the researcher (Wilkinson & Birmingham, 2003).

The research instrument used in this research was adapted from Zolait & Sulaiman (2008). The instrument has scales adapted from Rogers (2010) five attributes which measure an innovation's rate of adoption. The instrument consists of 25 scales across the five attributes on a seven-point likert scale. The instrument also consists of 12 demographic questions. The factor analysis conducted on the instruments showed that scales measuring the same manifest variable were correlated to each other as demonstrated in Figure 7. The test for reliability showed internal consistency as the Cronbach alphas were greater than 0.6.

Figure 3.1 Reliability and validity

PFA Result: Factors Underlying Behavioural Belief of IB

	Factor				
	1	2	3	4	5
RA01	.653				
RA02	.740				
RA03	.780				
RA04	.761				
RA05	.760				
COM01	.654				
COM02	.770				
COM03	.776				
OBS01		.707			
OBS02		.739			
OBS04		.750			
OBS05		.732			
OBS06		.764			
EOU01			.744		
EOU02			.810		
EOU03			.747		
EOU04			.535		
ATT1				.701	
ATT2				.663	
ATT3				.735	
ATT4				.654	
TRA01					.773
TRA02					.811
TRA03					.710
OBS03					
Eigenvalue	10.749	4.409	1.384	1.156	1.065
Variance explained	42.995	17.635	5.535	4.623	4.258
Cronbach's Alpha	0.94	0.87	0.93	0.91	0.88

Figure 10: Factor analysis results. Reprinted from "Incorporating the Innovation Attributes Introduced by Rogers' Theory into Theory of Reasoned Action: An Examination of Internet Banking Adoption in Yemen" by A.H.S Zolait & A Sulaiman, 2008, Computer and Information Science, 1, p.36. Copyright (2008) by the Computer and Information Science. Adapted with permission.

3.5 Procedure for data collection

There are several methods for collecting primary survey data. A questionnaire was used for this research. 70% of the data collected was through telephonic interviews and 30% through the physical completion of surveys. No online surveys were conducted.

3.6 Data analysis and interpretation

The research instruments are based on different levels of measurement. The adopter categories have nominal, ordinal, interval and ratio scales. The

innovation attributes and attitudes towards the technological innovation are based on interval scales.

The data was analysed using SAS university edition. The data analyses performed are descriptive statistics, factor analysis and logistic regression. Descriptive statistics are used to analyse different relationships between the variables. Factor analysis was used to assess construct validity and to test the validity of the instrument. The Cronbach alpha were used to test the reliability of the instrument.

The probability of adoption which is the dependent variable will be estimated by using dichotomous outcomes of either “will adopt” or “will not adopt” which will be represented by 1 and 0. The probability of adoption will then be calculated using logistic regression.

Logistic regression is used to model dichotomous outcome variables where the dependent variable has a binary response of will adopt or will not adopt (Subasi & Ercelebi, 2005; Kruppa et al., 2014).

3.7 Limitations of the study

The research is limited in its ability to explain technology adoption in general, as technology adoption does not only affect taxi owners but taxi drivers and commuters, therefore only focusing on the taxi owners limits the research.

3.8 Validity and reliability of research

Validity and reliability must be measured to meet sound results. Validity is explained as the extent to which tests evaluate what they were supposed to evaluate while reliability measures how accurate and precise a measurement procedure is (Kothari, 2004). Validity in quantitative research indicates that the results correspond with how things are in the real world (Sale, Lohfeld & Brazil, 2002). In experimental research, hypotheses which measure cause and effect relationships are validated (Onwuegbuzie, 2000).

3.8.1 External validity

External validity is the extent to which the results are generalizable to groups, environments, and contexts outside of the experimental settings (Onwuegbuzie, 2000).

3.8.2 Internal validity

To prove internal validity, the cause and effect relationships should be established and the results obtained should be due only to the manipulated independent variables (Onwuegbuzie, 2000).

To maximise the validity, factor analysis which was used to test whether the items measuring negative effect are more correlated to each other than to items measuring somatic symptoms (Clark& Watson, 1995).

We measured the extent to which each manifest variable correlate with each overall factor. We then evaluated the scores, which are called factor loading (Lee, pg.314:2015). In this research, for example, a factor would be attitude, while the manifest variable would be the scales under the factor. Any manifest variable may only correlate with a set of underlying factors (Lee, pg.314:2015). Factor loadings should not be greater than 1 and should not be negative.

Eigenvalues are used to determine how many factors to extract in the factor analysis (Brown, 2001). The analyst must check that the eigenvalues and proportions of variation are explained by the factors and no single factor should explain more than 100% of the variance (Lee, pg.326:2015). The analyst must also check Kaiser's measure of sampling adequacy as it should be greater than 0.8, if individual MSA scores are less than 0.5 it indicates the variable does not fit into factor structure and should be excluded (Lee, pg.327:2015). He/she would then decide on the number of factors and choose a final model.

3.8.3 Reliability

An instrument is reliable if it produces consistent results. A reliable instrument does not contribute to validity but in order for an instrument to be reliable it needs

to be valid (Kothari, 2004). Cronbach's alpha were used to test for reliability by determining the internal consistency and correlation of items in the instrument to gauge their reliability (Santos, 1999).

The Cronbach alpha should be at least greater than 0.6 and if it is less than 0.6 it indicates poor internal reliability (Lee, pg.46:2015). This would mean that one of the items do not agree with the other and it is best to remove it, if the Cronbach alpha is negative, it indicates that the researcher forgot to reverse one of the scales (Lee, pg.46:2015).

4 CHAPTER 4: PRESENTATION OF RESULTS

4.1 Introduction

In Chapter 3 procedures and methods to collect data were specified. Chapter 4 presents and describes the results in detail. The data is collected from 182 taxi owners in the Johannesburg metropolitan areas and is analysed and interpreted using statistical methods.

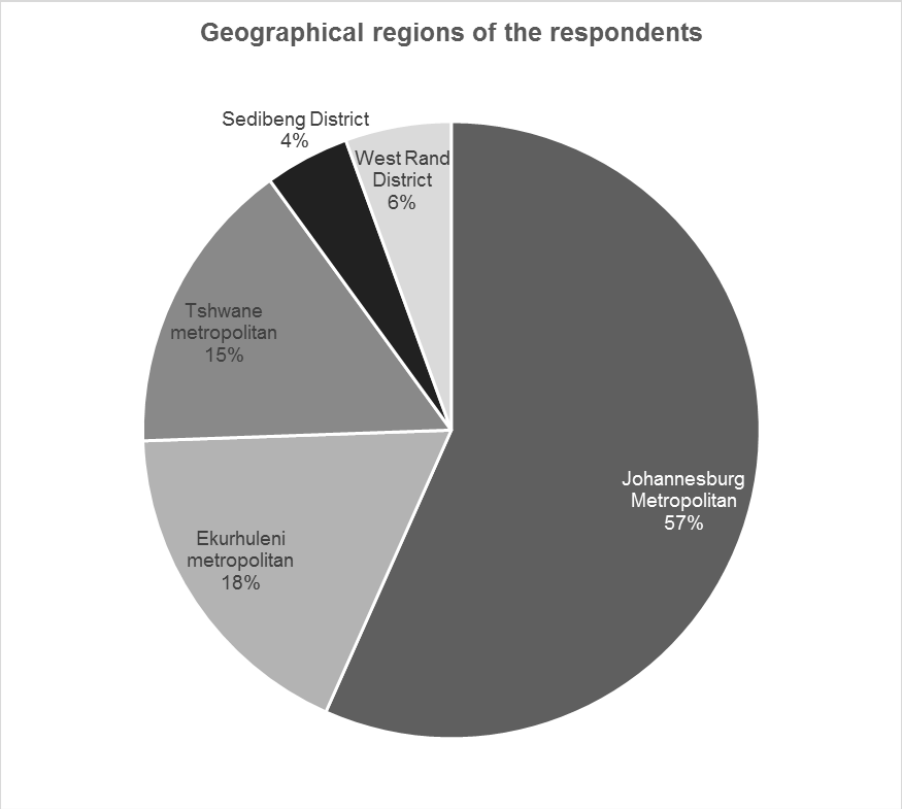
The chapter will be structured as follows:

- The demographic factors analyse the different relationships between adopter categories as the relationship amongst these variables gives an insight into the industry, how it is structured and helps to identify trends;
- As demonstrated in the literature, adopter categories or the demographics of an industry are an important element in the adoption behaviour. Means, correlations, tables and graphical representations are used for this analysis;
- The next section will evaluate whether the instrument used in the analysis was reliable and valid. Cronbach's alpha and factor analysis results will be presented through tables; and
- Results from the logistic regression are presented.

4.2 Demographic profile of respondents

The majority of the respondents were taxi owners operating in the Johannesburg area.

Figure 11: Geographical distribution



The taxi industry has been described as a predominantly male dominated industry however, data collected from 182 taxi owners showed that 46% of the respondents were female in relation to 54% male. Male taxi owners were ten years older, had the highest average number of employees and the highest average number of taxis owned as shown in Table1.

Table 1: Profile of the respondents

	Female	Male
Average age	45	55
Percentage of male and female	46%	54%
Average number of employees	2,1	2,5
Average number of taxis owned	2,1	4,7
Average years in taxi industry	6 to 10 years	16 to 20 years
Average level of education	High school	Primary School

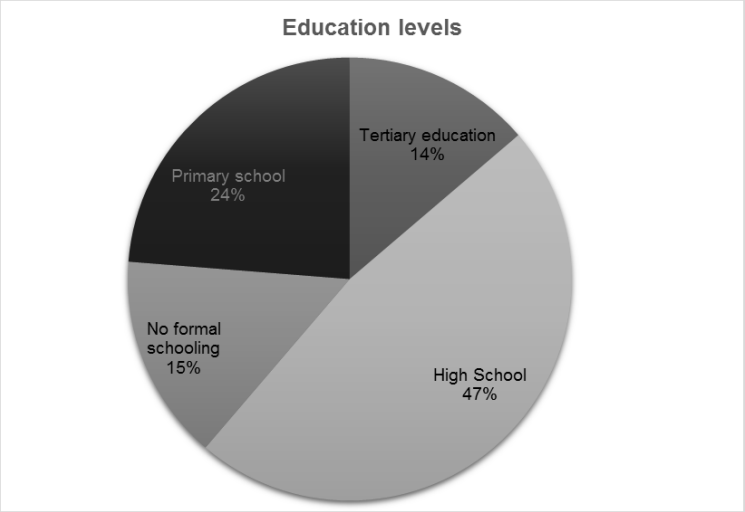
4.2.1 Scale of production

As shown in Table1 the variance in the average number of employees between male and female taxi owners is not significant while the variance in the average number of taxis owned is significant with a ratio of 1:2. The ratio of employees to number of taxis owned for female taxi owners is 1:1 and 1:2 for male taxi drivers, the overall ratio is 1:1.5.

4.2.2 Education

Data showed that female taxi owners had been in the taxi industry for a shorter period and had a higher average level of education than their male counterparts. As shown in Figure 12, 47% of the respondents had at least finished high school. 14 % obtained a tertiary qualification which encompasses a diploma, a degree, a postgraduate qualification or a professional qualification.

Figure 12: Education levels



15 % of the respondents had no formal school. Figure 13 shows the average level of education per age group. The older the taxi owners, the lower the average level of education. As shown in Figure 13, taxi owners between the ages of 30 and 40 have a higher average level of education (3,47) than those aged between 40 and 50 (2,73).

Figure 13: Average education level per age group

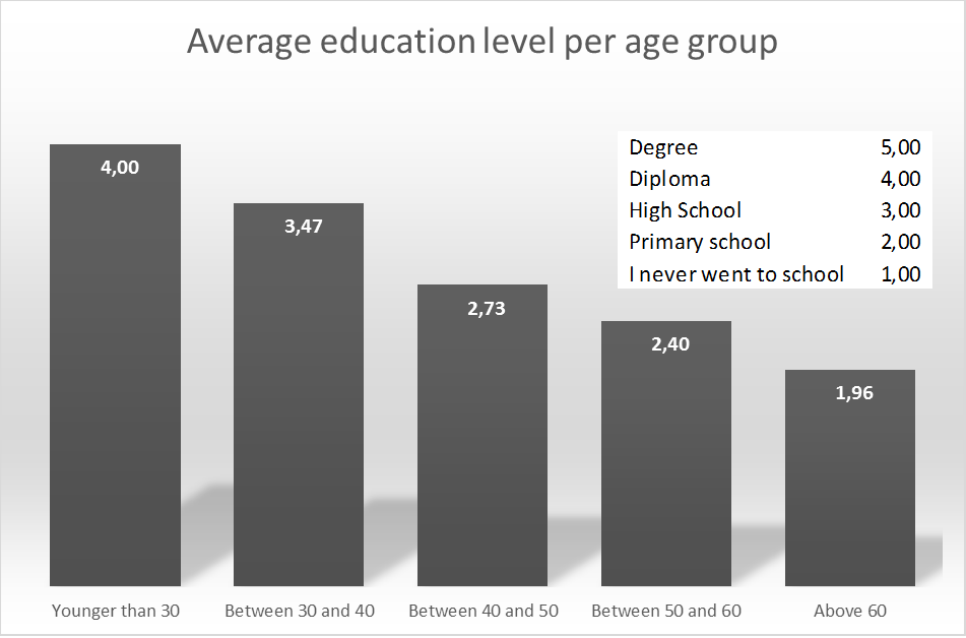


Table 2: Adoption by level of education

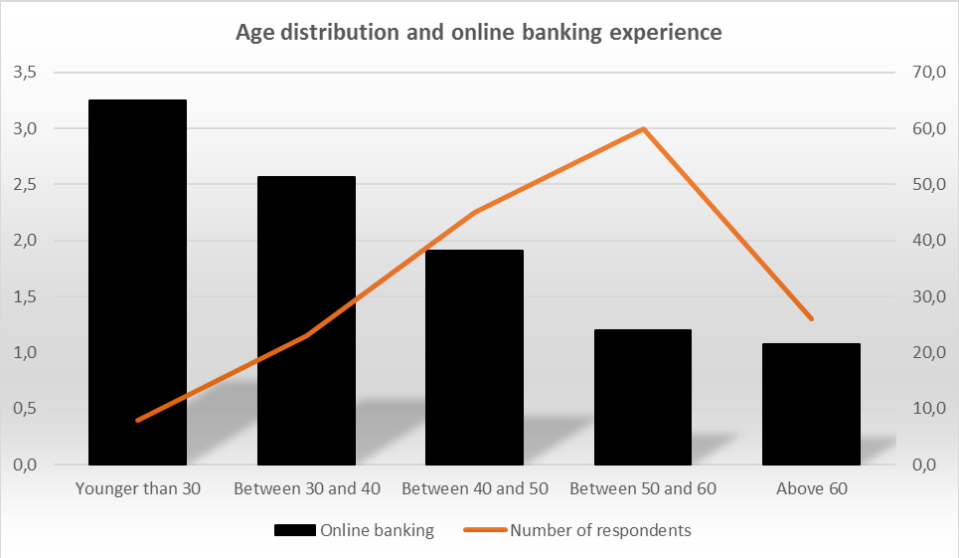
Education and adoption			
	% of respondents	Will adopt	Will not adopt
No formal education	15%	21%	79%
Primary school	24%	49%	51%
High School	47%	78%	22%
Tertiary education	14%	91%	9%

Table 2 shows that 15% of the respondents had no formal education and of that 15% only 21% were likely to adopt the electronic payment solution. The table shows that the higher the level of education, the more likely the probability of adoption.

4.2.3 Technology experience

Age has a negatively skewed distribution indicating the sample had more older taxi owners. Online banking had a positively skewed distribution indicating that younger taxi owners had more online banking experience. Respondents younger than 30 were fewer and had higher online banking experience. Online banking experience is negatively correlated to the number of respondents per age group as shown in Figure 14.

Figure 14: Age and banking experience



As shown in Figure 15 The ATM is the most widely used electronic banking device in the South African taxi industry and has been in the diffusion stage longer than the telephone and online banking.

Figure 15: Experience with banking

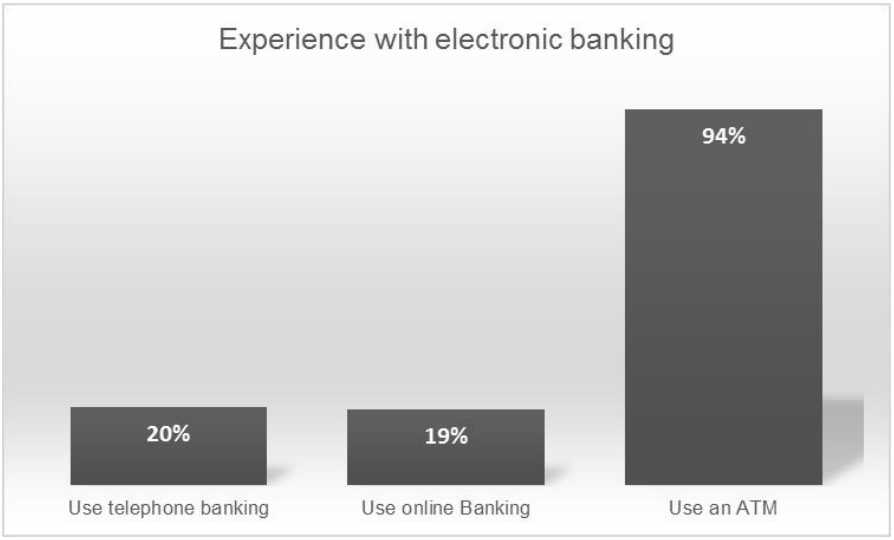
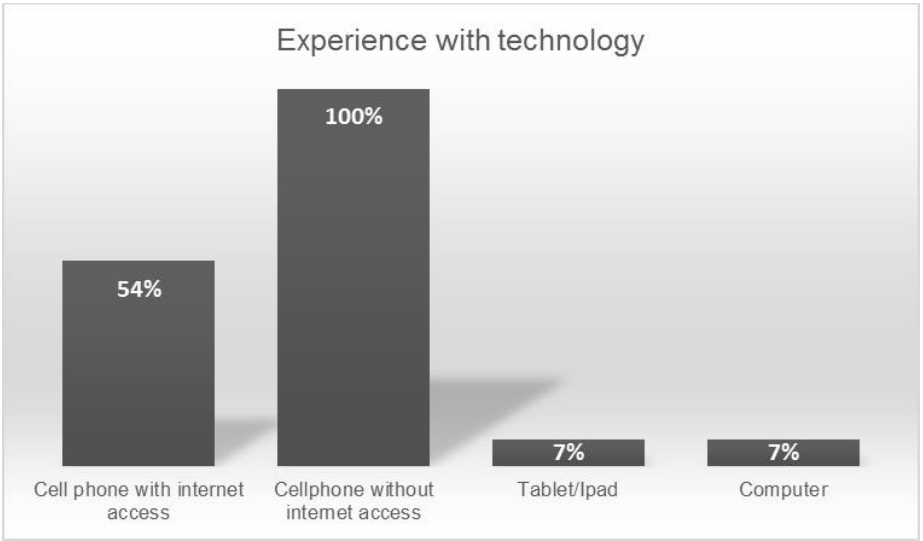


Figure 16 shows that 54% of the taxi owners have access to a cell phone with internet and only 7% have access to a computer.

Figure16: Experience with technology related products



4.2.4 Adopter categories

Table 3 shows averages amongst adopter categories. The level of education as previously stated is higher amongst taxi owners younger than 30. The younger the taxi owner, the higher the media exposure and technology expertise. The scale of production which measures the number of taxis and number of employees per taxi owner is higher for taxi owners above 60 years old.

Table 3: Averages amongst adopter categories

Adopter categories				
Age	**Level of education**	**Scale of production**	**Media exposure**	**Technology expertise**
Less than 30	4.0	1.9	4.5	11.3
31-40	3.5	2.3	3.8	10.0
41-50	2.7	2.9	3.5	7.0
51-60	2.4	2.8	2.8	5.3
Above 60	2.0	4.0	2.8	5.1

Older taxi owners have higher scales of production, lower levels of education, media exposure, and technology expertise.

4.2.5 Correlations

Table 4: Correlation amongst adopter categories

Correlation				
	Media exposure	**Level of education**	**Technology expertise**	**Scale of production**
Media exposure				
Level of education	0,60			
Technology expertise	0,68	0,55		
Scale of production	-0,05	-0,29	-0,02	
Age	-0,41	-0,56	-0,47	0,25

Table 4 shows the correlation amongst adopter categories. Media exposure has strong positive correlations with the level of education and technology expertise which indicates evidence of association. The level of education has strong positive correlations with technology expertise and strong negative relationship with age.

Table 5 shows correlations amongst the innovation attributes which are all strong evidence of association.

Table 5: Correlation amongst innovation attributes

Correlation					
	Attitude	Compatibility	Complexity	Observability	Relative advantage
Attitude					
Compatibility	0.90				
Complexity	0.93	0.95			
Observability	0.78	0.86	0.85		
Relative advantage	0.92	0.93	0.97	0.81	
Trialiability	0.87	0.96	0.93	0.91	0.88

4.3 Reliability and validity

The Cronbach's alphas are at least greater than 0.6 and this indicates good internal reliability of the scales.

Table 6: Cronbach's alpha

Cronbach alpha	
Attitude	0.98
Complexity	0.98
Observability	0.99
Trialability	0.98
Complexity	0.98
Relative advantage	0.99
Online banking Experience	0.61
Technology related experience	0.74
Media exposure	0.74

To test for the validity of the scales, exploratory factor analysis was used. To test for the fitness of the entire model MSA scores were evaluated for the entire model and all were above 0.9 which indicates all variables fit into factor structure. The overall MSA scores were also greater than 0.9.

The initial model did not have a good factor structure despite having a good overall fit. The analysis of the scree plot and proportions of variation explained suggested a model with four factors. The initial model explained a proportion of 0.99 in total, with the factor loading adding 2 percent to the explanation. The final

model also added 0.99 in total, with the factor loading adding 2 percent to the explanation. The analysis of factor loadings in the final model supports the four-factor model as the initial model splits most variables into two high loading variables each. The initial model included all the variables while in the final model, complexity was omitted. The complexity items did not seem to fit into any of the factors and appeared to have their own identity. The complexity variable had a good MSA score and will be used in later statistics. Trialability and compatibility variables were combined into one variable and as seen in Table 7, they are the first factor. The second relates to observability variables, the third to relative advantage and the fourth to the attitude variables.

Table 7: Factor loadings of final Model

	Factor1	Factor2	Factor3	Factor4
Trialability2	1.11			
Compatibility2	1.07			
Trialability1	1.04			
Trialability3	0.97			
Compatibility1	0.93			
Compatibility3	0.79			
Observability4		1.07		
Observability5		1.07		
Observability2		0.96		
Observability1		0.92		
Observability3		0.82		
Observability6		0.72		
Relative_advantage3			1.06	
Relative_advantage4			1.06	
Relative_advantage2			1.01	
Relative_advantage1			0.78	
Attitude2				1.11
Attitude1				0.98
Attitude3				0.66
Attitude4				0.51

4.4 Logistic regression results

The logistic regression tabulated in Table 8 lists the r-square, the test for the global null hypothesis and the analysis of the maximum likelihood estimates.

Results of the likelihood ratio test and the efficient score test for testing the joint significance of the explanatory variables (individual attributes, Innovation attributes and attitude) are included in the testing of the global null hypothesis.

The analysis of maximum likelihood estimates lists the parameter estimates, their standard errors, and the results of the Wald test for individual parameters. The parameters must have a p-value less than 0.05 to be statistically significant.

Table 8: Logistic regression results

Logistic Regression Analysis					
R-Square	0,690				
Testing Global Null Hypothesis: BETA=0					
Test	Chi-Square	DF	Pr > ChiSq		
Likelihood Ratio	185,971	11	<.0001		
Score	117,323	11	<.0001		
Wald	12,268	11	0.3439		
Analysis of Maximum Likelihood Estimates					
Parameter	DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	1	-45,798	15,916	8,280	0,004
Age	1	0,118	0,079	2,222	0,136
Level of education	1	3,048	1,571	3,767	0,042
Media exposure	1	0,930	0,832	1,250	0,264
Scale of production	1	-1,126	0,715	2,483	0,115
Technology expertise	1	1,363	0,625	4,759	0,029
Relative advantage	1	5,871	2,581	5,175	0,023
Complexity	1	2,988	1,693	3,114	0,078
Compatibility	1	0,779	1,939	0,161	0,688
Observability	1	-3,723	2,497	2,224	0,136
Trialability	1	7,161	3,282	4,760	0,029
Attitude	1	-7,548	3,470	4,732	0,030

Table 8 shows that the R-square for the model is 0.69 which indicated that 0.69 of the variability in the probability of adoption is explained by the independent variables.

The likelihood ratio chi-square of 185.97 with a p-value of 0.0001 indicates that the model is statistically significant. The score test also indicates that the model

is statistically significant. The analysis of maximum likelihood estimates shows the hypothesis test for each independent variable in the model.

4.5 Results pertaining to Hypothesis 1

The results pertaining to hypothesis 1 and 2 are based on the logistic regression on Table 8.

Hypothesis 1a. Taxi owners who are older in age are more likely to adopt technology than younger taxi owners.

Reject hypothesis. The p-value (0.14) is not significant at the 95% confidence interval.

Hypothesis 1b. Taxi owners with technology-related expertise are more likely to adopt technology than taxi owners with no-specific technology related expertise.

Accept hypothesis, the p-value (0.03) is significant at 95% confidence interval.

Hypothesis 1c. Taxi owners with more education are more likely to be adopters of technological innovations.

Accept hypothesis. The p-value (0.04) is significant at the 95% confidence interval.

Hypothesis 1d. Taxi owners who have a greater mass media exposure are more likely to adopt technological innovations than taxi drivers who do not have media exposure.

Reject hypothesis. The p-value (0.26) is not significant at the 95% confidence interval.

Hypothesis 1e. Taxi owners who have larger scales of production are more likely to adopt technological innovations than taxi owners with one taxi.

Reject hypothesis, the p-value (0.12) is not significant at 95% confidence interval.

Level of education and technology expertise are both significant at the 95% confidence interval. However, Age, and Mass media exposure and scales of production do not influence the probability of adoption.

4.6 Results pertaining to Hypothesis 2

Hypothesis 2a. A taxi owner's perception of relative advantages of an innovation is positively correlated to the probability of its adoption.

Accept hypothesis, the p-value (0.02) is significant at 95% confidence interval.

Hypothesis 2b. The higher the taxi owners perceived compatibility of the innovation, the higher its probability of adoption.

Reject hypothesis. The p-value (0.69) is not significant at the 95% confidence interval.

Hypothesis 2c. The lower the perceived complexity of the electronic payment solution, the higher the probability of adoption.

Reject hypothesis. The p-value (0.08) is not significant at the 95% confidence interval.

Hypothesis 2d. The higher the perceived trialability of the electronic payment system the higher its probability of adoption.

Accept hypothesis, the p-value (0.03) is significant at 95% confidence interval.

Hypothesis 2e. The more observable the electronic payment system is, the higher its probability of adoption.

Reject hypothesis. The p-value (0.14) is not significant at the 95% confidence interval.

Hypothesis 3. Taxi owner's attitudes towards the innovation are highly correlated to the probability of adopting the innovation.

Accept hypothesis, the p-value (0.03) is significant at 95% confidence interval.

Attitude towards the innovation, its relative advantage and trialability are statistically significant at the 95% confidence interval.

4.7 Summary of the results

The chapter summarised all the results from the data collected from 182 taxi owners in the industry. The demographic results were elaborated according to adopter categories to provide insight into the relationships that exists. The reliability and validity of the instrument was tested and the instrument was found to be reliable and valid. All Cronbach alphas were above 0.6 which indicates a good internal reliability of the scales.

The logistic regression was reported and attitude, relative advantage, trialability, the level of education and technology expertise were found to be relevant at the 95% confidence interval. These results will be discussed further in the following chapter.

5 CHAPTER 5: DISCUSSION OF THE RESULTS

5.1 Introduction

This research seeks to understand the factors affecting the adoption of the electronic payment solution in the South African taxi industry. This chapter will summarise the findings of the factors that affect the adoption of the electronic payment system.

The findings of the study will be discussed in alignment with the finds from the following areas:

- Demographics;
- Adopter categories; and
- Innovation attributes.

5.2 Demographic profile of respondents

The South African taxi industry is predominantly a male dominated industry, there is no accurate gender breakdown but it is estimated that only 2 percent of the total workforce in the taxi industry consists women (Barrett, 2003). There is much more balance in the gender disparities than what is currently reported. The fact that 98% percent of the workforce is male may have more to do with the fact that taxi drivers are the largest workforce in the taxi industry and are predominantly male. There were 54% male respondents in the random sample with an average age of 55. Data about the differences between male and female taxi owners emerged and indicated male taxi owners were ten years older, had the highest average number of employees and the highest average number of taxis owned.

86 % of the respondents had not received a tertiary education, which illustrates the state of South African labour market as individuals who do not have tertiary education are not normally absorbed within the formal sector. Female taxi owners were on average more educated than their male counterparts. The analysis of demographics found an inverse relationship between age and education, the younger taxi owners being more educated than the older taxi owners.

It is currently estimated that the ratio of taxis to employees in the taxi industry is 1:1.5 (Barrett, 2003). The overall ratio of taxis to employees in this study was found to be 1:1.5 which is consistent with Barrett (2003). The ratio of employee to number of taxis owned for female taxi owners is 1:1 and 1:2 for male taxi owners.

The demographics also showed that the younger more educated taxi owners used electronic banking more frequently than the older taxi owners. There are strong negative and positive relationships between age, education and electronic banking.

The demographic factors provide an insightful look into the taxi industry, specifically the relationship between the adopter categories as tabulated in Table 3. It is evident that taxi owners who are older have less education, less technology experience but have a higher average number of workers and taxis owned.

5.3 Discussion pertaining to adopter categories

5.3.1 Age

Hypothesis 1a states that taxi owners who are older in age are more likely to adopt technology than younger taxi owners. The average age in the sample was 50.2 with an average of 45 for females and 55 for males. Research has found contradicting results on how age affects technology adoption, with the contradiction attributable to the nature of the product or innovation. Logistic regression results Reject the hypothesis that there is no relationship between age and the probability of adoption of the electronic payment system.

5.3.2 Technology expertise

Hypothesis 1b states taxi owners with technology-related expertise are more likely to adopt technology than taxi owners with no-specific technology related expertise. Research states that adopters are users of products which exhibit similar behaviour to the innovation they adopt, as the familiarity with the new innovation reduces the efforts required (Dickerson & Gentry, 1993). Stafford (2003) found that the usage rate is a strong indicator of the probability of adoption.

Familiarity with technological products and online banking was used to measure technology expertise. The hypothesis is accepted at a p-value of 0.03 which is significant at 95% confidence interval. Taxi owners who do online banking and use technology related products are more likely to adopt the electronic payment solution that taxi owners who do not.

5.3.3 Education

Hypothesis 1c states that taxi owners with more education are more likely to be adopters of technological innovations.

Banerjee et al., (2008) conducted research on the unemployment rate in South Africa and found that higher education is correlated to better employment opportunities and greater labour market participation while individuals who do not have tertiary education are not normally absorbed within the formal sector and end up in the informal economy. The South African taxi industry consists of individuals who are typically poorer, less educated, and lack the minimum skills demanded by the labour market (Fobosi, 2013). 86 % of the respondents had not received any tertiary education. The hypothesis is accepted at a p-value of 0.04 which is significant at the 95% confidence interval.

The level of education affects the probability of adoption. The correlation results show strong positive correlation between the level of education and technology expertise. Research by Dickerson & Gentry (1983) found that more education resulted in better understanding of the functions performed by technology products.

5.3.4 Mass media exposure

Hypothesis 1d states that taxi owners who have a greater mass media exposure are more likely to adopt technological innovations than taxi drivers who do not have media exposure. The hypothesis is rejected. The p-value (0.26) is not significant at the 95% confidence interval. This indicates mass media does not influence the probability of exposure. These results are not consistent with those of Lee, Lee & Schumann (2002), Wozniak (1987;1993) who found that communication factors serve as significant predictors of the adoption of technological innovations.

The taxi industry is highly dependent on interpersonal communication to operate and as a result, mass media might not be a major indicator. For an electronic payment system to be implemented in a route it has to go through the taxi association. The taxi association manages everything relating to that route including all communication.

5.3.5 Scale of production

Hypothesis 1e states that taxi owners who have a fleet of taxis are more likely to adopt technological innovations than taxi owners with one taxi. The hypothesis is rejected, the p-value (0.12) is not significant at 95% confidence interval.

It appears that the number of taxis and employees taxi owners have do not increase their probability of adoption. These results are not consistent with the findings of Fenn & Bruce (2001) and Wozniak (1984; 1987). Taxi owners with greater scales of production do not view that they will derive greater economic benefit from adopting the innovation.

5.4 Discussion pertaining to innovation attributes

5.4.1 Relative advantage

Hypothesis 2a states that a taxi owner's perception of the relative advantages of an innovation is positively correlated to the probability of its adoption. Previous literature has proved that the perceived relative advantage of an innovation is positively correlated to the probability of its adoption. The hypothesis is Accepted, the p-value (0.02) is significant at the 95% confidence interval. These results are consistent with those of Rogers (1995; 2010), Sahin (2006), Zolait & Sulaiman (2008), Haggman (2009), Souranta (2003), Lin, Chiu &Lim (2011). Relative advantage measures the extent to which the innovation is better than the state it supersedes. 61% of the respondents stated that the electronic payment system is better than the cash payment solution while 16% stated that the cash payment method is better than the electronic payment solution.

5.4.2 Compatibility

Hypothesis 2b states that the higher the taxi owners perceived compatibility of the innovation, the higher its probability of adoption. The p-value (0.69) is not significant at the 95% confidence interval, and therefore, the taxi owner's perception of the compatibility of the innovation does not affect the probability of adoption. Compatibility measures that innovations are consistent with current values, experience and needs of users and is linked to a potential adopter's work style and previous experience. The electronic payment solution is not compatible with current work styles and the idea behind the introduction of the electronic payment solution is to alter the work style and users experience hence the compatibility is not likely to influence the probability of adoption. These results are compatible with those of Souranta (2003) and Lin, Chiu &Lim (2011).

5.4.3 Complexity

Hypothesis 2c states that the lower the perceived complexity of the electronic payment solution, the higher the probability of adoption. Complexity measures

whether the innovations are easy to use. Taxi owners who have technology-related experience are more likely to find the innovation less complex. The p-value (0.08) is not significant at the 95% confidence interval which implies that the taxi owner's perception of the complexity of the innovation does not affect his or her probability of adoption. This finding is inconsistent with previous findings who found that the more complex the innovation, the less likely it will be adopted. The results are only consistent with those of Souranta (2003) and Lin, Chiu &Lim (2011)

5.4.4 Trialability

Hypothesis 2d states that the higher the perceived trialability of the electronic payment system the higher its probability of adoption. Research has found that the more trialable the innovation the higher its probability of adoption. The hypothesis is Accepted, the p-value (0.03) is significant at 95% confidence interval. Taxi owner's perception of the innovations trialability affects its probability of adoption. 59% of the respondents indicated they would use the solution on a trial basis.

5.4.5 Observability

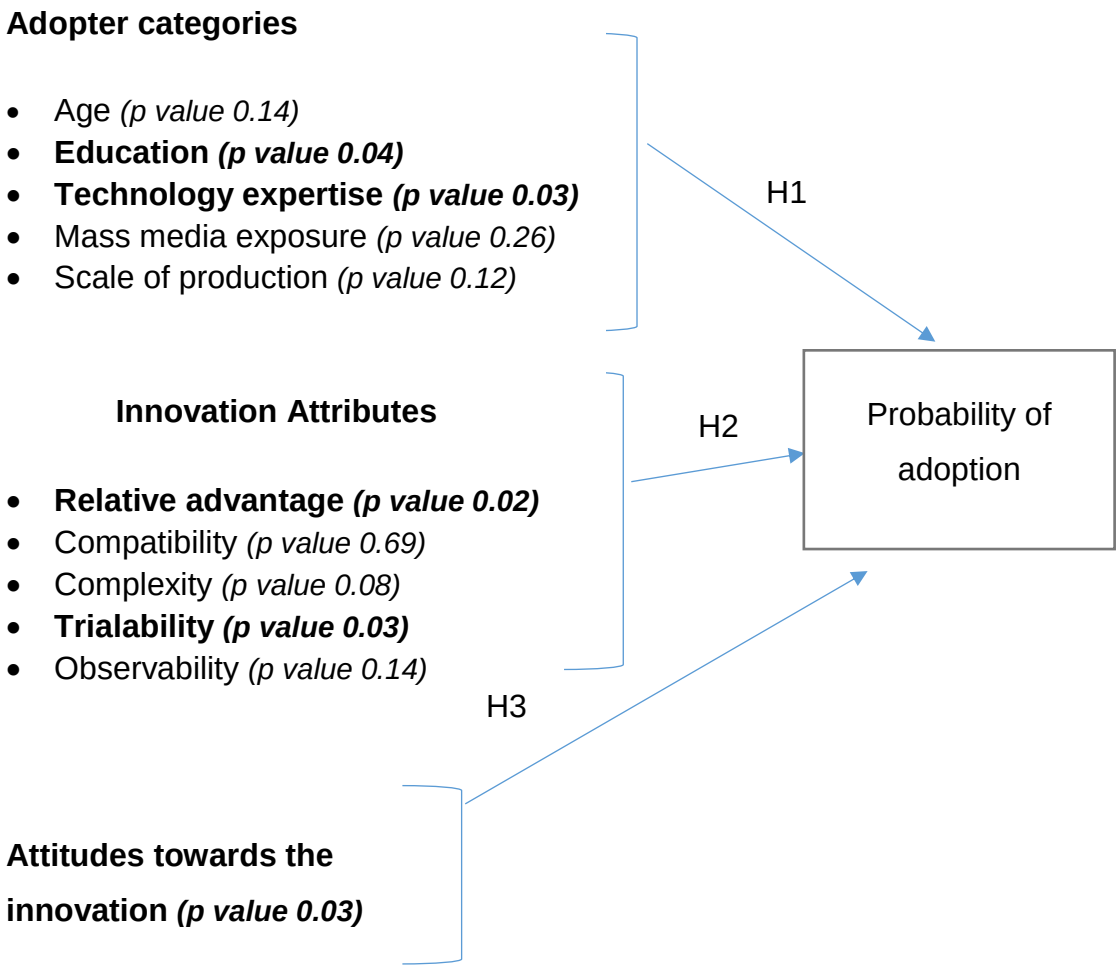
Hypothesis 2e states that the more observable the electronic payment system is, the higher its probability of adoption. Observability as stated in the literature review measures whether the outcomes of an innovation are visible to others and how easy it is to observe and communicate the benefits. The hypothesis is Rejected, the p-value (0.14) is not significant at the 95% confidence interval. These results are inconsistent with previous literature (Rogers, 1995; Rogers, 2010; Sahin, 2006; Alkhateeb et.al, 2010; Zolait & Sulaiman, 2008 Haggman, 2009; Martins, Steil & Todesco, 2004), which found that the more observable an innovation, the higher its probability of adoption, but it is consistent with Souranta (2003) and Lin, Chiu &Lim (2011).

5.4.6 Attitudes

Hypothesis 3 states that taxi owners' attitudes towards the innovation are highly correlated to the probability of adopting the innovation. The hypothesis is Accepted, the p-value (0.03) is significant at the 95% confidence interval. The taxi owner's attitude towards the innovation affects his or her probability of adoption.

5.5 Conclusion

The results indicate that not all adopter categories and innovation attributes affect the probability of adoption. Age, mass media exposure and scale of production are adopter categories that do not affect adoption in the South African taxi industry. Relative advantage and trialability are the only innovation attributes that affect the probability of adoption.



6 CHAPTER 6: CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

6.1 Introduction

This chapter will provide an overview of the research, conclusions, limitations and recommendations for future research. The results were presented and major findings were presented in the previous chapter. Based on the findings conclusions will be drawn and the implications of the results stated.

This chapter will be summarised into the following sections:

- Conclusion of the study;
  - Summarised findings with reference to the context of the taxi industry
  - Differences with other published research
  - Findings and existing theory
  - Contribution of the study
- Implications and recommendations; and
- Future research.

6.2 Conclusions of the study

The taxi industry is a cheap and convenient form of transport and consists of small financial transactions. Taxi drivers collect fares on behalf of the taxi owners and are remunerated in multiple ways as stated in the first chapter. The taxi industry is therefore a cash-based sector. The electronic payment system will benefit taxi owners through easier revenue management and operational control. In determining which adopter categories affect adoption, the level of education and technology experience were significant. Technology expertise is related to electronic banking and the availability and use of technology products. Less than 20% of the respondents use online banking and less than 7% have access to a computer. Taxi owners with technology experience and more education were more likely to adopt the electronic payment system than those than do not. There is also a strong positive relationship between level of education and technology experience. The relationship between adoption and education indicated that 47 % of the respondents which were respondents with high school education had 78% chance of adoption and 14% of the respondents who had post graduate education had 91% chance of adoption. This indicates a large part of our sample (57%) had positive attitudes about adopting the electronic payment solution. Therefore, these results indicate that high school education is sufficient for a probability of adoption.

Relative advantage and trialability were the only innovation attributes significant at the 95% confidence interval. Relative advantage measures the extent to which the innovation is better than the state it supersedes. 61% of the respondents stated that the electronic payment system is better than the cash payment solution, while 16% stated the cash payment method is better than the electronic payment solution. Trialability measures whether an innovation can be experimented with. 59% of the respondents indicated they would use the solution on a trial basis. Attitude was significant in predicting the probability of adoption. 57% of the respondents had positive attitudes towards the electronic payment solution. 24% of the respondent neither agreed nor disagreed and 19% had negative attitudes towards the electronic payment system.

Innovation adoption studies have described different characteristics of adopters because the product (innovation) is different and the adoption process is different for the different products. These studies have also produced different results depending on the characteristics of the innovation and its context. Adopter categories will yield different results depending on the characteristics of the industry they operate in and country. There is therefore no specific characteristics of an adopter that is general for every range of product in every industry.

The results on the age of an adopter was consistent with those of Rogers (1995; 2003) who found that adopters are not different from non-adopters in terms of age. Results from other studies varied depending on characteristics of innovation and environment. Findings on education and technology expertise are consistent with literature. Mass media exposure and scale of production did not affect probability of adoption. The taxi industry has a very strong interpersonal communication which is more effective in forming and altering attitudes towards innovations (Alkhateeb et.al, 2010), hence mass media exposure even though can reach a large number of individuals isn't significant. Literature on farming innovations indicates that the greater the scales of production the more likely the probability of adoption. In the taxi industry, older taxi owners have greater scales of production and are likely less education and have less technology expertise.

Relative advantage and trialability are the only innovation attributes that are relevant. Taxi owner's perception of whether the electronic payment solution is superior to the cash payment systems affects their probability of adoption. The results also show that the taxi owner's perception of how experimental the innovation is affects their probability of adoption.

Complexity, compatibility and observability were found to be insignificant at the 95% confidence interval.

The results from education levels and technology experience agrees with those of Dickerson & Gentry (1983), Mukoyama (2004), Karjaluoto, Mattila & Pento (2002), Lee, Lee & Schumann (2002), Au & Enderwick (2000), Wozniak (1984; 1987) and Kim & Lee (2011) amongst many. The results for age indicated that

age doesn't affect the probability of adoption. Research by Lin, Chiu &Lim (2011) on Social networks indicated that age was a significant predictor of adoption. Stafford (2003) found that adopters tend to be older and have higher incomes and therefore can afford costs associated with technological innovations. Morris & Venkatesh (2000) argue that ageing resulted in a decline in intellectual ability or intelligence. Karjaluoto, Mattila & Pento (2002) argue that older consumers struggle with new technology and are more likely to have negative attitudes towards change. In the South African taxi industry age, does not affect the probability of adoption. Scales of production and mass media exposure did not influence the probability of adoption which is inconsistent with other available research. For an electronic payment system to be implemented in a route it has to go through the taxi association. The taxi association manages everything relating to that route including all communication.

Only relative advantage and trialability were significant in affecting the probability of adoption. Research by Martins, Steil & Todesco (2004) found that observability and trialability are the two variables that appeared as the two most significant ones, while relative advantage and complexity exerted little influence. Lin, Chiu &Lim (2011)'s study about social networks indicated that only relative advantage, compatibility and complexity are influential in an individual's adoption decision while Zolait & Sulaiman (2008) found that all the attributes affected an individual's intention to adopt internet banking.

This also indicates that due to the nature of a social system there are different results about innovation attributes and different adopter categories can be identified in different social systems. The taxi industry consists of individuals who are typically poorer, less educated, and lack the minimum skills demanded by the labour market. National culture also affects how individuals operate in a social system. As an example, Suoranta (2003) conducted research on the adoption of mobile banking in Finland. If similar research were conducted in a third world, the adopter categories or perceived attributes would have been different. The results have reiterated how different innovations will be perceived differently in each social system. Further research needs to be conducted to understand the influence of national culture and the social system on the adoption or probability

of adoption of technological innovations. The results from the research and the work conducted on this research have indicated that more taxi owners have positive attitudes about the electronic fare collection system.

This research can contribute to the actual adoption and diffusion of the electronic payment system in the south African taxi industry. The research has identified that education, technology experience, relative advantage and trialability affect the probability of adoption. Parties involved in trying to implement the system can ensure that they address the above as part of their implementation process.

6.3 Implications and Recommendations

South Africa's past affected the growth and the culture in the South African taxi industry. Adoption research should study how the social system has an effect on adopter categories and perceptions about innovations. Schmidt (2014) states that there is an economic logic for the taxi industry to evolve and modernise, however it struggles with resistance to change and innovation. He further states that there is little interest in modernising and formalising the industry due to low levels of skills and trust. If the taxi businesses aren't registered with SARS, they don't contribute towards the skills levy managed by Transport Education Training Authority (TETA) which seeks to facilitate skills development in the South African taxi industry. The adoption of the electronic payment solution will help improve skills transfer in the industry. Education and knowledge need to be addressed in order to formalise and modernise the taxi industry for not just taxi owners but taxi drivers and other members of the social system.

Relative advantage and trialability are significant as taxi owners as stated by Schmidt (2014) have low skills and trust and therefore want to test if the system works before investing into a system that might not work. 55% of the taxi owners believed that the electronic payment system is better than the system in supersedes. The electronic fare collection system needs to be sold for its commercial benefit to the taxi industry instead of being presented as a regulatory

case for change. This system will not only benefit the taxi industry but the country as a whole by making public transport affordable through fare integration.

6.4 Suggestions for further research

Further research should be conducted to understand the probability that the electronic payment system will be accepted by other members in the social system. The electronic fare collection system seeks to address issues by changing taxi driver behaviour. Taxi drivers and commuters will be the ones using the system on a daily basis, therefore research should also focus on these adopters.

Figure 17: *Factors influencing physician adoption of e-detailing*. Reprinted from "Physicians' Adoption of Pharmaceutical E-Detailing: Application of Rogers' Innovation-Diffusion Model" by Alkhateeb, F. M., Khanfar, N. M., & Loudon, D. (2009), *Services Marketing Quarterly*, *31*(1), 116-132. Copyright (2009) by the *Information systems research*. Adapted with permission.

Future research on the probability of adoption should incorporate the social system and peer influence as a form of communication instead of mass media as

shown in figure 17 from a model by Alkhateeb et.al (2009). Information in the taxi industry flows from the taxi association and as such the industry is more likely to be influenced by personal contact instead of mass media. Future research should also assist in building a better understanding and insights into the taxi industry.

REFERENCES

Alkhateeb, F. M., Khanfar, N. M., & Loudon, D. (2009). Physicians' Adoption of Pharmaceutical E-Detailing: Application of Rogers' Innovation-Diffusion Model.*Services Marketing Quarterly*, *31*(1), 116-132.

Banerjee, A., Galiani, S., Levinsohn, J., McLaren, Z., & Woolard, I. (2008). Why has unemployment risen in the new South Africa? 1. *Economics of Transition*, *16*(4), 715-740.

Barhyte, d. Y., Redman, b. K., & Neill, k. M. (1990). Population or sample: design decision. *Nursing research*, 39(5), 309.

Barrett, J. (2003). *Organizing in the informal economy: A case study of the minibus taxi industry in South Africa* (No. 358158). International Labour Organization.

Bessant, J., Von Stamm, B., Moeslein, K. M., & Neyer, A. K. (2010). Backing outsiders: selection strategies for discontinuous innovation. *R&d Management*, *40*(4), 345-356.

Brentani, U., & Reid, S. E. (2012). The fuzzy front-end of discontinuous innovation: Insights for research and management. *Journal of Product Innovation Management*, *29*(1), 70-87.

Brancheau, J. C., & Wetherbe, J. C. (1990). The adoption of spreadsheet software: testing innovation diffusion theory in the context of end-user computing. *Information Systems Research*, 1(2), 115-143.

Chang, J., Bai, X., & Li, J. J. (2015). The influence of leadership on product and process innovations in China: The contingent role of knowledge acquisition capability. *Industrial marketing management*, *50*, 18-29.

Clark, L. A., & Watson, D. (1995). Constructing validity: Basic issues in objective scale development. *Psychological assessment*, 7(3), 309.

Compeau, D., Higgins, C. A., & Huff, S. (1999). Social cognitive theory and individual reactions to computing technology: A longitudinal study. *MIS quarterly*, 145-158.

Corso, M., & Pellegrini, L. (2007). Continuous and discontinuous innovation: Overcoming the innovator dilemma. *Creativity and Innovation Management*, *16*(4), 333-347.

Creswell, J. W. (1994). Research design: Qualitative and quantitative approaches. Thousands Oaks, CA: Sage.

Department of labour. (2016). *Sectorial determination*. Retrieved 5 March 2016, from http://www.labour.gov.za/DOL/legislation/sectoral-determinations/sectoral-determination-11-taxi-sector

Dickerson, M. D., & Gentry, J. W. (1983). Characteristics of adopters and non-adopters of home computers. *Journal of Consumer research*, 225-235.

Durndell, A., & Haag, Z. (2002). Computer self efficacy, computer anxiety, attitudes towards the Internet and reported experience with the Internet, by gender, in an East European sample. *Computers in human behavior*, 18(5), 521-535.

Ellen, P. S., Bearden, W. O., & Sharma, S. (1991). Resistance to technological innovations: an examination of the role of self-efficacy and performance satisfaction. *Journal of the Academy of Marketing Science*, 19(4), 297-307.

Faria, A., Fenn, P., & Bruce, A. (2002). Determinants of adoption of flexible production technologies: evidence from Portuguese manufacturing industry. *Economics of Innovation and New Technology*, *11*(6), 569-580.

Fobosi, S., 2012. The continuous struggle for freedom: The violation of human rights in South African informal settlements. [ONLINE] Available at: http://www.polity.org.za/article/the-continuous-struggle-for-freedom-the-violation-of-human-rights-in-south-african-informal-settlements-2012-10-04. [Accessed 08 July 15].

Hirsch, A. (2006). Accelerated and Shared Growth Initiative–South Africa. *A strategic Perspective.*

Hirschheim, R., & Newman, M. (1988). Information systems and user resistance: theory and practice. *The Computer Journal*, 31(5), 398-408.

Hughes, P. (2010). Paradigms, methods and knowledge. *Doing early childhood research: international perspectives on theory & practice*, *2*, 35-61.

Hullova, D., Trott, P., & Simms, C. D. (2016). Uncovering the reciprocal complementarity between product and process innovation. *Research Policy*, *45*(5), 929-940.

Ingle, M. (2009). An historical overview of problems associated with the formalization of the South African minibus taxi industry.

Kristian Häggman, S. (2009). Functional actors and perceptions of innovation attributes: influence on innovation adoption. *European Journal of Innovation Management*, 12(3), 386-407.

Igbaria, M., & Iivari, J. (1995). The effects of self-efficacy on computer usage. *Omega*, 23(6), 587-605.

Joubert, D., & Biermann, E. (2010). EMV specification usage within public transport automated fare collection.

Kai-ming Au, A., & Enderwick, P. (2000). A cognitive model on attitude towards technology adoption. *Journal of Managerial Psychology*, *15*(4), 266-282.

Karjaluoto, H. (2002). Electronic banking in Finland: Consumer beliefs, attitudes, intentions and behaviors.

Karjaluoto, H., Mattila, M., & Pento, T. (2002). Factors underlying attitude formation towards online banking in Finland. *International journal of bank marketing*, *20*(6), 261-272.

Kim, H. Y., Lee, J. Y., Mun, J. M., & Johnson, K. K. (2016). Consumer adoption of smart in-store technology: assessing the predictive value of attitude versus

beliefs in the technology acceptance model. *International Journal of Fashion Design, Technology and Education*, 1-11.

Kim, Y. J., & Lee, J. W. (2011). Technological change, human capital structure, and multiple growth paths*. *Japanese Economic Review*, 62(3), 305-330.

Kothari, C. R. (2004). *Research methodology: Methods and techniques*. New Age International.

Lapointe, L., & Rivard, S. (2005). A multilevel model of resistance to information technology implementation. *MIS quarterly*, 461-491.

Lavrakas, P. J. (2008). *Encyclopedia of survey research methods*. Sage Publications.

LEE, E. J., Lee, J., & Schumann, D. W. (2002). The influence of communication source and mode on consumer adoption of technological innovations. *Journal of Consumer Affairs*, *36*(1), 1-27.

Liao, C., Palvia, P., & Chen, J. L. (2009). Information technology adoption behavior life cycle: Toward a Technology Continuance Theory (TCT).*International Journal of Information Management*, 29(4), 309-320.

Lin, H. F. (2011). An empirical investigation of mobile banking adoption: The effect of innovation attributes and knowledge-based trust. *International journal of information management*, *31*(3), 252-260.

Lin, J. Y. (1991). Education and innovation adoption in agriculture: Evidence from hybrid rice in China. *American Journal of Agricultural Economics*, *73*(3), 713-723.

Lin, T. T., Chiu, V. C., & Lim, W. (2011). Factors affecting the adoption of social network sites: examining four adopter categories of Singapore's working adults. *Asian Journal of Communication*, *21*(3), 221-242.

Madden, T. J., Ellen, P. S., & Ajzen, I. (1992). A comparison of the theory of planned behavior and the theory of reasoned action. *Personality and social psychology Bulletin*, *18*(1), 3-9.

Mallat, N., & Tuunainen, V. K. (2008). Exploring merchant adoption of mobile payment systems: An empirical study. *e-Service Journal*, 6(2), 24-57.

Martins, C. B., Steil, A. V., & Todesco, J. L. (2004). Factors influencing the adoption of the Internet as a teaching tool at foreign language schools. *Computers & Education*, *42*(4), 353-374.

Mathieson, K. (1991). Predicting user intentions: comparing the technology acceptance model with the theory of planned behavior. *Information systems research*, 2(3), 173-191.

Miranda, M. Q., Farias, J. S., de Araújo Schwartz, C., & de Almeida, J. P. L. (2016). Technology adoption in diffusion of innovations perspective: introduction of an ERP system in a non-profit organization. *RAI Revista de Administração e Inovação*, *13*(1), 48-57.

Moore, N. (2016, April 1). Taxi industry tries to usher in smart card system. *Mail & Guardian*. Retrieved October 12, 2016, from http://mg.co.za/article/2016-03-31-taxi-industry-tries-to-usher-in-smart-card-system

Mukoyama, T. (2004). Diffusion and innovation of new technologies under skill heterogeneity. *Journal of Economic Growth*, 9(4), 451-479.

Munnukka, J. (2007). Characteristics of early adopters in mobile communications markets. *Marketing Intelligence & Planning*, *25*(7), 719-731.

Nelson, R. R., & Phelps, E. S. (1966). Investment in humans, technological diffusion, and economic growth. *The American Economic Review*, 69-75.

Nordin, S. M., Noor, S. M., & bin Md Saad, M. S. (2014). Innovation Diffusion of New Technologies in the Malaysian Paddy Fertilizer Industry. *Procedia-Social and Behavioral Sciences*, *109*, 768-778.

Onwuegbuzie, A. J. (2000). Expanding the Framework of Internal and External Validity in Quantitative Research.

Padilha, C. K., & Gomes, G. (2016). Innovation culture and performance in innovation of products and processes: a study in companies of textile industry. *RAI Revista de Administração e Inovação*, *13*(4), 285-294.

Pan, X., & Li, S. (2016). Dynamic optimal control of process–product innovation with learning by doing. *European Journal of Operational Research*, *248*(1), 136-145.

Phillips, L. A., Calantone, R., & Lee, M. T. (1994). International technology adoption: Behavior structure, demand certainty and culture. *Journal of Business & Industrial Marketing*, 9(2), 16-28.

Plouffe, C. R., Hulland, J. S., & Vandenbosch, M. (2001). Research report: richness versus parsimony in modeling technology adoption decisions—understanding merchant adoption of a smart card-based payment system. *Information systems research*, 12(2), 208-222.

Ramayah, T., Rouibah, K., Gopi, M., & Rangel, G. J. (2009). A decomposed theory of reasoned action to explain intention to use Internet stock trading among Malaysian investors. *Computers in Human Behavior*, *25*(6), 1222-1230.

Ratten, V. (2015). International Consumer Attitudes Toward Cloud Computing: A Social Cognitive Theory and Technology Acceptance Model Perspective.*Thunderbird International Business Review*, 57(3), 217-228.

Reid, S. E., & De Brentani, U. (2004). The fuzzy front end of new product development for discontinuous innovations: A theoretical model. *Journal of product innovation management*, *21*(3), 170-184.

Rogers, E. M. (2010). *Diffusion of innovations*. Simon and Schuster.

Rogers Everett, M. (1995). Diffusion of innovations. New York.

Sahin, I. (2006). Detailed Review of Rogers' Diffusion of Innovations Theory and Educational Technology-Related Studies Based on Rogers' Theory. *Online Submission*, 5(2).

Sale, J. E., Lohfeld, L. H., & Brazil, K. (2002). Revisiting the quantitative-qualitative debate: Implications for mixed-methods research. *Quality and quantity*, 36(1), 43-53.

Santos, J. R. A. (1999). Cronbach's alpha: A tool for assessing the reliability of scales. *Journal of extension*, 37(2), 1-5.

Sauti, G. (2008). *Minibus taxi drivers are they all'children born from the same mother?'* (Doctoral dissertation).

Schiavone, F. (2012). Resistance to industry technological change in communities of practice: The "ambivalent" case of radio amateurs. *Journal of Organizational Change Management*, 25(6), 784-797.

Stafford, T. F. (2003). Differentiating between adopter categories in the uses and gratifications for Internet services. Engineering Management, *IEEE Transactions on*, 50(4), 427-435.

Straub, E. T. (2009). Understanding technology adoption: Theory and future directions for informal learning. *Review of educational research*, *79*(2), 625-649.

Subasi, A., & Ercelebi, E. (2005). Classification of EEG signals using neural network and logistic regression. *Computer methods and programs in biomedicine*, *78*(2), 87-99.

Suoranta, M. (2003). *Adoption of mobile banking in Finland*. Jyväskylän yliopisto.

Straub, D., Keil, M., & Brenner, W. (1997). Testing the technology acceptance model across cultures: A three country study. *Information & management*,33(1), 1-11.

Tavassoli, S., & Karlsson, C. (2015). *Persistence of Various Types of Innovation Analysed and Explained* (No. 2015/19). Lund University, CIRCLE-Center for Innovation, Research and Competences in the Learning Economy.

Tschannen-Moran, M., & Hoy, A. W. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and teacher education*, 17(7), 783-805.

Turan, A., Tunç, A. Ö., & Zehir, C. (2015). A Theoretical Model Proposal: Personal Innovativeness and User Involvement as Antecedents of Unified Theory of Acceptance and Use of Technology. *Procedia-Social and Behavioral Sciences*, *210*, 43-51.

Valodia, I., & Devey, R. (2012). The informal economy in South Africa: debates, issues and policies. Margin:*The Journal of Applied Economic Research*, 6(2), 133-157.

Vishwanath, A., & Goldhaber, G. M. (2003). An examination of the factors contributing to adoption decisions among late-diffused technology products.*New media & society*, 5(4), 547-572.

Walters, J. (2008). Overview of public transport policy developments in South Africa. *Research in Transportation Economics*, 22(1), 98-108.

Walters, J. (2013). Overview of public transport policy developments in South Africa. *Research in Transportation Economics*, 39(1), 34-45.

Weigel, F. K., Hazen, B. T., Cegielski, C. G., & Hall, D. J. (2014). Diffusion of Innovations and the Theory of Planned Behavior in Information Systems Research: A Metaanalysis. *Communications of the Association for Information Systems*, 34(1), 31.

Woolf, S. E., & Joubert, J. W. (2009). A look at paratransit in South Africa.

Woolf, S. E., & Joubert, J. W. (2013). A people-centred view on paratransit in South Africa. *Cities*, 35, 284-293.

Wosiyana, M. (2013). An investigation of the impact of the taxi recapitalization project-A case study of Durban and Pietermaritzburg. SATC 2013.

Wozniak, G. D. (1984). The adoption of interrelated innovations: A human capital approach. *The Review of Economics and Statistics*, 70-79.

Wozniak, G. D. (1987). Human capital, information, and the early adoption of new technology. *Journal of Human Resources*, 101-112.

Wozniak, G. D. (1993). Joint information acquisition and new technology adoption: Late versus early adoption. *The Review of Economics and Statistics*, 438-445.

Yousafzai, S. Y., Foxall, G. R., & Pallister, J. G. (2010). Explaining internet banking behavior: theory of reasoned action, theory of planned behavior, or technology acceptance model?. *Journal of Applied Social Psychology*, *40*(5), 1172-1202.

Zolait, A. H. S., & Sulaiman, A. (2008). Incorporating the innovation attributes introduced by Rogers' theory into theory of reasoned action: An examination of Internet banking adoption in Yemen. *Computer and Information Science*, 1(1), p36.

APPENDIX A

Actual Research Instrument

Q1 Which Johannesburg Metropolitan area do you operate under?

- ❍ Ekurhuleni Metropolitan (1)
- ❍ Johannesburg Metropolitan (2)
- ❍ Tshwane Metropolitan (3)
- ❍ Sedibeng District (4)
- ❍ West Rand District (5)

Q2 Gender

- ❍ Male (1)
- ❍ Female (2)

Q3 Age

- ❍ 18-24 years old (1)
- ❍ 25-34 years old (2)
- ❍ 35-44 years old (3)
- ❍ 45-54 years old (4)
- ❍ 55-64 years old (5)
- ❍ 65 or older (6)

Q4 What is the highest level of education you have completed?

- ❍ I never went to school (1)
- ❍ Primary school (2)
- ❍ High school (3)
- ❍ Diploma (4)
- ❍ Degree (5)
- ❍ Honours (6)
- ❍ Masters (7)
- ❍ Doctorate (8)
- ❍ Professional qualification (e.g. CA(SA)) (9)

Q5 How many taxis do you own?

Q6 How many years have you been in the taxi industry?

- ❍ 1 to 5 (1)
- ❍ 6-10 (2)
- ❍ 11-15 (3)
- ❍ 16-20 (4)
- ❍ Above 20 (5)

Q7 How many employees to you have?

- ❍ 1 (1)
- ❍ 2 to 3 (2)
- ❍ 4 to 9 (3)
- ❍ 10 -20 (4)
- ❍ 21 and above (5)
- ❍ I work alone (6)

Q8 How often do you perform the following activities?

	Never (1)	Less than Once a Month (2)	Once a Month (3)	2-3 Times a Month (4)	Once a Week (5)	2-3 Times a Week (6)	Daily (7)
Reading a newspaper (1)	❍	❍	❍	❍	❍	❍	❍
Participating in social networks (e.g. Facebook, Twitter) (2)	❍	❍	❍	❍	❍	❍	❍
Reading news on the Internet (3)	❍	❍	❍	❍	❍	❍	❍
Obtaining practical information about the taxi industry (4)	❍	❍	❍	❍	❍	❍	❍
Watching TV news (5)	❍	❍	❍	❍	❍	❍	❍
Browsing the Internet for information (6)	❍	❍	❍	❍	❍	❍	❍
Reading association newsletter (7)	❍	❍	❍	❍	❍	❍	❍

Q9 Are any of these devices available to you? (tick options)

- ❑ Desktop computer (1)
- ❑ Portable laptop, or notebook (2)
- ❑ Tablet computer (e.g. iPad) (3)
- ❑ Internet connection (4)
- ❑ Video games console e.g. Sony PlayStation (5)
- ❑ Cell phone (without Internet access) (6)
- ❑ Cell phone (with Internet access) (7)
- ❑ Portable music player (Mp3/Mp4 player, iPod or similar) (8)
- ❑ Printer (9)
- ❑ USB (memory) stick (10)

Q10 How frequently do you use the following services?

	Never (1)	Less than Once a Month (2)	Once a Month (3)	2-3 Times a Month (4)	Once a Week (5)	2-3 Times a Week (6)	Daily (7)
Visiting the bank branch (1)	❍	❍	❍	❍	❍	❍	❍
Telephone banking (2)	❍	❍	❍	❍	❍	❍	❍
Online banking (3)	❍	❍	❍	❍	❍	❍	❍
Automated Teller Machine (ATM) (4)	❍	❍	❍	❍	❍	❍	❍

Q11 Attitude towards electronic payment solution in the South African taxi industry

	Entirely disagree (1)	Mostly disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Mostly agree (6)	Entirely agree (7)
Electronic payment solution is a good idea. (1)	❍	❍	❍	❍	❍	❍	❍
Electronic payment solution is a wise idea. (2)	❍	❍	❍	❍	❍	❍	❍
I like the idea of using the electronic payment solution. (3)	❍	❍	❍	❍	❍	❍	❍
Using the electronic payment solution would be a pleasant experience. (4)	❍	❍	❍	❍	❍	❍	❍

Q12 Relative advantage

	Entirely disagree (1)	Mostly disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Mostly agree (6)	Entirely agree (7)
Using the electronic payment solution would enable me to accomplish my tasks more quickly (1)	❍	❍	❍	❍	❍	❍	❍
Using the electronic payment solution would improve the quality of my work (2)	❍	❍	❍	❍	❍	❍	❍
Using the electronic payment solution would enhance my effectiveness (3)	❍	❍	❍	❍	❍	❍	❍
Using the electronic payment solution would make my job easier (4)	❍	❍	❍	❍	❍	❍	❍
Using the electronic payment solution will give me greater control over my work (5)	❍	❍	❍	❍	❍	❍	❍

Q13 Complexity

	Entirely disagree (1)	Mostly disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Mostly agree (6)	Entirely agree (7)
Learning to operate the electronic payment solution would be easy for me (1)	❍	❍	❍	❍	❍	❍	❍
Overall, If I were to use the electronic payment solution, it would be easy to use (2)	❍	❍	❍	❍	❍	❍	❍
It would be easy for me to become skillful at using electronic payment solution (3)	❍	❍	❍	❍	❍	❍	❍
I believe that it would be easy to get the electronic payment solution to do what I want it to do (4)	❍	❍	❍	❍	❍	❍	❍

Q14 Compatibility

	Entirely disagree (1)	Mostly disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Mostly agree (6)	Entirely agree (7)
Electronic payment solution cards would be compatible with most aspects of my work (1)	❍	❍	❍	❍	❍	❍	❍
Electronic payment solution cards would fit my work style (2)	❍	❍	❍	❍	❍	❍	❍
Electronic payment solution cards would fit well with the way I like to work (3)	❍	❍	❍	❍	❍	❍	❍

Q15 Trialability

	Entirely disagree (1)	Mostly disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Mostly agree (6)	Entirely agree (7)
I want to be able to use an electronic payment solution on a trial basis (1)	❍	❍	❍	❍	❍	❍	❍
I want to be able to properly try out an electronic payment solution. (2)	❍	❍	❍	❍	❍	❍	❍
I want to be permitted to use an electronic payment solution on a trial basis long enough to see what it can do (3)	❍	❍	❍	❍	❍	❍	❍

Q16 Observability

	Entirely disagree (1)	Mostly disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Mostly agree (6)	Entirely agree (7)
I will use an electronic payment solution, when many use it. (1)	❍	❍	❍	❍	❍	❍	❍
I will use an electronic payment solution when I have seen others using it. (2)	❍	❍	❍	❍	❍	❍	❍
I will use an electronic payment solution as soon as I get to know about it. (3)	❍	❍	❍	❍	❍	❍	❍
I will use an electronic payment solution if it becomes popular. (4)	❍	❍	❍	❍	❍	❍	❍
I will wait until other taxi owners start using the electronic payment solution. (5)	❍	❍	❍	❍	❍	❍	❍
I will use an electronic payment solution when other people have a successful experience of using it (6)	❍	❍	❍	❍	❍	❍	❍

APPENDIX B

Consistency matrix

Evaluate whether adopter categories, innovation attributes and attitudes affect the probability of adoption.					
Aims of research	**Literature Review**	**Hypotheses or Propositions or Research questions**	**Source of data**	**Type of data**	**Analysis**
human capital/ Adopter categories	Rogers (2003), Rogers (1995), Stafford (2003), Dickenson & Gentry (1983)	Hypothesis 1a. Taxi owners who are younger in age are more likely to adopt technology than older taxi owners.	See Appendix	Independent variable (Age) is ordinal and dependent variable (Probability of adoption) is nominal	**Factor analysis and logistic regression**
	Kim & Lee (2011), Wozniak (1984), Nelson & Phelps (1966), Vishwanath & Goldhaber (2003),Rogers (2003), Rogers (1995), Dickenson & Gentry (1983)	Hypothesis 1b. Taxi owners with technology related expertise are more likely to adopt technology compared to taxi owners with no-specific technology related expertise.		Independent variable (Expertise) is interval and dependent variable is nominal	
	Nelson & Phelps (1966), Kim & Lee (2011), Wozniak (1984), Brancheau & Wetherbe (1990), Vishwanath & Goldhaber (2003), Dickenson & Gentry (1983)	Hypothesis 1c. Taxi owners with more education are more likely to be adopters of technology innovations		Independent variable (education) is ordinal and dependent variable is nominal	
	Wozniak (1984),Rogers (2003), Rogers (1995), Alkhateeb, Khanfar &Loudon (2010)	Hypothesis 1d. Taxi owners who have a greater mass media exposure are more likely to adopt than taxi drivers who do not have media exposure		Independent variable (Media exposure) is ordinal and dependent variable is nominal	
	Wozniak (1984),Rogers (2003), Rogers (1995)	Hypothesis 1e. Taxi owners who have a fleet of taxis are more likely to adopt technology innovations than taxi owners with one taxi.		Independent variable (number of taxis) is interval and dependent variable is nominal	
Innovation attributes	Weigel, Hazen, Celgielski & hall (2014),Rogers, (1995), Rogers (2003), Sahin (2006), Zolait & Sulaiman (2008) Haggman (2009)	Hypothesis 2a. A taxi owner's perception of relative advantages of an innovation is positively correlated to the probability of its adoption.	See Appendix	Independent variable (relative advantage) is interval and dependent variable (Probability of adoption) is nominal	
	Rogers, (1995), Rogers (2003), Sahin (2006), Zolait & Sulaiman (2008), Haggman (2009), Alkhateeb et.al (2010)	Hypothesis 2b. The higher the taxi owners perceived compatibility of the innovation the higher its probability of adoption.		Independent variable (compatibility) is interval and dependent variable (Probability of adoption) is nominal	
	Rogers, (1995), Rogers (2003), Sahin (2006), Zolait & Sulaiman (2008), Haggman (2009), Alkhateeb et.al (2010)	Hypothesis 2c. The lower the perceived complexity of the electronic payment solution the higher the probability of adoption.		Independent variable (complexity) is interval and dependent variable (Probability of adoption) is nominal	
	Rogers, (1995), Rogers (2003), Sahin (2006), Zolait & Sulaiman (2008), Haggman (2009), Alkhateeb et.al (2010)	Hypothesis 2d. The higher the perceived trialability of the electronic payment system the higher its probability of adoption.		Independent variable (trialability) is interval and dependent variable (Probability of adoption) is nominal	
	Rogers, (1995), Rogers (2003), Sahin (2006), Zolait & Sulaiman (2008), Haggman (2009), Alkhateeb et.al (2010)	Hypothesis 2e. The more observable the electronic payment system the higher its probability of adoption.		Independent variable (observability) is interval and dependent variable (Probability of adoption) is nominal	
Atitude	Rogers, (1995), Rogers (2003), Zolait & Sulaiman (2008)	Hypothesis 3. Taxi owner's attitudes towards the innovation are highly correlated to the probability of adopting the innovation.	See Appendix	Independent variable (attitude) is interval and dependent variable (Probability of adoption) is nominal	