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AN EXPLORATORY STUDY ON THE FEASIBILITY OF ADOPTING SELF-SERVICE FUEL STATIONS IN JOHANNESBURG: MOTORISTS' PERSPECTIVE.

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A Masters dissertation submitted in partial fulfilment of the requirements for the degree of the Master of Commerce (Marketing) in The School of Economic and Business Sciences, The University of the Witwatersrand.

Supervisors: Mr Norman Chiliya & Prof Richard Chinomona

25 JANUARY 2015

PLAGARISM DECLARATION

I, Lloyd Kudzanai Taona Uta declare that:

- The work in this dissertation is my own original work;
- All of the sources which were used or referred to have been documented and recognised.
- This dissertation has not been previously submitted in full or partial fulfilment of the requirements for an equivalent or higher qualification at any other recognized education institution.



ACKNOWLEDGEMENTS

There are several people I would like to thank for their unwavering support in conducting my research.

I would like to extend my gratitude firstly, to my supervisors, Mr Norman Chiliya and Prof Richard Chinomona, who managed to take time-off their busy schedules to provide the much needed guidance and support while I worked on my research. Special thanks also go to the Marketing Division of Wits University who have also been supportive and resourceful when I needed assistance and second opinions.

I would like to also take this opportunity to especially thank my loving parents for providing the opportunity for me to further my studies and for always believing in me and encouraging me in all my endevours. Without them, this study would not have been possible and I certainly appreciate their support.

I would also like thank all my friends and family particularly Tinashe and Kudzanayi whom I have lived with for over a decade. They have certainly never missed an opportunity to help me unwind and encourage me whenever it was most necessary during the duration of my studies. Finally, I would like to dedicate this dissertation to one of my beloved close-friend and brother, Tatenda Zinyama who helped me realise the importance of valuing the simple things in life and making the most out of each and every day, may his soul rest in eternal peace.

Thank you all once again for being part of this incredible journey and God bless.

Lloyd

Abstract

The South African petroleum industry is well-known to be a significant contributor to the country's GDP. The industry is also known to employ close to 60000 employees in South Africa making it one of the most essential industries that is helping to uplift the country's economy. However, like most industries in the country, the petroleum industry is not immune to strikes and go-slows which have increasingly become more pronounced over the years. This situation has consequently caused a number of problems for service stations as most service stations do not have complete control of the environment that they operate in, making it difficult for these fuel service stations to meet set targets and be able to ensure that greater profit margins are realised over time. This research sought to determine motorists' perspectives on the adoption of self-service fuel stations in Johannesburg. The research focused on the adoption of these self-service fuel stations by assessing the general attitudes and perceptions of motorists on the innovation and findings have revealed that motorists generally accept the adoption of such an innovation provided that they understand and benefit from the functionality of adopting such innovations should they be introduced.

The research was primarily a quantitative study and a five point likert scale questionnaire was distributed to potential respondents who were Johannesburg motorists above the age of 18 based on the motor-vehicle type they used.

Results from the study revealed that motorists are more likely to consider adoption of Self-Service Fuel Stations provided they perceive such facilities to be useful and enhance their service experience at service-stations. Another interesting finding was that security and safety were a concern for most motorists who felt the variable will go a long way in influencing their decisions and attitude to consider adopting these facilities should they be introduced within the South African market.

Marketers should therefore ensure that they consider the functionality and potential benefits that Self-Service Fuel Stations may have to Johannesburg motorists as this may go a long way in ensuring their wide adoption within the city should they be introduced.

Keywords: Self-Service Fuel Stations, Self-Service Technologies, DIY, Perceived Usefulness, Perceived Ease of Use

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LIST OF ACRONYMS

1) PU- Perceived Usefulness
2) SST- Self-Service Technology
3) SSS- Self-Service Satisfaction
4) MPS- Motorists Perceived Safety
5) TAM- Technology Acceptance Model
6) MSSTA- Motorists Self-Service Technology Acceptance
7) MPEOU- Motorists Perceived Ease of Use

CHAPTER 1 INTRODUCTION TO THE STUDY

1.1 Introduction

The petroleum industry is an important industry for South Africa as it makes a significant contribution towards the country's GDP (Matsho, 2010). However, like many other industries in the country, the petroleum industry is not immune to strikes and go-slows which have become more pronounced over recent years (The Economist, 2012). This situation has consequently caused a number of problems for service stations as most do not have complete control of the environment that their businesses operate in, making it difficult for them to meet set targets and ensure that greater profit margins are realised over time.

The concept of adopting self-service fuel stations was first introduced to the United States market in the early 1930s, although it became increasingly popular in the 1960s (Jakle & Sculle, 2002). The initial adoption of these stations was relatively limited due to the fact that, in most cases, petrol attendants were the only people who were legally sanctioned to make use of the petrol machines at service-stations due to fears that adopting the new system would create fire hazards in neighbouring communities (Jakle *et al.*, 2002). However, the American market continued to adopt self-service fuel stations, with 40 percent of gasoline sold under the Citco-Brand being sold at such outlets by 1977 (Jakle *et al.*, 2002). Over the years, countries such as the United Arab Emirates have also begun to adopt these self-service fuel stations, with 15 service stations introduced by the Emirates Petroleum Product Company on the 12th of December 2013 in an effort to increase convenience for motorists (Sambidge, 2013).

The South African Petroleum Industry is perhaps one of the largest fuel industries in Southern Africa and is a large contributor to the South African economy (Matsho *et al.*, 2010). According to Thomas (2005), the fuel industry is also an important economic factor for the country as it employs over 58 000 people. Due to the significant impact that the oil industry has on the economy of South Africa, the government has adopted various regulatory instruments, such as fuel taxes, which regulate the price of fuel (Mokoena & Lloyd, 2005).

Although oil contributes meaningfully to the economy of South Africa, and government has tried to regulate the industry, the South African fuel industry is highly characterised by low profit margins and high stock turnover, which presents a major problem to the 4500 to 5000

fuel retail outlets across the country. (Sartorius, Eitzen & Hart, 2007). According to Sartorius *et al.* (2007), of the gross profit made by most service stations, 50.83% goes towards paying the wages of fuel attendants, cashiers and administrative staff, as well as the owners' salary or return on investments. Most of the petrol attendants tend to have on the job-training and do not require much experience to operate the fuel pumps, which makes it easier for owners to hire employees for very low wages. According to the Numsa Deputy General Secretary, Karl Kloet, the average fuel attendant's weekly wages amounted to R700, before they were reviewed after a three week strike by employees in the fuel industry (Roane, Maphumulo & Sapa, 2013)

The fuel industry may be commended for creating thousands of jobs in South Africa, with an estimated total of 50000 created to date (Heistein, 2013). This is slightly less than the number of fuel attendants employed in 2005, estimated to be 58000 (Thomas, 2005). The reduction in the number of fuel attendants working at service stations may have largely resulted from the fact that most service stations are not that profitable, as fuel prices tend to be fixed in South Africa. The industry has the potential to expose fuel attendants to a number of health problems as the attendants will be continuously exposed to harmful carcinogens contained in both petrol and diesel when serving motorists (Udonwa, Uko, Ikpeme, Ibanga & Okon, 2009). Gadhia, Thumba & Kevadiya (2010) have also revealed that petrol attendants are at high risk of being exposed to various toxic elements that are contained in petrol such as Benzene, which is a carcinogen known to cause leukemia. Operating fuel pumps is also known to cause dizziness, drowsiness unconsciousness and sometimes even death (Gadhia, et al., 2010). The adoption of self-service fuel stations may help to mitigate problems and dangers associated with being exposed to fuel toxins by fuel attendants over a long period of time.

Hsieh (2005) notes that self-service technologies continue to be adopted by organizations in order to obtain the much needed competitive advantage as well as increase convenience for the final consumer who will then be able to make use of these self-service fuel-stations. However, even though self-service fuel stations (SSFS) are increasingly becoming popular in most developed countries, it is still unknown whether such innovations can be adopted in emerging economies such as South Africa. This research therefore determined the levels at

which self-service stations may be adopted by South African motorists by assessing the pros and cons associated with adopting self-service fuel stations. The researcher made use of relevant case studies of countries which have adopted self-service fuel stations in the market and also assessed the feasibility of adopting SSFS based on perceptions of Johannesburg motorists regarding their adoption in the South African market by conducting an exploratory quantitative study.

The adoption of self-service fuel stations in Johannesburg is likely to be met by a lot of resistance by a number of stakeholders, particularly fuel attendants, who may feel that the new system may compromise their job security. Disabled motorists may also feel that the adoption of such service stations may make it difficult for them to make use of the facilities as their mobility is limited, which is the case in Canada where there are very few conventional fuel service stations (Crawford, 2010).

New innovations are often met by resistance to change as various stakeholders would like to protect their own interests when a firm is looking to change its business model or looking to introduce a new technology or concept (Berna-Martinez & Macia-Perez, 2012). In most cases, unions tend to take up this role, with the support of government legislation, which provides unions with the rights to take industrial action or participate in consumer boycotts in order to strengthen their bargaining power with employers. Most such industrial action is undertaken in order to address issues that may affect the wellbeing of employees in work-environments in terms of safety, wage increases and job-security (Dau-Schmidt & Ellis, 2009). The study therefore also highlighted some of the challenges that may be faced by fuel-service companies which may want to adopt the self-service stations and suggest ways in which they can mitigate such problems.

This research sought to determine the feasibility of adopting self-service stations based on motorists' perceptions. The research focused on the adoption of these self-service fuel stations by assessing the general attitudes and perceptions of motorists on the innovation.

1.2 Problem Statement

The adoption of self-service fuel-stations in South Africa is a fairly under-researched topic. Authors such as Molefe (2006) have merely highlighted the potential problems associated with entering the highly saturated but potentially lucrative market, particularly the costs

associated with setting up and tapping into existing distribution channels. Abdelaziz, Hegazy and Elabbassy (2010) concentrated on the adoption of self service centres in retail outlets and international airports for the convenience of travellers without specifically considering the adoption of self-service fuel stations. Consequently, not much research has been made to establish the feasibility of creating self-service fuel-stations in emerging economies such as South Africa in order to ensure a more reliable and cost-effective service is made available to Johannesburg motorists.

Although the South African petroleum industry is one of the major economic contributors to the country's GDP Matsho (2010), the industry also tends to be one of the most vulnerable and the ripple effects that result, if the industry is disturbed, can be catastrophic. The 2013 Numsa strike which saw a multi-week strike of employees in the fuel and motor-manufacturing industries, left many motorists stranded and unable to travel, with some service-stations being blocked by strikers at Westmead, a surburb in Johannesburg (Roane *et al.*, 2013). It therefore becomes imperative for service-stations to find ways of mitigating such operational problems by adopting the self-service filling-stations in order to ensure that motorists are able to serve themselves should the need arise.

The 21st century consumer values experience and convenience when making purchases of goods or services (Keillor, 2007). According to the utilitarian view, consumers are concerned with purchasing products in a timely and efficient manner (Childers, Peck, Carr, & Carson, 2001). The importance of creating convenience for the consumer in order to increase sales has also been highlighted by (Sartorius *et al.,* 2007). As a result, the adoption of self-service fuel stations may go a long way in helping to ensure that motorists obtain the service they desire and fuel service-station companies may be able to generate higher revenue and a larger sales growth.

The research questions guiding this research were:

1) Are South African motorists ready to adopt the self-service fuel station innovation?
2) What challenges are motorists likely to face if the self-service fuel station innovation is to be introduced in South Africa, particularly Johannesburg, and how can these challenges be mitigated?
3) Which factors from Technological Acceptance Model by (Davis, 1989), are likely to affect the adoption of self-service stations in South Africa?

4) Would the adoption of fuel service station be more beneficial than detrimental to the socio-economic condition of motorists in South Africa?

1.3 Research Gap

Apart from the fact that the study has been under-researched within a South African context, it can be noted that the study may also go a long way in helping to re-discover how some of the TAM elements by Davis (1989) can be applied to consumers who make use of self-service stations. Elements such as perceived ease-of use, user acceptance as well as some innovation elements by Rodgers (1995) may also be applied such as complexity, triability and relative advantage. This therefore suggests that there are various elements to be considered in order to determine the feasibility of adopting self-service fuel stations by Johannesburg motorists which may influence the general acceptance of this business model by fuel service-stations.

Prahalad and Ramaswamy (2013) also noted that there is a need to create new experiences for the consumer market. This may particularly be beneficial for motorists and by incorporating Do-it-Yourself tasks in services such as those offered by fuel service-stations, consumer satisfaction and loyalty may increase over time as it helps to increase the levels of participation by motorists which may intrinsically motivate them to continue making use of a particular product or service. Co-production is when a consumer and a supplier or service-provider work together to create value for the consumer through their product and service offerings. Co-production may also go a long way in creating numerous interactions that are valuable in developing relationships for the customer (Terblanche, 2013).

1.3.1 Significance of the Study

Authors such as Gernetzky (2013) merely highlighted the consequences that were associated with the industrial action by Numsa in 2013 which included a reduction in investor confidence as BMW decided to reconsider its expansion prospects within South Africa. The Department of Labour's Industrial Action Report for 2013 also revealed that government is not doing enough to the reduce incidences of strikes in the country, which has led to an increase in working hours lost from 2.8 million hours in 2011 to 3.3million hours in 2012 (Motau, 2013). This study may therefore provide a practical solution that can be adopted by

fuel service stations in order to address problems associated with industrial action which may potentially disrupt service delivery for the oil industry and the South African economy at large.

The study may be useful to most service-stations as the adoption of the self-service filling station concept will greatly help to lower operational costs which would ultimately lead to a reduction in fuel prices charged as overhead costs. The price of fuel continued its upward spiral with a 39c per litre increase predicted for January 2014 (TimesLive, 2013). This upward spiral may therefore need to be controlled in order to reduce the negative impact on the consumer by making the price of fuel relatively more affordable. The failure to adopt self-service fuel stations in Oregon and New Jersey has had an effect on gasoline price in these states as fuel price rose by $0.03 per litre to $0.05 per litre higher than in any other American states which had adopted self-service fuel stations (Johnson & Romeo, 2000). The disparity in fuel prices for convectional and self-service fuel stations is therefore an important element that should be taken into consideration by fuel station owners in order to help create value for their consumers.

The fuel price fluctuations have continued to concern several stakeholders within the fuel industry since the oil crisis in 1973 (Regnier, 2007). This is mainly due to the fact that a number of industries are highly reliant on fuel, particularly tourism which tends to have an inherent transport component, which is why an increase in fuel price is likely to negatively affect demand for the commodity but other products and services that are heavily reliant on the product (Allcott, & Wozny, 2014). The increase in fuel prices may also have ripple-effects on the fuel attendants as the reduced revenue may result in some fuel attendants losing their jobs as the firms may fail to support a large number of fuel attendants when the revenue streams have been compromised.

Frey and Osborne (2013) have highlighted how the adoption of self-service fuel stations may possibly lead to job losses for routine intensive occupations. However, it should be noted that the adoption of such a business model is also likely to be beneficial to the community in the long term as the self-service stations will be able to save income generated and channel it towards corporate social responsibility projects which are more sustainable and can help the local society develop rather than employ a few individuals who receive very low wages that may not be enough to make an actual impact in their lives.

Furthermore, current legislation does not permit persons who are not fuel service station attendants to administer or dispense fuel. Section 2A (5) (b) of the Petroleum Products Act of 2003 clearly forbidding self-service by consumers of prescribed petroleum products on the premises of a licensed retailer government. This research will therefore be used as a basis for creating a framework that can be used by legislators to consider the adoption of self-service fuel stations in Johannesburg.

The other important contributions of the study are postulated below:

1) The research provides more literature on the adoptability of self-service stations in South Africa.
2) The research may potentially influence smaller start-up companies of petroleum to adopt self-service stations in order to reduce overhead costs which will allow these firms to grow at a faster rate in order to compete with well-established energy companies such as SASOL, BP and Shell. Smaller firms will therefore be in a better position to penetrate the already saturated market more easily.
3) The study addresses the attitudes of motorists regarding their perception of the self-service stations and whether or not the adoption of these filling-stations will add value to their experiences at service-stations.
4) The research covered underlying literature behind the successful adoption of self-service technology which can also be applied in other fields and industries that include vending machines.
5) Results of the study may be used by governing bodies such as the Department of Energy, to create strategic plans that may be used to ensure that self-service stations are effectively implemented in South Africa and are particularly useful to motorists.

In light of the above, the following objectives have been formulated:

1.4 Objectives of the Study

The researcher identified a number of objectives that the study should address and these are listed below:

1.4.1 Primary Objective

The study sought to determine the feasibility of adopting self-service fuel stations by focusing on motorists' perspectives on the adoption of these facilities in an effort to increase motorists' intrinsic satisfaction and foster consumer loyalty.

1.4.2 Empirical Objectives

In order to effectively meet the primary objective, the researcher formulated a list of secondary objectives as a guideline and these are stated below:

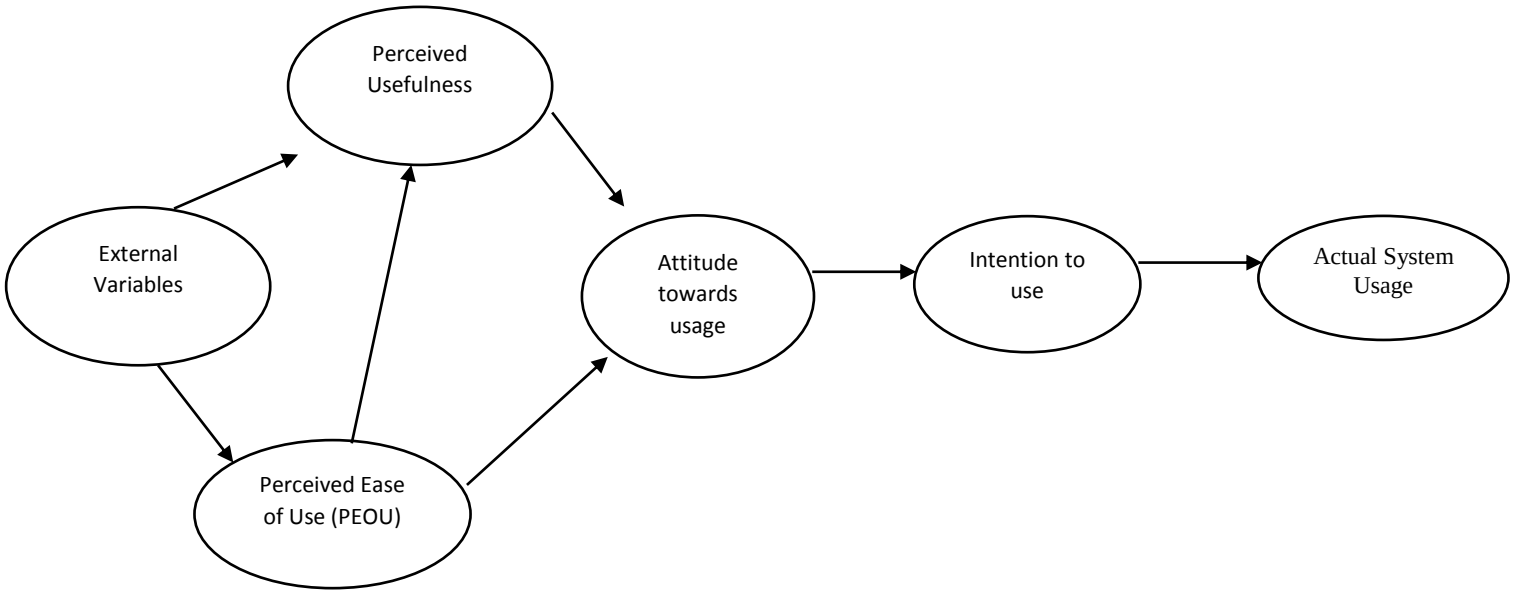
1) To conduct a quantitative study on motorists in Johannesburg in order to determine their perception on the adoption of self-service stations in South Africa.
2) To review literature on the successful adoption of self-service stations in countries such as the United Arab Emirates and United States of America.
3) The research also evaluated some of the various elements that may affect the adoption of self-service stations by motorists such as Do-it-Yourself tasks.
4) To analyse data collected from the questionnaires distributed to motorists in the Johannesburg region by using the SPSS statistical software.
5) To draw up conclusions on motorists' perception of self-service fuel stations based on the output from the SPSS statistical software.

1.5 Proposed Theoretical Model and Hypotheses

To date, there has not been a widely agreed self-service technology model that has been adopted (Kelly, Lawlor & Mulvey, 2010). However, the Technological Acceptance Model by (Davis, 1989) is one of the best models that addresses innovation as it explores the various factors that influence Technological Acceptance. TAM is particularly important in this instance as it is the basis for the proposed conceptual model for the adoption of self-service stations by motorists. Numerous empirical studies have established TAM as a good indicator to determine factors that affect the usage of certain innovations (Venkatesh & Davis, 2000). TAM was originally created to determine technology systems usage in the workplace (Kelly

et al., 2010) and is composed of various elements which include Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Behavioural intention (BI), Attitude and Intention to Use. According to (Venkatesh *et al.*, 2000) the behavioural intention is primarily based on two main elements, which are perceived usefulness and perceived ease of use. The original TAM by (Davis, 1989) is provided below:

Figure 1: TAM model by Davis (1989)



Source: Davis (1989)

Elements of the TAM by Davis (1989), are particularly essential in helping to determine the Motorists Self-Service Technology Acceptances (MSSTA) as factors such as Perceived Ease of Use (PEOU) are common predictors that can be used by motorists to determine whether they can make use of self-service stations. Other elements that have been used in the modified version of the TAM have been adapted from innovation factors by Rodgers (1995) who argued that elements such as complexity and relative advantage are critical in helping to determine the levels at which a particular technology is accepted by the intended user. The researcher has also included safety as another variable that may influence behavioural intent of customer to make use of new innovations. These elements are further discussed in greater

detail below and have been applied in the context of motorists and their susceptibility to adopt self-service stations:

1.5.1 Perceived Usefulness Construct

Perceived Usefulness can be defined as the extent to which a SST can enhance the user's performance whilst Perceived Ease of Use has been defined as the extent to which SST are regarded as easy to operate by the user (Rose & Forgarty, 2006). The model suggests that Perceived Usefulness and Perceived Ease of Use are both likely to influence Attitude towards usage of a particular innovation by the user. The model also suggests that behavioural intention to use is directly influenced by the attitude towards usage of a particular service or innovation by the user (Shroff, Deneen & Ng, 2011). The impact that Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) has on acceptance and use of a technological innovation is also reinforced by Porter and Donthu (2006) who also acknowledge the significance of the two elements on the model.

1.5.2 Attitude Construct

Attitude has been defined as the assessment that is made by the user to determine the level of desirability of using a particular technology. Attitude is a very important variable that should be assessed as it ultimately has an effect on the technological acceptance and behavioural intention to use (Davis, 1989). Behavioural intention is influenced by the beliefs about using certain resources and if these beliefs are strong, this may go a long way in helping to increase the adoption of a new innovation or service by a particular user (Tao, 2008). Attitude is also a common predictor variable that shapes consumer behaviour (Hoyer MacInnis & Pieters, 2012). Motorists' attitude towards the new self-service stations is likely to influence general Motorists Self-Service Technology Acceptance (MSSTA). It therefore becomes imperative for the researcher to assess the behaviour and attitude of motorists towards the adoption of self-service fuel stations around Johannesburg.

1.5.3 Motorists Perceived Safety (MPS) Construct:

Security and peace-of mind are essential for businesses as this will create a conducive platform for them to transact with their clients. Motorists are most likely to assess the levels of safety associated with making use of a self-service station, more especially if the service station is based in a country with high crime-rates such as South Africa (Holtmann & Domingo-Swarts, 2007). As a result this element is a key construct for the proposed model as it may ultimately affect the levels at which the innovation will be adopted by South African motorists.

A hypothesis was therefore formulated to test the relationship between Motorists Perceived Safety (MPS) and its influence on motorists' attitude (MA) and is provided below:

Motorists' perceptions of safety of self-service fuel stations (SSFS) determines overall attitude towards self-service fuel stations.

1.5.4 Motorists perceived safety Construct:

Largely refers to the peace of mind of particular motorists when making use of the self service station. If the environment is crime free and conducive for do-it-yourself tasks, this may influence or motivate more motorists to make use of this service and can lead to an increase in the level of acceptance of the service. Past research has highlighted the importance of security as they ruled it as one of the determinant factors that tends to influence the adoption of a particular SST (Kelly et al., 2010). A hypothesis was therefore created to test the relationship between perceived safety and self-service technology acceptance and this is provided below:

Motorists Perceptions on Safety (MPS) of self-service fuel stations determine Motorists' Self-Service Technology Acceptance (MSSTA)

1.5.5 Complexity Construct

Complexity is also likely to determine the levels at which self-service stations will be used by motorists. If the self-service stations appear to be complex to operate, most motorists are

likely to be reluctant to make use of these services. Complexity is negatively correlated to the adoption of a given innovation (Sahin, 2006). This makes adoption of a given innovation less likely if the level of complexity is relatively high as most users and consumers would value simplicity and ease of use when using a particular service or product.

It has been noted that the level of complexity of a particular innovation or product is most likely to attract or deter consumers from making use of the given product or service (Plsek, 2003). As customers' experiences continue to determine the success of a company's offering (Gentile, Spiller & Noci, 2007) the researcher has proposed to test the relationship between complexity and self-service technology acceptance with the hypothesis given below:

Motorists' Perceptions on complexity of self-service fuel stations determines their overall acceptance of self-service fuel stations

The researcher has assumed that the more complex a particular self-service innovation is, the less likely it will be adopted by the intended audience both in the short term and in the long term. The relationship between the level of complexity and its impact on acceptance will therefore be tested by the researcher.

Motorists' Attitudes towards SSFS influences Motorists' Self Service Technology Acceptance of self-service fuel stations.

Motorists' Perceptions on Usefulness (MPU) of self-service fuel stations influences Motorists' Attitude (MA) towards the adoption of self-service fuel stations.

1.5.6 Relative advantage (RA)

Relative advantage refers to the degree to which a particular product or service becomes more advantageous or beneficial to the consumer or user, when compared to other products within its class or product range (Roblyer, 2005). This study will therefore assess the extent to which the adoption of the self-service station maybe particularly beneficial to motorists in both the short and long-term.

Based on the two variables above, a hypothesis was formulated to test the relationship between the two:

Relative advantage of self-service fuel stations determines Motorists' Perceived Ease of Use MPEOU of self-service fuel-stations (SSFS)

Relative advantage has also been closely linked to Motorists' Self Service Technology Acceptance (MSSTA) as it can be suggested that if motorists assume that a particular service is likely to be beneficial to them, they are most likely to adopt that particular service. The study will therefore test the hypothesis below:

Relative advantage of self-service fuel-stations (SSFS) determines Motorists' Self–Service Technology Acceptance (MSSTA)

Khare (2011) believes that consumer attitudes are heavily influenced by perception. The researcher has therefore formulated a hypothesis to determine whether Motorists Perceived Ease of Use (MPEOU) may influence the Motorists Attitude towards the use of self-service stations. The hypothesis is provide below:

Motorists' Perceived Ease of Use (MPEOU) of self-service fuel stations (SSFS) determine Motorists' Attitude towards adopting the self-service fuel stations (SSFS).

Motorists' Self-Service Technology Acceptance is also another important element that should be considered when implementing a new business model. This element was adapted from the TAM model by Davis and can be used to assess the levels at which a particular service can be easily adopted by the potential market should a new product or service be introduced.

1.5.7 Perceived Ease of Use Construct

As mentioned earlier, Perceived Ease of Use (PEOU) is one of the main elements in the TAM model as it is a common predictor used to determine whether a particular product or service can be used with the least effort Davis (1989), and is not difficult to understand, learn or operate (Kigongo, 2011). Some authors argue that perceived ease of use could improve attitude toward adoption regardless of the usefulness of a particular product or service (Kulviwat, Bruner, & Kumar, 2007). If the user considers it to be easy to use it is more likely that the user will make use of the service in future.

1.5.8 Motorists Self Service Satisfaction Construct

Motorists' Self-Service Satisfaction (MSSS) is largely influenced by cognitive factors emanating from the use of a given product or service and it is particularly important to ensure that the satisfaction is high in order to motivate motorists to make use of the service in the future.

A hypothesis was formulated to establish the relationship between Motorists Self-Service Technology and Motorists Self-Service Satisfaction:

Motorist's Self-Service Technology Acceptance (MSSTA) of SSFS determines Motorists Self-Service Stations Satisfaction (MSSS).

Another hypothesis was also formulated in order to determine whether there is a relationship between perceived ease of use and motorists self-service technology acceptance

Motorists' Perceived Ease of Use (MPEOU) of SSFS determine Motorists' Self-Service Technology Acceptance (MSSTA)

1.5.9 Proposed Hypothesis

Based on the constructs provided above, the following hypothesis have therefore been formulated:

H_1: Motorists' perceptions of safety of self-service fuel stations (SSFS) determines overall motorists' attitude towards self-service fuel stations.

H_2: Motorists Perceptions of Safety (MPS) of SSFSs determine Motorists' Self-Service Technology Acceptance (MSSTA).

H_3: Motorists' Attitudes towards SSFSs influences Motorists' Self-Service Technology Acceptance of self-service fuel stations

H_4: Motorists' Perceived Usefulness (MPU) of self-service fuel stations influences Motorists' Attitude (MA) towards the adoption of self-service fuel stations.

H_5: Motorists' Perceived Ease of Use (MPEOU) of SSFS determine Motorists' Attitude towards adopting SSFSs.

H_6: Motorists' Perceived Ease of Use (MPEOU) of SSFSs determines Motorists Self-Service Technology Acceptance (MSSTA)

H_7: Relative advantage of self-service fuel-stations (SSFS) determines Motorists' Perceived Ease of Use MPEOU of SSFSs.

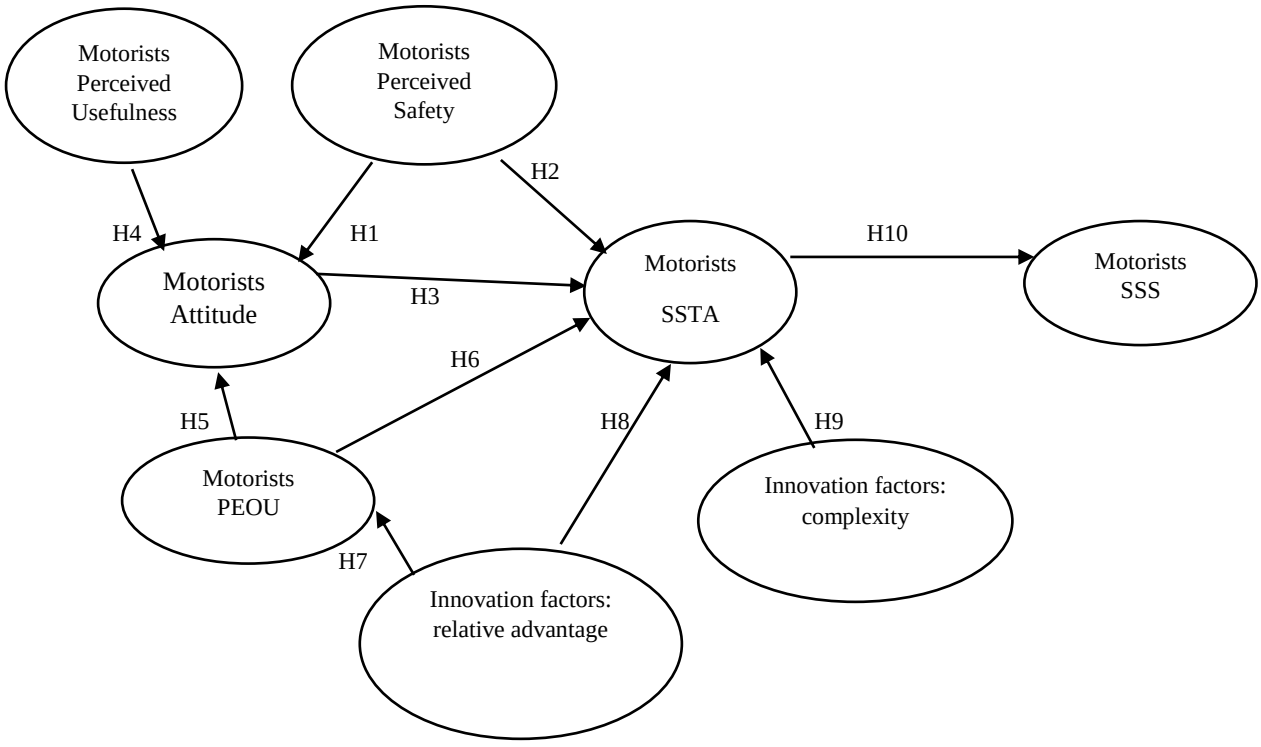
H_8: Relative advantage of SSFS determines Motorists' Self–Service Technology Acceptance (MSSTA)

H_9: Motorists' Perceptions on Complexity of SSFSs determines their overall acceptance of self-service fuel stations.

H_{10}: Motorist's Self-Service Technology Acceptance (MSSTA) of SSFS determines Motorists Self-Service Stations Satisfaction (MSSS).

1.6 Proposed Model for motorists to adopt self-service stations

Figure 2: Adapted from TAM Model by (Davis 1989)



Source: Davis (1989)

1.6.2 Proposed Research Design and Methodology

1.6.2.1 Research Paradigm

The research design that has been adopted by the researcher will be very closely linked to societal reality. As it is a quantitative study, the Positivism paradigm was adopted in order to obtain objective truth from the study. The paradigm is also relevant to the study as it asserts that real events can be observed empirically and explained with logical analysis (Kaboub, 2008). The researcher thus examined literature from countries which have managed to adopt self-service fuel stations to enhance their service delivery and increase consumer convenience such as United States of America and United Arab Emirates.

1.6.2.2 Data Collection

The research took the form primarily of a quantitative study and in order to ensure that the study is conducted successfully, the researcher made use of both primary and secondary data collection methods. Primary research was used to ensure that data collected directly addresses problems about which there may not be a wealth of published information (Driscoll, 2011). In this instance, the researcher sought to establish the perception of motorist on the adoption of self-service fuel-stations in Johannesburg and the information was obtained from dispensing a questionnaire to willing respondents, who are motorists and above the legal age for driving in South Africa.

Stratified sampling is a primary research technique that is used to sort a given population into non-overlapping groups (César & Carvalho, 2011). The population sample was then sub-divided into sub-units or strata and this was primarily done in order to fairly represent all the segments that constitute the given population sample. The researcher therefore grouped motorists based on the motor vehicle type that they used. The four primary strata which were used to determine the general perception of motorists are therefore motor cycles, light passenger vehicles, large heavy motor-vehicles and taxis.

1.6.2.3 Demarcation of the population and sample size

In order to determine the sample size that was to be used to conduct the quantitative study the Raosoft sample size calculator was used at a 5% level of significance. Sampling is the systematic and cost-effective way of reducing the data-size while ensuring that the important attributes of the particular population are not changed (Meng, 2009). Gautrain (2014) revealed that they are approximately 300000 cars in the Pretoria-Johannesburg Traffic corridor. The potential number of respondents who were invited to participate in the study was therefore 390, travelling around the Johannesburg region. As discussed earlier the population sample was divided according to strata or groups in order to ensure that data would be gathered from all the potential market segments. The primary respondents who would participate in the study were motorists who drive around Johannesburg and in order to participate, they had to be above the age of 18years and have a valid driver's license. The questionnaire would therefore be able to accommodate respondents from different backgrounds and occupations such as students, pensioners, and workers.

The researcher made use of convenience sampling in order to gather data from active motorists. To ensure that data collection was made easier and covered motorists of different age-groups, the researcher dispensed the questionnaire to university students as well as motorists around Johannesburg. Potential respondents were engaged in areas with high thresholds of motorists such as working and learning institutions around the city. Verbal consent was requested from responsible authorities before the questionnaire was dispensed to the intended respondents. The researcher avoided dispensing the questionnaire at service stations as this might not be convenient for the potential respondents and the service station staff.

1.6.2.4 Reliability and Validity

A pilot-study was conducted initially in order to test for reliability and validity. A pilot study is a narrowed version of the full study which is done in order to increase the likelihood of a study's success as it helps to assess whether the study is realistic and valid (Teijlingen & Hundley, 2001). The researcher therefore dispensed the questionnaire to thirty respondents and analysed the data using the SPSS statistical software, to determine the reliability and

validity of the questionnaire. Based on the data collected and analysed, the questionnaire was then restructured and dispensed to respondents on a wider scale.

Convenience sampling was adopted in order to meet time and budgetary constraints. The number of questions was primarily determined by the number of variables in the model with each variable expected to have at least 5 questions. The proposed model that was adopted has a total of 7 variables and each construct needed to be analysed individually to determine its impact on the perception that consumers have of technological innovation.

1.6.2.5 Data Analysis

The SPSS statistical software was used in order to analyse data collected from the respondents and results of the study will be based on the interpretations of the output of the SPSS statistical software.

As data was collected from different respondents around Johannesburg, comparison tests were also conducted in order to try and establish the potential deviation in the perception of motorists from based on gender, motor-vehicle type and age-group of respondents who participated in the study.

The researcher made use of both inferential and descriptive statistics to analyse the data collected from the questionnaire. Data collected was tested for validity and reliability as a preliminary pilot study was conducted. Once the pilot study had been conducted and the reliability and validity were satisfactory, the researcher then went on to dispense the questionnaire to a larger number of respondents around Johannesburg.

1.7 Ethical Considerations

In order for data to be collected from motorists, an ethical clearance was obtained from the University of the Witwatersrand Ethics committee. In order to ensure that data collected is reliable and reflects the true perceptions and views of the respondents, the questionnaire was not compulsory. However, respondents may be voluntarily invited to answer the questionnaire by the researcher when it is most convenient for them to do so. The data collected would strictly be used for research purposes only and individual questionnaires

would not be distributed were advised to give honest and sincere answers and no negative consequences would result should the respondents have chosen otherwise.

1.8 Proposed Research Plan

As mentioned earlier, the exploratory research was a quantitative study. Stratified sampling was used in order to represent a wider sample of motorists in Johannesburg based on their motor-vehicle type**.** Respondents were selected randomly from different areas around Johannesburg in order to ensure that there is a fair representation and to reduce unwanted bias of information.

The researcher then made use of an appropriate case study of how the USA that managed to successfully adopt self-service stations on a wider scale as well as look at some of the challenges that the countries have faced from adopting the system. This will therefore suggest that the researcher also made use of secondary data information in order to create a more accurate and reliable research paper which can be used practically by the South African Petroleum Industry Association (SAPIA).

1.9 Conclusion

Chapter one gave a comprehensive introduction of the research by discussing some of the various elements that the research covered. The researcher gave the objectives that the research covered as well as looking at the significance of the study, which included providing a framework that could be used by governments should they consider adopting Self-Service Fuel Stations (SSFS) in Johannesburg. The chapter also provided a brief summary of the proposed research plan that was then adopted by the researcher to determine the perceptions of adopting SSFS by Johannesburg motorists.

Chapter two will provide a more detailed overview of the fuel industry in the world, with particular attention being paid to the South African fuel industry and how it has evolved over the years. The researcher will make use of existing literature on the fuel industry and will also provide an overview of the Self-Service Technology (SSTs) and Do-it-Yourself business models as these elements are closely related to the adoption and operation of Self-Service Fuel Stations. The researcher will not only highlight the benefits that are largely associated

with the adoption of SSFS by various stakeholders but also provide some of the potential challenges that may be faced by stakeholders who are looking to make use of such facilities in South Africa. The researcher will also make use of a few case-studies of developed countries that have successfully introduced SSFS and some of the implications that have come with the adoption of these facilities by focusing on UAE and USA which have adopted such facilities on a larger scale.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

The fuel industry is largely regarded as competitive which is why the fuel-pricing is closely monitored in order to retain customers have become more price sensitive recently (Litman, T. 2011). It has been noted that an estimated 30% of motorists are price-sensitive and often willing to travel an extra 10 minutes to save on the price they have to pay for fuel (Grogan, 2012). Moreover, service stations are largely characterised by low profit-margins Grogan (2012), which limits opportunities for growth and presents a number of challenges for fuel station owners who would be looking to make their businesses more sustainable.

Oil prices have unfortunately continued to increase over the years and may continue to do so due to the general global economic growth which has consequently led to an increase in fuel demand (Fournier, Koske, Wanner, & Zipperer 2013). In South Africa, oil prices tend to fluctuate depending on a number of factors that include the levels of demand and supply (which have recently been perpetuated by economic growth in many emerging economies such as China and India) as well as the Dollar-Rand Exchange rate which would mean that a weaker rand increases the general price of fuel in the country.

Political unrest in some of the oil producing countries particularly the Middle-East region as well as weak protection of investors rights in oil producing companies has also lowered the amount of potential investments in the oil industries, resulting in the lower supply of oil in relation to demand and this has consequently led to the increase in price of fuel (Ratner & Nerurkar 2011).

The fuel industry is one of the most important industries in South Africa as it largely contributes towards the GDP of the economy, with an estimated contribution of over 2% of the GDP (Swart, 2010). The fuel industry in South Africa has grown tremendously since 1954, when it was fairly underdeveloped, to a point where it became the second largest oil refiner on the continent after Egypt (Wakeford, 2013). The country has also continued to develop significantly since 1994 and has grown to become one of the most developed African countries and Africa's second largest economy, after Nigeria (Hinshaw & Mcgroarty, 2014). In light of these rapid changes and developments, there has also been a shift in demand for

products and services within the South African consumer product and services market which has increased the energy consumption in most sectors of the economy. The three largest consumers of energy in the country are Industry, which accounts for 41% of the energy consumption, Transport, which accounts for 28% of the energy consumption in the country and Residential areas which accounts for 17% of the energy consumption and it has been noted that crude oil accounts for 10% of all the energy sources (Department of Minerals and Energy, 2005).

Despite the growth of the energy sector over the years, there has been a growing concern over the ever-escalating prices of liquid fuels in South Africa in recent years. The global fuel prices are highly influenced by the effects of demand and supply (Heijden & Tsedu 2008). As South Africa's economy continues to expand, the demand for liquid fuels has also grown rapidly which has consequently led to the increase in fuel prices. South Africa imports 95% of its crude oil supply from OPEC members who account for 38% of the world's liquid fuel production and as South Africa is a net-importer of crude oil, SAIPA does not have much control of the fuel prices that are charged by their suppliers as they have lower bargaining power than their supplier (Heijden et al. 2008).

As oil is highly regarded as an important factor of production, increase in prices often leads to macroeconomic disruptions as it reduces the national income of the importing country. Increase in oil prices also reduces aggreagate demand for goods and services and causes dislocation in some sectors of the economy (Nkomo, 2009). The high fuel prices consequently have a negative impact on the transport sector of South Africa's economy as the mobility of more than half of the country's population is reactive to oil price flactuations (Wakeford, 2013). The low-income transport users, who are mostly commuters, have had to lose a greater percentage of their income on transport costs whilst the freight transportation and logistical costs have also risen due to the increase in oil prices (Wakeford et al. 2013). Such vulnerabilities within the transport sectors would therefore need to be addressed and mitigated to ensure that the sector is able to operate more effciently and effectively which will go a long way in fostering the economic growth of South Africa.

The rise of oil prices is largely undesirable as it has a negative impact on the economy and leads to an upward increase in production costs (González et al. 2009). It therefore becomes imperative for service-stations to consider reducing the amounts of unnecessary overheads as much as possible in order to control oil prices as they affect the economics of countries at a macro and micro-economic level (Yépez-García & Dana, 2012).

It can be noted that the price of oil has generally followed an upward trend from 1999 and even though it fell between 2008 and 2009 due to the recession, it has continued to increase over the years Gronwald (2012). A number of authors have also predicted the increase in oil-prices with some suggesting that the price of Brent Crude will continue to increase due to an increase in demand for oil particularly from non-OECD countries such as China and India which have been greatly influenced by the growth of GDP per capita. The demand for fuel has also continued to grow in many emerging and developing countries due to the general population growth which has increased the number of economically active individuals in the market (Fournier, Koske, Wanner, & Zipperer, 2013). Consequently it becomes imperative for firms come up with ways to mitigate problems associated with fuel price increases in order to ensure that fuel service-station companies are able to retain consumer loyalty and ensure sustainability in their business operations.

2.2 Self-service Technological innovation

2.2.1 Benefits of SSTs

Self-service technologies (SSTs) have directly affected consumer behaviour and the way in which a number of service and product companies interact with the 21st century consumer (Wang, Harris, & Patterson 2012). Self-service Technologies (SST) refers to any interface or interaction that a consumer has with a machine in order to obtain a particular product or service without necessarily having to directly interact with a firm's staff. SSTs create a unique value proposition for the consumers which is largely centred on convenience and creating new experiences that arouse consumers' cognitive senses, yet at the same time, helping to cut-down operating costs for firms as well as the final consumer (Castro Atkinson, & Ezell 2010). Castro et al. (2010) also highlighted the importance of SSTs as economic enablers which may contribute meaningfully towards financial prosperity and quality of life.

This may be particularly true for fuel attendants who are constantly exposed to dangerous gases that may have a negative impact on their health (Udonwa, Uko, Ikpeme, Ibanga, & Okon, 2009).

SST adoption has increasingly become more common with various automated systems being made available to the market in order to meet demand for products and services (Hilton, Hughes, Little, & Marandi, 2013). Some of these SSTs include vending machines, automated teller machines as well as ticket-booking machines which have all been created for the convenience of the consumer and firms which will then be in a position to lower the number of staff that they need. The wide-spread adoption of SSTs may also have been influenced by the shift in demand for products or services at different times of the day, month or year which is why it may be essential to ensure that SSTs are available to supplement the staffing of any particular firm as staffing tends to be costly (Curran, Meuter, & Surprenate, 2003).

The significance of SSTs is highly regarded by 21st century companies as these technological innovations facilitate in the creation of standardised interaction with consumers thereby creating a more consistent service atmosphere (Hsieh, Yen, & Chin, 2004). SST innovations therefore allow for better control of the firm's corporate culture as they ensure uniformity in interacting with the consumers is maintained. Firms may therefore prefer the use of SSTs as it becomes easier to manage consistent interaction with consumers, unlike having a large number of staff members who may tend to have different personality traits which may ultimately affect the perception that consumers have of the firm or its products and services.

The adoption of self-service technological innovations has certainly been met with mixed reactions by the market (Collier, Sherrell, Babakus, & Horky, 2012). Consumers are likely to be more accepting and adopt technological innovation as it is associated with spontaneous delight, easy to use and fosters greater control for the consumer (Castro, Atkinson, & Ezell 2010). However although SSTs may prove to be more beneficial to the market, some consumers might be reluctant to adopting these new SSTs.

2.2.2 Problems with adopting SSTs

Some consumers might be reluctant to adopt SST innovations and may consider them to invoke feelings of anxiety. Kulviwat, Bruner and Kumar (2007) have also realised that consumers are more likely to reject a particular technology as they fear being overwhelmed by new innovations. Marketers are therefore faced with the challenge of addressing

technophobia amongst consumers in order to increase the levels of adoption of SSTs by the market overtime.

The introduction of the technological innovations has greatly affected service encounters between a firm's staff and consumers which were once more interactive (Curran Meuter & Surprenate 2003). Coppola and Verneau (2014) have noticed that a number of consumers are generally technophobic whilst others are comfortable with the current level of services that they obtain from convectional service-providers and therefore do not see the reason to adopt SSTs. Consumers may therefore not be as motivated to make use of SSTs if they are comfortable with the current service delivery. This is more especially as some consumers may prefer interacting with the firms' personnel than making use of technological innovations to acquire a given product or service (Kattara & El-Said, 2014). Interacting with the staff of a given firm may play a part to intristically and extristically motivate consumers to make informed purchase-decisions as it enduces personal-selling which is particularly useful when making decisions for high-involvement products (Boone & Kurtz, 2011). Consequently, some consumers may become reluctant to making use of the services as they may find SSTs to be straining and would prefer interacting with a firm's staff instead. Consumers are also likely to prefer staff interaction when making involvement purchases as they would need to seek council from the firms' staff before making purchase decisions.

Another major problem with SSTs is the challenge of effectively managing incidences of dissatisfied customers as there may not be any direct interface between the customer and the employees. If such situations are not handled properly, cognitive dissonance may result, which may affect the brand-image of the organization and promote massive consumerism of the firms' products and services in a given market. This may potentially result in the loss of market-share to competitors, which ultimately reduces the total revenue generated by the given firm (Robertson & Shaw, 2007). Human intervention should therefore support SSTs in order to help enhance the experience that consumers may be seeking from their usage or adoption of self-service technological innovations (Castro, Atkinson, & Ezell 2010).

The researcher has therefore noted that there are a number of benefits associated with the adoption of self-service stations in Johanneburg by assessing the benefits that are associated with the usage of SSTs in business environments. Percieved waiting time, companionship and complexity are some of the major situational factors which influence the adoption of SSTs in

most markets (Wang *et al.* 2012). Authors such as Hilton, Hughes, Little and Marandi (2013) have also highlighted the importance of SSTs as an effective way of empowering the consumer and increasing the levels of control that they have in self-service encounters. Situational factors also play a role in inlfuencing the adoption of self-service technologies by the market as it was noted that high-outcome desirability consumers are more likely to make use of SSTs than low-outcome desirability consumers (Lee & Allaway, 2002).

On the other hand the researcher has also noted that there are a number of challenges that firms are likely to face in introducing SSTs in markets that are predominantly made up of employee and consumer service interaction. A particular challenge is reducing the levels of resistance to change as some consumers may prefer the use of personell in their service encounters to obtain a particular product or service. In light of these potential challenges, it will therefore be imperative for firms to consider various measures that can be taken in order to reduce the effect of these challenges to the successful adoption of SSTs in a given market and these may include conducting workshops and other awareness campaigns in order to increase the wider adoption of these services by consumers.

2.3 SSTs in the fuel industry

Self-service technological innovation has continued to grow tremendously within the fuel industry in most developed countries and this has largely been due to the need for fuel stations to cut down costs and increase capacity to generate more revenue. The self-service fuel stations have been widely adopted by a number of developed countries such as U.A.E, USA and most European countries over the years. A number of self-service stations are available in various markets, with most located in public places for the convenience of consumers. The concept of vending machines basically applies to the self-service-fuel stations, which may make it fairly easy for South African motorists to adopt as it involves consumers transacting with machines to obtain a particular product.

2.3.1 Self-Service Technologies within the fuel industry

Most self-service fuel stations make use of pay-at-the pump machines when serving motorists. A motorist becomes responsible for refuelling the automobile without the

assistance of the fuel attendant. The steps involved in refuelling a car using self-service fuel pumps are are quite simple to follow. First a motorist opens the hatch or leaver for the fuel tank to open. The motorist then selects a payment method which can be cash, credit card or any other bank card and enters pin for verification. The machine will then prompt the user to enter the amount of fuel requested in litres and display the equivalent Rand value which will reflect on the pump as the fuel is being put in the car. After the transaction is complete, the motorists will then receive a receipt from the machine to complete the transaction. Although motorists might not require the assistance of fuel attendants, it is highly recommended for self-service stations to have a few attendants who will assist in supervising the usage of the fuel pumps.

Below is an insert to illustrate the usage of self-service fuel stations by motorists. Figure 3 shows a typical self-service machine pump that is used by motorists when making credit card payment. Figure 4 then goes on to show a motorists dispensing fuel into his motor-vehicle.

Figure 3: A motorists initiating a transaction to make use of a pay-at-the-station pump



Figure 4: A motorist making use of a self-service fuel station facility



2.3.2 Challenges associated with the adoption of self-service fuel stations by various stakeholders

There are a number of challenges faced by stakeholders considering introducing new self-service technologies in the fuel industry.

Some proponents against the adoption of self-service fuel stations have argued that SSFSs have the potential to create fire harzards to the surrounding community (Scott, 2007). This is mainly due to the fact that motorists are more likely to smoke than experienced fuel attendants when obtaining fuel, which is harzadous and has the potential to cause fires (Castro et al. 2010). Other proponents also suggest that SSFS have the potential to cause undue traffic congestion, which may consequently cause accidents if they are not well-monitored (Castro et al. 2010). Assertions have also been made regarding female motorists, who are more likely to be reluctant to clean dirty windscreens in the same way service attendants do. This is more likely to be the case in cold weather, which consequently can lead to fatal accidents. All these problems may have a negative impact on the adoption of fuel service stations. Authors such as Castro et al (2010), have also noted that policymakers and government leaders may also negatively affect the rate of adoption of SSTs as they may not appreciate the significance of such innovations in improving service delivery and general standards of living.

However, proponents such as Udonwa, Uko, Ikpeme, Ibanga, & Okon, B. (2009) argue for the adoption of self-service fuel stations acknowledge the benefits SSFS will bring to the South African market and counter-argue that the risks of cigarette fires is very low and may be similar to those found in convectional fuel service-stations. Propoents who argue for the adoption of SSFS also argue that the lot area for convectional stations is limited and may not necessarily be as big as that of SSFSs, which may increase the chances of vehicle-collisions. The acceptance of SSFS is therefore more likely if the benefits associated with its usage are significantly greater than the benefits associated with the use of convectional fuel service-stations in the market and if the benefits outweigh the problems associated with the adoption of such innovations in Johannesburg. This was also confirmed by (Xia & Suri, 2014) who noted that consumers are more likely to assess whether engaging in co-production of a particular product or service is likely to be more beneficial than soliciting the efforts of the service provider before adopting a particular SST.

2.4 Do-It-Yourself Concept

Do-it-yourself (D.I.Y) products and services allow consumers to be active participants or co-producers that work towards creating a desired output. Consumers tend to become co-producers or co-creators when they are involved in activities which were traditionally performed by company employees (Wolf & McQuit, 2011). Most DIY products and services help to ensure that consumers are intrinsically motivated to make use of similar innovations, which is why they tend to be relatively easy to use and may not require much supervision. DIY consumers are regarded as sophisticated and demanding consumers who seek to obtain the highest value from the consumption of products and services (Bickers, 2005). Firms should therefore try and identify the unique needs of this segment of the market in order to address these needs and realise greater profitability and consumer loyalty over time.

D.I.Y may often prove to be relatively more expensive, highly involved, more time consuming and require a higher level of skill from the consumer (Wolf et al 2011). As this may be the case, DIY products and services should offer a value proposition that is centred on creating a unique experience for the consumer, which may go a long way in helping firms to capture market-share overtime.

Although some DIY products tend to be relatively expensive or slightly lower priced than the normal products and services, some DIY products may be affordable and cost-effective for consumers in the long run. Consequently a fraction of consumers may prefer making use of D.I.Y products as they may offer relative economic benefits by lowering costs of production which ultimately leads to price reductions for the consumer (Etgar 2009). This may potentially attract the rational consumer who will be seeking to obtain the greatest value from the money spent. Furthermore, DIY products and services help to facilitate firms which might have relatively lower human capital to cope with the increase in demand for the firms' products and services.

2.4.1 Why consider DIY?

The adoption of DIY products or services is not entirely based on lifestyle or necessity but rather explanations for the adoption of DIY products and services tend to co-exist and may combine differently in dynamic population groups (William 2004). It has been noted, however, that there are two types of consumers who make use of self-service innovations and these have been classified as willing and reluctant consumers (Williams, et al., 2012). Willing consumers are those who are looking to participate in the co-production of a particular product or service whilst reluctant consumers are forced by circumstances to be co-producers of a particular product or service. Consequently it becomes imperative to strike a balance in the service offering by creating a DIY service that is better able to meet the demands of various segments profitably as the reasons for adopting SST innovation tend to be multifaceted.

2.4.2 D.I.Y in the South African Fuel industry

Introducing DIY to the Johannesburg fuel industry may go a long way in creating a more sustainable business model for fuel service-station companies to generate revenue and ensure sustainability and growth. However in order for such a strategy to meet the desired outcome, service stations firms would need to directly involve consumers by training them on how to use self-service machines when they are introduced in order to ensure that the facilities are

fully utilized. Experience is also an essential element for consumers to consider as it is a major determinant of the attitude that consumers have of a particular technological innovation. As this is the case, self-service stations may therefore need to invest in training workshops for consumers to be able to make use self-service pumps should they be considered for adoption on a wider scale within Johannesburg.

The marketing mix is an important marketing tool that is used to implement various marketing strategies by a number of organizations. There are four primary marketing mix elements that are used by firms which are Price, Product, Promotion and Place (AmyPoh, Saludin, & Mukaidono, 2012). Place is an important factor that should be used by firms in order to target a market effectively and as this is the case, firms should strive to ensure that the particular product or service offering is accessible for the intended market in order to realise profitability. It may also be highly recommended that self-service fuel stations be located in areas which are safe and secure and have a low crime rate in order to ensure that they are well utilised by the Johannesburg motorists more especially as the country is characterised by high crime-rates.

2.4.3 Shortcomings of D.I.Y in the fuel industry and the effect they have on the disabled.

It has been noted that although DIY may be beneficial to a larger number of motorists, there is also a significant number of consumers who may not be intrinsically motivated to be co-producers of a particular product or service (Xia & Suri, 2014).The adoption of self-service stations by the Johannesburg market may face strong opposition from a number of consumers particularly disabled persons who may prefer making use of petrol attendants as their mobility is fairly compromised. As this is the case, it may be fairly impractical to completely replace the convectional fuel stations with the SSFS as it would make it difficult for disabled persons to make use of these facilities. However adoption of self-service station facilities will greatly reduce the number of attendants that are required by fuel-stations.

Other proponents against the adoption of D.I.Y may argue that their service experience is likely to be negatively affected if they are made to make use of self-service machines with minimal supervision. A study by Glory Global Solutions also revealed that 88% of women and man have been equally frustrated by the usage of self-service machines which allow consumers to be co-producers of a given product or service (Boccaccio, 2014). This was also supported by the Vice-President of Marketing and Sales Operations of Glory Global

Solutions who also believes in the importance of over-the counter services as they go a long way in helping to foster human interaction and consumer participation (Boccaccio et al, 2014).

2.5 Reconstructing the Johannesburg Fuel Service-Station Business Model

Innovation, in its most simplified form, refers to the introduction of something new in order to influence an outcome (Davenport, 2013). As this is the case, the introduction of SSFS in South Africa will be regarded as innovation as it will seek to bring significant changes in the service industry.

Most service stations have similar primary and secondary activities. However, how they use their resources tends to determine their overall profitability and success (Mosikoane & Molefe, 2006). The convectional service station business model are said to be centred on creating convenience for the consumer and ensuring that they have ready access to the service station's products and services. However, the heavy reliance on fuel-station service attendants has compromised the access that consumers had for products and services at fuel-stations, with such problems as industrial action by fuel-station service attendants affecting the service delivery. This is why it has become necessary for service stations operating in South Africa to consider modifying the business model.

A business model is a blueprint framework that shows how various elements are linked to create value for their consumers. Innovations in business models are essential in helping to build competitive advantages for businesses in order to meet the ever-changing and competitive market-place (Sorescu, Frambach, Singh, Rangaswamyd, & Bridges, 2011). In order for service-stations to increase the capacity of revenue generation in such a highly contested market, it is important for firms to consider adopting more sustainable business models that will help to cut down costs and create a unique value proposition to the consumer. The value proposition may therefore include elements of DIY through the adoption of self-service technological innovations (SSTs) which essentially help service-stations to cut down on operating costs and unwanted overheads while ensuring that consumers have access to service facilities at any time of the day, month or year. The adoption of the SST and DIY within the service station business model will go a long way in

helping to build a more relevant value proposition in order to meet the needs of the 21st century consumer more effectively.

There have been several advancements in technology around the world which has resulted in the introduction and wide adoption of environmentally friendly automobiles such as the Toyota Hybrid (Beltramello, 2012). As a result, this has greatly shaped the consumption and behaviour patterns of the 21st century consumer and in order for firms to be better able to create a competitive advantage, it will be essential for them to consider the needs of the 21st century consumer by modifying traditional or existing business models (Elms & Low, 2013). There has been a surge in the demand and supply of electric vehicles around the world and it has been widely predicted that there would be a significant number of electronic vehicles by 2030 (Papadopoulos, Akizu, Cipcigan, Jenkins, & Zabala, 2011). However, the success of these new automobiles has been slowed down by policies, regulations and infrastructure that is unable to support the needs and wants of the intended market resulting in low profit margins (Nieuwenhuis & Wells, 2012). USA, U.A.E and a number of European countries have benefited widely from the adoption of self-service stations and the researcher has discussed how the United States of America has successfully implemented the self-service fuel station system overtime.

2.6 Case Study: Self-Service Fuel Stations in USA

Self-Service stations have been largely adopted in the United States and as payment methods become faster and safer, with the introduction of pumps with credit card facilities, there is less need for a customer to interact with the service-station attendants (Rhoads, 2008). Past research has indicated that of the 170000 service stations in USA, only 2 167 stations still function as convectional fuel service-stations with the exception of Oregon and New Jersey where the self-service fuel stations were banned to reduce unemployment rates as well as safe-guard surrounding communities against fire hazards (Scott, 2007). Due to such harsh regulations, a number of fuel dealers have voiced their opinions and have opposed the banning of self-service gas stations in these two states as they felt strongly that it created extra costs and inconvenience to customers (Rather, 2007).

The growth of the self-service station business model in America has largely been influenced by the consistent increase in fuel prices over the years which has consequently led to a

decrease in demand for fuel products. As the price of fuel increases, the owners' profit margins were lowered which consequently slowed down the development of these industries (Needleman, 2012). It became imperative for firms to consider cutting down costs by adopting the self-service stations in their operations (Needleman 2012).

The rise in fuel prices had also weakened the purchasing power of consumers and forced them to consider making use of automobiles which use alternative forms of energy and vehicles that are more economical. It has been confirmed that the unprecedented increase in fuel prices between 2002 and 2007 led to a decrease in demand for SUVs in America from 63 percent to 52 percent (Klier & Linn, 2009). The decrease in demand for SUVs may suggest that oil prices increase have an inverse impact on consumer purchase decisions as they become more rational and economical when making purchases (Klier & Linn, 2010).

The benefits of adopting self-service stations have been resounding for the USA economy. High oil prices have often led to an increase in the prices for basic necessities particularly food products as oil is a major factor of production (OECD, 2008). Self service station adoption has not only made it more affordable for consumers to purchase fuel at relatively affordable prices but has also increased the purchasing power of consumers significantly. Self-service fuel stations also proved to be particularly useful for consumers who may not want to interact with the fuel attendants in service stations which is why self-service fuel stations will go a long way in helping to increase the levels of consumer satisfaction.

SSFS have also been beneficial to service-station owners whose gross profit margin has increased dramatically due to reductions in operating costs as they would not need as much fuel attendants. Unlike conventional fuel stations which may tend to have different personality traits of its staff members, the self-service fuel stations owners are more likely to have better control of their corporate culture as they do not have a large number of staff members since consumers will be directly interfacing with the self-service station machines.

However, despite the convenience and lower operating costs that come with the adoption of self-service stations, it should be noted that self-service fuel stations require at least one attendant to assist consumers whenever it is necessary, particularly the aged and disabled persons as they might find machines difficult to operate.

Overall the self-service fuel-station industry has been beneficial for firms as it has helped to increase the levels of profitability and revenue generation in the USA. The revenue that is generated may then be invested by firms in research and development initiatives that may

reduce the negative environmental impacts. The fuel industry may also have sufficient funds to take part in corporate social responsibility initiatives over time from the favourable gross profit margins that it gains from the adoption of self-service fuel stations.

However, as mentioned earlier, the adoption of self-service stations in some parts of the United States has also been marked by controversy and negative criticism as some of the states have opposed the adoption of such service stations as hazardous, and capable of having serious implications for the community. Residents in the state of Oregon and New Jersey have all defended the ban of self-service stations in the two states as they strongly feel that this will go a long way in securing employment for a number of people within the state. The adoption of self-service fuel stations has also been resisted by other stakeholders who feel that it will be cumbersome for the disabled and elderly to fill in their automobiles with fuel as they may not be in a position to be able to help themselves due to mobility issues. Firms have also faced challenges and pressure from bodies such as ADA which were set up in 1990. Such bodies have also continued to advocate against the discrimination of disabled persons in convenience stations by ensuring that fuel service stations are also readily accessible to the disabled persons within the communities (Wayne, 2012).

Other stakeholders who are also against the adoption of self-service stations in the United States include the Department of Environmental Quality of Oregon which strongly believes that the introduction of more self-service stations in the United States is likely to severely damage the environment as it will increase the levels of unwanted underground pollution (Rhoads, 2008).

2.7 Conclusion

Chapter 2 covered the existing literature on self-service fuel stations by looking at the individual elements associated with the adoption of such innovations. The researcher examined literature on the Self-service technology and D.I.Y service facilities and how these value-propositions tend to positively influence service experiences of consumers. Particular attention was also given to USA which is one of the many developed economies that has successfully implemented self-service fuel stations by looking at some of the success and issues that relate to the implementation of such facilities around the country. The researcher was then able to have a better understanding of the benefits and potential challenges that future adopters of SSFS are likely to face when implementing such innovations. In America,

there are two states which have prohibited the adoption of SSFS as they feel that it is likely to lead to unwanted fires should consumers fail to make use of the SSFS facilities.

CHAPTER 3 HYPOTHESES AND MODEL:

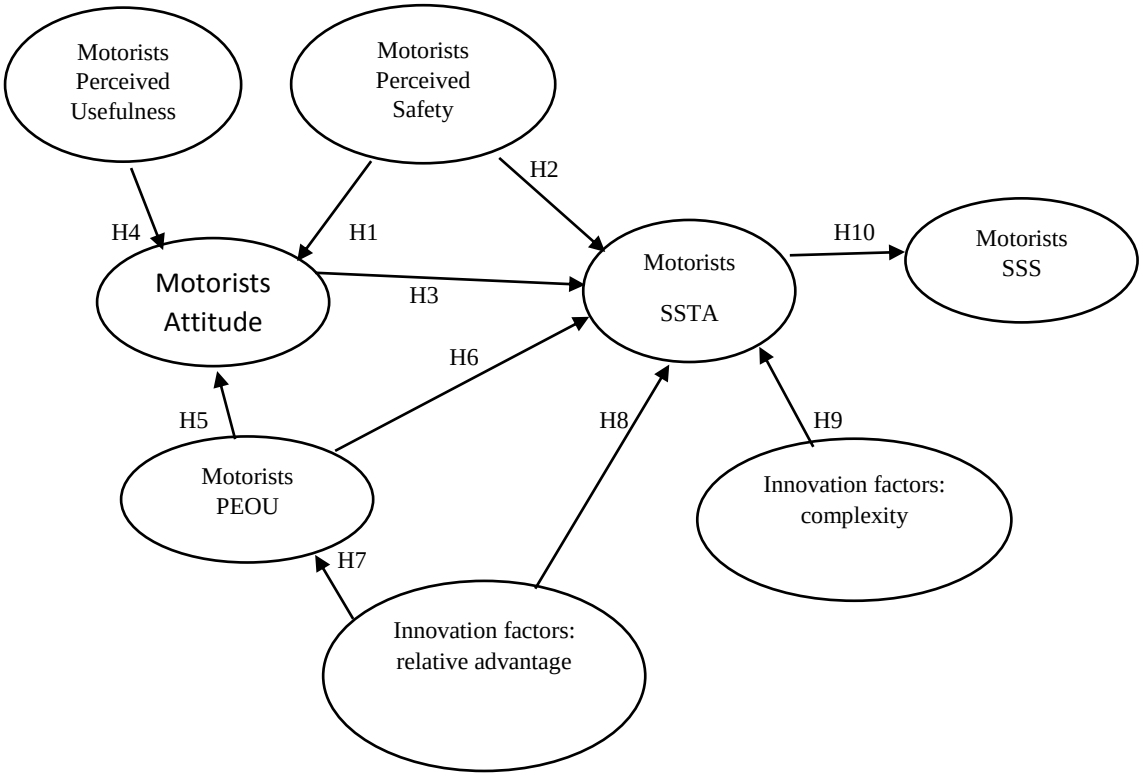
3.1 Introduction

Chapter 2 focused on the theoretical background of some of the key elements that relate to the adoption of self-service fuel stations in Johannesburg. Chapter 3 explains the main attributes that directly influence consumer behaviour and the potential adoption of self-service fuel stations (SSFS) by Johannesburg motorists. The researcher adopted the theoretical model attributes by Rogers (1995) for the Diffusion of Innovation model and Technological Acceptance Model by Davis (1989) as the two models provide a more detailed study on the factors that tend to influence the adoption of technological innovation by individuals. It should be noted that although there is no defined relationship between TAM and DOI as they are from different disciplines, the two models share the view that the adoption of a particular innovation is determined by the perceived positive attributes that the technology has (Yi, Jackson, Park & Probst, 2006).

3.2 Proposed Model for motorists to adopt self-service stations

For the purposes of this study, the researcher created a modified version of the Technological Acceptance Model by Davis (1989) in order to determine the motorists' perceptions on adopting SSFS. The key constructs of the model were adapted from the TAM by Davis (1989) and Roger's Diffusion of Innovation Theory (1995). The modified version of the TAM model is therefore illustrated below:

Figure 5: Adapted from TAM Model by (Davis 1989)



Elements of TAM by Davis (1989), are particularly essential in helping to determine the Motorists Self-Service Technology Acceptances (MSSTA) as factors such as Perceived Ease of Use (PEOU) are common predictors that can be used to determine the intention to use technological innovations. Other elements that have been used in the modified version of the TAM have been adapted from innovation factors by Rodgers (1995) who argued that elements such as Complexity and Relative Advantage (RA) are critical in determining the potential adoption of a given innovation. For the purposes of this study, the researcher decided to introduce the safety and security variable as it may also influence behavioural intent of customers to make use of new innovations. These elements are further discussed in greater detail and have been applied in the context of motorists and their susceptibility to adopt SSFS.

3.2.1 Motorists' Perceived Usefulness Construct

Perceived Usefulness (PU) can be defined as the extent to which a SST can enhance the user's performance (Rose & Forgarty, 2006). The original TAM suggests that Perceived Usefulness and Perceived Ease of Use influence Attitude towards usage of a particular innovation (Davis, 1989). The impact that perceived ease of use (PEOU) and perceived usefulness (PU) has on acceptance and use of a technological innovation is also reinforced by Porter and Donthu (2006) who also acknowledge the significance of the two elements.

The importance of PU in the adoption of new innovations has also been highlighted by Calisir and Calisir (2004) who suggested that the adoption of certain innovations may tend to revolve around the perceived usefulness of the innovations. Perceived Usefulness of SSFS may therefore be particularly important in influencing the adoption of SSFS by Johannesburg motorists as motorists are more likely to make use of the SSFS if they derive a significant level of functionality and convenience from its adoption and usage. Motorists are more likely to enjoy the adoption of SSFS and perceive such facilities to be convenient particularly when service attendants decide to take industrial action.

Authors such as Guritno and Siringoringo, (2013) have noted that perceived usefulness and perceived ease of use attract attitudes towards the usability of a given innovation although the study was highly focused on online shopping. Perceived Usefulness has also been considered as a very strong determinant which influences the attitude of potential users of an innovation or facility suggesting that there is a positive relationship between Perceived Usefulness and Attitude (Planing, 2014). For the purposes of the study, the researcher tested the effect that Perceived Usefulness has on Motorists Attitude towards the adoption of SSFS.

The following hypothesis has therefore been formulated to test the whether there is a positive relationship between Motorists Perceived Usefulness and Motorists' Attitude towards the adoption of Self-Service Fuel stations:

Motorists' Perceived Usefulness (MPU) of self-service fuel stations influences Motorists' Attitude (MA) towards the adoption of self-service fuel stations.

After conducting a pilot study, it was noted that the scales used to measure the Motorists Perceived Usefulness (MPU) had a Cronbach Alpha of 0.848 which suggests that the research

instrument used to test the reliability of the MPU construct is reliable. The findings will be discussed further in Chapter 4.

3.2.2 Attitude Construct

Attitude has been defined as the assessment that is made by the user to determine the level of desirability of using a particular technology. Pilot study results revealed that the Cronbach-Alpha was 0,815 for the attitude construct scales which suggests that the research instruments that were adopted to test this variable were very reliable.

Attitude is an important variable that should be assessed as it ultimately has an effect on the technological acceptance and behavioural intention to use a given innovation (Davis, 1989). Behavioural intention is influenced by the beliefs that using certain innovations will be beneficial for the user and if these beliefs are high, this may go a long way in helping to increase the adoption of new innovations or services by the intended users (Tao, 2008). It is therefore important for firms to try and influence the beliefs of the market they intend to serve by making use of PU and PEOU variables as they can go a long way in helping to increase the wide adoption of SSFS by motorists in Johannesburg.

Although authors such as Davis and Venkatesh (1996) claim that the significance of attitude in technological adoption is quite small, it should be noted that attitude does amplify the potential users' beliefs and perceptions on a particular innovation and may prompt the user to make a decision. Kim, Chun and Song, (2009) put it more simply by giving an example that a user with a favourable attitude towards using a particular innovation is more likely to continue making use of this innovation, but a user who has a weak or negative attitude towards a certain innovation is likely to discontinue usage of that innovation and make use of alternatives instead. According to Davis (1989), Attitude is heavily influenced by PU and PEOU which is why it is important for new innovations to be functional and less complex in order to arouse the positive cognitive senses of the intended user which goes a long way in ensuring that it is continuously used. Shroff, Deneen and Ng (2011) also went on to suggest that behavioural intention to use an innovation is directly influenced by the attitude towards usage of a particular service or innovation by the user which also makes Attitude (A) an important factor that should be considered when introducing a new innovation to the market.

Attitude is therefore an essential aspect that may influence the adoption of self-service fuel stations in Johannesburg as it may go a long way in influencing the perceptions that Johannesburg motorists have of self-service fuel stations. This is also mainly due to the fact that developing effective user attitudes may go a long way in ensuring innovation adoption diffusion and acceptance by potential users (Malhotra & Galletta, 1999). Suki, Ramayah, & Ly, (2012) also noted the significance of a positive attitude and how it is positively influences the intention to use a given innovation. The researcher has therefore formulated the following hypothesis to test whether there is a positive relationship between Motorist Attitude and Motorists Self-Service Technology Acceptance:

Motorists' Attitudes towards SSFSs influences Motorists' Self-Service Technology Acceptance of self-service fuel stations

Safety and security are also important elements that tend to affect how we transact and interact with businesses as consumers (Hall, Timothy, & Duval, 2012). Security concerns have affected how consumers adopt various innovations particularly online-shopping which was not highly welcomed initially with 48.3 % of respondents in a survey confirming that security concerns had influenced their decisions not to transact online (Gadeib, 2001). The use of new innovations that are centred on adding value to consumer experiences such as online shopping platforms have however continued to grow over the years and various factors that include compatibility, usefulness and security have helped to shape the attitudes and consumer behaviour over time (Eri, Islam, & Daud, 2011). Security concerns continue to exist within the product and service industries particularly those that require financial transactions to be made by the consumer (Xiaoren, Xiangdong, & Ling, 2013). As this is the case, the researcher realised how security may be an important factor that is likely to affect the adoption of a given innovation. The researcher formulated a hypothesis to test whether there is a positive relationship between Motorists Perceived Safety and Motorists Attitude and the hypothesis has therefore been provided below:

Motorists' perceptions of safety of self-service fuel stations (SSFS) determines overall motorists' attitude towards self-service fuel stations.

3.2.3 Motorists' Perceived Safety (MPS) Construct:

Security and peace-of mind are essential for businesses operating nowadays as this creates a conducive platform for firms to be able to transact with their intended market more effectively. Motorists are likely to first assess the levels of safety and security associated with making use of a self-service fuel station, more especially if the service station is based in a country with high crime-rates such as South Africa (Holtmann & Domingo-Swarts, 2007). As a result this element is a key construct for the proposed model as it may ultimately affect the levels at which the innovation will be adopted by the South African motorists.

Authors such as AlGhamdi, Nguyen and Jones (2013) have highlighted how security and privacy concerns tend to influence the attitude of potential users in the e-Commerce industry. However, although this has been the case, no research has investigated how perceived safety of motorists may influence the attitude that they have on the adoption of self-service fuel stations should they be introduced in South Africa. Authors such as Laforet and Li (2005) merely highlighted how security concerns have slowed down the wide adoption of online banking in China whilst authors such as McCole, Ramsey and Williams, (2010) discovered that attitude towards innovations tends to be weakened when there are security concerns. These findings may be true and are likely to apply in the potential adoption of SSFS by the South African market.

Consequently it becomes imperative to determine whether motorists perceived safety does have an effect on the attitude of motorists in adopting SSFS in South Africa. Preliminary results from the Pilot study revealed that the Cronbach Alpha of 0.741 was found which suggests that the scale used is reliable.

The following hypothesis has been formulated to determine whether there is a positive relationship between Motorists Perceived Safety and Motorists Self-Service Technology Acceptance (MSSTA):

Motorists Perceptions of Safety (MPS) of SSFSs determine Motorists' Self-Service Technology Acceptance (MSSTA)

3.2.4 Motorists' Perceived Ease of Use

As mentioned earlier, Perceived Ease of Use (PEOU) refers to the amount of effort required by a particular user to make use of an innovation and this tends to affect a user's intention to use or re-use the given innovation (Shen & Chiou, 2010). In order for Johannesburg motorists to adopt self-service fuel stations on a larger scale, the innovations should be user-friendly in order for them to be widely adopted. Im, Hong and Kang (2011) have also highlighted how an innovation's ease of use has an impact in increasing its chances of adoption overtime.

For the purposes of this study, the researcher will measure the effect of MPEOU on the motorists' attitude towards the innovation as well as assess the impact that MPEOU has on technological acceptance. Davis (1989) established that PEOU may positively influence the attitude of the user, if the user finds the experience with the innovation to be particularly effortless. Although PEOU has been covered by various authors, not much research has been conducted on the PEOU associated with the use of SSFS. A number of authors have researched PEOU in the context of e-commerce with authors such as Guritno and Siringoringo (2013) merely focusing on online shopping and the perceptions that users had of the system.

The following Hypothesis was formulated to test the MPEOU variable in order to determine its influence in the adoption of self-service fuel stations by Johannesburg motorists:

Motorists' Perceived Ease of Use (MPEOU) of SSFS determine Motorists' Attitude towards adopting the self-service fuel stations (SSFS).

The researcher conducted a pilot study to determine whether the scales used to measure MPEOU variable for the Johannesburg motorists. Results showed that the scales were reliable as the researcher obtained a Cronbach-Alpha of 0.7502.

3.2.5 Innovation Factors-Relative Advantage Constructs

Rogers' (1995) Diffusion of Innovation Theory is probably one of the most comprehensive theories that explains how technological innovation diffuses and is assimilated by members of a social system over a period of time. The researcher made use of two variables from the DOI model which are namely Relative advantage and complexity as they play a significant role in influencing the adoption of technological innovation. Relative advantage is when an

innovation is considered to be better than the system that it replaces (Lee, Hsieh, & Hsu, 2011). In this context, the variable would be used to measure the potential relative advantage of adopting self-service fuels station to Johannesburg motorists.

The researcher analysed the effect of relative advantage on MPEOU and Motorists' technology acceptance. Lee, Hsieh and Hsu (2011) have noted that there is a significant relationship between Relative advantage and PEOU which may suggest that this may be the same result when motorists perceived relative advantage is used to test whether it has an effect on MPEOU. The pilot study conducted by the researcher revealed that a Cronbach Alpha of 0.85 was obtained which suggests that the scales used to measure the Relative Advantage research instrument adopted in the study was reliable.

The researcher therefore formulated the following hypothesis to test whether there is a positive relationship between Relative Advantage and Motorists Perceived Ease of Use:

Relative advantage of self-service fuel-stations (SSFS) determines Motorists' Perceived Ease of Use MPEOU of SSFSs.

There seems to be a positive relationship between relative advantage and technological acceptance or intention to use a given innovation (Cohen, 2009). This is mainly due to the fact that most adopters of innovation are likely to consider making use of a given technology, innovation or facility provided they benefit significantly from its adoption.

For the purposes of this study, the researcher also formulated a hypothesis to test whether there is a positive relationship between relative advantage and motorists' self-service technology acceptance. The hypothesis has been provided below:

Relative advantage of SSFSs determines Motorists' Self–Service Technology Acceptance (MSSTA)

3.2.6 Innovation Factors –Complexity Construct

Complexity is the extent to which consumers find a particular innovation to be easy to understand or use. For new adopters of an innovation, who have never been exposed to a similar product, the adoption of new innovations may be thwarted as they may need to go through a learning phase in order to be better able to make use of the given innovations (Kolodinsky, Hogarth & Hilgert, 2004). Empirical studies have also shown that complexity

had a significantly large effect on the intention to use (Shih, 2007) which may also suggest that complexity of an innovation may potentially determine the level of technological acceptance.

The hypothesis below has therefore been formulated to determine the effect of complexity on influencing motorists' self-service technology acceptance:

Motorists' Perceptions on Complexity of SSFSs determines their overall acceptance of self-service fuel stations.

A pilot study conducted earlier reviewed that the scale had a Cronbach alpha of 0.52 which may suggest that the variable may not be as reliable.

3.2.7 Motorists' Self-service Technology Acceptance (MSSTA) Construct

The MSSTA variable is another equally important variable that influences the level of satisfaction that motorists may have from the adoption of SSFS. Technological acceptance is widely regarded as an important element that has the potential to influence repeat usage of a particular innovation. According to Agarwal (2000) individuals are likely to exhibit different behaviours towards a new innovation which may include acceptance, rejection, sabotage and resistance to change. It therefore becomes imperative for firms that are looking to introduce new innovations into the market to be more oriented towards offering innovations that can be adopted by the intended market. This was also noted by other authors who realised that in order for an innovation to be adopted there is need to know the various factors that would allow organizations to manipulate those factors in order to promote the wide adoption of the innovation (Holden & Karsh, 2010)

The MSSTA variable is largely a dependent variable and a number of predictor variables, including complexity, attitude and PEOU were tested to establish the influence they have on MSSTA. The MSSTA variable is however, the predictor variable which will ultimately influence the MSSS consequently. Results from the pilot study showed a Cronbach Alpha of 0.992 which suggests that the scales used to measure the variable are reliable.

Past research has revealed that Perceived Ease of Use of most innovations tends to influence the attitude that potential users may have of those innovations which consequently results in the adoption of the given innovation (Leong, Ooi, Chong, & Lin, 2011). Another study on the

adoption of mobile commerce, however revealed that there seems to be no significant relationship between perceived ease of use and potential adoption of an innovation by the users (Chong, Chan, & Ooi, 2012). The researcher however noted the importance of technological acceptance that there should be a positive relationship between Motorists' Perceived Ease of Use and Motorists' Self-Service Technology Acceptance. A hypothesis has therefore been formulated below:

Motorists' Perceived Ease of Use (MPEOU) of SSFSs determines Motorists Self-Service Technology Acceptance (MSSTA)

3.2.8 Motorists' Self-Service Satisfaction Construct

Customer satisfaction continues to be closely monitored by most innovative and growing firms as it goes a long way in helping to determine the success and competitive advantage of most firms (Zhao, Lu, Zhang, & Chau, 2012). Customer satisfaction also known to be one of the key drivers for successful businesses operating in the 21st century as they tend to influence the potential market-share that a firm has (Rego, Morgan, & Fornell, 2013). Previous research has also shown that there seems to be an increased level of job satisfaction amongst employees that adopt technological innovation in the workplace (Sweis, Sweis, Attar, & Hammad, 2013). The adoption of innovations which may ultimately lead to the satisfaction of various stakeholders may also be applied in the context of adoption of SSFS by Johannesburg motorists. The researcher therefore proposed that there seems to be a positive relationship between Motorists' Self-Service Technological Acceptance and Motorists Self-Service Satisfaction.

The following hypothesis was therefore formulated to test whether there is a positive relationship between MSSTA and MSSS:

Motorist's Self-Service Technology Acceptance (MSSTA) of SSFS determines Motorists Self-Service Stations Satisfaction (MSSS).

3.3 Proposed Hypotheses

Based on the constructs that have been included in the theoretical model adopted for the study, the researcher therefore formulated the following hypotheses in order to test the various elements which are likely to influence the potential adoption of SSFS by Johannesburg motorists:

H_1: Motorists' perceptions of safety of self-service fuel stations (SSFS) determines overall motorists' attitude towards self-service fuel stations.

H_2: Motorists Perceptions of Safety (MPS) of SSFSs determine Motorists' Self-Service Technology Acceptance (MSSTA).

H_3: Motorists' Attitudes towards SSFSs influences Motorists' Self-Service Technology Acceptance of self-service fuel stations

H_4: Motorists' Perceived Usefulness (MPU) of self-service fuel stations influences Motorists' Attitude (MA) towards the adoption of self-service fuel stations.

H_5: Motorists' Perceived Ease of Use (MPEOU) of SSFS determine Motorists' Attitude towards adopting SSFSs.

H_6: Motorists' Perceived Ease of Use (MPEOU) of SSFSs determines Motorists Self-Service Technology Acceptance (MSSTA)

H_7: Relative advantage of self-service fuel-stations (SSFS) determines Motorists' Perceived Ease of Use MPEOU of SSFSs.

H_8: Relative advantage of SSFS determines Motorists' Self–Service Technology Acceptance (MSSTA)

H_9: Motorists' Perceptions on Complexity of SSFSs determines their overall acceptance of self-service fuel stations.

H_{10}: Motorist's Self-Service Technology Acceptance (MSSTA) of SSFS determines Motorists Self-Service Stations Satisfaction (MSSS).

3.4 Conclusion

Chapter 3 provided us with a more comprehensive structure of the proposed hypothesis model that the researcher selected for the study. The researcher also used the chapter to explain the various variables that make up the proposed hypothesis model. Most of the elements that were selected for adoption in the proposed theoretical model were based on the TAM model by Davis (1989) and Rodgers' (1995) Diffusion of Innovation theory. After the theoretical model had been constructed a number of hypothesis were then formulated in order to determine their relationships with one another. The researcher also used the variables within the theoretical model to test how they are likely to influence the potential adoption of SSFS by Johannesburg Motorists.

CHAPTER 4 RESEARCH DESIGN AND METHODOLOGY

4.1 Introduction

Chapter three gave a more comprehensive discussion on the factors which may influence the adoption of SSFS by Johannesburg motorists. The researcher formulated a number of hypothesis in order to determine the levels at which the various variables, within the model, tend to influence the adoption of SSFS in the long-run. Chapter 4 discussed the research design and methodology that was adopted by the researcher in order to gather the data required to determine the perception of Johannesburg motorists with regards to the adoption of SSFS. The researcher then provided some background on the various methodologies that can be used by researchers then went on to focus on the preferred research design and methodology that was adopted to determine Johannesburg motorists' perceptions on the adoption of SSFS.

4.2 Research Design

There are two main approaches of collecting data when conducting a research and these are quantitative and qualitative methods. Although it has been noted that there are significant differences between the two research approaches, there has been a growing need to increase the levels at which both quantitative and qualitative are used together when conducting social science research (Onwuegbuzie & Leech, 2005). Authors such as Jick (1979) have also recommended the adoption of both research methodologies as they tend to complement each other. Onwuegbuzie and Leech (2005) also realized that mono-method research is likely to negatively affect research results of a given study. Some authors who also second the notion of mixing the two methodologies believe that relying on one research methodology is likely to have a negative effect on the results that will be produced as it restricts or limits the amount of valuable information that could be used to come up with a reliable and valid conclusion (Tashakkori, & Teddlie, Eds, 2010).

The research was primarily a quantitative in nature and made use of primary and secondary sources of data. Questionnaires were therefore distributed to Johannesburg motorists in order to assess their perceptions and attitude towards the adoption of SSFS and technological innovation in general.

The research is also highly inclined to the positivism paradigm and this paradigm will be discussed further in the chapters to follow. The two research methods that could be adopted were however discussed further below:

4.2.1 Primary and Secondary Research

Secondary Research involves the use of existing sources of data in order to investigate a particular subject of interest. In order to conduct secondary research, most researchers make use of journals, newspaper articles, textbooks and other online reading material. The main advantage associated with secondary research is that information gathering is relatively quicker and cheaper to obtain through than primary research methods which tend to be relatively more expensive and resource straining for researchers who would need to obtain data from a large volume of respondents.

Although secondary research may be considered to be relatively cheaper and less time consuming when compared to quantitative research methods, it can be noted that there are a number of disadvantages that make secondary research less reliable and desirable to adopt when conducting research. Firstly, the data and information obtained from secondary studies may tend to be outdated and irrelevant to most researches as the data may have been specifically collected for a particular research which may make it fairly difficult to apply or contextualize in a given research. As information obtained from secondary studies may not be as reliable, this may consequently affect the credibility of the research or investigation if the methodology is adopted and the sources used to obtain the information are not updated.

For the purposes of this study both primary and secondary research were adopted in order to obtain a better perception of motorists with regards to the adoption of SSFS in Johannesburg.

4.2.2 Quantitative Research

Quantitative research is one of the most widely used approaches of gathering data that is specific to a given research. Quantitative is a primarily a cause-comparative research which is used by most researcher to assess how two or more variables have an effect on each other or on an outcome (Creswell, 2013).

The researcher adopted quantitative research more especially as there is not much literature regarding the SSFS adoption in developing countries and as this provides a more scientific analysis on the perceptions of motorists with regards to adopting SSFSs based on given variables.

Unlike qualitative research, which may often involve smaller focus groups who are taken through interviews in order to determine their perceptions on a particular subject of interest, quantitative research provides a scientific approach to analysing research which goes a long way in helping to fairly represent the population that the research intends to cover (Bellenger, Bellenger, Goldstucker, Bernhardt and Goldstucker, 2011),.

Quantitative research is probably the most effective way of conducting research as the data obtained will be up to date unlike having to rely on data and information from previous studies which may not only be irrelevant but also outdated and not compatible with the situation at hand. Technological innovation and Self-Service adoption has continued to grow in most developed countries as firms find new ways of enhancing the experience of their customers. As innovation perceptions continue to evolve, it becomes imperative for researchers to have the most updated information on market perceptions regarding a particular innovation which is why using the quantitative research approach will be the most effective way of gathering data.

Although quantitative research is widely appreciated as an effective tool for data collection, it should be noted that there are a number of limitations associated with making use of this research methodology when collecting data. Firstly, quantitative research is relatively expensive to conduct and tends to be resource straining as it takes time to design a reliable and valid questionnaire that can be used to collect data from potential respondents.

4.3 The Positivism Paradigm

They are four main paradigms that can be used when conducting research and these are Positivism, interpretivism, Critical Orientations and Post-structuralism. For the purposes of this study, the Positivism paradigm was adopted as its underlying philosophy is centered on cause-effect relationships amongst constructs within a given theoretical model. Adopting the Positivism paradigm would therefore be most appropriate as the researcher was looking to determine the effect of 8 variables on influencing the adoption of SSFS by Johannesburg motorist. The positivism paradigm essentially makes use of augmented reality and asserts that

real events can be observed empirically and can be explained with logical analysis (Kaboub, 2008). Consequently this has made the positivism paradigm more inclined to quantitative studies which requires more factual information of proving the cause-effect relationships between or amongst variables.

4.4 Data Collection and Design

In order to have a better understanding of the perceptions of motorists, the researcher created a 5 Point-Likert scale questionnaire that essentially tests the perceptions of motorists regarding the usage of SSFS. The sample size of potential respondents was based on the average total number of cars that travel to and from Johannesburg on a normal working day and it was established that an estimated 300000 motor vehicles travel to and from Johannesburg everyday **(**Gautrain, 2013**).** The researcher decided to make use of stratified sampling in order to be better able to collect data from a variety of potential users. Stratified sampling is an effective way of ensuring that the sample selected is a true representation of the population composition Tipton, Hedges, Vaden-Kiernan, Borman, Sullivan and Caverly (2014). For the purposes of this study the data-collection was stratified based on motorist vehicle-type.

According to AA South Africa, there are four classifications of motor-vehicles in South Africa and these are Light motor-vehicles, medium motor vehicles, larger heavy vehicles and extra-large heavy vehicles. For the purposes of this study the motor-vehicle types used were light vehicles, medium motor-vehicles, large heavy vehicles and taxis as they are the main motor-vehicle types that travel around Johannesburg. It has been discovered that of the total traffic travelling from Pretoria to Johannesburg on a daily basis, 20% of the people travel by taxi with over 48% of people who live around Johannesburg make use of taxis as a mode of transport when travelling to work (Simpson, Z., McKay, T., Patel, N., Sithole, A., van den Berg, R., & Chipp, K, n.d.). From the total sample size population of 390, the researcher then stratified the respondents equally amongst the four motor-vehicle types that were selected for the purposes of the research.

4.4.1 Longitudinal and Cross-Sectional Design

Longitudinal and Cross-sectional Data Design are two methods that are commonly used by researchers to collect scientific data. The two data designs tend to differ with longitudinal studies being widely regarded as dynamic and heterogeneous, as the data collection is repetitive and can be done at different time intervals (Frees, 2004). Longitudinal design has also been supported largely by Cheng, Edwards, Maldonado-Molina, Komro and Muller (2010) who also believe that longitudinal data design is a more effective way of conducting a quantitative study as it may also be used to assess the consistency of data collected. Cross-sectional design, on the other-hand, is widely regarded as static as it involves researchers collecting data to investigate a particular subject of interest at a point in time (Ployhart & Vandenberg, 2010).

Longitudinal Research Design

Longitudinal research design is widely recommended for on-going research on particular issues in order to evaluate a before and after attitude of the same respondents. This research design is highly effective when the researcher would need to make a follow-up interview. The longitudinal data design argues that there is likely to be a change in variability between or amongst constructs over a period of time (Ployhart & Vandenberg, 2010). A more concise definition of longitudinal research is that it is a study of change in at least one of the variables in a given model and at least three observations are made to the model (Ployhart & Vandenberg, 2010).

Cross-Sectional Design

With cross-sectional design, all the variables and relationships are set in static form by default (Ployhart & Vandenberg, 2010). Most cross-sectional researches are conducted to assess the prevalence of an outcome of interest for a given population at a particular point in time. Cross-sectional research tends to be relatively more affordable than longitudinal research as it is less resource straining and is once-off unlike longitudinal research which is on-going and may require the researcher to make more than three observations of the same variable. The researcher will therefore adopt cross-sectional design in order to determine the perception of Johannesburg motorists with regards to adopting self-service fuel stations. The

research design has been selected as it is relatively cheaper and convenient given the budget and time constraints that the researcher has as well as the fact that it allows the researcher to have an understanding of Johannesburg motorists on SSFS

4.5 Sample Selection

In order to obtain a valid sample for the study, the researcher made use of Raosoft to come up with a sample size estimate that would determine the number of potential respondents required to answer the questionnaire. At 5% level of significance it was established that a an approximate sample size of 390 respondents would be required to participate in the study after having established that a total number of 300000 cars travel between the Johannesburg-Pretoria corridor daily (Gautrain, 2013)

4.5.1 Primary Data Collection Instrument

The questionnaire that was used in the study was divided into two sections. Section A was primarily meant to collect the demographic information of the respondents who participated in the survey whilst Section B focused on the 8 variables that determine the adoption of SSFS by Johannesburg motorists.

4.5.2 Format of the Questionnaire-Section A:

As mentioned earlier, this section was primarily centered on collecting demographic information of Johannesburg motorists in order to determine the distribution of the population sample of Johannesburg motorists. The section was composed of close-ended questions that were meant to quantify the total number of respondents who participated in the study as well as to verify whether the questionnaire was able to target the intended respondents that the researcher was looking to survey. The data collected in this section included age-group, gender and motor-vehicle type. The researcher decided to make use of stratified sampling in order to ensure that respondents are grouped based on the motor-vehicle type that they use.

4.5.3 Format of the Questionnaire-Section B:

This section was composed of the various factors and elements that influence a motorist's decision to adopt self-service fuel stations or technological innovation in general. Eight constructs were used to assess motorists' perceptions and the format of this section was in the form of a 5 point Likert scale layout of closed-ended questions. 1 Represented Strongly Disagree whilst 5 represented Strongly Agree. An Example of the type of questions asked to respondents has been provided below. In this instance, the variable that was Motorists' Perceived Ease of Use and respondents were supposed to select the degree to which they agreed or disagreed to the statements that were provided (Refer to Annexure attached):

Strongly Disagree ⟶					**Strongly agree**
1) I am likely to find it easy for me to adopt a new self-service innovation.	1	2	3	4	5
2) I am likely to find it easy to interact with self-service innovations.	1	2	3	4	5
3) I am likely to feel comfortable making use of a self-service fuel station	1	2	3	4	5
4) Using a self-service fuel station is likely to be fairly demanding for me.	1	2	3	4	5
5) I am likely to have problems when learning how to use the self-service fuel station system	1	2	3	4	5
6) A lot of knowledge and skill is required in order for me to make use of the self-service fuel station	1	2	3	4	5

4.6 Data Processing and Analysis

Pilot Study

A pilot study is a preliminary investigation that is conducted in order to evaluate the feasibility of conducting a particular research with particular attention being paid to time and associated costs of conducting the research (Thabane, Ma, Chu, Cheng, Ismaila, Rios, & Goldsmith, 2010). These studies may therefore provide a basis for a researcher to make more informed decisions on whether to pursue a given study or not.

A pilot study was conducted in order to determine the level of reliability and validity of the self-administered questionnaire that was used as the research instrument for the quantitative study. The target respondents were active motorists above the age of 18 who drive within and

around Johannesburg. Potential respondents were invited to participate voluntarily and the researcher also took note of any questions that respondents found ambiguous in order to edit the questionnaire and make it more understandable.

After all the data for the 30 respondents who volunteered to answer the questionnaire was coded into excel spreadsheet, the data was then imported into the SPSS statistical software for further analysis to determine whether the research questionnaire was reliable and valid. The Cronbach alpha is a measure of internal consistency and is particularly important when conducting a pilot study (Tavakol & Dennick, 2011). The scales for a given variable will be considered as acceptable and valid if the Cronbach-Alpha in above 0.6. Most of the constructs that were tested in the pilot- study had acceptable validity and reliability as the Cronbach-Alphas were above 0.6.

The researcher made editions and modifications to the questionnaire in some areas where the respondents failed to understand, which proved to be highly beneficial as the researcher obtained a more reliable and valid research instrument that was then distributed to a larger sample of potential respondents of Johannesburg motorists. The results of the pilot study are been displayed below:

Table 1: Reliability Test Results for Pilot Study

Variable	Cronbach-Alpha
Attitude	0,815
Motorists Perceived Safety	0.741
Motorists Perceived Ease of Use	0.7502.
Innovation Factors-Relative Advantage	0.85
MSSTA	0.992
Innovation Factors-Complexity	0.52
MPU	0.848
MSSS	0.769

From the results, it can be noted that most of the variables that were tested are reliable as the Cronbach-Alpha of each variable of the proposed model is greater than 0.6. The complexity variable however does have a Cronbach alpha below 0.6 which may suggest that it is not reliable and valid to a greater extent. It has however been noted that complexity is likely to influence the intention to use a particular innovation (Shih, 2007). As this is the case, the researcher did not discard the variable as it could go a long way in helping to determine the perceptions of adopting SSFSs by Johannesburg motorists. MSSTA had the highest Cronbach Alpha as it was 0.992 which suggests that the scales used to measure this variable are very reliable.

4.7 Conclusion

Chapter 4 discussed the research design and methodology that was used in the study. The Researcher adopted the Positivist paradigm approach, which is based on augmented reality in conducting the research. The research was primarily a quantitative study and a 5 point Likert Scale questionnaire was formulated in order to effectively understand the perceptions of Johannesburg motorists regarding the adoption of Self-Service Fuel Stations. A pilot-study was then conducted to test for the reliability and validity of the research instrument that was going to be used as the primary source of information and the research instruments had a Cronbach Alpha between 0.6 and 0.992 which indicated that the research instruments that were adopted for the study were highly reliable.

CHAPTER 5: ANALYSIS AND FINDINGS

5.1 Introduction

Chapter 4 provided us with the Research Design and Methodology adopted by the researcher in order to determine the feasibility of adopting SSFS by Johannesburg motorists based on their perceptions. It was established that the methodology adopted was primarily a quantitative research method and data was collected from the distribution of a 5 point Likert scale questionnaire to Johannesburg motorists. This chapter will provide more detailed information on the analysis and findings based on the data collected. The researcher will start by providing background information on the descriptive statistics before looking into inferential statistics, which seeks to test the relationships amongst variables of the model that was selected for the study.

5.2 Reliability Test

Validity and Reliability tests are two important ways of discovering the appropriateness and levels of accuracy associated with given measuring instruments (Tavakol & Dennick, 2011). The researcher therefore made use of validity and reliability tests of the research instruments before introducing the questionnaire to a wider sample of potential respondents.

A pilot study was therefore initially conducted in order to determine the levels of reliability and validity of the research instruments that were adopted in the study. The pilot study was conducted at the 5% level of significance and a total of 30 respondents were invited to participate. The study was also used to test how well the potential respondents understood the questionnaire before it was distributed to a wider population sample. Results of the pilot study revealed that the questions were reliable as the Cronbach-Alpha range was between 0.6 and 0.86 which suggests that the questions asked in the research instrument were reliable and could therefore be adopted in the study. A summary of the resulting Cronbach-Alphas and their corresponding variables have been provided below:

Table 2: Reliability Test Results for Full-Study

Variable	Cronbach Alpha
MA	0.78
MPU	0.86
RA	0.83
MSSTA	0.85
INNOVATION-COMPLEXITY	0.61
MPEOU	0.58
MPS	0.80
MSSS	0.78

The above table shows the Cronbach-Alphas for the full-study. It may be noted that the research instrument used to measure Motorists Perceived Usefulness (MPU) had the greatest level of reliability as the Cronbach-Alpha is 0.86. This variable is closely followed by MSSTA and RA, which had Cronbach-alphas of 0.85 and 0.83 respectively. Motorists' Perceived Safety (MPS) also had a high level of reliability with a Cronbach Alpha of 0.8 and this variable is closely followed by Motorists' Attitude (MA) and Motorists' Self-Service Satisfaction (MSSS) which both have Cronbach-Alphas of 0.78. The results of the full-study have however shown that Complexity and MPEOU have the lowest Cronbach-Alphas of 0.61 and 0.58 respectively. The researcher noted that the MPEOU had a low Cronbach alpha below the acceptable Cronbach alpha of 0.6 as it may be an important variable in assessing the perceptions of motorists on the adoption of SSFSs with authors such as Davis (1989) as well as Shen and Chiou (2010) also noting the significance of perceived ease of use in influencing the attitude and intention to use a particular innovation.

5.3 Validity Test

The Correlation Matrix is widely adopted to determine the linear relationships between two given variables in order to assess the strength of the relationship. The value between two given variables should be between +1 and -1 with a positive number suggesting that there is a positive relationship between the two given variables whilst a negative number suggests that there is an inverse relationship between two given variables.

Table 3: Correlation Matrix for Johannesburg Motorists' perceptions on SSFS adoption

	MA	MPU	RA	MSSTA	INN	MPEOU	MPS	MSSS
MA	1							
MPU	**0.430336**	1						
RA	0.458329	**0.657721**	1					
MSSTA	0.207025	0.380689	**0.419904**	1				
INN	0.021609	0.024	0.045	**0.0484**	1			
MPEOU	0.149	0.169	0.168	0.191	**0.2116**	1		
MPS	-.003	.000	.000	0.058	0.075625	**0.030625**	1	
MSSS	0.1169	0.131	0.19	0.32	0.033	0.123	**0.210681**	1

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

The correlation matrix above suggests that the highest correlation between constructs in the theoretical model that was adopted for the purposes of this study is between Relative Advantage (RA) and Motorists Perceived Usefulness (MPU) which have a squared variance of 0.6577. This may therefore suggest that there is a strong and positive relationship between MPU and RA. The results are similar to findings by Wang, Meister and Wang (2011) who also suggested that the two constructs were distinct although highly related to one another.

For the purposes of this study, the researcher covered the correlations amongst constructs within the context of the theoretical model that was adopted in order to determine motorists' perceptions on the adoption of SSFS in Johannesburg.

From the table, it can also be noted that there seems to be a weak relationship towards the adoption of SSFS between Motorists' Perceived Safety (MPS) and Motorists' Attitude (MA). Another important discovery that was obtained from the correlation matrix above is that there is a weak relationship between RA and MPEOU which may also suggest that the relative

advantage that comes with SSFS adoption is likely to positively influence motorists' perceptions on the ease of usefulness of these SSFS over a period of time.

The correlation matrix above also suggests that there is a moderate relationship between MSSTA and RA as the correlation coefficient of the two variables is 0.419904. Results from the correlation matrix have also shown that there is a weak relationship between MPEOU and MA as the correlation coefficient is 0.149. Although there is a positive relationship between the two constructs, it should be noted that the relationship between MPEOU and MA is weak. There however, seems to be a moderate relationship between MSSTA and MSSS as the researcher had proposed that MSSTA is likely to positively influence motorists' self-service satisfaction overtime and this is reflected by a correlation coefficient of 0.32.

MPEOU and MSSTA have a weak relationship as the correlation coefficient is 0.191. This may go on to suggest that the MPEOU may potentially influence the levels at which Johannesburg motorists are likely to accept or adopt self-service fuel stations overtime. This finding is similar to many findings by researchers who also confirmed that Perceived Ease of Use is likely to lead to technological acceptance overtime (Venkatesh, 2000). The correlation matrix also helps us to test the relationship between MPS and MSSTA as security is an important element that is likely to be considered by motorists who are looking to adopt SSFS. Results show that there is a positive relationship as MPS is likely to ultimately lead to self-service station adoption by Johannesburg motorists. It may also be however noted that the results from the correlation matrix suggest that the relationship between MPS and MSSTA is not high.

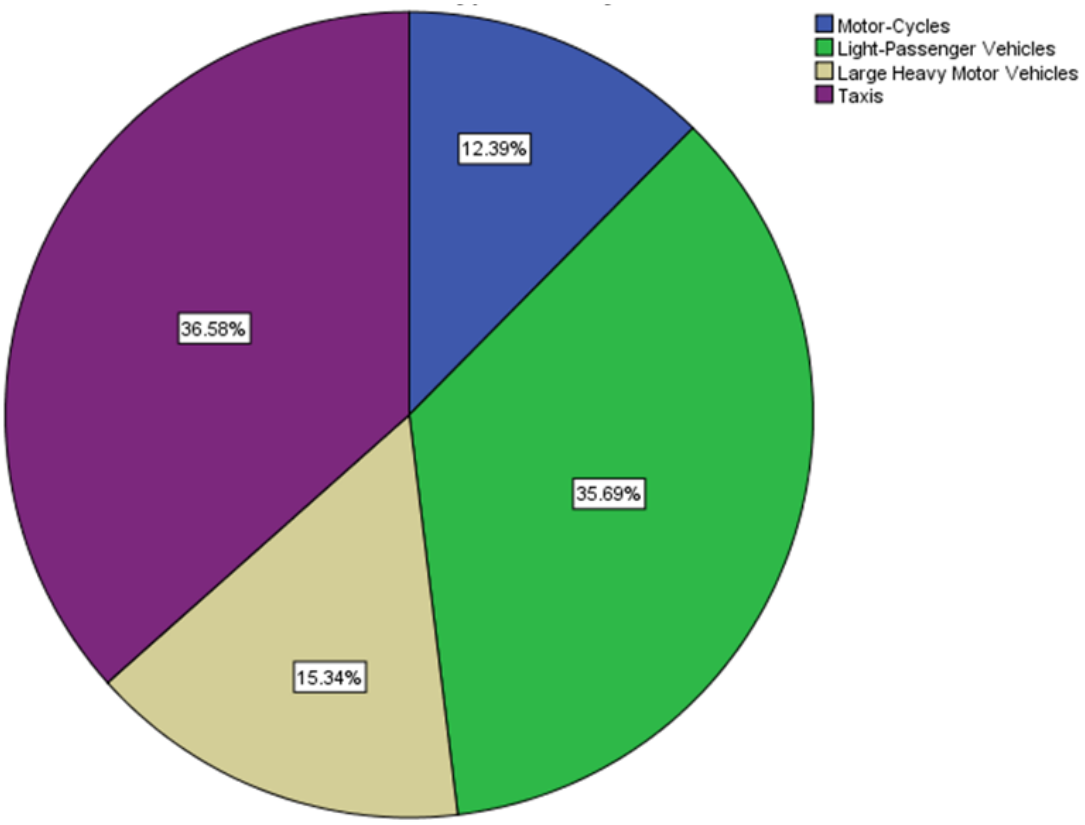
Complexity is yet another important element that is likely to influence MSSTA overtime. Results from the table reveal that there is a weak relationship between complexity and MSSTA which may also suggest that an innovation factor such as complexity is likely to influence MSSTA. It has been noted that the less complex an innovation is, the higher the chances of these innovations to be adopted by potential users.

Finally, results have shown that motorist's attitude (MA) is also likely to influence MSSTA as a positive attitude towards the adoption of self-service fuel stations is consequently going to influence or lead to the acceptance of SSFS by Johannesburg motorists' overtime. The correlation coefficient value that was obtained for this element has been 0.207. This goes in line with findings made earlier that suggested that attitude tends to influence behavioural intention to use a given technological innovation.

5.4 Descriptive Statistics

The researcher managed to obtain 339 completed questionnaires from the initial 390 questionnaires which were dispensed to potential respondents in the study. The response rate was therefore 86.92% which was highly favorable as the researcher had to individually approach and invite willing motorists to answer the questionnaire. The distribution of respondents who participated in the study based on the motor-vehicle type that they use have therefore been provided in the pie-chart below:

Figure 6: Percentage Distribution of motorist by motor vehicle type used



From the pie-chart presented above we can note that the researcher managed to obtain the most responses from light-motor vehicle motorists and taxi drivers who composed of 35.69% and 36.58% of the total responses of the questionnaire respectively. The least number of responses was made by motorcyclists and truck-drivers as they were relatively more difficult to get hold of in Johannesburg

5.4.1 Demographic Statistics

Demographic statistics merely refer to the quantifiable statistics of a given population. The researcher was able to collect the following information of respondents who participated in the study based on their age group, gender and motor-vehicle type.

Table 4: Distribution of motorists' population based on gender and age-group

		Age					Total
		18-24	**25-34**	**35-44**	**45-54**	**55-64**	
Gender	**Male**	125	78	3	4	1	211
	Female	100	21	5	2	0	128
Total		225	99	8	6	1	339

From the table above we can observe that the most number of respondents who participated in the study were between the ages of 18 and 24 years of age as they constituted 66,4% of the total population that participated in the study. 99 respondents who participated in the study were between the ages of 25-34 and these respondents constituted 29% of the total population which is quite significant. The remaining age groups, however, covered a relatively smaller population sample as only 4.42% of the respondents were above the age of 35 years. The probable reason for the relatively younger demographic participation in the study may be attributed to the fact that Johannesburg is largely constituted of a very youthful demographic with 60-67% of the South African population under the age of 30 (Crause & Booyens, 2010). As this is the case, it was fairly difficult to obtain information from motorists in the older age-groups.

The table above also shows that there was a higher percentage of males who participated in the study relative to their female counter-parts as the males constituted 62.2 % of the total respondents whilst the female population constituted the remaining 37.8% of the total respondents who participated in the study. This is more especially as the researcher was able to obtain more data from male motorists than the female motorists.

Chi Squared Tests to test the relationship between Gender and Age groups of Johannesburg motorists

Chi squared tests are statistical tools that are commonly used to test the association between two or more constructs (Diener-West M, 2008). The researcher was looking to establish whether there was a relationship between gender and age groups of the motorists that participated in the study as this would potentially affect the validity and reliability of the results. The data was processed at the 5% level of significance and the results from this test have been provided below:

Table 5:Chi-squared test to determine relationship between Gender and Age group

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	18.553[a]	4	.001
Likelihood Ratio	19.751	4	.001
Linear-by-Linear Association	6.320	1	.012
N of Valid Cases	339		

H_0: There is no relationship between Gender and Age group of motorists

H_1: There is a relationship between Gender and Age group of motorists

From the table above a Chi-Squared value of 18.553 was obtained and after calculating the p-value we failed to reject H_0 as the p-value was greater than the level of significance of 0.05 which suggests that there is no relationship between gender and age group of motorists who participated in the study.

Demographic Statistics of motorists by motor vehicle type and age groups

The researcher managed to obtain most of the data from light-motor vehicle motorists and taxi drivers as they were relatively more available in the city as compared to large heavy-motor vehicle motorists and motorcyclists. 72% of the respondents of the questionnaire were composed of light motor-vehicle motorists as well as taxi-drivers. The table below seeks to illustrate the distribution of the motor-vehicle types based on the age-groups of the motorists.

Table 6: Distribution of Johannesburg motorist by Motor-vehicle-type and Age-group

		Motor Vehicle Type				
		Motor-Cycles	**Light-Passenger Vehicles**	**Large Heavy Motor Vehicles**	**Taxis**	**Total**
Age-group	**18-24**	27	85	24	89	225
	25-34	14	28	23	34	99
	35-44	0	5	2	1	8
	45-54	1	2	3	0	6
	55-64	0	1	0	0	1
Total		42	121	52	124	339

Table 7: Chi-squared test to determine the relationship between motor-vehicle type and age-group

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	23.124[a]	12	.027
Likelihood Ratio	24.776	12	.016
Linear-by-Linear Association	1.038	1	.308
N of Valid Cases	339		

H_0: There is no relationship between age group and motor vehicle type of motorists

H_1: there is a relationship between age group and the motor vehicle-type of motorists

Using the 5% level of significance we fail to reject H_0 as the Chi-Square value is 23.124. Using the Chi-Square calculator we may note that the p-value is 0.97 which therefore suggests that there is no relationship between vehicle type selected by the owner and the age-groups of the motorists as the p-value is greater than the level of significance.

5.5 Inferential Statistics:

Inferential statistics are more advanced statistical tests that are conducted to determine a given population's perception on certain issues relating to a particular study (Larson, 2006). Some of the inferential statistics that were used in the study in order to determine the feasibility of adopting SSFS in Johannesburg by Johannesburg motorists include Factor analysis, ANOVA, Linear Regressions, Path Modelling and these will be discussed in greater detail by the researcher.

5.5.1 Factor analysis

The factor analysis is a data reduction tool that is used to check for redundancy from a set of correlated variables. The factor analysis for the variables that were tested in the study have therefore been provided below:

Table 8: Factor Analysis Loadings for SSFS Theoretical Model

Variable			Estimate
MA1	<---	MA	0.714
MA2	<---	MA	0.705
MA3	<---	MA	0.591
MA4	<---	MA	0.529
MA5	<---	MA	0.355
MA6	<---	MA	0.724
MA7	<---	MA	0.773
MA8	<---	MA	0.571
MPU8	<---	MPU	0.607
MPU7	<---	MPU	0.498
MPU6	<---	MPU	0.49
MPU5	<---	MPU	0.777
MPU4	<---	MPU	0.719
MPU3	<---	MPU	0.698
MPU2	<---	MPU	0.746
MPU1	<---	MPU	0.756
MSSTA5	<---	MSSTA	0.73
MSSTA4	<---	MSSTA	0.604
MSSTA3	<---	MSSTA	0.766
MSSTA2	<---	MSSTA	0.728
MSSTA1	<---	MSSTA	0.831
RA5	<---	RA	0.612
RA4	<---	RA	0.606

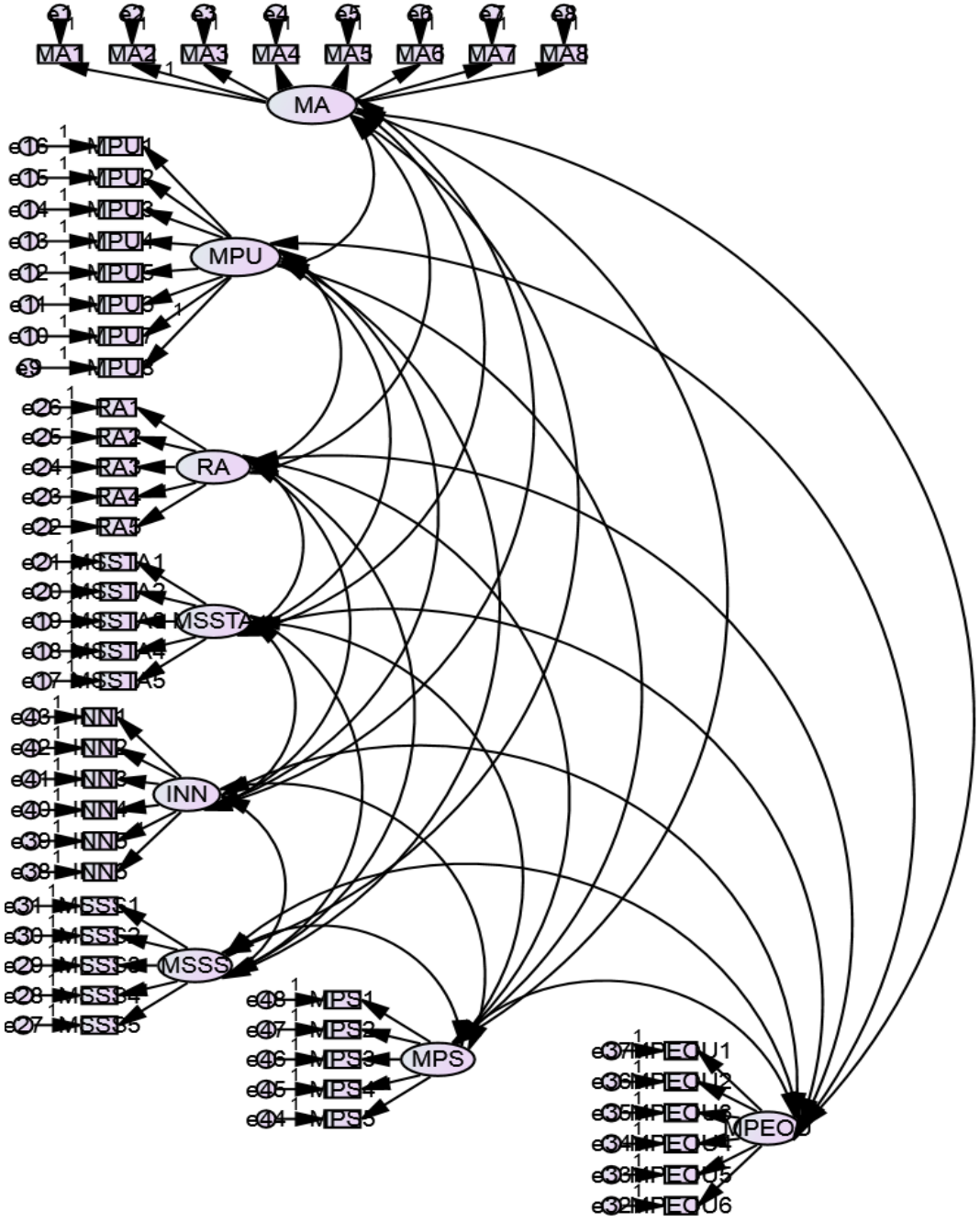
RA3	<---	RA	0.693
RA2	<---	RA	0.822
RA1	<---	RA	0.833
MSSS5	<---	MSSS	0.755
MSSS4	<---	MSSS	0.722
MSSS3	<---	MSSS	0.494
MSSS2	<---	MSSS	0.587
MSSS1	<---	MSSS	0.727
MPEOU6	<---	MPEOU	0.149
MPEOU5	<---	MPEOU	0.15
MPEOU4	<---	MPEOU	0.034
MPEOU3	<---	MPEOU	-0.767
MPEOU2	<---	MPEOU	-0.878
MPEOU1	<---	MPEOU	-0.864
INN6	<---	INN	0.822
INN5	<---	INN	0.677
INN4	<---	INN	0.115
INN3	<---	INN	-0.154
INN2	<---	INN	-0.061
INN1	<---	INN	-0.084
MPS5	<---	MPS	0.375
MPS4	<---	MPS	0.673
MPS3	<---	MPS	0.77
MPS2	<---	MPS	0.762
MPS1	<---	MPS	0.789

The factor loadings from the variables that make up the model above suggest that there is a high level of reliability with most of the factor-loadings greater than the acceptable 0.5. There are however instances when the factor loadings have been relatively low for example with the INN-complexity variable. The Cronbach alpha for the variable has however proven that the variable is reliable as it is 0.61, which suggests that it is reliable. The factor loadings above were therefore used to test the eight variables that were formulated in order to determine the perceptions of motorists regarding the adoption of self-service fuel stations and most of the results have suggested that the instruments that were adopted to test the various variables were effective which is why they were adopted in the study.

5.5.2 Confirmatory Factor Analysis

Confirmatory Factor Analysis is a statistical method that is largely used to investigate the structure of multivariate data (Harrington, 2008).Below is the CFA model that was created by the researcher based on the variables that were included in the theoretical model:

Figure 7: Confirmatory Factor Analysis Model for SSFS Model:



Key:

MPU= Motorists' Perceived Usefulness

MPS= Motorists' Perceived Safety

MA = Motorists' Attitude

RA = Relative Advantage

INN= Innovation factors-complexity

MSSS= Motorists' Self-Service Satisfaction

MSSTA= Motorists' Self-Service Technological Acceptance

e = measurement error

The results of the model have therefore been illustrated below:

Table 9: Model Fit Results

Model fit criteria	**Chi-square (χ^2 /DF)**	**GFI**	**CFI**	**TLI**	**IFI**	**RFI**	**NFI**	**RMSEA**
Indicator value	2.46	0.687	0.757	0.74	0.76	0.649	0.673	0.074

From the table above, we can notice that the Chi-square for the SSFS Theoretical model is within the acceptable range of between 1 and 3 as it is 2.46. This result may therefore suggest that there is a goodness of fit of the data which therefore means that there is not much difference between the expected and the actual results that were obtained from the theoretical model. The Goodness of Fit Index is used to show the overall degree of fit of a given theoretical model. The results show that a Goodness of Fit Index (GFI) of 0.687 was obtained, which is less than the more acceptable value of 0.9 or greater. The Tucker Lunar Index also had a relatively lower goodness of fit as the value for the construct measurement was 0.74 which is less than the acceptable 0.9. A TLI lower than 0.9 may suggest that the model that was selected for the study may be complex and may therefore not be as desirable.

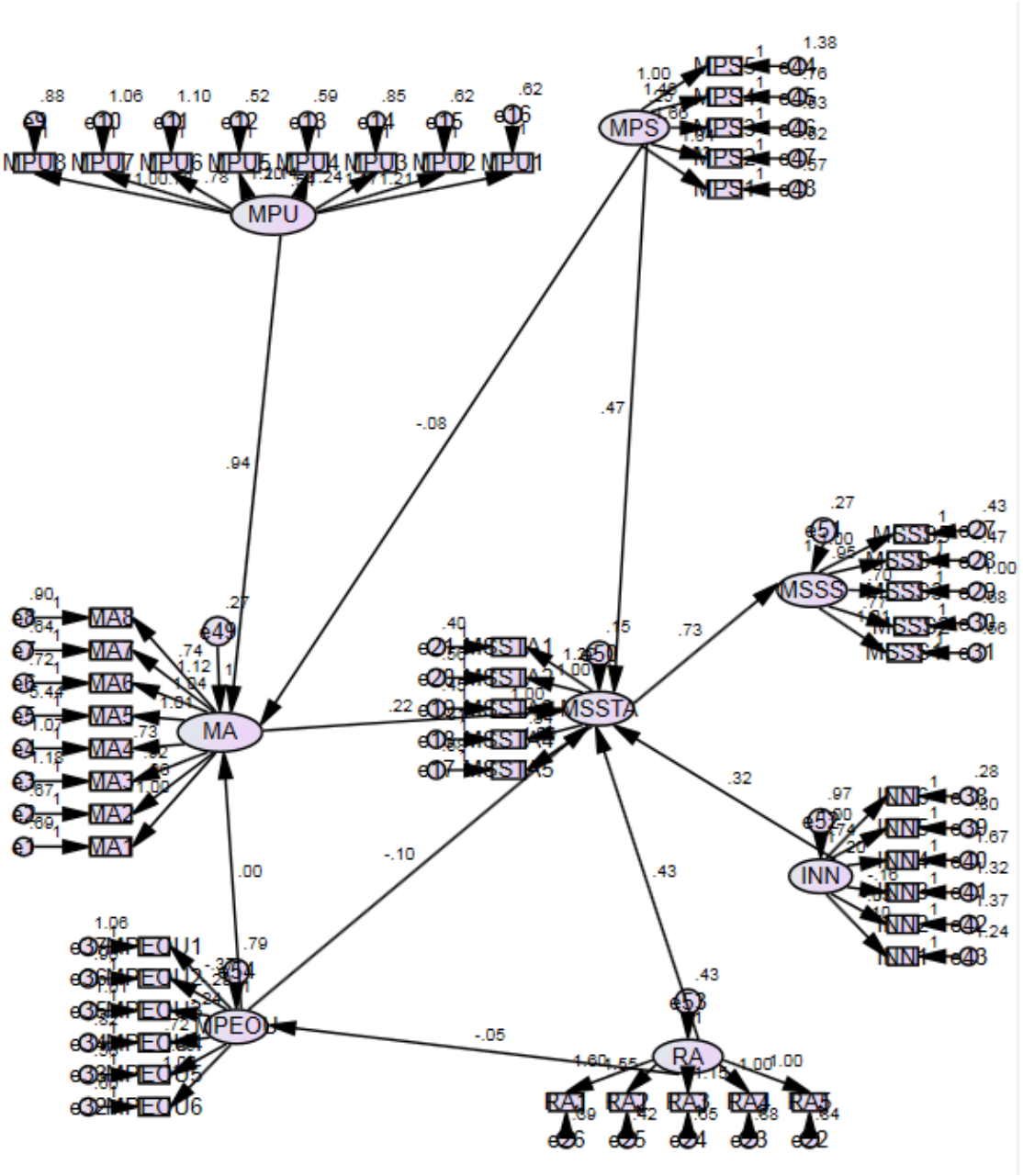
A CFI value 0.757 was obtained which also suggest that there is generally a goodness of fit of the data that was used in the theoretical model. It has been widely suggested that the goodness fit index should be above o.9 but authors such as Loehlin (1998) have also suggested that there also is goodness of fit even if the value of the CFI may be less than 0.9 but close to 0.9 (Kotzab, Seuring, Müller, & Reiner, 2006). The Incremental Fit Index that was obtained in the study was 0.76, which is close to the more acceptable IFI of 0.9. The RFI or Relative Fit Index is used to compare the chi-square of the hypothesized model to that of a null or baseline model. The RFI for the SSFS theoretical model was 0.649 while the NFI was 0.673.

The root mean square error of approximation (REMSA) which seeks to also evaluate the goodness of fit of the model was 0.074 which is less than the maximum acceptable level of 0.08. The REMSA obtained in this study therefore represented a reasonable error of approximation below 0.08, which has been suggested by a number of researchers (Middleton, Erguner-Tekinalp, Williams, Stadler, & Dow, 2011)

5.5.3 Structural Modelling Equations

Structural Modelling equations are primarily used by researchers to obtain a confirmatory approach to the analysis of a structural theory bearing on a given phenomenon (Byrne, 2013). Below is the Path Model of the theoretical model that was adopted by the researcher in order to gauge motorists' perceptions on the adoption of SSFS in Johannesburg:

Figure 8: Path Model Analysis for SSFS Theoretical Model



Key:

MPU= Motorists' Perceived Usefulness

MPS= Motorists' Perceived Safety

MA = Motorists' Attitude

RA = Relative Advantage

INN= Innovation factors-complexity

MSSS= Motorists' Self-Service Satisfaction

MSSTA= Motorists' Self-Service Technological Acceptance

e = measurement error

Table 10: Results for Hypothesis tested by the theoretical model

Proposed relationship hypothesis	**Hypothesis**	**Factor Loading**	**P Value P<0.01**	**Supported/ Rejected**
MPS→MA	H_1	0.08 [c]	0.01	Supported and significant
MPS→MSSTA	H_2	0.47 [c]	0.01	Supported and significant
MA→MSSTA	H_3	0.22[c]	0.01	Supported and significant
MPU→MA	H_4	0.94[c]	0.01	Supported and significant
MPEOU→MA	H_5	0.79[c]	0.01	Supported and significant
MPEOU→MSSTA	H_6	-0.1[c]	0.01	Supported and significant
RA→MPEOU	H_7	-0.05[c]	0.01	Supported and significant
RA→MSSTA	H_8	0.43[c]	0.01	Supported and significant
INN→MSSTA	H_9	0.32 [c]	0.01	Supported and significant
MSSTA→MSSS	H_{10}	0.73[c]	0.01	Supported and significant

Key:

MPU= Motorists' Perceived Usefulness

MPS= Motorists' Perceived Safety

MA = Motorists' Attitude

RA = Relative Advantage

INN= Innovation factors-complexity

MSSS= Motorists' Self-Service Satisfaction

MSSTA= Motorists' Self-Service Technological Acceptance

The factor loadings in the table above were generally positive with most ranging between the figures of 0 and 0.94 which clearly indicates strong relationships amongst latent variables that were adopted in the SSFS theoretical model particularly those greater than 0.7 (Costello, 2009). An exception was however made for hypothesis H_6 and H_2 which both had negative factor loadings of -0.1 and –0.05 respectively. The hypotheses were however highly significant, as was shown in the table, which may indicate that the hypothesis were significant.

5.5.4 Independent Sample t-tests

The independent t-tests seek to determine whether two samples are different from each other based on their mean values. This statistical method was therefore used to test whether motorists self-service technological acceptance is likely to be different based on gender as well as whether gender is likely to influence Johannesburg motorists attitude towards the adoption of self-service fuels stations.

Comparing motorists' attitudes on the adoption of SSFS based on gender

H_0: There is no difference in motorists' attitudes on the adoption of SSFS across genders

H_1: There is a difference in motorists' attitudes on the adoption of SSFS across genders

Group Statistics

Table 11: Group Statistics of Johannesburg Motorists Attitude

A1		N	Mean	Std. Deviation	Std. Error Mean
MA1	1.0	211	3.374	1.2099	.0833
	2.0	128	3.227	1.1786	.1042
MA2	1.0	211	3.346	1.1827	.0814
	2.0	128	3.391	1.1380	.1006
MA3	1.0	211	2.720	1.3531	.0932
	2.0	128	2.703	1.3420	.1186
MA4	1.0	211	3.626	1.2139	.0836
	2.0	128	3.500	1.2102	.1070
MA5	1.0	211	3.445	3.0064	.2070
	2.0	128	3.266	1.2642	.1117
MA6	1.0	211	3.227	1.2707	.0875
	2.0	128	3.234	1.1804	.1043
MA7	1.0	211	3.223	1.2546	.0864
	2.0	128	3.273	1.2594	.1113
MA8	1.0	211	4.033	1.1355	.0782
	2.0	128	3.742	1.1381	.1006

Independent Samples Test

Table 12: Independent Sample t-test Comparing Motorists' Attitudes towards SSFS adoption based on gender

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
MA1	Equal variances assumed	.521	.471	1.101	337	.272	.1478	.1342	-.1162	.4119
	Equal variances not assumed			1.108	273.643	.269	.1478	.1334	-.1147	.4104
MA2	Equal variances assumed	.098	.754	-.342	337	.733	-.0447	.1306	-.3016	.2123
	Equal variances not assumed			-.345	276.233	.730	-.0447	.1294	-.2994	.2101
MA3	Equal variances assumed	.068	.794	.114	337	.909	.0173	.1511	-.2800	.3145
	Equal variances not assumed			.114	269.880	.909	.0173	.1508	-.2797	.3142
MA4	Equal variances assumed	.198	.657	.925	337	.356	.1256	.1358	-.1416	.3928

	Equal variances not assumed			.925	268.778	.356	.1256	.1357	-.1417	.3928
MA5	Equal variances assumed	.523	.470	.643	337	.521	.1799	.2797	-.3704	.7301
	Equal variances not assumed			.765	307.115	.445	.1799	.2352	-.2830	.6427
MA6	Equal variances assumed	1.460	.228	-.050	337	.960	-.0069	.1386	-.2796	.2658
	Equal variances not assumed			-.051	283.564	.960	-.0069	.1362	-.2749	.2611
MA7	Equal variances assumed	.134	.715	-.360	337	.719	-.0507	.1408	-.3276	.2262
	Equal variances not assumed			-.360	267.342	.719	-.0507	.1409	-.3281	.2267
MA8	Equal variances assumed	.364	.547	2.285	337	.023	.2910	.1273	.0405	.5414
	Equal variances not assumed			2.284	267.671	.023	.2910	.1274	.0402	.5418

Results from the tests above reveal that there is no difference in motorists' attitudes on the adoption of SSFS across Gender as the p-values are greater than the 5% level of significance.

This may prove to be important when firms consider adopting SSFS as motorists' perceptions are likely to be similar across genders.

Comparing MSSTA on the adoption of SSFS based on gender

H_0: There is no difference in motorists' self-service technological acceptance across genders

H_1: There is a difference in the motorists' self-service technological acceptance based on gender.

Table 13: Group Statistics of Johannesburg MSSTA

Group Statistics

	A1	N	Mean	Std. Deviation	Std. Error Mean
MSSTA1	1.0	211	3.735	1.2054	.0830
	2.0	128	4.016	1.0194	.0901
MSSTA2	1.0	211	3.668	1.0971	.0755
	2.0	128	3.648	1.0543	.0932
MSSTA3	1.0	211	3.796	1.0561	.0727
	2.0	128	4.133	.9422	.0833
MSSTA4	1.0	211	3.569	1.1501	.0792
	2.0	128	3.891	1.0366	.0916
MSSTA5	1.0	211	3.853	1.1179	.0770
	2.0	128	3.938	1.0481	.0926

Table 14: Independent Sample t-test Comparing MSSTA of SSFS based on gender

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
MSSTA1	Equal variances assumed	10.563	.001	-2.203	337	.028	-.2810	.1276	-.5320	-.0300
	Equal variances not assumed			-2.294	302.297	.022	-.2810	.1225	-.5221	-.0400
MSSTA2	Equal variances assumed	.142	.707	.164	337	.870	.0198	.1211	-.2185	.2581
	Equal variances not assumed			.165	276.494	.869	.0198	.1200	-.2163	.2560
MSSTA3	Equal variances assumed	4.064	.045	-2.961	337	.003	-.3366	.1137	-.5602	-.1130
	Equal variances not assumed			-3.045	291.847	.003	-.3366	.1106	-.5542	-.1190
MSSTA4	Equal variances assumed	7.945	.005	-2.592	337	.010	-.3219	.1242	-.5662	-.0776

	Equal variances not assumed			-2.658	289.764	.008	-.3219	.1211	-.5602	-.0836
MSSTA5	Equal variances assumed	1.707	.192	-.690	337	.491	-.0844	.1224	-.3251	.1563
	Equal variances not assumed			-.701	281.665	.484	-.0844	.1204	-.3215	.1526

Results from the table above suggest that there is no difference in Motorists' Self Service Technology Acceptance across gender in some instances although to a greater extent it can be assumed that there is a significant difference in MSSTA across genders as 3 of the 5 questions asked had p-values ranging between 0.003 and 0.028 which are less than the 5% level of significance.

5.5.5 ANOVA tests to determine motorists' attitudes based on age group and motor vehicle type

Another important test conducted by the researcher was to identify whether there will be differences in motorists; attitude' based on the motor-vehicle type as well as the age group they are in. It has been widely accepted that older generations tend to be more reluctant to adopting technological innovations when compared to the younger generations who tend to be tech-savvy (Huh & Kim, 2008). The researcher was therefore looking to see if there would be differences in motorists' attitudes amongst age groups that participated in the study. In order to ensure that comparisons were made with more than the two sample groups, the researcher made use of the one-way ANOVA. The one way ANOVA is a statistical technique that is commonly used to determine whether they are significant differences between two or more unrelated groups (González-Rodríguez, Colubi & Gil 2012).

5.5.6 ANOVA test on Motorists' Attitudes (MA) based on age-groups

H_0: There is no difference in motorists' attitudes based on age-group

H_1: There is a difference in the motorists' attitudes based on age-group.

Table 15: ANOVA test on motorists' attitudes towards SSFS adoption based on age-group

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
MA1	Between Groups	1.497	4	.374	.258	.905
	Within Groups	484.096	334	1.449		
	Total	485.593	338			
MA2	Between Groups	4.509	4	1.127	.829	.507
	Within Groups	453.863	334	1.359		
	Total	458.372	338			
MA3	Between Groups	4.309	4	1.077	.591	.669
	Within Groups	608.936	334	1.823		
	Total	613.245	338			
MA4	Between Groups	1.808	4	.452	.305	.875
	Within Groups	494.871	334	1.482		
	Total	496.678	338			
MA5	Between Groups	3.886	4	.971	.155	.961
	Within Groups	2099.784	334	6.287		
	Total	2103.670	338			
MA6	Between Groups	3.521	4	.880	.574	.682
	Within Groups	512.532	334	1.535		
	Total	516.053	338			
MA7	Between Groups	3.002	4	.751	.474	.755
	Within Groups	529.163	334	1.584		
	Total	532.165	338			
MA8	Between Groups	2.203	4	.551	.418	.795
	Within Groups	439.802	334	1.317		
	Total	442.006	338			

Based on the table above, we can therefore conclude that there were insignificant differences amongst age-groups with regards to motorists' attitudes towards the adoption of self-service fuel stations in Johannesburg as the p-value of the data is greater than the 5% level of significance. We therefore fail to reject H_0, which states that there is no difference between the means with regards to motorists' attitude towards the adoption of SSFS.

ANOVA test on Motorists' Attitudes (MA) based on motor-vehicle type

H_0: There is no difference in motorists' attitudes towards the adoption of self-service fuel stations based on motor-vehicle type

H_1: There is a difference in the motorists' attitudes towards the adoption of self-service fuel stations based on motor-vehicle type

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
MA1	Between Groups	3.513	3	1.171	.814	.487
	Within Groups	482.080	335	1.439		
	Total	485.593	338			
MA2	Between Groups	1.304	3	.435	.319	.812
	Within Groups	457.068	335	1.364		
	Total	458.372	338			
MA3	Between Groups	4.087	3	1.362	.749	.523
	Within Groups	609.158	335	1.818		
	Total	613.245	338			
MA4	Between Groups	2.871	3	.957	.649	.584
	Within Groups	493.807	335	1.474		
	Total	496.678	338			
MA5	Between Groups	16.683	3	5.561	.893	.445
	Within Groups	2086.987	335	6.230		
	Total	2103.670	338			
MA6	Between Groups	.808	3	.269	.175	.913
	Within Groups	515.245	335	1.538		
	Total	516.053	338			
MA7	Between Groups	.455	3	.152	.096	.962
	Within Groups	531.710	335	1.587		
	Total	532.165	338			
MA8	Between Groups	3.684	3	1.228	.939	.422
	Within Groups	438.322	335	1.308		
	Total	442.006	338			

Based on the table above we can conclude that there is no significant differences in motorists' attitudes towards the adoption of SSFS across motor-vehicle types as the p-values are greater than the 5% level of significance.

5.5.7 ANOVA test on Motorists' Self-Service Technology Acceptance (MSSTA) based on Age-group

H_0: There is no difference in motorists' self-service technological acceptance based on age-group

H_1: There is a difference in the motorists' self-service technological acceptance based on age-group.

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
MSSTA1	Between Groups	3.687	4	.922	.700	.592
	Within Groups	439.712	334	1.317		
	Total	443.398	338			
MSSTA2	Between Groups	1.969	4	.492	.419	.795
	Within Groups	392.019	334	1.174		
	Total	393.988	338			
MSSTA3	Between Groups	10.423	4	2.606	2.519	.041
	Within Groups	345.582	334	1.035		
	Total	356.006	338			
MSSTA4	Between Groups	5.760	4	1.440	1.154	.331
	Within Groups	416.718	334	1.248		
	Total	422.478	338			
MSSTA5	Between Groups	1.180	4	.295	.246	.912
	Within Groups	401.333	334	1.202		
	Total	402.513	338			

Based on the table above, we can note that there is no difference in motorists' self-service technological acceptance based on age-group in general as the p-values are greater than the 5% level of significance. We therefore fail to reject H0 and this is particularly important as many would assume that there is likely to be a difference in opinion with regards to technological acceptance of self-service technologies by motorists in different age-groups as the older generation may tend to be less tech-savvy than the younger Y-generation.

ANOVA test to show differences in Motorists' Self-Service Technology Acceptance (MSSTA) based on motor-vehicle type

H_0: There is no difference in motorists' self-service technological acceptance based on motor-vehicle type

H_1: There is a difference in the motorists' self-service technological acceptance based on motor-vehicle type.

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
MSSTA1	Between Groups	1.979	3	.660	.501	.682
	Within Groups	441.419	335	1.318		
	Total	443.398	338			
MSSTA2	Between Groups	3.906	3	1.302	1.118	.342
	Within Groups	390.082	335	1.164		
	Total	393.988	338			
MSSTA3	Between Groups	.841	3	.280	.264	.851
	Within Groups	355.165	335	1.060		
	Total	356.006	338			
MSSTA4	Between Groups	3.145	3	1.048	.838	.474
	Within Groups	419.333	335	1.252		
	Total	422.478	338			
MSSTA5	Between Groups	1.723	3	.574	.480	.696
	Within Groups	400.791	335	1.196		
	Total	402.513	338			

The table above indicates that there is no difference in the results for motorists' self-service technological acceptance MSSTA irrespective to the motor-vehicle type they make use of when considering the adoption of SSFSs.

5.6 Conclusion

Chapter 5 provided more insightful information on the inferential and descriptive statistics obtained by the researcher. Based on the statistics, conducted using SPSS and AMOS 22, it was noted that the questionnaire dispensed to Johannesburg motorists was reliable as it had positive Cronbach alphas over 0.6. The results from the correlation matrix also showed that there were mostly positive relationships amongst the constructs that were tested in the model. The highest positive relationship amongst the variables was between RA and MPU, which had a correlation coefficient of 0.657721. MPU and MA also had a high positive relationship of 0.430336 and this was also revealed by a high factor loading of 0.94 from the path modelling that was conducted.

Results from the analysis have also revealed that the relationships amongst the constructs in the SSFS theoretical model are largely significant which suggests that they have effects on each other. The researcher also made comparisons of groups of motorists that participated in the questionnaire based on age-group, motor-vehicle type used and gender and results showed that there were no differences in the means which implies that there was not much variation in perceptions of SSFS facilities by Johannesburg motorists.

CHAPTER 6: FINDINGS AND CONCLUSIONS

6.1 Introduction

Chapter 5 provided us with analysis findings that were obtained from the quantitative research conducted in the study. It was noted that the research instruments that were used in the study were reliable and valid based on the various statistical tests that were made. Important discoveries also included the fact that the hypothesis which were tested were significant which goes on to suggest that the constructs that were adopted to determine the perceptions of motorists on the adoption of SSFS are important as they help to influence attitude and acceptance of Johannesburg motorists.

6.2 Main findings

A number of findings were established from the inferential and descriptive statistics that were implemented in the quantitative study. The quantitative study revealed that there is generally a positive attitude towards the adoption of SSFS by Johannesburg motorists. It was also noted that constructs from the theoretical model such as MSSTA, MPU, MPEOU, Relative Advantage and Attitude were key drivers that are likely to influence the potential adoption of these SSFS overtime as they would ultimately influence MSSS.

The ANOVA tests showed that there was no significant difference in motorists' attitudes towards the usage of SSFS based on age-group and this may greatly help to reduce the need for stakeholders, particularly fuel station owners, to customize fuel stations substantially in order to meet the homogeneous needs of the potential market for such facilities based on age-group as it would prove to be too costly to implement and may also be potentially difficult to manage. Having a more uniform SSFS implementation will go a long way in helping to reduce unnecessary implementation costs.

An ANOVA test was also ran to determine MSSTA based on the motor-vehicle types that are used by the motorists. Results from the ANOVA test revealed that there seems to be no difference in motorists self-service technology acceptance based on the motor-vehicle type used. This finding essentially means that there was no variation in motorists' perceptions of

self-service technology acceptance irrespective of whether the motorists made use of a light motor vehicle, heavy motor-vehicle motor-cycle or taxi as a mode of transport. Such a finding is particularly important as it had been assumed that MSSTA may be highly influenced by the motor-vehicle type used by the motorists suggesting that the perceptions of motorists were likely to differ based on the motor-vehicle type they used.

Another important discovery was the fact that Relative Advantage associated with the adoption of SSFS is likely to significantly influence MSSTA which may then be imperative for fuel-station owners and other stakeholders to establish and highlight the advantages associated with the usage of SSFS to Johannesburg motorists as it will go a long way in helping to increase the potential adoption of such facilities in the long-run. It was also discovered that a high relative advantage associated with the usage of SSFS is also likely to positively influence the perception that motorists have of the usefulness of these facilities. As MPU has a positive influence on the acceptance of such an innovation, it will therefore be beneficial for SSFS owners to highly consider the benefits or relative advantage that the service brings to the consumer as it will affect the consumers perceived usefulness of the facility.

Another important finding that was made by the researcher was that MPS had very little influence on Motorists' Attitudes, which had a low factor loading. This was also confirmed by the squared correlation matrix, which also had a very low squared variance of -0.003. There was a moderate factor loading between MPS and MSSTA of 0.47, which suggests that the relationship between the two variables was okay. Results of the study also highlighted that there was a significant relationship between the two variables as the p-value was less than the 5% level of significance.

The researcher also discovered that the MPU is highly likely to influence motorists' attitudes (MA) towards SSFS significantly as the relationship between the two constructs had a high fact-loading of 0.94. It will therefore become imperative for firms to consider the functionality and practicality of SSFS to the motorists as it has high implications on the Motorists' Attitude towards the innovation since it ultimately influences the acceptance of such innovations by Johannesburg motorists.

6.3 Contributions

This research provided an insight on Johannesburg motorists' perceptions regarding the adoption of SSFS. The research also provided us with a platform that can be used by policyholders in order to create a framework which can go a long way in helping to ensure the successful introduction of SSFS in Johannesburg and South Africa as it continues to develop overtime. Currently, it is illegal and prohibited for South African motorists to dispense fuel into their vehicles without making use of designated fuel attendants. The study may therefore aid in proving that the introduction of SSFS may be feasible in Johannesburg based on the favorable perceptions of Johannesburg motorists.

The study also provided important information that should be considered by management when looking to introduce SSFS for the convenience and service experience of their consumers. Management may therefore ensure that the SSFS facilities are relatively easy to use and provide a relative advantage to consumers, which may go a long way in ensuring their successful adoption by Johannesburg motorists.

The study provided academic literature on Self-Service Fuel Station adoption in South Africa and provides an insight into the South African fuel industry. An important finding was the fact that MPU had a significant impact on the Motorists Attitude towards the use and adoption of SSFSs with a factor loading of 0.94 which highlights the importance of functionality of the facility in order to influence the attitudes of potential users. There is also need to transform the business model of fuel service-stations by introducing SSFSs in order to reduce fuel-prices. The SSFS business model has the potential to be adopted by a wider South African market and can be considered for adoption in other emerging and developing economies, which include the SADC region and other countries around the world. In the long-term a reduction in fuel-prices may reduce production costs in the manufacturing industry, which may foster economic growth in the region and ensure convenience for motorists.

The researcher was able to offer a practical solution that could greatly help to mitigate the risks of an increase in unemployment rates should the SSFS be adopted by emphasizing the fact that SSFS are meant to only complement and support the existing convectional service stations and not replace them completely. The researcher also suggested that firms may also rather consider increasing revenues obtained from the adoption of SFSS and concentrate their

efforts on long-term social responsibility projects which are more beneficial to the communities that the service-stations will serve. This suggestion may also help to lower the risks of fuel attendants getting exposed to harmful carcinogens which have the potential to have long-term negative effects to their health and well-being.

6.4 Recommendations and managerial implications

A number of managerial implications and recommendations have been formulated based on the findings of the study. Firstly, management of fuel service stations should identify effective ways of helping to enhance motorists' attitudes (MA) towards the adoption of SSFS in order to ensure that these SSFS may be widely accepted by the potential market they intend to serve. In order to effectively create a positive attitude amongst the potential users of these facilities, management may focus on the MPU as it has a significant impact on MA and may ultimately influence motorists' self-service technology acceptance overtime. Management would therefore need to highlight and emphasize on the functionality of SSFS and how that can be of benefit to the potential users to entice them to consider making use of these services.

In order to help increase MPU of SSFS, management and marketers may consider educating motorists on the value-proposition of convenience and service experience that is brought by the adoption of SSFSs to motorists which can go a long way in increasing the wide adoption of these facilities should they be introduced for Johannesburg motorists.

Based on the questionnaire distributed to motorists around Johannesburg, Safety and security were a concern for most respondents who participated in the study as they feared for their safety and security should the SSFSs be introduced in Johannesburg as the city is well known for its high crime rates (Fonio & Pisapia, 2014). The study revealed a factor loading of 0.47 on the effect of MPS on MA which suggests that it is important for management to help increase motorists' perceived safety as it can go a long way in influencing their attitude towards the usage and adoption of SSFS. Motorists Perceived Safety may be enhanced by ensuring that the SSFS are kept safe and secure and that security officers constantly monitor the activities around these facilities.

Results from the study also suggest that there seems to be a need for potential adopters of SSFS to consider the relative advantage that comes with the adoption of such facilities as they can go a long way in influencing motorists' self-service technology acceptance and

ultimately lead to the wide adoption of such services by Johannesburg motorists. The stakeholders should therefore focus on the benefits associated with the usage of SSFS facilities, particularly convenience to motorists when there is industrial action. Furthermore, fuel prices are likely to decline as operation costs in service stations are likely to be reduced. This may subsequently help service stations to become more sustainable and help increase their profit-margins which can then make it easier for fuel-station companies to commit in corporate social responsibility projects in the communities that they serve and this may go a long way in helping to leverage the brand equities of the firms that adopt these SSFS.

6.5 Limitations and Opportunities for future research

Although it can be noted that the research provided great insight into the perceptions of Johannesburg motorists regarding the adoption of self-service fuel stations, the research did not adequately cover the perspectives of other stakeholders who are likely to be directly or indirectly affected by the introduction of SSFSs. These include fuel station owners, fuel service station attendants and the government. Future researchers should therefore consider the feasibility of adopting such service stations by looking at the perspectives of staff and owners of the fuel-stations as they are directly also affected by the adoption of such innovations.

The researcher had time and budget constraints which limited the study to focusing on Johannesburg motorists and as they tend to be widely dispersed, convenience sampling was adopted, resulting in the majority of the data being collected from taxi-drivers and light-motor-vehicle drivers who accounted for 72.27% of the respondents. Initially, the researcher had proposed an equal stratified sample of each motor-vehicle type in order to fully represent the four motor-vehicle types chosen for the study. The researcher generally found motorists for these vehicle types to be relatively more available and accessible when compared to motorcyclists and heavy truck-load drivers. Future research should therefore consider ensuring that motorists of all motor-vehicle types are well represented in order to ensure that there is no bias in the results of the data collected.

Another important limitation that future researchers may also need to address is to ensure that age-groups of all potential respondents are well represented as the research was conducted mostly on youthful Johannesburg motorists between the ages of 18-24 who constituted 66.4%

of the total population which consequently under-represented the older age-groups. This may go a long way in helping to reduce unnecessary bias that may result as there is a general assumption that the older generation is less tech-savvy and therefore less likely to welcome the introduction of SSFS than their younger counterparts.

The language barrier may have made it more difficult for the researcher to obtain information on motorists' perceptions regarding the adoption of SSFS to a greater extent. The researcher managed to make the questionnaire available in English only, which may have made it fairly difficult to attract and invite a wider sample of potential respondents who could have given more insight on the feasibility of adopting SSFS. Efforts were, however, made, where possible, to try and explain the questionnaire to potential respondents who were looking to participate in the study. Future researchers may therefore consider introducing the questionnaire to a wide- variety of South African languages in order to help increase the response rate and ensure that more reliable data is obtained.

6.6 Conclusion

The research gave an empirical view on the perceptions of Johannesburg motorists. The findings from the study show that there seems to be a general consensus that SSFS may be feasible for adoption from the perspective of motorists as there seems to be a positive attitude and a generally high level of MSSTA. Results have also shown that all the hypothesis that were formulated in the study were supported which suggests that the variables that were included in the proposed theoretical model were valid which has been illustrated in table 9 in Chapter 5. Findings have therefore shown that there seems to be a very significant relationship between MPU and motorists' attitude, which is why it is imperative for fuel station owners to highlight the usefulness associated with the adoption of SSFS as it can go a long way in ensuring the adoption of such services by Johannesburg motorists.

Security was also an important element that most motorists were concerned with regarding the adoption of such innovations in Johannesburg as the city has experienced a high crime-rate for several years. In order to help mitigate problems such as resistance to change that

may arise, management should ensure that the SFSS are secure and safe for motorists to make use of.

The research also revealed how the adoption of SSFS may potentially be beneficial not only to motorists, who would have more convenient access to fuel, but also to service station owners to help reduce operational costs associated with running their fuel-stations. Findings from the literature used in the research also suggested that fuel-station staff may lower the risks of being affected by harmful carcinogens contained in fuel as the adoption of these SSFS will greatly help to reduce their exposure to dangerous fuel toxins.

Therefore although motorists are presently concerned with the safety associated with adopting SSFS, it can be noted that to a larger extent it is feasible for SSFS to be introduced for the convenience of Johannesburg motorists, provided that they are perceived as useful and motorists' attitudes are favourable towards the adoption of these facilities as this can potentially influence the acceptance of the facilities.

We can therefore conclude that to a greater extent, Johannesburg motorists are more likely to benefit from the adoption of SSFS and are more likely to appreciate the introduction of such a service as it will help to increase the service experience they obtain at fuel stations. The adoption of self-service fuel stations will also go a long way in ensuring that the convenience of motorists is maintained, more especially as South Africa is prone to industrial action, which may tend to disrupt the service industry.

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APPENDIX



Research Questionnaire Johannesburg Motorists

Hello, my name is Lloyd Uta and I am a Master's student at the University of the Witwatersrand. As part of my course at the University, I need to complete a research assignment and would like to invite you to take part in my survey.

The aim of the voluntary survey is to obtain motorists perceptions on **the feasibility of adopting self-service fuel stations in Johannesburg**. The findings will help assess whether it is feasible to adopt self-service stations in Johannesburg for the convenience of motorists. The data will be collected for research purposes only. The survey should not take more than 10 minutes to complete.

As it is a voluntary, you have no obligation to take part. However if you initially do consent to participate, you are also free to withdraw from participation and may inform the researcher. All responses received are anonymous and information collected will not be distributed to any other party and should you decide to pull out of the survey they will not be any negative consequences.

Thank you for taking your time to complete this survey. Should you have any questions or if you would like a copy of a summary of the final research report, please feel free to contact me on : kudzanai.uta@gmail.com or cell : 0794060419.

In case you have any questions or queries you can also communicate with my supervisors:

Dr Norman Chiliya

Email: Nchiliya@webmail.co.za

Or :

Prof. Richard Chinomona

Email: rchinos@hotmail.com

University of the Witwatersrand, Johannesburg

Title of Research Project: An Exploratory Study on the Feasibility of Adopting Self-Service Fuel Stations in Johannesburg: Motorists' Perspective.

Name of principal researcher: Lloyd Uta

Department/research group address: Faculty of Commerce, Law and Management (Marketing)
Telephone: 079 406 0419
Email: kudzanai.uta@gmail.com
Nature of Research: Quantitative Research
Participant's involvement: Respondent (To fill up the questionnaire)

What's involved? The participant is required to fill up the questionnaire
Risks: No risks involved
Benefits: No benefits

I acknowledge the following:

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

Signature of Participant:

Name of Participant: _____

Signature of researcher: 

Name of researcher: Lloyd Uta
Date 06 June 2014

About self-service fuel stations

Self-service fuel stations allow motorists to dispense their own fuel at fuel service-stations using the pay-at-the pump system. There has been an increase in the adoption of self-service fuel stations by most developed countries as well as emerging economies around the world. Below are pictures that illustrate how motorists make use of self-service fuel stations.

Insert A: A motorists initiating a transaction to make use of a pay-at-the-station pump



Insert B: A motorist making use of a self-service fuel station facility



Adoption of technology

My research will investigate whether it is feasible for self-service stations to be adopted by Johannesburg Motorists.

The following survey includes questions that assess the perceptions of motorists on the adoption of self-service stations. The survey also includes questions about age and gender and it will take 10 minutes of your time to complete the survey. You must be 18 years or older to participate in the study. Incomplete questionnaires will not be considered.

Please answer the following questions by circling the number that best represents your chosen response.

SECTION A

1) What is your gender Male Female

2) How old are you? Please select the age that you are in in the spaces provided below

Age	mark (X)
18-24	
25-34	
35-44	
45-54	
55-64	
65 and over	

3) Have you ever used any self-service machine before : Yes No

4) Have you ever used a self-service fuel station before : Yes No

5) What is your current occupation: _____

6) Please Select the Vehicle Type you use	mark (X)
Motor-Cycles	
Light-Passenger Vehicles(without trailer)	
Large Heavy motor vehicles	
Taxis	

7) How is your usage rate of service stations?

Usage rate	mark (X)
Heavy-user (visit service station more than 5 times a week)	
Frequent user (visit service station 3-4 times a week)	
Average User (visit service station 2-3)	
Minimal-user (visit service station once a week)	

For the following items, please indicate your perception towards the adoption of self-service fuel stations. Circle the response that best describes your level of agreement to each statement. (1=strongly disagree 2=disagree, 3=neutral 4= agree, or 5 strongly agree)

SECTION B

Attitude

Strongly Disagree → **Strongly agree**					
7) Self-service stations have a relative advantage when compared to regular service stations	1	2	3	4	5
8) The use of self-service stations will give me more control and fulfilment	1	2	3	4	5
9) I would choose to make use of a self-service fuel station to avoid interacting with service employees	1	2	3	4	5
10) I believe I can make use of self-service stations without any assistance.	1	2	3	4	5
11) I see the adoption of the fuel self-service station as beneficial to me as a motorist and the South African fuel industry.	1	2	3	4	5
12) I believe that adopting self-service stations will enhance service delivery for fuel service stations in the long-run.	1	2	3	4	5
13) I have a generally favorable attitude toward using the self-service fuel station business model	1	2	3	4	5
14) I enjoy trying new technological innovations to enhance my service experience.	1	2	3	4	5

Question **Response**

Perceived usefulness of self-service stations

Strongly Disagree → Strongly agree					
15) I intend to use the self-service fuel stations when they are introduced in South Africa as they will improve my experiences at fuel service stations.	1	2	3	4	5
16) I believe that self-service fuel stations are convenient for motorists	1	2	3	4	5
17) I feel that adopting self-service stations will reduce congestion at service stations	1	2	3	4	5
18) Using the self-service station enables me to accomplish tasks more quickly.	1	2	3	4	5
19) Using the self-service station System will enhance my experience at the service station.	1	2	3	4	5
20) I believe that adopting self-service fuel-stations will significantly reduce the risks of health problems for fuel attendants.	1	2	3	4	5
21) Self-service fuel stations will help to reduce fuel costs in the long run.	1	2	3	4	5
22) I would feel less pressured when I make use of self-service stations than when I use traditional service stations	1	2	3	4	5

Questions 17-21: The following questions are focused on your perception of self-service stations regarding the relative advantage that is acquired from its usage

Please Circle the response that best describes your level of agreement to each statement. (1=strongly disagree 2=disagree, 3=neutral 4=agree, or 5 =agree)

Innovation factors-relative advantage

Question **Response**

Strongly disagree → Strongly agree					
23) I would prefer self-service stations to convectional service stations.	1	2	3	4	5
24) I believe that self-service stations will be more convenient for me	1	2	3	4	5
25) I believe that self-service fuel stations will greatly enhance the service experience for oil companies and retailers.	1	2	3	4	5
26) I am comfortable using self-service innovations to cut down costs	1	2	3	4	5
27) I am motivated to make use of a particular self-service innovation provided there is sufficient training and it improves my work	1	2	3	4	5

Motorists Self-Service Station Technology Acceptance

Question **Response**

Strongly disagree → Strongly agree					
28) I am willing to try out new self-service innovations if they have the potential to add value.	1	2	3	4	5
29) I believe that self-service stations will create new experiences for me as a consumer.	1	2	3	4	5
30) The more I use a particular innovation, the more I become comfortable with it	1	2	3	4	5
31) I am comfortable asking people who I know to help me when I do not understand how to use a particular self-service innovation	1	2	3	4	5
32) I tend to appreciate a technological innovation when I continuously make use of it.	1	2	3	4	5

Innovation factors- complexity

Strongly Disagree → Strongly agree					
33) I find the terminology associated with many self-service innovations confusing.	1	2	3	4	5
34) I become more confused and embarrassed if I ask assistance to operate a self-service machine.	1	2	3	4	5
35) I avoid making use of self-service innovations because they are difficult to operate.	1	2	3	4	5
36) I will not use a self-service station if I find it confusing or too complex to understand.	1	2	3	4	5
37) I am likely to recommend self-service machines to my friends if I enjoy the experience of using them.	1	2	3	4	5
38) The more I use a particular self-service technological innovation, the easier it becomes.	1	2	3	4	5

Please Circle the response that best describes your level of agreement to each statement.

(1=strongly disagree 2=disagree, 3=neutral 4= agree, or 5 strongly agree)

Perceived ease of use

Strongly Disagree → Strongly agree					
39) I am likely to find it easy for me to adopt a new self-service innovation.	1	2	3	4	5
40) I am likely to find it easy to interact with self-service innovations.	1	2	3	4	5
41) I am likely to feel comfortable making use of a self-service fuel station	1	2	3	4	5
42) Using a self-service fuel station is likely to be fairly demanding for me.	1	2	3	4	5
43) I am likely to have problems when learning how to use the self-service fuel station system	1	2	3	4	5
44) A lot of knowledge and skill is required in order for me to make use of the self-service fuel station	1	2	3	4	5

Security

Strongly Disagree ⟶ Strongly agree					
45) I think Security and safety will be my greatest concern when adopting self-service fuel stations	1	2	3	4	5
46) I am likely to feel more vulnerable to theft when I use self-service fuel stations	1	2	3	4	5
47) I strongly feel that security should be tightened more at self-service stations for them to be more usable and for my peace of mind	1	2	3	4	5
48) I will not use a self-service fuel station if I don't feel safe	1	2	3	4	5
49) I would prefer paying the petrol attendant when refueling at a service station than paying using the machine.	1	2	3	4	5

Motorists Self-service Satisfaction

Strongly Disagree ⟶ Strongly agree					
50) I am likely to be satisfied with technological innovation that is easy to use	1	2	3	4	5
51) I believe that adequate experience with self-service fuel stations will help increase my usage rate over time	1	2	3	4	5
52) I will not use a particular technological innovation if I am not satisfied by using it.	1	2	3	4	5
53) I will definitely recommend a particular technological innovation to my peers if I find its usage satisfactory	1	2	3	4	5
54) The level of satisfaction that I get from making use of a self-service-station will influence my decision to re-use it.	1	2	3	4	5

Thank you!!!!!

Research Office

HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)
R14/49 Uta

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER H14/07/18**
PROJECT TITLE	Exploratory study on the feasibility of adopting self-service fuel stations in Johannesburg: Motorists' perceptive
INVESTIGATOR(S)	Mr L Uta
SCHOOL/DEPARTMENT	Economic & Business Science
DATE CONSIDERED	18 July 2014
DECISION OF THE COMMITTEE	Approved Unconditionally
EXPIRY DATE	21/08/2016
DATE 22/08/2014	**CHAIRPERSON** (Professor T Milani)

cc: Supervisor : Mr N Chiliya

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10000, 10th Floor, Senate House, University.

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. **I agree to completion of a yearly progress report.**

_____ ____/____/____
Signature **Date**

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES