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Consumer perceptions and criteria for purchase of electric vehicles in South Africa

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Consumer perceptions and criteria for purchase of electric vehicles in South Africa

A research report submitted by

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A research report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Business Administration

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Johannesburg, April 2018

ABSTRACT

The objective of this research was to explore the perceptions and purchase criteria of Electric Vehicles among consumers in South Africa. As the world transitions from the use of fossil fuel in motor vehicles to renewable sources of energy the contribution that this study aims to make is towards the understanding of the psyche of consumers in South Africa. The study concludes that although negative perceptions towards EVs exist related to convenience, driving range, social image impact and cost, perceived cost savings associated with fuel and maintenance are major motivating factors for consumers in South Africa. The findings of this study have implications on motor vehicle manufacturers and distributers in South Africa who will have to change the negative perceptions that consumers have towards EVs, as well as policy makers who would have to ensure that a conducive policy and legislative landscape exists to encourage the adoption of EVs in South Africa.

The methodology used for this research is Qualitative. 12 semi-structured interviews were conducted with consumers and the interviews were transcribed to text for analysis. The interview transcripts were analysed which resulted in the emergence of 6 broad themes. First, respondents were concerned about whether the driving range of an Electric Vehicle would be sufficient to meet their long-distance needs; Second, respondents expressed concern about the reliability of South Africa's power supply; Third, respondents said an Electric Vehicle would be the ideal urban vehicle; Fourth, respondents were saw Electric Vehicles as being good for the environment; Fifth, respondents expressed concern about whether an Electric Vehicle would be good for their social image; And finally, respondents were concerned about the cost of Electric Vehicles but they believe that Electric Vehicles offer the benefit of long-term savings in vehicle operating and maintenance costs.

The findings revealed that South African consumers are apprehensive about the usefulness of Electric Vehicles as a primary household vehicle given their frequent need to drive long distances and the unavailability of battery charging infrastructure. However, as a secondary vehicle in the home an Electric Vehicle perceived as a viable option for shorter urban commutes.

Most respondents acknowledged the importance of the role that the electrification of mobility will play in reducing the harmful impact of motor vehicle exhaust emissions in South Africa. However, the level of concern that South African consumers have for the environment has not developed to the extent that it influences their vehicle purchase decision.

The findings also reveal that South African consumers are motivated to a large extent by the brand of the car that they buy over the function or utility that the vehicle offers. Respondents expressed significant concern about the impact of driving an Electric Vehicle on their social image.

Finally, the findings reveal that South African consumers perceive Electric Vehicles to be more expensive to buy but cheaper to operate and maintain than conventional petrol or diesel cars.

DECLARATION

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

Mangaliso Molomo

Signed at ……Parktown……

On the ……26th …….. day of ……October…… 2018..

DEDICATION

To my parents Rammonaseswa and Nosipo Molomo, without your continued sacrifice for the liberation of our country this research would not be possible.

I dedicate this and the rest of my life's work to you.

To my children Khumo and Lesedi, I pave the way for you.

ACKNOWLEDGEMENTS

My brother Mtutuzeli and his wife Suzan for providing refuge in my time of need as I wrote this report.

My employer Toyota South Africa for funding my studies and allowing me the time to focus on my research, I am eternally grateful. Arigatōgozaimasu. Anata no sapōto o hijō ni hontōni arigatō.

The Bro Code for making this a thoroughly enjoyable research journey.

My supervisor, Bruce Conradie, your patience, guidance, support and encouragement got me across the finish line. Thank you.

Tendani Makwarela, I lost count of the number of times you came to my rescue. Thank you Tendi.

Kgaugelo Kutu, you are the rock on which this MBA was built.

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Chapter 1: INTRODUCTION

1.1 Purpose of the study

The motor industry is undergoing an evolution that will drastically change the face of mobility. The advent of self-driving cars and Electric Vehicles will have a ripple effect across multiple industries that developed around the motor industry and re-write the rules on how human beings travel.

The International Energy Agency (2017) puts forward that the electrification of road transportation can yield benefits including a reduction in harmful emissions and energy security resulting from a diversification of energy supply. This suggests that the electrification of mobility has the potential to alleviate South Africa's reliance on fossil fuels and reduce the amount of harmful gases emitted into the atmosphere. For South Africa to realise the benefits that could accrue from a shift to electric mobility, a significant rate of adoption of vehicles that emit very little or no harmful gases would need to transpire.

The purpose of this research is to investigate consumer perceptions of Electric Vehicles (EVs) in South Africa; the literature is comprehensive on the acceptance of electric mobility in more mature markets. However, limited research exists on the perception and purchase criteria for EVs in the South African automotive industry. The aim of this study is to expand upon existing EV research in other countries by providing an analysis of the perceptions and criteria that play a role in the preferences of consumers for EVs in South Africa.

This study was limited to South African consumers who have not purchased an electric vehicle, further limitations are discussed in section 3.7.

1.2 Context of the study

NAAMSA (2018) reports that a total of 557 586 new passenger vehicles were sold in South Africa in 2017; in 2010 the number of passenger vehicles sold was 337 130. In parallel with the growth in new vehicle sales in South Africa, according to Toyota South Africa Motors (2017), the number of automotive brands in South Africa tripled from 20 in 1995 to

60 in 2017, giving the South African consumer significantly more choice of brand and type of motor vehicle he or she wishes to buy.

As the proliferation of automotive brands in South Africa has grown, so have consumers' taste and preferences for cars with more advanced technologies developed. We are reminded by Giffi, Vitale, Schiller, and Robinson (2018) that vehicle manufacturers, component suppliers and technology companies continue to invest enormous amounts of money to make advanced technologies available to drivers across the globe.

Relative to the history of the automobile, EVs are a new phenomenon sweeping across developed economies. Since the launch in 1997 of Toyota's electric version of its popular RAV4, the adoption of EVs across Europe and the United States has seen steady growth (Soltani-Sobh, Heaslip, Stevanovic, Bosworth, & Radivojevic, 2017).

As with most high-tech innovations spawned abroad, the introduction of electric mobility to the South African market has for several reasons been slow and as a result the adoption of EVs, HEVs and PHEVs in South Africa is in its infancy.

Notwithstanding the slow adoption of EVs in South Africa, efforts to increase the adoption of these vehicles are being made by organisations such as the Electric Vehicle Industry Association (EVIA), whose purpose, according to EVIA (2018), is to guide the development of the policy and regulatory framework that will create a favourable environment encouraging the adoption of clean mobility in South Africa.

The economists Mohr and Fourie (2011) acknowledge that the demand for goods and services is a function of the price of the product and other factors; this study seeks to understand these factors. It is within this context of the global shift towards electric mobility that this research will examine South African consumers' perception of EVs and what fulfilled criteria would result in a purchase decision.

1.3 Problem statement

In their 2017 report, the International Energy Agency (2017) discussed the rapid global growth in the adoption rate of EVs, which is most observable in China; consumer preference for EVs is gaining momentum across Europe, Asia and the United States. We

know that EVs have been widely accepted in Europe, Asia and the United States, but we lack research addressing South African consumers' perceptions of electric mobility. This research study will aim to address this knowledge gap.

The research problem is to uncover from South African consumers their perceptions about EVs in general and their criteria for the purchase of EVs. How they perceive EVs, their attitudes towards potential purchase; beliefs about the utility of EVs; opinions about their status value and what the motivators are that would result in a decision to purchase an EV as opposed to the criteria of buying a conventional vehicle.

1.4 Significance of the study

1.4.1 *Global EV acceptance*

Across Europe, Asia and the United States, consumer appetite for EVs is growing at an increasing rate. The International Energy Agency (2017) reports that in 2016 more than 750 000 EVs were sold worldwide, bringing the total number of EVs in circulation globally to just over 2 million by the end of 2016. At the end of 2015 there were just over 1 million EVs in operation globally.

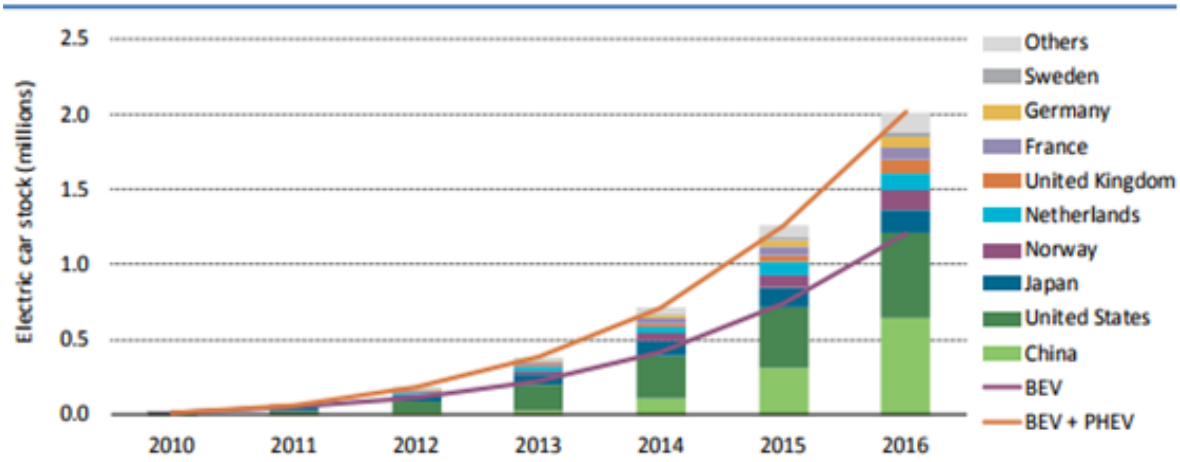


Figure 1 - Electric Vehicle Growth 2010 – 2016 (International Energy Agency, 2017)

The growth rate in the adoption of EVs is significant; Eppstein, Grover, Marshall, and Rizzo (2011) attribute this global adoption to a growing appreciation of the utility and lower running costs of EVs. EV adoption can also be attributed to heightened awareness of the environmental benefits of EVs over conventional petrol or diesel-powered vehicles. Riga (2015) discussed the relationship between a consumer's environmental attitude and their adoption of environmentally responsible products and sustainable technologies. Riga (2015) argues that EVs should be considered sustainable technologies because of their small carbon footprint.

1.4.2 *Global forecasted EV Growth*

At the growth rates discussed in 1.4.1 above, several researchers hold the view that the numbers of global EV units in operation will continue to grow and will eventually surpass the conventional petrol and diesel vehicle units in operation. The International Energy Agency (2017) suggests that relative to conventional petrol and diesel vehicles, the cost competitiveness of EVs will continue to improve as research and development into EVs advances. The International Energy Agency (2017) goes on to propose that the global EV units in operation will be in excess of 70 million by the year 2025.

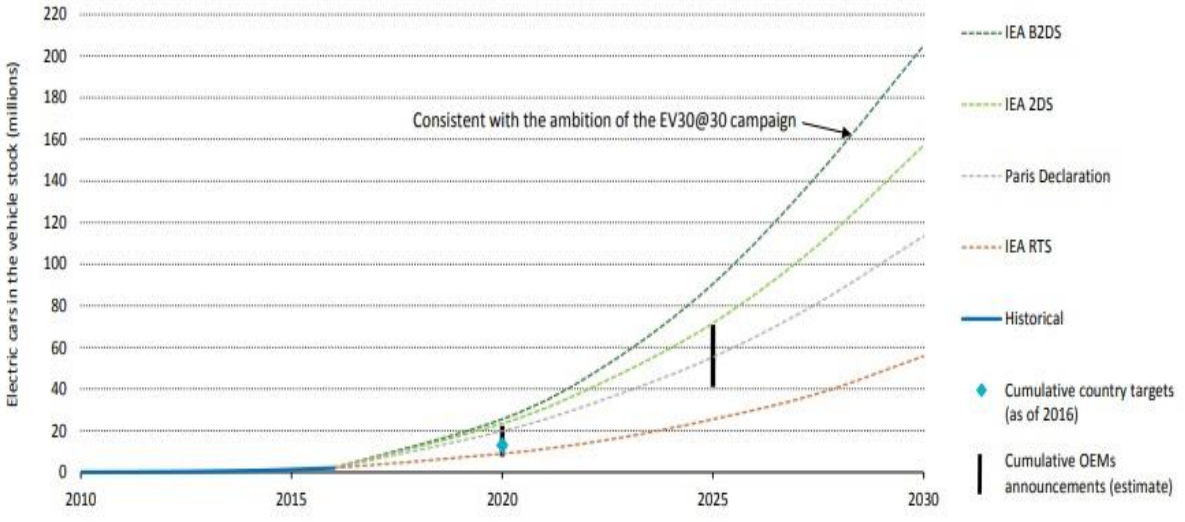


Figure 2 - Scenarios for Electric Vehicles to 2030 (International Energy Agency, 2017)

Vehicle fleets such as taxis will switch to EVs in response to the demands placed on them by cities to reduce their contribution to the pollution of urban areas (Kuppusamy, Magazine, & Rao, 2017). Shafiei, Thorkelsson, Ásgeirsson, Davidsdottir, Raberto, and Stefansson (2012) in their study predicting the evolution of the market share of EVs in Iceland, found that high fuel prices coupled with the ever-decreasing costs of EVs will see the proportion of EVs rising to overtake that of conventional vehicles.

1.4.3 *Global Environmental Concerns*

Awareness is increasing globally about the harmful effect that carbon emissions from motor vehicles have on the environment. Jansson, Nordlund, and Westin (2017) point out that the most significant human influence on Earth's climate emanates from fossil fuel combustion. According to Jansson et al. (2017), motor vehicles are responsible for approximately 80% of greenhouse gas emissions such as carbon dioxide (CO2).

The concern that motor vehicle emissions are harming the environment is significant to the extent that governments around the world are acting to reduce the harmful gases produced by motor vehicles. Policies are aimed at replacing conventional petrol and diesel cars, with cars that use clean energy being implemented by national governments and cities throughout the world (Mannberg, Jansson, Pettersson, Brännlund, & Lindgren, 2014).

The South African Government has also expressed its desire to see an increase in the number of EVs on South Africa's roads, (Khutsoane, 2016) and it acknowledges that the transport sector contributes 91% of South Africa's carbon footprint through the combustion of petrol and diesel. In the national Green Transport Strategy, Khutsoane (2016) stresses the Government's commitment to substantially reducing the environmental impact of the transport sector by promoting the widespread adoption of EVs in South Africa.

Globally, consumers are also becoming more environmentally aware, which is increasingly reflected in consumer purchase decisions. Jansson et al. (2017) found that personal norms for less environmentally harmful vehicles played a significant role in consumers adopting EVs in Sweden. Their finding is corroborated by (Chen & Hung, 2016), who observed that the intention to use green products is significantly influenced by the environmental ethics of consumers.

1.4.4 *Motor Manufacturers' stated direction*

The major car manufacturers have made it clear that over the coming decade they will begin to phase out the production of vehicles powered solely by an internal combustion engine and significantly increase the proportion of BEVs, PHEVs, HEVs and FCEVs that they produce.

Toyota

(Toyota Motor Corporation, 2017) highlights that addressing environmental challenges is of utmost importance; to this end, the Toyota Motor Corporation (2017) states that by 2025 every Toyota model will be available as an EV globally.

Volkswagen

Volkswagen's Electrification strategy, named 'Roadmap E', has the target of every model being electrified across all brands and in every market by 2030 (Volkswagen Group, 2017). Volkswagen believes that the transformation of the motor industry towards EVs is unstoppable and inevitable.

Volvo

(Volvo, 2017) sees environmental friendliness as one of the hallmarks of their cars. Volvo believes that EVs should no longer be seen as niche and should move into the mainstream. Volvo (2017) has the stated target of 10% of global sales being EVs by 2020.

BMW

According to (BMW, 2017), one of the central pillars of the corporate strategy of BMW is electrification. BMW has the target of 15% - 25% of their sales being EVs by 2025.

Mercedes Benz

(Mercedes Benz, 2017) has stated that the future of their range of cars will be emission free and that EV are one of the pillars of mobility of the future at Mercedes Benz. Mercedes Benz has set the target of offering an electric derivative of each of its models by 2022.

1.5 Delimitations of the study

This study was limited to the perceptions and purchase criteria of EVs of consumers who reside in Johannesburg and the study focused only on Battery Electric Vehicles.

1.6 Definition of terms

OEM – Original Equipment Manufacturer.

EV – Electric Vehicle.

FCEV – Fuel Cell Electric Vehicle – Fuel Cell vehicles are fuelled by hydrogen which they use to generate electricity to supply power to a motor. (Toyota, 2017).

ICE – Internal Combustion Engine – A traditional motor vehicle engine fuelled only by either petrol or diesel (Canadian Fuels Association, 2016).

BEV – Battery Electric Vehicle – BEVs do have neither a fuel tank, nor an engine. They have an electric motor that is powered by rechargeable batteries. The batteries in a BEV are recharged by plugging the vehicle into an electric power source. (Canadian Fuels Association, 2016)

HEV – Hybrid Electric Vehicle – HEVs have an electric motor that is powered by batteries as well as an internal combustion engine that is fuelled by petrol or diesel. The vehicle uses either or both power sources depending on the speed of the vehicle. The batteries in

a HEV are not recharged by plugging the vehicle into a power source, instead energy is captured from the braking system of the vehicle when the brakes are applied and transferred to the battery. (Canadian Fuels Association, 2016).

PHEV – Plugin-Hybrid Electric Vehicle – PHEVs are identical to HEVs except that the batteries of a PHEV can be recharged by plugging the vehicle into an electric power source. (Canadian Fuels Association, 2016).

1.7 Assumptions

The research assumes that:

i. The EV adoption rate in South Africa is low and EV availability is not widespread.
ii. Respondents express their perceptions about EVs truthfully and speak honestly about their purchase criteria for EVs.

2 LITERATURE REVIEW

2.1 Introduction

The impact of carbon dioxide emissions from motor vehicles on the environment is well documented and, according to Jansson et al. (2017), accepted the world over as one of the major crises facing humanity today. The developed world has realised the environmental impact of their industrialisation and this has prompted their governments to act; for example, Mannberg et al. (2014) discussed various tax-related incentives in Sweden, where the city of Stockholm was actively seeking to reduce carbon emissions from motor vehicles.

In this literature review, the researcher will seek to give context to the visible global shift towards mobility electrification. Understanding South African consumers' perception of EVs is relevant in the context of the stated intention of the South African government to wean the transport sector off fossil fuels (Khutsoane, 2016). The literature review will begin with a discussion of EVs and the review will then explore models that discuss consumer perception and behaviour.

2.2 Background discussion

2.2.1 *EVs*

EVs are categorised into four types depending on the ratio of electricity that powers the vehicle. The four types of EV are:

Battery Electric Vehicle (BEV)

Battery EVs are not powered by an internal combustion motor at all; instead, they are 100% powered by an electric motor that draws power from a battery. The battery is recharged by plugging the vehicle into an external source of electricity. Battery EVs are advantageous in that they emit no emissions, they do not require oil and filter changes, and, depending on the cost of

electricity, they are potentially considerably cheaper to run than conventional petrol or diesel vehicles (Carley, D., 2014).

Hybrid Electric Vehicle (HEV)

Hybrid EVs, as the name suggests, use both electricity and petrol to power the vehicle. The vehicle has both a petrol engine and an electric motor that complement each other. Via a process called regenerative braking, the car recaptures electric energy which it uses to recharge the electric battery. Although HEVs still produce emissions, these are less harmful than conventional petrol cars while consuming less petrol (Carley, D., 2014).

Plugin-Hybrid Electric Vehicle (PHEV)

Plugin Hybrid EVs are an advancement of the Hybrid EV; they have an internal combustion petrol engine as well as an electric motor that draws power from a battery. The battery is recharged by plugging the vehicle into an external source of electricity. During operation, the vehicle defaults to the electric motor. Once the power in the battery is depleted, the vehicle automatically switches over to the internal combustion engine and begins to use petrol. PHEVs possess the same environmental advantages as HEVs, with the added advantage of having a battery with a longer range than that of an HEV that can be recharged via using a potentially cheaper source of fuel than petrol (Carley, D., 2014).

2.2.2 *EV Development*

2.2.2.1 *The Catalyst*

The (United Nations, 2017) sustainable development goal number 13 is a call to all countries to ‘Take urgent action to combat climate change and its impacts’. To this end, all United Nations member states have committed to implementing strategies that will slow down the rate at which the average global temperature is rising; forecast by the United Nations (2017) to rise by two degrees Celsius this century, the average global temperature increased by 0.85 degrees Celsius over the period 1880 to 2012.

Through the development of EVs, motor manufacturers are giving governments around the world a powerful weapon in their war against emissions as they look for strategies to achieve the United Nations Sustainable Goal number 13. 2017 saw announcements by the UK and France that the sale of internal combustion engine vehicles would be banned from 2040 (Bloomberg, 2017). China, the world's largest motor vehicle market, has warned motor vehicle manufacturers to adjust their strategies as the Chinese government plans to introduce bans on petrol and diesel-fuelled vehicles (CNN, 2017). More near-term measures have been announced by the cities of London (City Of London, 2015) and Paris (Evening Standard, 2017) to ban petrol and diesel cars from entering their cities by 2030. In 2020 the city of Oxford will introduce the first phase of a zero emission zone prohibiting all buses, cars and taxis that are fuelled by petrol or diesel from entering certain parts of the city (City Of Oxford, 2017).

A by-product of the mass adoption of EVs will be an increased demand for electricity to recharge their batteries. Vassileva and Campillo (2017) studied this phenomenon in Sweden and suggested that power operators will have to put in place strategies to mitigate the risks associated with spikes on power grids resulting from users of EVs charging their vehicles during peak evening hours after work. This is relevant in the South African context, given the country's recent history of power supply instability and the resulting load reduction strategies implemented by Eskom (2015).

In South Africa, the Departments of Trade and Industry, Energy, and Transport, supported by the United Nations Industrial Development Organisation (UNIDO) and the South African EVs Industry Association (EVIA) launched Low Carbon Transport South Africa (LCT-SA) in 2016; through this initiative and under the umbrella of the national Green Transport Strategy, the Government of South Africa is planning South Africa's move away from fossil-fuelled motor vehicles (Department of Transport, 2017).

2.2.3 *The Consumer Perspective*

From the consumer perspective, data from the International Energy Agency (2017) show that across Asia, Europe and the United States, the car buyers' preference for EVs is

growing; the data forecast that the trend to zero emission mobility will grow at an increasing rate over the period 2020 - 2030 (International Energy Agency, 2017).

2.2.3.1 *Consumer Perception*

'What an individual thinks about a particular product or service is his/her perception towards the same' (Jisana, 2014). According to Sinha and Singh (2016), a consumer's purchase decision is preceded by the perception of several factors that are taken into consideration; Forsythe and Shi (2003) put forward that the main factor considered by consumers is perceived risk. They suggested that when consumers are unsure that their purchase goals will be met they become apprehensive about making the purchase.

Forsythe and Shi (2003) categorise perceived risk into six dimensions: Perceived Financial Risk, Perceived Product Performance Risk, Perceived Social Risk, Perceived Psychological Risk, Perceived Physical Risk and Perceived Time/Convenience Loss Risk.

Sinha and Singh (2016) put forward that perceived benefit is an equally important factor in the perception that a consumer has of a product; they categorise perceived benefit in the dimensions of: Perceived Product Offering, Perceived Convenience, Perceived Cost Savings and Perceived Enjoyment/Hedonic Benefit.

Ziefle, Beul-Leusmann, Kasugai, and Schwalm (2014) studied German consumer attitudes towards traditional motor vehicles compared to EVs. They examined the perceived benefits and risks that consumers saw regarding EVs and they found that the most crucially important perceived benefit dimensions to be taken into consideration in their decision to purchase an EV were: (1) Positive environmental impact and (2) long-term cost saving, while the perceived risk dimensions were: (1) Availability of charging stations and (2) Cost.

Carley, S., Krause, Lane, and Graham (2013) investigated consumer intent to purchase EVs in the United States. Their study looked at what influenced consumer attitudes and preferences with regard to EVs, and they concluded that consumer

interest in EVs is shaped primarily by consumer perceptions of the perceived advantages and disadvantages associated with owning an EV.

Carley, S. et al. (2013) put forward three primary benefits associated with the perceived advantage: (1) Fuel economy and lower fuel costs; (2) Environmental concerns; and (3) Being at the cutting edge of new technology. Perceived advantages were attributed to three primary concerns: (1) High vehicle purchase price; (2) Long battery recharging time; and (3) Limited driving range.

2.2.3.2 *Environmental Awareness*

Consumers are gaining an appreciation of the benefits of owning an EV (Zhang, Yu, & Zou, 2011), as well as an appreciation of the need, as pointed out by Jansson et al. (2017), to reduce their individual carbon footprint and how through the adoption of smart energy technologies such as EVs their environmental self-identity is strengthened (Peters, van der Werff, & Steg, 2018). The decision about the vehicles that car buyers choose to drive has in recent years seen a new variable added to the mix; we learn from Peters et al. (2018) that environmental concern is increasingly playing a role in their vehicle purchase decisions. Lai, Liu, Sun, Zhang, and Xu (2015) put forward that consumers' behavioural intention to purchase an EV is influenced by environmental concerns. Their assertion is supported by the work of Ziefle et al. (2014), who found environmental concerns to be the strongest variable of perceived benefit in the EV purchase decision-making process.

According to Schuitema, Anable, Skippon, and Kinnear (2013), consumers want to display their identity to others through the products that they buy; therefore, environmentally aware consumers are more likely to purchase an EV because it portrays an image matching the environmentally concerned self-image of the consumer. The work of Schuitema et al. (2013) derives from the self-concept theory of Sirgy (1982), where he postulates that the perception of an alignment between the product image and the consumer's self-image increases the likelihood that the consumer will purchase the product. The study of Kressmann, Sirgy, Herrmann, Huber, Huber, and Lee (2006) puts forward that consumers will show a preference for cars whose brand personality resonates with the consumer's self-concept; we

can derive from this assertion that in their vehicle purchase decision-making process, environmentally aware consumers will show a preference for environmentally friendly cars.

2.2.3.3 *Vehicle operating cost*

The estimated cost of operating a vehicle is a variable that comes into play during the vehicle purchase decision-making process (Letmathe & Suares, 2017). Lipman and Delucchi (2006) define the operating cost of a vehicle as comprising the cost of fuel, periodic maintenance costs and repair costs. van der Kuip (2011) studied the potential for EVs among lease drivers, finding that of the five attributes analysed, the monthly cost of operating a vehicle was the second-most important attribute in the vehicle purchase decision-making process. van der Kuip (2011) argues that because EVs have lower variable costs, from an operating cost perspective EVs have an advantage over regular petrol or diesel cars. Lipman and Delucchi (2006) studied the lifecycle cost of Hybrid EVs and found that over their lifetime, HEVs are less costly to the consumer than conventional petrol or diesel vehicles.

The studies discussed above speak of the economic benefits of purchasing an EV over a conventional vehicle. Lai et al. (2015) studied behavioural intentions towards EVs in Macau and their analysis investigated whether consumer perceptions of EVs were influenced by perceived economic benefits. Their study of behavioural intentions concluded that perceptions of EVs in Macau were directly affected by perceptions of economic benefits, which is corroborated by the study conducted by Sinha and Singh (2016), who observed that perceived economic benefits strongly influenced consumer perceptions.

2.2.3.4 *Familiarity/Awareness*

According to Blackwell, Miniard, and Engel (2001), the consumer purchase decision-making process is strongly influenced by what the consumer knows or does not know; they define consumer knowledge as the information that consumers maintain in memory that is relevant to the purchase and consumption of products.

In their study of the role of memory and consumer knowledge in consumer perception, O'Donnell and Brown (2011) postulate that because of the important role that memory plays in consumers decision-making processes, effective marketing information and marketing messages should be used by marketers to enhance consumer familiarity and awareness and positively affect consumers' perceptions of their products (O'Donnell & Brown, 2011).

The United States National Renewable Energy Laboratory (2016) studied consumer views on EVs in the United States. They concluded that consumers' awareness and knowledge of the benefits of EVs enhancing their perceptions of EVs is a strong precursor to their decision to purchase an EV.

2.3 Theoretical models of consumer behaviour

Around the world, the changing tastes and preferences of consumers and the rapidly increasing levels of sophistication (Blackwell et al., 2001) have prompted several researchers to investigate consumer behaviour. Some of the models frequently used to study the behaviour of consumers that the researcher will use in this study include:

- The Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975).
- The Theory of Planned Behaviour (TPB) (Ajzen, 1991).
- The Technology Acceptance Model (TAM) (Davis, 1989).
- The Value-Based Adoption Model (VAM) (Kim, Chan, & Gupta, 2007).
- Personal Innovativeness in the Domain of IT (Argarwal & Prasad, 1998).

2.3.1 *Theory of Reasoned Action*

The Theory of Reasoned Action, first put forward by Fishbein and Ajzen (1975), is a social psychology model used to understand intended human behaviour. According to Ghobakhloo, Zulkifli, and Aziz (2010), the Theory of Reasoned Action studies behavioural intentions and the interplay between the subjective norm, an individual's attitudes and behavioural intentions and the resultant behaviour.

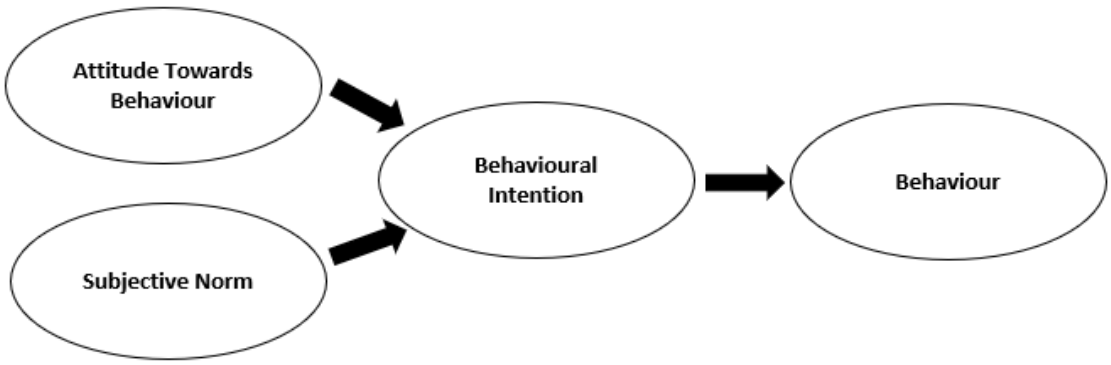


Figure 3 - The Theory of Reasoned Action (Fishbein & Ajzen, 1975)

The subjective norm refers to an individual's belief that 'most people who are important to him/her think that he/she should or should not perform the behaviour in question' (Maduku, 2010). Behavioural intention to act out a certain behaviour is the product of the subjective norm and the individual's attitude, and, according to Maduku (2010), an individual's perception of the desirability of the outcome of certain behaviours determines that individual's attitude towards the behaviour.

Mishra, Akman, and Mishra (2014) successfully applied the Theory of Reasoned Action to their study of Green Information Technology acceptance, in which they found attitudinal belief to be a significant factor influencing attitude, behavioural intentions and actual behaviour. Mishra et al. (2014) did not find any relationship between prior experience and the adoption of Green Information Technology, the relevance to this research being that EVs are a relatively new phenomenon and therefore prior experience in using them may not be common.

2.3.2 *Theory of Planned Behaviour*

Ajzen (1991) put forward the Theory of Planned Behaviour as being designed to predict and explain human behaviour in specific contexts. A key differentiator between the Theory of Planned Behaviour and the Theory of Reasoned Action is the addition of perceived behavioural control to the Theory of Planned Behaviour.

In the Theory of Planned Behaviour, Ajzen (1991) suggested three constructs of intention. [1] Attitude which is the extent to which an individual evaluates a behaviour to be favourable. [2] The subjective norm which is the perception of pressure from the person's social circles to perform the behaviour. [3] Perceived behavioural control which is the perception of how easily the behaviour can be achieved.

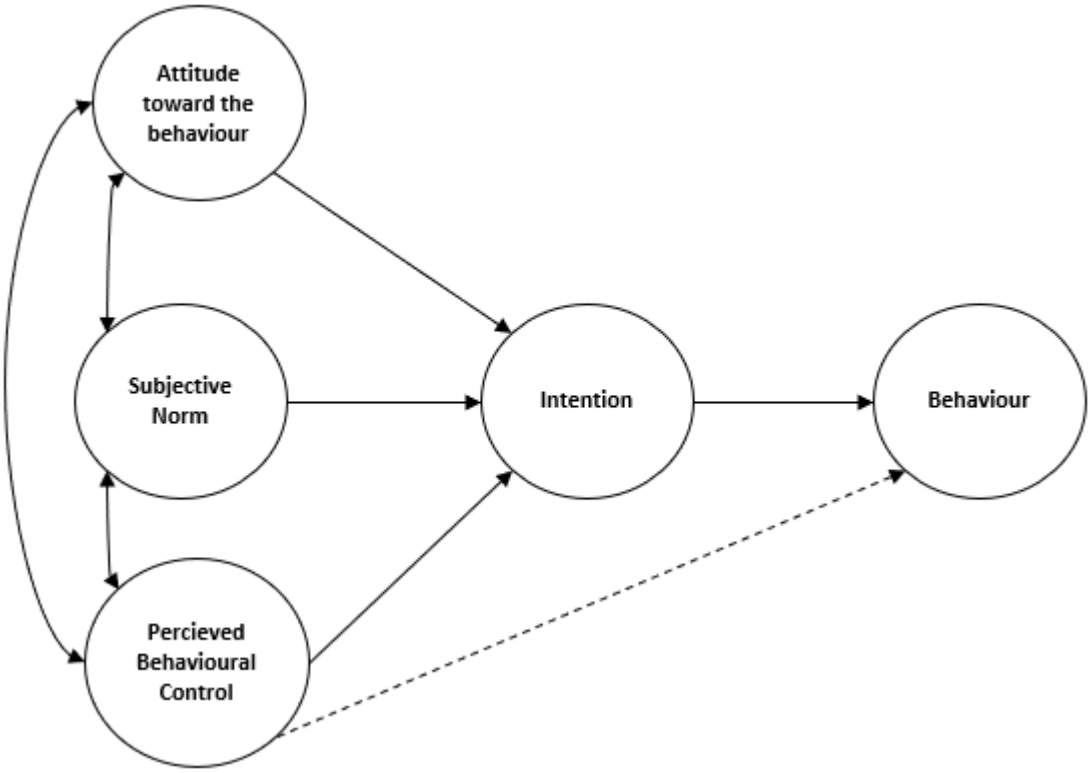


Figure 4 - The Theory of Planned Behaviour (Ajzen, 1991)

2.3.3 *Technology Acceptance Model*

According to Maduku (2010), the Technology Acceptance Model proposed by Davis (1989) models user acceptance of technology and is adapted from the Theory of Reasoned Action. The Technology Acceptance Model provides an explanation of the determinants of technology acceptance across a broad range of technologies.

In his work proposing the Technology Acceptance Model, Davis (1989) asks the question 'what causes people to accept or reject information technology'? Davis

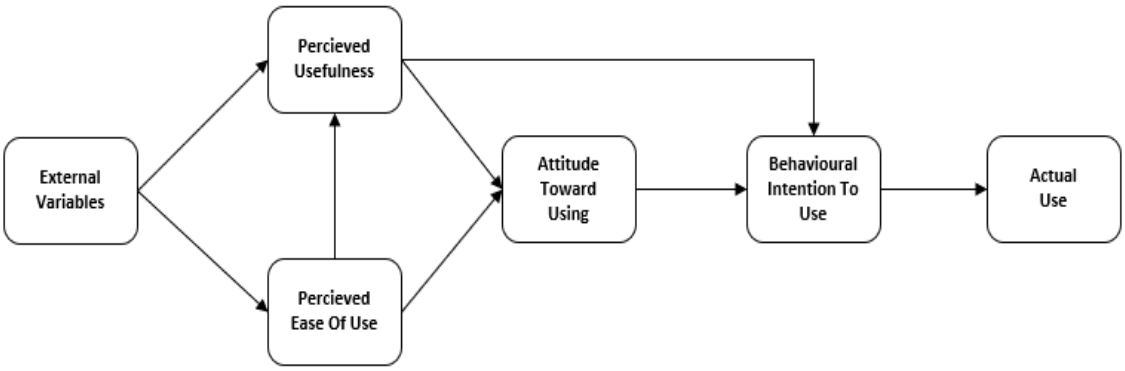


Figure 5 - The Technology Acceptance Model (Davis, 1989)

(1989) suggested that technology acceptance is the function of two variables, Perceived Ease of Use and Perceived Usefulness.

Davis (1989) provides definitions for perceived usefulness and perceived ease of use; he defines perceived usefulness as the degree to which the user believes that using the technology would add value to him/her, whereas the perceived ease of use was defined as the degree to which the user believes that using the technology would be free of effort

The Technology Acceptance Model has assumed the position of the premier model in understanding the determinants of human behaviour towards potential acceptance of technology. The strength of the Technology Acceptance Model is confirmed by numerous studies emphasising its broad applicability to various technologies (Marangunic & Granic, 2015).

An example of the broad application of the Technology Acceptance Model to various technologies is the work of Chuah, Rauschnabel, Krey, Nguyen, Ramayah, and Lade (2016), who studied the adoption of smart watches through the lens of the Technology Acceptance Model.

2.3.4 *Value-Based Adoption Model*

To aid the theoretical understanding of behaviour, Kim et al. (2007) proposed the Value-Based Adoption Model which seeks to explain the behaviour of consumers in a personal context.

The Value-Based Adoption model suggests that consumers' purchase intentions are driven by perceived value; Zeithaml (1988) described perceived value as the consumer's evaluation of the utility of a product, the evaluation is based on the perception of what the consumer receives in exchange for what the consumer gives. The study performed by Kim et al. (2007) found that perceived value is not only conditional on the cognitive elements of usefulness and fee, but also on enjoyment, which is an affective element.

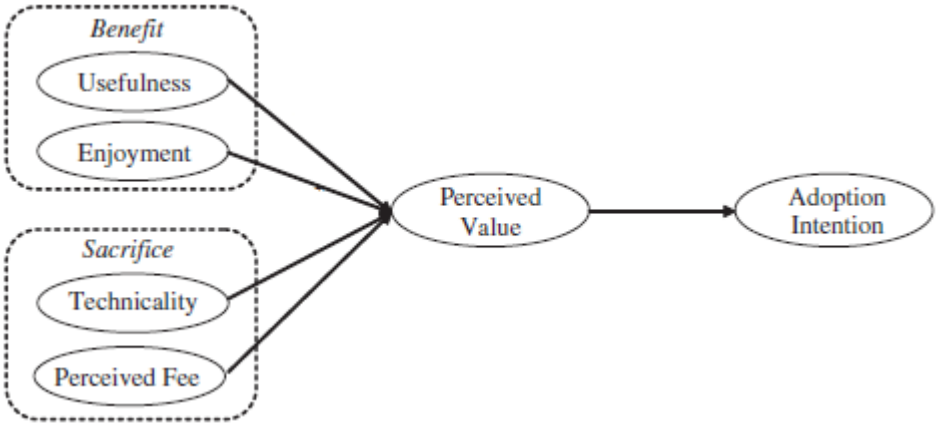


Figure 6 - The Value-Based Adoption Model (Kim et al., 2007)

According to the Value-Based Adoption model perceived value is a function of the benefit derived from and the sacrifice made to acquire the product. According to Kim et al. (2007) the benefit stems from the customer's belief that the product's attributes have some desirable functions that it can perform and the consumer's experience of immediate pleasure from using the product or any activity involving the use of the product that the consumer perceives to be personally enjoyable. Sacrifice is the monetary and/or non-monetary cost of acquiring the product (Kim et al., 2007).

Kim et al. (2007) developed the Value-Based Adoption Model to explain customers' adoption of the mobile internet from the value maximisation perspective. Their study's findings regarding mobile internet adoption demonstrate that consumers' perceptions of the value of the mobile internet is the principal determinant of their adoption intention.

From the utilitarian perspective, Thaler (2008) views customer value perceptions as a function of the product's acquisition and transaction utility. According to Thaler (2008), acquisition value depends on the value of the product compared to the outlay, while transaction value depends solely on the perceived merits of the transaction. Because customers evaluate several different attributes, price is an important, but not the sole determinant of the perceived value of a product. The view of Kim et al. (2007) is that perceived value represents an overall assessment of the product, based on which the consumer decides and on their choice behaviour.

2.3.5 *Personal innovativeness*

Argarwal and Prasad (1998) proposed the construct of Personal Innovativeness in the Domain of Information Technology as being useful in the identification of individuals who have a greater propensity to adopt technological innovations earlier than others. They define personal innovativeness as the degree to which an individual is willing to try out any new technology.

Yi, Fiedler, and Park (2006) discussed the differences in individuals' willingness to take the risk of trying out an innovation. In their study of Adopter Category Innovativeness, they point out that some people are apprehensive of new ideas and therefore hesitant to change the way they do things. The work of Argarwal and Prasad (1998) is relevant to this study because personal innovativeness, according to Yi et al. (2006), captures an individual's predisposed propensity to adopt an innovation; the relevance to this study is further highlighted by the fact that Argarwal and Prasad (1998) found a compelling correlation between personal innovativeness and behavioural intention to adopt an innovation.

Personal Innovativeness in the Domain of Information Technology derives from the work of Rogers (1983), who contends that innovations are not adopted at the same time by all individuals in a social system; rather, individuals adopt innovations in a time sequence. Rogers (1983) described this adoption time sequence by means of the following adopter categories:

Innovators: Venturesome. Individuals who are very eager to try new ideas; the innovator plays the role of introducing a new idea to a social system.

Early Adopters: Respectable. Individuals in this category are described as the people to consult with before adopting an innovation.

Early Majority: Deliberate. The early majority will adopt an innovation just before the average adopter.

Late Majority: Sceptical. The late majority tend to adopt innovations out of necessity.

Laggards: Traditional. Laggards are typically the last to adopt an innovation.

2.4 Conclusion of the Literature Review

Technological advances and environmental concerns are resulting in EVs becoming more common around the world (Bansal, Kockelman, and Singh (2016). A review of the literature demonstrates the increasingly important role that environmental awareness is playing in vehicle purchase decisions (Peters et al. (2018), as well as, in particular, the perceived environmental benefits (Lai et al., 2015) and self-image enhancement (Schuitema et al., 2013) associated with EV ownership.

Various studies have been undertaken with a view to understanding consumer attitudes towards EVs (Ziefle et al., 2014), (Carley, S. et al., 2013), and the criteria that must be fulfilled in order for the purchase decision to be made (Emsenhuber, 2012), (Kuppusamy et al., 2017), (Soltani-Sobh et al., 2017). The main themes evident in the literature point to *utility* (Maduku, 2010), (Chang & Hsiao, 2011), *perceived value* (Sinha & Singh, 2016), (Zeithaml, 1988), (Steenkamp & Burgess, 2002), (Chuah et al., 2016), and *personal innovativeness* (Argarwal and Prasad (1998) as being the strongest influencers of customer behaviour (Forsythe & Shi, 2003), (Sinha & Singh, 2016).

In South Africa the proliferation of EVs has not yet gathered momentum; therefore, understanding consumer attitudes towards EVs in South Africa is vital to the adoption of EVs. In South Africa there is a lack of previous research in this area of research therefore knowledge about consumer perceptions of EVs in South Africa is lacking. This research aims to fill this knowledge gap by answering the question, what are South African consumers perceptions about EVs in general and what are their criteria for the purchase of EVs.

3 RESEARCH METHODOLOGY

The following sections will describe the methodology and design of the research that the researcher used to understand the customer perceptions and purchase criteria of EVs in South Africa.

Following on from the discussions on methodology and design, the population and sample, and research instrument will be presented. The following two sections will discuss the procedures used for collection and analysis of the data. This will be followed by a discussion of the limitations, validity and reliability of the study.

3.1 Research methodology/paradigm

This area of research is one that is at an early stage in South Africa. Therefore, through this research, the researcher will contribute to establishing what future questions could be asked. The researcher adopted the interpretivist paradigm to explore this subject by interpreting the understanding of consumers and a qualitative approach to seek the perceptions of individuals (Thanh & Thanh, 2015). The results of this study may underlie future quantitative research (Creswell, 2003).

Creswell (2007) advocates the use of qualitative methods to develop theories when the complexities of the research topic are not adequately explored by existing theories. The researcher looked to uncover multiple meanings of individual consumer perceptions with the intention of understanding the themes that emerged (Creswell, 2003). Because the theoretical knowledge about consumer preferences for EVs in South Africa is incomplete, the researcher sought to obtain knowledge on this subject through the eyes of the consumer (Jonker & Pennink, 2010).

3.2 Research Design

Because the area of study explored by the research topic is relatively new in South Africa, the nature of this study is exploratory. Qualitative data was used to help the researcher to understand the complex descriptions of the consumers' perceptions (Wahyuni, 2012).

3.3 Population and sample

3.3.1 *Population*

The essence of qualitative studies is to identify a small number of cases from which the researcher can gain deep insight into the research topic (Patton, 1990). The population of this research is defined as South African consumers who already own a car but do not own an EV.

3.3.2 *Sample and sampling method*

The sample frame for this research is South African consumers who can afford to buy an EV if they choose to do so. The researcher sought to find complex and in-depth information on the experience and understanding of the individuals selected for this study; therefore, the purposive sample method was adopted (Devers & Frankel, 2000). The researcher was guided by Ragin and Amoroso (2011), who suggested that a good sample size for qualitative studies is 12 to 15 respondents.

3.4 The research instrument

The research instrument that the researcher used is in-depth semi-structured interviews. The aim of the interviews was to gain an in-depth understanding of the thoughts and opinions of the respondents in order to find the information necessary to answer the research question. The researcher selected semi-structured interviews because they allow the interview respondents to articulate their own perspectives on EVs (Wahyuni, 2012).

The interviews had three sections: Section one retrieved biographical information from the respondents. Section two dealt with the respondents' perceptions of EVs. Section three addressed the respondents' criteria for purchasing an EV. Sections two and three comprised open-ended questions, intended to extract complex and meaningful information.

3.5 Procedure for data collection

The interviews were scheduled at the convenience of the respondents, either at their homes or the offices. The researcher carried out a mock interview to verify that the research instrument will yield useful and relevant data (Wahyuni, 2012). The researcher took steps to ensure that the interviews were conducted in an environment that was comfortable for each respondent (Babbie, 2013).

Semi-structured interviews offer flexibility and allowed the researcher to collect in-depth and detailed feedback (Babbie, 2013). In the process of collecting the data the researcher was wary of the saturation point; Jonker and Pennink (2010) suggested that saturation point in the research process occurs when the researcher realises that he or she is not hearing anything new. This is corroborated by Saunders, Sim, Kingstone, Baker, Waterfield, Bartlam, Burroughs, and Jinks (2017), who discussed saturation as being the point at which no new data are being found and, therefore, the point at which the researcher should stop sampling.

The researcher ensured that each respondent clearly understood the aim of the research and assured them that his/her confidentiality and anonymity were guaranteed. With the consent of the respondents, some of the interviews were voice recorded (Kale & Brinkman, 2009). In addition to voice recordings, the researcher also took written notes. To enable more accurate data analysis and interpretation, the recordings were transcribed by a professional transcription service. Babbie (2013) suggested that if an interview contains open-ended questions, the answers given by the respondents must be recorded exactly as given with no attempt made to paraphrase or correct their grammar.

3.6 Data analysis and interpretation

Babbie (2013) defined qualitative data analysis as a non-numerical evaluation of observations made through in-depth interviews; according to Babbie, the purpose of qualitative data analysis is to discover underlying meanings and patterns of relationships.

Babbie makes the point that the researcher must have good insight and a strong ability to reflect if he/she is to uncover important patterns in a collection of observations.
The researcher performed a thematic content analysis during the analysis and interpretation of the data. Braun and Clarke (2006) described thematic analysis as a method of analysis that organises and describes qualitative data in rich detail by identifying, analysing and reporting patterns (themes) in the data. Thematic content analysis allowed the researcher to identify repetitive patterns in the data (Braun & Clarke, 2006). The thematic content analysis approach that the researcher adopted is derived from the following the six-step framework suggested by Braun and Clarke (2006, pp. 16-23)

Step 1: Become familiar with the data.
The researcher becomes fully immersed in the data by thoroughly reading the interview transcripts and attentively listening to the interview recordings.

Step 2: Generate initial codes.
The researcher identifies initial codes in the data that appear meaningful and give context to the conversation.

Step 3: Search for themes.
The researcher performs analysis on the codes to reveal themes.

Step 4: Review themes.
The researcher reviews the identified themes in the data in-depth and organises them logically with clear distinctions between the themes.

Step 5: Define and name the themes.
The researcher provides a name for each theme as well as a working definition that clearly identifies each one.

Step 6: Produce the report.

The researcher produces a report of the results of the data analysis in addressing the research question.

3.7 Limitations of the study

The first limitation of this study is that the stated criteria for purchase of EVs in the presentation and discussion of the results may not necessarily be an accurate predictor of actual consumer behaviour. The second limitation is that the perceptions may not be representative of the entire motor vehicle consumer market in South Africa. The third limitation is that that the sample was confined to consumers who do not own electric vehicles therefore the perceptions are not those of actual buyers.

3.8 Validity and reliability

Leedy and Ormrod (2010) introduce the validity and reliability of measurement instruments as factors influencing the extent to which learning from the study can be gleaned and the extent to which meaningful conclusions can be drawn from the research data. Babbie (2013) proposed that validity is about whether the measurements actually measure what they are intended to measure.

3.8.1 *Validity*

Creswell (2007) proposes the peer review approach as an effective strategy that he suggests should be used by qualitative researchers to ensure validity and trustworthiness. Babbie (2013) also proposed peer debriefing as an effective means of testing the researchers' thinking by involving individuals whose views on the study are impartial. Lincoln and Guba (1985) described the peer as the "devil's advocate" they further describe the peer as "an individual who keeps the researcher honest; asks hard questions about methods, meanings, and interpretations".

The researcher ensured the validity and trustworthiness of this study by employing the peer review approach because it provided the researcher with an external perspective of the research process. Guided by Pandey and Patnaik (2014) the researcher exposed this study to a disinterested peer who assisted the researcher in uncovering biases.

3.8.2 *Reliability*

Neuman (2014) proposed that reliability means dependability; he suggested that the same thing should recur under identical or very similar conditions. Babbie (2013) believes that a major hindrance to the reliability of qualitative studies is the researchers' own biases. To address these issues of reliability, Creswell (2003) proposed that the research instrument should undergo a pre-test to ensure the reliability of the study; as discussed above in the procedure for data collection and the measures suggested by (Wahyuni, 2012) to ensure reliability, the researcher conducted two mock interviews to ensure reliability. The mock interviews revealed that questions related to the respondents view of EVs in Europe did not yield data relevant to the study, the structure of the interview was amended accordingly.

To further enhance the reliability of the study the researcher recorded and transcribed the interviews and took detailed field notes to augment the interview transcripts as suggested by Creswell (2007). Green and Thorogood (2009) proposed the use of direct interview quotations in the presentation of the results to enhance the credibility of the analysis, they suggested that including raw data demonstrates the link between the researchers' interpretation and the data. In the presentation of the results the researcher has made use of direct quotations to illustrate the themes that emerged and to give weight to the reliability of the findings.

3.9 Ethical Considerations

This study was conducted to meet the ethical standards set by the University of The Witwatersrand. Respondents voluntarily participated in the study and they were fully briefed about the process that would be followed. The researcher has taken steps to ensure that the personal information of all respondents is kept confidential, no names of individuals or companies involved in this study will be disclosed to any party. All respondents are adults who signed a form in which they consented to voluntarily partake in the study.

The research was only conducted after ethical clearance was granted by the Wits Business School Ethics Committee.

4 PRESENTATION OF RESULTS

4.1 Introduction

In this chapter, the researcher presents the results from the 12 semi-structured interviews that were conducted with South African consumers about their perceptions and purchase criteria of EVs. The interviews were recorded, then transcribed to test for ease of analysis; all 12 transcripts were thoroughly analysed, and 134 codes emerged from the analysis.

The 134 codes were categorised, resulting in the emergence of broader themes. The of the results presentation and the discussion of the categories and themes follows the main research problem. The main problem is obtaining from South African consumers their perceptions about EVs in general, as well as their criteria for purchasing EVs.

To respect their anonymity and protect their identities, the 12 interviewees are discussed as Respondents 1 to 12. This chapter includes some direct quotations from the 12 respondents, which are taken from the transcripts verbatim. The presentation of the researcher's interpretations is based on the views and attitudes of the respondents as expressed by the interviewees; any language or grammatical errors in their responses have not been corrected (Babbie, 2013).

The researcher uses italics to highlight the quotes taken directly from the interview transcripts.

4.2 Perceptions of and purchase criteria for EVs

In this section of the report, the researcher presents 6 themes derived from a thorough analysis of the interview transcripts; (1) Range Anxiety; (2) Reliability of electricity supply; (3) Convenience; (4) Social Image Concern (5) The right thing to do; (6) The bottom line.

4.2.1 *Range Anxiety*

8 respondents expressed concern about the availability of charging stations to recharge, this concern emanates from the perception that EVs have a short driving range before their battery needs to be recharged. Respondents spoke about frequent visits to their rural homes and holidays that required them to drive long distances. The perceived inconvenience centred around whether they would be able find a conveniently located charging station and how long it would take to charge the vehicle. Respondent 2 was worried about his frequent trips to his parents' home in rural Free State:

> '*I get that I can charge it when I'm here in Jozi, and if I'm in Qwa Qwa, what do I do? Am I really gonna spend money on a car just to get stuck in the middle of nowhere because I can't recharge the battery?*' **[Respondent 2]**

Consumers are accustomed to a level of convenience in the ability to plan the refuelling schedule of an internal combustion engine vehicle based on their knowledge of how many kilometres they drive. The respondents compared their experience of refuelling conventional internal combustion engine vehicles against their perception of the charging requirements of EVs, the perception is that the battery range of a single charge of an EV is far shorter than the mileage that is achievable on a single tank of petrol or diesel:

> 'W*hat comes to mind is the inconvenience of having to charge this thing more times than I need to fill up a petrol tank or diesel tank*' **[Respondent 6]**

Anxiety about the short driving range of EVs was not only limited to long-distance driving, respondents also expressed concern about charging infrastructure in and around major cities and the need to recharge frequently in urban areas; Respondent 4 expanded on this:

> '*I do know that I've only seen very few places, where you have these electrical booths. But local areas, smaller areas, even in the suburb where I stay, I haven't seen not one single one. We still have a far way to go where that's concerned, because you have to make it convenient for people*' **[Respondent 4]**

Theme Summary

The results reveal that consumers have a high-level awareness of the functioning of EVs in that they are powered by batteries that need to be recharged. The perception of consumers is that the driving range offered by EVs is too short to meet their needs when the need arises to drive a long distance. This perception is an inhibitor to the purchase decision and consumers will not likely buy an EV as their primary vehicle.

4.2.2 *Reliability of electricity supply*

South Africa's recent history of electricity supply outages was a point of discussion that was brought up by 7 of the 12 respondents when responding to the question about inconvenience; they identified load shedding as a concern that would be a barrier to them making the decision to buy an EV. Respondent 7 compared a near-empty petrol tank to a near-depleted EV battery:

> '*I think that here in Kyalami we were load shedded more than anywhere, but at least if my car is on reserve I can drive slowly to Engen garage. What if they are load shedding us in Midrand and my Electric car is left with 1 kilometre?*' **[Respondent 7]**

Two of the 7 respondents highlighted possible spikes in electricity demand during the peak early evening hours; Respondent 11 added the dimension of the additional strain on the national power grid during the winter months:

> '*I'm imagining a situation where it's winter and you know in winter we all use our heaters, then we are all recharging our cars when we get home after work, I mean can you imagine there will be chaos, they will start load shedding again*' **[Respondent 11]**

One of the respondents suggested that the growing success of EVs in Europe could be attributed to the availability of charging infrastructure and the stability and reliability of electricity supply; he described his experience with EVs in Europe and compared it to South Africa:

> '*Look, I'm very interested in electric cars, I think they're the future, my only issue is where we would recharge the things. I travel to Europe three to four times a year*

and everywhere you go there's a little outlet where the people can plug their car in to recharge, I don't see that here. And I suppose they can do that sort of thing in Sweden because they don't have any power supply problems whereas here we have load shedding, who knows what Eskom is going to do?' **[Respondent 9]**

Theme Summary

The results reveal that consumers believe that there is insufficient infrastructure in the country to support recharging requirements; coupled with this, they perceive South Africa's power supply to be too unstable, hence the purchase of an EV would pose a risk to their mobility.

4.2.3 *Convenience*

While all the respondents spoke of convenience when they described their perceptions, 3 of the 12 also saw factors of inconvenience that they associate with EVs. EVs would be ideal for consumers that do not need to drive long distances or as a second vehicle for consumers that have an internal combustion vehicle as their primary vehicle. The perception of the convenience of a vehicle that would be ideal for short distance local trips was expressed by Respondent 7:

'*The furthest my wife drives is to visit her mother in Vosloo [Vosloorus], and even that happens once a month, so actually the furthest she goes is to drop the kids at school, that means she'll never have to pour petrol and we can recharge right here in the garage*' **[Respondent 7]**

Seven respondents suggested that the idea of refuelling their vehicle at home was very appealing to them. Respondents 3, 9 and 10 strongly highlighted that home-charging was a significant dimension of convenience, while Respondent 10 also saw inconvenience in the length of time it might take to charge an EV:

'*I can do charges at my home or wherever it is. These things are having a range of plus minus 400km and where I stay is about 20km from work, just do the maths, are you kidding me? It's not a brainer*' **[Respondent 3]**

'*Immediately I think about the convenience of home recharging, I mean for me, I would never have to go to a petrol station*' **[Respondent 9]**

'*I think it would be great to be able to re-fuel my car at home, but I've read somewhere that it takes a few hours to recharge, so that's not good from a time and convenience perspective*' **[Respondent 10]**

Respondents also discussed the inconvenience dimension of urban commutes; consumers expect EVs to fit into or augment their lifestyles and not force them to change the way they do things. They spoke about inconvenience in having to deviate from set routines to recharge an EV:

'*So it's a convenience factor, at the moment, you're just driving to the garage, and you fill your tank and it takes under five minutes. Whether I have to now go and park my vehicle and wait two or three hours (to recharge), it's going to impact me. If I now have to go and drive somewhere and go and sit outside of my normal route or outside of my normal pattern it's going to disrupt me, and it's going to put a negative spin on my take on the whole electrical concept*' **[Respondent 4]**

According to Respondent 6, the batteries in EVs deplete quickly and therefore they need to be charged frequently; he balanced this perceived inconvenience with the convenience of charging at his home:

'*Even though I'm charging every day, I'm charging at home so that's cool*' **[Respondent 6]**

Theme Summary

South African consumers perceive that EVs offer convenience in terms of home-charging which eliminates the need to refuel at a filling station, thus making EVs ideal for city driving, which is characterised by short trips. On the other hand, there is a perception of inconveniently located charging stations and overly frequent recharging. The interviews revealed that for all 12 respondents, convenience is a strong motivating factor in their decision to purchase an EV, while the perceived inconvenience associated with owning

an EV was expressed by only 3 respondents and did not come across as a hindrance to the purchase decision.

4.2.4 *Social image concern*

Another theme that came out very strongly was the perceived impact on the social image of the respondents that owning an EV would have, and how they perceived the extent to which their decision to purchase an EV would be accepted by the people they considered to be important. Ten of the 12 respondents felt that driving an EV would tarnish their social image or fail to win the acceptance of the people that mattered to them. Respondents were very critical of the impact that an EV might have on their image:

> '*What will people who see me say about me when I arrive with this electronic car? This influences me coming from a background of poverty, I have to show my success to demonstrate to my mother, my father, my family, my friends that as a young black man I have made it, I can't show my success with an electronic car, what will people say?*' **[Respondent 3]**

Respondents also felt that EVs could advertise them as environmentally conscious consumers; they saw that it might give them the opportunity to showcase themselves as doing their part to protect the environment:

> '*Obviously the look is one thing and right now the only one I know is that Nissan Leaf and it doesn't look nice, for me at least, it doesn't suit my style, but then I also want to say to people, this is my contribution to the environment and you should follow suit*' **[Respondent 4]**

Respondents expressed that they would need to see other people's satisfaction with EVs before taking the risk for themselves. The view of the respondents was that they were not willing to '*set the trend*' or '*be a guinea pig*'. EVs would have to be well established and accepted as trendy before they will consider buying one:

'*No, I'm not an early adopter, I'm perhaps old school, so the answer is, no. It is of interest. But I wouldn't be in the first batch, maybe the second batch? Or even third batch?*' **[Respondent 10]**

'*You don't see them on the roads and that tells you something, then my perception is there's something that is not ok with these things, why are people not buying them?*' **[Respondent 3]**

Some respondents felt that an EV would be good for their image and he would gain the approval of the people that are important to them. The responses highlight to the researcher that consumers feel strongly that they expect their car too be an expression to the outside world of who they are:

'*The car is your external skin, what you clothe yourself as, a car is an extension of that as well so you look good in it, an extension of you or what you clothe yourself as so when it comes to an electric car that's also what comes to mind, what you want to be seen as, for me personally I think an electric car can make some kind of a positive statement about me*' **[Respondent 11]**

Respondents also made it clear that brands matter. As discussed above, most feel that driving an EV would damage their social image. However, this concern is not as strong when the EV in question is a premium brand vehicle, consumers feel that their social image would not be tarnished by a premium brand EV:

'*It depends, for example if it's a BMW electric car it's ok for my image. You must show that you are at that level to be accepted at that level. The world wants finished products, even if I lose my house or one of my contracts my car is a statement to my business partners that things are ok, that I am in control*' **[Respondent 7]**

Theme Summary

Most consumers believe that by driving an EV their social standing will be negatively impacted, although some believe that an EV will portray a positive image about them. The majority were wary of their personal brand and the negative impact of being seen

driving an EV of that brand. Consumers in South Africa would rather wait to see whether EVs become accepted than be the trend setters.
If faced with the choice between a vehicle with an internal combustion engine and an identical EV, most South African consumers are unlikely to opt for the electric derivative because the electric derivative is perceived to be inferior in terms of social appeal to the vehicle with an internal combustion engine.

4.2.5 *The right thing to do*

Environmental concern is a theme that came across strongly in 9 of the 12 interviews; 8 of the 9 respondents who discussed the environmental concern dimension in-depth, did so with no prompting from the researcher. Respondent 1 discussed her overall concern for the environment and suggested that she would look cool in what she called an 'environmentally trendy' car:

> '*Electric cars are trendy right? They're environmentally trendy and I'm always going with the trend and I'm looking at the environment, right down to detergents and even electric cars, it's the right thing to do isn't it?*' **[Respondent 1]**

One of the respondents strongly expressed his concern for the environment to the extent that he broadened the scope of his discussion around the environmental concern dimension, more than environmental benefit; he suggested that he saw his purchase of an EV as a contribution to sustainability:

> '*We then begin to see a form of sustainability over a period of time as opposed to the very extractive production of oil which is a finite resource and there's only a limited amount that we can extract so this seems to be a lot more sustainable from an economic or ecologic perspective*' **[Respondent 5]**

Respondents also displayed awareness that harmful emissions will be reduced in South Africa if EVs replace internal combustion engines, even though South Africa uses coal-fired power stations that emit harmful gasses to produce electricity:

> '*I just want to get to point B and most important is that I care about the environment, even though in the South African context, we produce electricity from coal. If you*

remove all these combustion engines off the road, you are cutting back on emissions, the power generation remains what it is, but you are removing combustion engines off the road' **[Respondent 6]**

One respondent was critical of South African consumers' appreciation of the need to reduce carbon emissions; he felt strongly that although the adoption of EVs will yield environmental benefit, in South Africa the average consumer does not know of or have an appreciation for the need to reduce emissions. Therefore, his decision to buy an EV would only be a drop in the ocean and have no meaningful impact in reducing carbon emissions:

'*How many people really know about emissions? How many people even know about the scandals of the people who have been penalised for lying about emissions? You're talking to people who are staying in Soweto, next to a mining dump. You want to tell them about emissions? He doesn't even know what comes out of that mining dump. You're talking to people who are staying in Vosloorus and Katlehong where there's possible wetland underneath the ground*' **[Respondent 2]**

The views of Respondent 2 regarding individual versus mass adoption of EVs were echoed by another respondent who expanded on the notion of the lack of knowledge of harmful emissions by discussing the lack of exposure to the realities of carbon emissions:

'*Then, another dimension, South Africans don't travel. I've been to cities that have emission problems, when you just get outside you can smell that something's not right in the air. Now South Africans. A general South African has never moved from KZN, to Jo'burg, and he's thirty. Does he care about emissions*?' Respondent 3.

Three of the 12 respondents indicated that even though they did understand that by driving an EV they would be contributing to emissions reduction, it would not influence their purchase decision. One of the 3, suggested that this was the case because he lacked the knowledge that would influence his thinking otherwise:

'*I am not an environmentally conscious person, not at all, so that wouldn't come into play for me, and it's more that I don't know than me not caring, I've heard about the ozone layer since I was in standard 6, and recently I heard that the*

ozone layer is healing itself, and I've heard that electric cars don't cause damage to the ozone layer, it doesn't really worry me' **[Respondent 11]**

Theme Summary

South African consumers perceive the widespread adoption of EVs to be beneficial to the environment. The majority of respondents displayed a high level of environmental concern; however, this concern is unlikely to positively influence their decision to purchase an EV when weighed against all other factors. A few of the respondents showed indifference to the reduction in carbon emissions that accompanies EV ownership; for these consumers concern for the environment plays no part in their purchase decisions. The results also highlight the fact that a large number of South Africans living in urban areas are still fighting poverty and struggling to meet basic needs, thus placing concern for the environment outside their radar of consideration; for this section of the population environmental concern would not be a contributing factor to their decision to purchase an EV.

4.2.6 *The bottom line*

The final theme that emerged strongly from the analysis of the codes was the financial implications for the consumer. All 12 respondents reported perceived cost saving in the total cost of ownership of an EV, although some were also wary of the cost of purchasing an EV:

'*I know that they are expensive to buy and obviously I want a healthy environment, but I don't want to do it at the expense of my own pocket. Because at the end of the day, my bottom line, is what puts food on the table. So if I can save a couple of rands in terms of the vehicle that I need to get around in, if they can make it cost competitive with a normal vehicle then why not, you would go for the electric rather than fuel*' **[Respondent 4]**

Four respondents highlighted that they would expect the cost of maintenance of a full EV to be lower because of the absence of an engine that requires regular servicing, making the point that this would be a major draw towards an EV:

'*I think there will be cost savings in refuelling, it's an electric motor, there are no moving parts, so savings in terms of the periodic maintenance, that internal combustion engines have, whereas a pure electric - not a hybrid or a plug-in hybrid - pure electric, presents the cost saving of not having to service a vehicle every so often and I think that will be a big pull factor for me*' **[Respondent 6]**

The views of Respondent 6 were echoed by another respondent who suggested that the benefit of the low cost of maintaining an EV outweighs any other benefit:

'*Resources are limited in terms of you as an individual, and you have to now consider how you plug here and there and derive the maximum benefit that you can get. Automatically there is cost savings of having such a vehicle, that is why it will always outweigh any other thing, in terms of maintenance cost, because I'm using the current petrol car as a base*' **[Respondent 3]**

Respondent 5 again broadened the discussion and suggested that more economically savvy consumers would have a greater propensity to purchase an EV because they would be able to derive more long-term benefits:

'*If I had R100 today, do I spend it on something that's a luxury, or spend it on something where I derive a bit better utility? And I think in the future, people are going to become a lot smarter where people will say the long-term benefit of an electric car far exceeds the short-term cost, which I have to outlay upfront*' **[Respondent 5]**

Fuel efficiency and the saving on monthly petrol or diesel spending was a dimension that was brought up by all the respondents; one respondent described his swapping a vehicle that had a high fuel consumption with his current vehicle, which is very fuel efficient. He then suggested that given the opportunity to reduce this spending even further, he would not hesitate:

'*If I look at numbers, I don't spend anything less than R2,500 a month, and I bought my car because of efficiency, because I have a diesel car right now. Now I'm so happy with this one, it gives me 1,100 k's for a tank, so I pour diesel twice a month, literally. If you come here and you tell me, with an electric car you will not spend the*

amount of money you're spending now, I will jump. And it would be number one in my consideration' **[Respondent 2]**

Respondent 1 discussed her view of the current and future situations in South Africa; her perception of Electric Cars in South Africa today is that they are elitist, although she believed innovation will result in the price of EVs reducing over time, thus making them more accessible and offering consumers the benefit of low-cost and low-maintenance cars:

'*Look, from what I know, it's, I suppose, at a stage where the curve that the cost of technology follows, so it's at that point currently still, where electric cars are beyond the reach of most. And for me, it's always been for the elite, where you could if it's a second car, and yet actually having an EV would be more cost effective, I think EVs is ultimately low maintenance and low cost*' **[Respondent 1]**

Of the 12 respondents, 10 perceived the cost of electricity to be lower than the cost of petrol or diesel; one respondent spoke more holistically about the cost of maintaining and refuelling an EV. He discussed the cost of electricity and his household consumption of electricity relative to the cost of petrol in the context of charging an EV at home:

'*The immediate benefit to me that I can see would be fuel cost savings... Less 800 to 900 bucks per week, so that can amount to 3600 per month roughly that I can re-direct elsewhere*' **[Respondent 11]**

Theme Summary

The perceptions of high purchase prices, fuel cost savings and low maintenance costs are the financial implication dimensions that strongly emerged from the interviews. All 12 respondents felt strongly that this theme outweighs all the others and would be the main reason for their EV purchase decision.

The result of the analysis of all the interviews reveals that all the other criteria become relevant only if the purchase price is competitive relative to a similar vehicle with an internal combustion engine.

4.3 Summary of the results

Although the consumers in the sample reside in Johannesburg where the lifestyles and patterns of daily travel would suit the use of EVs the results presented above suggest that the motor industry in South Africa will face a significant challenge in the marketing of EVs to consumers in South Africa.

The table below is a summary of the results of the analysis of all the interviews. An in-depth discussion of these results follows in chapter 5.

	Theme					
	Range Anxiety	Electricity Supply	Convenience	Social Image Fit	The right thing to do	The bottom line
Respondent 1	Inadequate charging infrastructure.	Load Sheeding Concern	It takes too long to charge.	Yes	Yes	I can save on fuel and maintenance.
Respondent 2	Inadequate charging infrastructure.	Load Sheeding Concern	Good for short distances.	No, EV's do not portray success	No, South Africans don't care.	I can save on fuel and maintenance.
Respondent 3	Unsure	Stable but unreliable at times	I can charge at home.	No, what will people say?	No, South Africans are not exposed to pollution	I can save on fuel and maintenance.
Respondent 4	Inadequate charging infrastructure.	Stable but unreliable at times	It takes too long to charge. Good for short distances.	No, EV's are not my style	Yes	I can save on fuel and maintenance EV's are expensive to purchase
Respondent 5	Unsure	Stable enough	Good for short distances.	Yes	Yes	I can save on fuel and maintenance.
Respondent 6	Inadequate charging infrastructure.	Stable but unreliable at times	I will have to charge too frequently	Yes	Yes	I can save on fuel and maintenance.
Respondent 7	Inadequate charging infrastructure.	Load Sheeding Concern	I can charge at home. Convenient for short commutes.	No, I have to portray success	Yes	I can save on fuel and maintenance.
Respondent 8	Inadequate charging infrastructure.	Load Sheeding Concern	I can charge at home.	No	Yes	I can save on fuel and maintenance.
Respondent 9	Inadequate charging infrastructure.	Load Sheeding Concern	I can charge at home.	Yes	Yes	I can save on fuel and maintenance.
Respondent 10	Unsure	Stable enough	I can charge at home.	No	Yes	I can save on fuel and maintenance.
Respondent 11	Inadequate charging infrastructure.	Load Sheeding Concern	Good for short distances.	Yes	No, I'm not environmentally conscious	I can save on fuel and maintenance.
Respondent 12	Unsure	Load Sheeding Concern	It takes too long to charge.	No, EV's are for women,	Yes	I can save on fuel and maintenance.

Table 1 - Summary of results

5 DISCUSSION OF THE RESULTS

5.1 Introduction

In this chapter, the researcher will perform an analysis of the findings of the research; the researcher will explore the contradictions and correlations between the research finding and the literature.

The researcher will analyse the six themes that emerged in Chapter 4 against the literature on this subject, the six themes that emerged in chapter 4 were:

1. Range anxiety
2. Reliability of electricity supply
3. Convenience
    - EV recharging
    - Lifestyle/Utility
4. Social image concern
    - Approval of the people that matter
    - My social image
5. The right thing to do
    - Concern for the environment
6. The bottom line
    - EV pricing
    - Saving on fuel costs
    - Saving on maintenance costs

A review of the literature on consumer perception in 2.2.3.1 above highlighted that perception as a precursor to the purchase decision is based the perceived risks (Forsythe & Shi, 2003) and perceived benefits (Sinha & Singh, 2016) that consumers ascribe to the purchase and ownership of the product.

The discussion of the results below is guided by the literature by Forsythe and Shi (2003), who put forward six dimensions of the perceived risk that a consumer evaluates prior to making a purchase. These dimensions are: (1) Perceived Financial Risk, (2) Perceived

Product Performance Risk, (3) Perceived Social Risk, (4) Perceived Psychological Risk, (5) Perceived Physical Risk, (6) Perceived Time/Convenience Loss Risk. The discussion is also guided by the work of Sinha and Singh (2016), who categorised four dimensions of perceived benefit, namely: (1) Perceived Product Offering (2), Perceived Convenience, (3) Perceived Cost Savings, (4) Perceived Enjoyment/Hedonic Benefit.

The discussion on range anxiety in 4.2.1 above highlighted that in expressing their perceptions about EVs, the respondents raised their concerns about the readiness of infrastructure in South Africa regarding their decision to purchase an EV. The results reveal that the respondents were particularly concerned about the lack of conveniently located charging infrastructure and the stability of electricity supply linked to load shedding.

5.2 Range Anxiety

The results indicate that the anxiety about the short driving ranges of EVs linked to concerns about the availability of charging stations would be strong inhibitors against their decision to purchase an EV. These perceived disadvantages are in line with the findings of Carley, S. et al. (2013), who found range anxiety to be a major barrier against decisions to purchase EVs.

The range anxiety displayed by the respondents is driven mainly by the fact that they do not see charging stations as they go about their daily business; this finding is in line with the work of Ziefle et al. (2014), who found that German consumers saw the unavailability of charging stations as a technological barrier to their decision to purchase an EV. South African consumers report that seeing lots of petrol stations in urban areas as well as in remote areas on long-distance commutes meant that they see little risk of running out of fuel while driving a petrol or diesel-powered vehicle. However, they perceive the short driving range of EVs to be a product performance risk that they are not willing to take, given the lack of charging stations in South Africa.

5.3 Reliability of electricity supply

Load shedding is a countermeasure in response to a constrained power system used by Eskom (2015) to reduce the load on the national power grid through controlled and

scheduled power outages. The respondents perceived the risk of being unable to charge their vehicles as a result of load shedding in the areas they live in. Concern was also raised that although Eskom has not conducted load shedding in over a year, the widespread adoption of EVs could put additional strain on the national power grid and result in the resumption of load shedding.

The literature review of the study of Vassileva and Campillo (2017) highlights an analysis that reveals the impact on the power distribution systems of the widespread adoption of EVs in Sweden; they found that electricity consumption patterns reflect a significant increase in the consumption of electricity during peak evening hours when EVs are being charged. Vassileva and Campillo (2017) go on to advocate the implementation of load management measures by electricity suppliers that will ensure that the uncontrolled charging of EVs during peak hours does not interfere with supply.

The concerns raised by the respondents in this study are therefore relevant as a perceived convenience loss risk and a factor that would have a strong influence against their decision to purchase an EV.

5.4 Convenience

The results presented under the convenience theme in 4.2.3 show a significant degree of convenience benefit that consumers perceive to be associated with EV ownership. A the review of the literature in 2.3.3 above highlights the Technology Acceptance Model in which Davis (1989) puts forward the two determinants of acceptance of technologies as Perceived Ease of Use and Perceived Usefulness.

5.4.1 *EV recharging*

The results reveal that the ability to charge their car at home is highly appealing to consumers and strengthens the perception of convenience discussed by Sinha and Singh (2016); this positive perception is enabled by the perceived ease of use put forward by Davis (1989) in the Technology Acceptance Model as a determinant of acceptance. In discussing the need to recharge an EV away from home, the consumers in this study questioned where charging stations might be located and whether there

would be sufficient charging points at a station to support a number of vehicles simultaneously. The respondents also expressed their concern that the time it takes to recharge an EV's battery to full capacity is too long, so only charging at home would be convenient.

Li, Long, Chen, and Geng (2017) in their study of factors influencing consumer intentions to adopt EVs found that part of their reason for resistance to EVs was that consumers were accustomed to long intervals in internal combustion engine vehicles before there was a need to refuel at conveniently located petrol stations. Li et al. (2017) found that consumers who had driven an EV for more than 3 months tended to adjust their driving patterns and range preferences to ensure that they only needed to charge at home.

In analysing the effect of the positive attitude to home charging on purchase decisions against the Theory of Reasoned Action put forward by Fishbein and Ajzen (1975), consumers' perceptions of the desirability of the outcome of the decision to purchase an EV is strongly influenced by the perceived convenience associated with home-charging and not have to refuel at a filling station; this makes EVs more desirable to consumers than conventional internal combustion engines, although from the study conducted by Li et al. (2017) it is clear that that practical experience with or exposure to EVs will play an important role in influencing convenience perceptions in South Africa.

5.4.2 *Lifestyle/Utility*

Another dimension revealed by the results is that of the perception that the EV is a city vehicle ideal for short trips. Linked to this is the perceived convenience of home charging, consumers see this as an added convenience factor that would eliminate the need to go to a petrol station to refuel their vehicle.

Consumers see the perceived convenience of an EV as a second car in the home or a vehicle to be used solely for short urban commutes as outweighing the perceived loss of convenience associated with range anxiety, as discussed in the literature by Carley, S. et al. (2013). The perceived product performance risk of a short driving range in the context of a city-only vehicle is replaced by another perceived convenience benefit. This considers

an EV, instead of an internal combustion vehicle, as a second vehicle in the household for urban commuting. This analysis derives from the concept of perceived usefulness as put forward by Davis (1989), who proposed that perceived usefulness is the degree to which the use of a technology is perceived by the user of that technology to add value. The results are in line with the literature by Kim et al. (2007), who put forward that perceived value is a function of the benefit derived from and the sacrifice made to acquire a product. The consumers in this study indicated a willingness to make the necessary financial sacrifice to acquire this new technology based on the benefit derived from the ability of an EV to augment their lifestyle by providing convenient urban commuting

5.5 Social image concern

The literature on the Theory of Reasoned Action put forward by Fishbein and Ajzen (1975) and the Theory of Planned Behaviour proposed by Ajzen (1991) and discussed in the review of the literature in 2.3.1 and 2.3.2, respectively, form the basis of this discussion on the perceived social risk that consumers attach to the decision to purchase an EV.

The results presented under the social image concern theme in 4.2.4 above strongly indicate that the consumer decision to purchase an EV is heavily influenced by the degree of importance that the consumer attaches to the approval by others of his/her decision to purchase the EV. This finding supports the literature by Li et al. (2017), who studied the role of individual perception of pressure from external references and found this pressure to be a significant influencer of the decision to purchase an EV.

The results validate the assertion of Fishbein and Ajzen (1975) and Ajzen (1991) that the subjective norm, defined as an individual's belief that 'most people who are important to him/her think that he/she should or should not perform the behaviour in question' is a strong influencer of behaviour. Consumers expressed that the perceived pressure from their social circles to be seen to be successful in life will very strongly influence their decision to purchase an EV.

The researcher deduces from the results that consumers are are intent on displaying their success in life by, among other things, the type of motor vehicle that they choose to buy. This was expressed by several respondents:
"*We are so desperate for success and attaining the things we've been denied, that whatever we have access to, we perceive as success*" **[Respondent 4]**;
"*If you have made it in life, as a black guy, brand? BMW*" **[Respondent 3]**;
"*I can't explain it, I'm a chartered accountant, I should have known better but the first thing I did when I passed articles was an act of insolvency, I bought a brand-new BMW*" **[Respondent 7]**
This theme was consistently repeated with consumers indicating that the approval by family, friends and even people unknown to them of the car they drive is very important.

The need to display success means that South African consumers will only consider an EV once EVs are acknowledged by society as symbols of success. The results reveal that South African consumers would fall into the category of late majority described by Rogers (1983) in the literature on the Diffusion of Innovation. Rogers (1983) described people in this category as those that will not adopt an innovation until pressure from their peers motivates them to do so. Late Majority consumers require social acceptance of the innovation before they are convinced that it is acceptable to adopt the innovation.

Consumers believe that to be seen driving an EV would be detrimental to their social image because the car they drive is a statement of who they are and their standing in society. According to the respondents, EVs are not perceived to be stylish or trendy; therefore, because of the perceived social risk and because they feel pressure to project an image of success they would not consider an EV as an option unless the brand of vehicle is recognised as trendy and the aesthetic of the vehicle is appealing.

5.6 The right thing to do

The influence of environmental awareness and concerns on consumer behaviour and on the decision to purchase an EV, has been investigated by several researchers. The study by Jansson et al. (2017) highlighted that consumers are increasingly looking for ways to

reduce their individual carbon footprint through the adoption of low carbon emission products such as EVs.

The results of this study support the study by Schuitema et al. (2013), that by making the decision to buy an EV consumers want to be seen to be doing good to the environment; consumers also believe that by purchasing an EV they can show others their environmental self-identify, because according to Kressmann et al. (2006) they show a preference for cars whose brand personality resonates with the self-concept of the consumer.

Even though consumers express concern for the environment their purchase decisions are not driven by environmental concern to the extent that an EV becomes a viable option even though they acknowledge that it is the right thing to do. Therefore, the results of this study contradict the literature by Lai et al. (2015), who found that people's intentions to buy an EV are influenced by environmental concerns. The respondents expressed that they are concerned about the harmful impact of motor vehicle exhaust emissions on the environment and owning an EV would be good because it means that their contribution to damaging the environment would be reduced but this would not drive their purchase decision in respect of EVs.

5.7 The bottom line

The results highlight several dimensions related to the perceived financial risk and cost savings that consumers associate with EVs. Consumers believe that the purchase price of EVs is prohibitive, to the extent that they are perceived to be elitist and only for consumers who can afford a second car. This perception of financial risk is enough to put off consumers who, given the other considerations in their decision to buy an EV, would rather spend their money on an internal combustion engine vehicle.

The results indicate that the fuel saving dimension is inconsistent with some previous studies. Carley, S. et al. (2013) found that American consumers do not value the potential savings on fuel expenses that owning an EV brings; the results of this study indicate that South African consumers are acutely aware of the potential cost savings to the extent that

this is a motivating factor towards the purchase of an EV. Most consumers feel that saving on fuel would be a major deciding factor in the decision to purchase an EV.

Carley, S. et al. (2013) suggested that fuel and maintenance cost savings associated with EVs are the key tangible benefits of owning an EV. In support of the study by van der Kuip (2011), consumers highlight this perceived economic benefit as a major influencing factor in their decision for or against an EV. The finding of Lai et al. (2015) who found that the perception of EVs is directly influenced by the perceived economic benefits associated with their operating and maintenance cost savings corroborates the findings of this study.

5.8 Conclusion

The purpose of this chapter was to discuss and analyse the themes that emerged from the coding process undertaken on the interviews conducted for this study. These themes, linked to the research problem, were compared with previous studies.

Main problem

To find out from South African consumers what their perceptions are of EVs in general and their criteria for purchasing EVs.

5.8.1 *Findings*

The findings of this study are as follows:

5.8.1.1 ***Perceptions***

5.8.1.1.1 ***Range Anxiety:***

- The consumers' perception of EVs is that their battery capacity is insufficient and therefore depletes too quickly, thus resulting in the need for frequent charging.

5.8.1.1.2 ***Reliability of electricity supply:***

- Consumers are wary of South Africa's history of instability in power supply and are concerned about the potential impact to their mobility in the event of scheduled or unscheduled power outages.

5.8.1.1.3 ***Perceived Convenience:***

- The consumers' perception of EVs is that they are convenient for urban use and would be ideal as a vehicle that is not required to do long trips with extended recharging intervals.

5.8.1.1.4 ***Perceived Social Risk:***

- The consumers' perception of EVs is that they are neither stylish nor trendy enough to win the acceptance of the people in their social circles.

5.8.1.1.5 ***Perceived Environmental Benefit:***

- The consumers believe that EVs are environmentally friendly and that buying an EV instead of an internal combustion engine vehicle contributes to the greater good by lowering harmful exhaust emissions.

5.8.1.1.6 ***Perceived Cost Saving:***

- The consumers perceive EVs to be cost effective in terms of the lower costs of operating and maintaining an EV than an internal combustion engine vehicle.

5.8.1.2 ***Purchase Criteria***

5.8.1.2.1 *Cost Benefit*

- Given the choice between an EV and an internal combustion engine vehicle, consumers will purchase an EV if the cost of purchase is in line with the cost of a similar internal combustion engine vehicle.

5.8.1.2.2 *Convenience Benefit*

- Consumers in urban areas will purchase an EV either as a primary vehicle in the household that will be used for urban driving only or as a secondary vehicle in the household for urban driving, while the primary vehicle is used for longer trips.

5.8.1.2.3 *Social Image Benefit*

- Consumers will only consider an EV as an option if it satisfies the need to maintain his/her social image; the brand and aesthetic appeal of the vehicle will be the deciding criteria. An important dimension of this theme is that consumers will only consider buying an EV if EVs are regarded as a symbol of success by their peers.

5.8.1.2.4 *Environmental Concerns*

- South African consumers are unlikely to choose to buy an EV solely on the strength of the environmental benefit offered by EVs. Concern for the environment will play a part in the decision to purchase an EV but it will not be one of the decision criteria.

6 CONCLUSIONS & RECOMMENDATIONS

6.1 Introduction

In this chapter, the researcher provides a summary of the findings and conclusions of this study that the researcher has come to. The researcher also offers recommendations based on the outcome of this study. Finally, the researcher will make suggestions for further research into this subject.

6.2 Conclusions of the study

The purpose of this study was to investigate South African consumers perceptions of EVs in general and their criteria for purchasing EVs. Twelve semi-structured interviews were conducted with consumers and for ease of analysis the interviews were transcribed to text. The researcher proceeded to analyse the transcripts by means of a thematic content analysis. The researcher undertook a process of coding the transcripts and the thematic content analysis revealed 6 themes related to the perceptions that consumers have of EVs. This study aimed to fill the gap in the research in this field of study and provide future researchers with a foundation on which to build.

6.2.1 *Consumer perceptions and purchase criteria of EVs in South Africa*

There can be no doubt that there is a global shift towards the electrification of mobility and although South Africa represents a very small percentage of overall global motor vehicle sales, the South African automobile market is the largest on the African continent; the importance of the South African market to global motor vehicle manufacturers is evidenced by the presence of manufacturing facilities of 7 of these multinationals. As discussed in 1.4.4, all 7 of these manufacturers have stated their intention to significantly increase the number of EVs they sell in every market they operate in globally and South Africa will be no exception. The introduction of EVs to the South African market has been slow and the results of this study will shed some light on some of the perceptions that consumers have about Electric Cars that may impede or support widespread adoption.

Negative perceptions towards EVs exist related to convenience, driving range, social image impact and cost, while the negative perception regarding vehicle cost is one that has been seen in other countries where EVs have been introduced. It has been overcome through the implementation of Government subsidies and incentives that make EVs an attractive proposition for consumers, while perceptions regarding driving range and convenience were overcome by the widespread availability of charging stations. This study found that consumers' perceptions of convenience and driving range would be positively influenced by the widespread implementation of charging infrastructure for EVs.

Perceived cost savings associated with fuel is a major motivating factor for consumers in South Africa. However, a review of the literature revealed that this was not the case in the United States, where, like South Africa, consumers also see perceived cost benefits in the maintenance of an EV due to its reduced need for servicing.

Peculiar to this study is the dimension of the impact on the consumer's social image; the results revealed to the researcher that the acceptance by peers of the decision to purchase an EV is preceded by the acceptance of peers that EVs are a symbol of success and driving an EV means that the consumers social standing is elevated. The literature discusses the environmental self-identity of consumers who decide to buy an EV, although this study reveals that South African consumers attach more importance to being recognised as successful and trendy by the car that they drive than to being recognised as environmentally aware, and while environmental concern is a factor in the decision to purchase an EV, it is not a decision criterion. Although this study finds that consumers do in fact exhibit concern for the harmful impact of exhaust emissions on the environment, this environmental concern has not yet developed to the extent of influencing purchasing behaviour.

6.3 Recommendations

6.3.1 *Recommendations for car manufacturers*

A major component of the strategies of car manufacturers must be education; consumers must be made aware of the benefits and drawbacks of EVs in order for them to be able to

make informed decisions about the type of vehicle they want to buy. A second component that could be considered is to satisfy the social recognition need of consumers by positioning EVs as fashionable and trendy symbols of success.

6.3.2 *Recommendations for cities*

Cities in South Africa should consider following the lead of cities in Europe in taking steps to reduce the numbers of internal combustion engine vehicles before pollution reaches critical levels. One measure that cities could implement is the installation of charging stations in partnership with car manufacturers to give confidence to consumers that they would not be inconvenienced by a lack of charging infrastructure.

6.3.3 *Recommendations for policy makers*

Given the global shift towards electric mobility and South Africa's strong vehicle manufacturing sector, policy makers should now begin to consider how to support the multinational OEMs that have a presence in South Africa to transition to the manufacture of EVs for domestic consumption as well as for export in line with the OEMs strategic targets of the phasing out of internal combustion engines.

6.3.4 *Recommendations for fleet/rental companies*

There is an opportunity to create an electric rental segment for customers that require a vehicle for urban use only in Johannesburg. Rental companies should partner with car dealerships to install charging points at dealerships for customers that rent and EVs. The benefits for rental companies are savings in fuel and maintenance costs.

6.4 Suggestions for further research

Consumer psyche

In conducting this study, it became apparent to the researcher that South African consumers appear to be motivated by the brand of the car that they choose over the

function or utility of the vehicle. The psyche of South African consumers in relation to high-end motor vehicle brands is an area that should be explored further.

EV adoption model

Globally, car manufacturers have relied on Government support in the form of subsidies and incentives to increase their EV penetration to the point of over-reliance, whereby markets are not competitive without support. The researcher believes that it is possible to develop a business model for EV adoption in South Africa without relying on Government incentives, and that this should be explored.

Appendix A: Consent Letter

Dear Participant

Thank you for agreeing to participate and assist in this research. I am conducting this study in partial fulfilment of the requirements for the degree of Master of Business Administration in the University of the Witwatersrand, Johannesburg.

The purpose of my research is to explore South African consumers' perceptions and purchase criteria of EVs.

The interview will take approximately 45 minutes and will take place at a venue convenient to you. During the interview I will ask you questions about your perception of EVs and the criteria you would use to buy one. Rest assured that all the information that you share will remain confidential, no names will be mentioned anywhere in my report.

Thank you for your willingness to participate.

Yours sincerely,

Mangaliso Molomo

mmolomo@gmail.com

083-608-3136

CONSENT

I hereby agree to participate in this study exploring South African consumers' perceptions and purchase criteria of EVs. I understand that I am participating of my own free will and that I am not being forced in any way to participate. I also understand that I can end my participation at any time should I not want to continue, and that this decision will not in any way affect me negatively.

I understand that this is a research project whose purpose is not necessarily to benefit me personally in the immediate or short term.

I understand that my participation will remain confidential.

…… …….

Signature of Participant Date

I hereby agree to the tape-recording of my participation in the study:

…… …….

Signature of Participant Date

Appendix B: Research Interview

Thank you for taking the time to assist me in my research for my Master of Business Administration (MBA) degree. The title of my research is: "**Consumer perceptions and criteria for purchase of EVs in South Africa**"

Purpose of the research:
The purpose of this survey is to explore South African consumer's perception and attitude to EVs and the criteria that South African consumers would use to make the decision to purchase an EV.

Anonymity
You are NOT required to provide your name for this interview, your responses and the results of the study will remain anonymous.

Section One: Biographical Information

1. Gender of respondent

2. Age of respondent

Section Two: Perceptions of EVs

1. What comes to mind when you think about an Electric Car?
    a. Can you describe any of the different types of EV?
2. How would owning an EV disadvantage you?
    a. Do you think it would be complicated to operate or maintain?
3. Do you think that there is any benefit in owning an EV rather than a conventional petrol or diesel vehicle?
    a. Do you think it would be cheaper to operate and maintain?

Section Three: Purchase Criteria

1. Have you ever considered buying an EV?
    a. What were some of the reasons you decided not to make the purchase?

2. What characteristics or features would you look for in an EV?
    a. How safe do you think EVs are?
3. How would the brand of the EV influence your purchase decision?
4. Would you consider the impact on the environment when deciding whether to buy an EV?
    a. In general, are you the kind of person that acts in a pro-environmental way?
5. How would the opinions of your family / friends influence your decision to buy an EV?

Appendix C: Analysis of the codes

	Code
1	Be seen to be cool
2	Be seen to be progressive
3	Concern about EV charging infrastructure
4	Concern about EVs in S.A
5	Concern about new tech
6	I haven’t seen anywhere to charge
7	Concern about utility
8	Concerned about the environment
9	Consumer savvy
10	Cost consideration
11	Cost effective: They don’t use petrol
12	Driving a fancy vehicle matters
13	Early adopter risk
14	EV must be cool and trendy
15	EVs are a luxury purchase
16	EVs are for well-off people
17	EVs are innovative
18	EVs are more cost effective
19	EVs are Progressive and trendy
20	Us blacks have to drive far
21	Follows trends
22	Fulfil the expectations of my friends
23	Load shedding
24	Good General Understanding of EVs
25	Home charging convenience
26	Hopeful about infrastructure dev
27	I want to get into a fancy car
28	I want to get into a trendy car
29	I want to make an impression
30	I'm the trend setter in my circle
31	Image conscious
32	Knowledge of EV development
33	Lifestyle match
34	low fuel & maintenance
35	Luxury is important to me
36	My electric vehicle should be trendy
37	My EV will make a statement
38	Need for recognition
39	Need to be acknowledged
40	Open to the idea of EVs
41	Perception of risk
42	Seeking acceptance
43	I won’t need petrol
44	Strong peer influence
45	Tesla represents EVs

46	Uncertainty about EVs: There’s nowhere to charge
47	Uncertainty about practicality
48	Wait for local uptake
49	Want to see it in action first
50	Fashion trends
51	Environmental consideration
52	Social image need
53	EV Brand association
54	EVs are for the rich
55	EVs are more cost effective
56	Risk evaluation, E.V vs I.C.E
57	Concern about EV charging infrastructure availability
58	EVs are convenient
59	EV would be an option for me
60	It's a concern for me because it's so new
61	Need to see evidence of adoption first
62	EV must suit my lifestyle
63	Peer group acceptance
64	EVs are the future
65	Luxury aspiration
66	I want to make an impression
67	Utility & Social Image need
68	Driving an EV says I am progressive in my thinking
69	I don’t trust Eskom
70	By driving an EV I am making a statement about my environmental concern
71	It's not only about cost
72	It must be visually appealing
73	If I can afford it I will stick with my preferred brand of EV
74	Purchasing an EV requires a mindset change
75	I will buy an EV if there are incentives
76	EVs are expensive to purchase
77	EVs will appeal more to younger buyers
78	Celebrity reference groups will influence adoption
79	Consumer education is lacking
80	EVs are exclusive
81	I will buy an EV if it's priced competitively
82	Without government incentive there are no upfront cost benefits
83	The cost of electricity is lower than the cost of petrol
84	I will purchase an EV if the cost of refuelling is lower than my current cost
85	EV total cost of ownership is lower
86	EV is a good option for day to day work or school commute
87	I don’t wanna be a guinea pig
88	I would not need a car if there was good public transport
89	EV would be a good last mile option
90	I will buy an EV if it shows that I have made it
91	If it's not a BMW or Mercedes, it's nothing

92 I could use the EV cost savings for other things
93 EVs are not trendy & fashionable
94 With adequate marketing EVs will be adopted in S.A
95 For some people nothing matters except price
96 Perceived approval
97 The BMW electric car is appealing to me
98 Sales models are not geared towards EVs
99 I will buy an EV if the monthly instalment is reasonable
100 In general South Africans are not concerned about emissions
101 Concern about the environment is a higher-level concern
102 EVs are expensive therefore I will be picky about brand
103 An EV must meet my utility need
104 Home charging makes EVs convenient
105 EV cost saving benefit outweighs all other benefits
106 EVs are a no brainer if all concerns are addressed.
107 EV specs and characteristics should match those I am currently accustomed to.
108 Owning an EV will allow me to derive maximum value from my vehicle spend
109 The weight of the opinions of those who matter to me is significant
110 I need to portray a certain brand
111 What will people say?
112 Future Study: Abantu bazothini [What will people say]
113 Need to portray success
114 Perceptions transcend generations
115 Criteria for purchase is previous brand experience or knowledge
116 If Mercedes makes an electric car I'll buy it
117 Based on previous experience Hybrids are sluggish
118 It's too risky, nobody is buying them
119 Modern tech should be able to address the lack of power in Hybrids
120 Environmental concern needs to balance with cost
121 If both vehicles are priced the same, I will buy the EV
122 Purchase criteria: Aesthetics, cost, performance
123 Younger consumers look for attractiveness & performance
124 The brand must be recognisable
125 I would want to make a statement that I care about the environment
126 Safety is important
127 Purchase criteria: EV must be attractive, comfortable and portray my image
128 I want to be able to sell the idea of my vehicle to somebody else
129 South Africa does not have the required charging infrastructure
130 What if there are 4 EVs in the family and all need to charge overnight
131 EV must be quick to charge and the charge must last
132 Owning an EV must not interfere with my lifestyle

133 Cost & Convenience
134 Convenient charging infrastructure

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179–211. doi:10.1016/0749-5978(91)90020-T

Argarwal, R., & Prasad, J. (1998). A Conceptual and Operational Definition of Personal Innovativeness in the Domain of Information Technology. *Information Systems Research, 9*(2), 204-215.

Babbie, E. (2013). *The Practice of Social Research* (13th ed.). Canada: Cengage Learning.

Bansal, P., Kockelman, K., & Singh, A. (2016). Assessing public opinions of and interest in new vehicle technologies: An Austin perspective. *Transportation Research, 67*, 1-14.

Blackwell, R., Miniard, P., & Engel, J. (2001). *Consumer Behaviour*. Orlando, Florida: Harcourt College.

Bloomberg. (2017). U.K. Joins France, Says Goodbye to Fossil-Fuel Cars by 2040. Retrieved from https://www.bloomberg.com/news/articles/2017-07-25/u-k-to-ban-diesel-and-petrol-cars-from-2040-daily-telegraph

BMW. (2017). BMW Group announces next step in electrification strategy. Retrieved from https://www.press.bmwgroup.com/global/article/detail/T0273122EN/bmw-group-announces-next-step-in-electrification-strategy?language=en

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Retrieved from http://eprints.uwe.ac.uk/11735/1/thematic_analysis_revised_-_final.doc

Canadian Fuels Association. (2016). ICE, HEV, PHEV and BEV – What they mean and what's under the hood. Retrieved from http://www.canadianfuels.ca

Carley, D. (2014). *The Beginners Guide to Electric Vehicles(EV)*. Vancouver.

Carley, S., Krause, R., Lane, B., & Graham, J. (2013). Intent to purchase a plug-in electric vehicle: A survey of early impressions in large U.S. cites. *Transportation Research, 18*, 39-45.

Chang, T. S., & Hsiao, W. H. (2011). Consumers' automotive purchase decisions: The significance of vehicle-based infotainment systems. *African Journal of Business Management, 5*(11), 4152-4163. doi:10.5897/AJBM10.480

Chen, S. C., & Hung, C. W. (2016). Elucidating the factors influencing the acceptance of green products: An extension of theory of planned behavior. *Technological Forecasting & Social Change*(112), 155-163.

Chuah, H., Rauschnabel, P., Krey, N., Nguyen, B., Ramayah, T., & Lade, S. (2016). Wearable technologies: The role of usefulness and visibility in smartwatch adoption. *Computers in Human Behavior, 65*, 276-284.

City Of London. (2015). Driving away from diesel : Reducing air pollution from diesel vehicles. Retrieved from https://www.london.gov.uk/sites/default/files/Driving%20Away%20from%20Diesel%20final%20report.pdf

City Of Oxford. (2017). Oxford Zero Emission Zone (ZEZ). Retrieved from https://www.oxford.gov.uk/info/20216/air_quality_management/1227/oxford_zero_emission_zone_zez

CNN. (2017). China wants to ban gas and diesel cars [Press release]. Retrieved from http://money.cnn.com/2017/09/11/news/china-gas-electric-car-ban/index.html?iid=EL

Creswell, J. (2003). RESEARCH DESIGN Qualitative, Quantitative. and Mixed Methods Approaches *RESEARCH DESIGN Qualitative, Quantitative. and Mixed Methods Approaches*: Sage.

Creswell, J. (2007). *QUALITATIVE INQUIRY& RESEARCH DESIGN*: Sage.

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly, 13*(3), 319-340.

Department of Transport. (2017). *Draft Green Transport Strategy*. Pretoria: Government Gazette.

Devers, K., & Frankel, R. (2000). Study Design in Qualitative Research—2: Sampling and Data Collection Strategies. *Education for Health, 13*(2), 263-271.

Emsenhuber, E. M. (2012). *Determinants of the acceptance of electric vehicles: An Empirical Analysis.* (Master Of Marketing), Aarhus University.

Eppstein, M. J., Grover, D. K., Marshall, J. S., & Rizzo, D. M. (2011). An agent-based model to study market penetration of plug-in hybrid electric vehicles. *Energy Policy*(39), 3789-3802.

Eskom. (2015). What is load shedding. Retrieved from http://loadshedding.eskom.co.za/LoadShedding/Description

Evening Standard. (2017). Paris to ban all petrol and diesel cars by 2030. Retrieved from https://www.standard.co.uk/news/world/paris-to-ban-all-combustion-engine-petrol-diesel-cars-by-2030-a3656821.html

EVIA. (2018). EVIA'S AIM AND OBJECTIVES. Retrieved from http://evia.org.za/about/vision-and-mission

Fishbein, M., & Ajzen, I. (1975). *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research* Retrieved from http://people.umass.edu/aizen/f&a1975.html

Forsythe, S., & Shi, B. (2003). Consumer patronage and risk perceptions in Internet shopping. *Journal Of Business Research, 56*, 867 – 875.

Ghobakhloo, M., Zulkifli, N., & Aziz, F. (2010). The Interactive Model of User Information Technology Acceptance and Satisfaction in Small and Medium-sized Enterprises. *European Journal of Economics, Finance and Administrative Sciences*(19), 7-27.

Giffi, C., Vitale, J., Schiller, T., & Robinson, R. (2018). A reality check on advanced vehicle technologies. *Insights exploring new automotive business models and consumer preferences*. Retrieved from

Green, J., & Thorogood, N. (2009). *Qualitative methods for health research*. London: Sage.

International Energy Agency. (2017). *Global EV Outlook 2017*. Retrieved from https://www.iea.org/publications/freepublications/publication/GlobalEVOutlook2017.pdf

Jansson, J., Nordlund, A., & Westin, K. (2017). Examining drivers of sustainable consumption: The influence of norms and opinion leadership on electric vehicle adoption in Sweden. *Journal of Cleaner Production*(154), 176-187.

Jisana, T. (2014). CONSUMER BEHAVIOUR MODELS: AN OVERVIEW. *Sai Om Journal of Commerce & Management, 1*(5), 34 - 43.

Jonker, J., & Pennink, B. (2010). *The Essence Of Research Methodology*. Amsterdam: Springer.

Khutsoane, B. (2016). *National Department Of Transport Green Transport Strategy*. Paper presented at the Electric Vehicle Industry Association Launch, Johannesburg.

Kim, H. W., Chan, H. C., & Gupta, S. (2007). Value-based Adoption of Mobile Internet: An empirical investigation. *Decision Support Systems, 43*, 111-126. doi:10.1016/j.dss.2005.05.009

Kressmann, F., Sirgy, J. M., Herrmann, A., Huber, F., Huber, S., & Lee, D. J. (2006). Direct and indirect effects of self-image congruence on brand loyalty. *Journal Of Business Research*(59), 955-964.

Kuppusamy, S., Magazine, M. J., & Rao, U. (2017). Electric vehicle adoption decisions in a fleet environment. *European Journal of Operational Research*(262), 123-135.

Lai, I., Liu, Y., Sun, X., Zhang, H., & Xu, W. (2015). Factors Influencing the Behavioural Intention towards Full Electric Vehicles: An Empirical Study in Macau *Sustainability*(7), 12564-12585.

Leedy, P., & Ormrod, J. (2010). *Practical Research PLANNING AND DESIGN*. New Jersey: Merrill.

Letmathe, P., & Suares, M. (2017). A consumer-oriented total cost of ownership model for different vehicle types in Germany. *Transportation Research Part D, 57*, 314-335.

Li, W., Long, R., Chen, H., & Geng, J. (2017). A review of factors influencing consumer intentions to adopt battery electric vehicles. *Renewable and Sustainable Energy Reviews, 78*, 318-328.

Lincoln, Y., & Guba, E. (1985). *Naturalistic Inquiry*. Newbury Park, CA: Sage.

Lipman, T. E., & Delucchi, M. A. (2006). A retail and lifecycle cost analysis of hybrid electric vehicles. *Transportation Research, 11*(2), 115-132.

Maduku, D. (2010). *UNDERSTANDING ATTITUDES TOWARDS AND USAGE OF TECHNOLOGY-BASED BANKING SERVICES IN GAUTENG, SOUTH AFRICA.* (Master Of Commerce), University of Johannesburg, Johannesburg.

Mannberg, A., Jansson, J., Pettersson, T., Brännlund, R., & Lindgren, U. (2014). Do tax incentives affect households' adoption of 'green' cars? A panel study of the Stockholm congestion tax. *Energy Policy*(74), 286-299.

Marangunic, N., & Granic, A. (2015). Technology acceptance model: a literature review from 1986 to 2013. *Universal Access in the Information Society, 14*, 81-95. doi:10.1007/s10209-014-0348-1

Mercedes Benz. (2017). Mercedes-Benz Electric Car. Retrieved from https://www.daimler.com/innovation/case/electric/concept-eq-2.html

Mishra, D., Akman, I., & Mishra, A. (2014). Theory of Reasoned Action application for Green Information Technology acceptance. *Computers in Human Behavior*(36), 29-40.

Mohr, P., & Fourie, L. (2011). *Economics For South African Students*: Van Schaik.

NAAMSA. (2018). New Vehicle Sales - Total Market. Retrieved from https://www.naamsa.co.za/flash/total.html

National Renewable Energy Laboratory. (2016). *Consumer Views on Plug-in Electric Vehicles – National Benchmark Report*.

Neuman, W. (2014). *Social Research Methods: Qualitative and Quantitative Approaches*. Essex: Pearson.

O'Donnell, E., & Brown, S. (2011). THE EFFECT OF MEMORY STRUCTURE AND FUNCTION ON CONSUMERS' PERCEPTION AND RECALL OF MARKETING MESSAGES: A REVIEW OF THE MEMORY RESEARCH IN MARKETING. *Academy of Marketing Studies Journal, 15*(1), 71-85.

Pandey, S., & Patnaik, S. (2014). ESTABLISHING RELIABILITY AND VALIDITY IN QUALITATIVE INQUIRY: A CRITICAL EXAMINATION *Jharkhand Journal of Development and Management Studies, 12*(1), 5743-5753

Patton, M. (1990). *Qualitative evaluation and research methods*. Beverly Hills: Sage.

Peters, A. M., van der Werff, E., & Steg, L. (2018). Beyond purchasing: Electric vehicle adoption motivation and consistent sustainable energy behaviour in The Netherlands. *Energy Research & Social Science*(39), 234-247.

Ragin, C., & Amoroso, L. (2011). *CONSTRUCTING SOCIAL RESEARCH The Unity and Diversity of Method*: Sage.

Riga, D. (2015). *Hybrid Electric Vehicles: Driving Towards Sustainability.* (Masters of Arts in Organisational Psychology), University of the Witwatersrand, Johannesburg.

Rogers, E. (1983). *DIFFUSION OF INNOVATIONS* (3rd ed.). New York: The Free Press.

Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., et al. (2017). Saturation in qualitative research: exploring its conceptualization and operationalization. *Quality & Quantity*. doi:10.1007/s11135-017-0574-8

Schuitema, G., Anable, A., Skippon, S., & Kinnear, N. (2013). The role of instrumental, hedonic and symbolic attributes in the intention to adopt electric vehicles. *Transportation Research Part A*(48), 39-49.

Shafiei, E., Thorkelsson, H., Ásgeirsson, E. I., Davidsdottir, B., Raberto, M., & Stefansson, H. (2012). An agent-based modeling approach to predict the evolution of market share of electric vehicles: A case study from Iceland. *Technological Forecasting & Social Change*(79), 1638-1653.

Sinha, P., & Singh, S. (2016). E-RETAILING IN DEVELOPING ECONOMY-A STUDY ON CONSUMERS' PERCEPTIONS. *Academy of Marketing Studies Journal, 20*(3), 62-72.

Sirgy, J. M. (1982). Self-Concept in Consumer Behavior: A Critical Review. *Journal of Consumer Research, 9*(3), 287-300.

Soltani-Sobh, A., Heaslip, K., Stevanovic, A., Bosworth, R., & Radivojevic, D. (2017). *Analysis of the Electric Vehicles Adoption over the United States*. Paper presented at the 19th EURO Working Group on Transportation Meeting, Istanbul, Turkey.

Steenkamp, J., & Burgess, S. (2002). Optimum stimulation level and exploratory consumer behavior in an emerging consumer market. *International Journal of Research in Marketing, 19*, 131-150.

Thaler, R. (2008). Mental Accounting and Consumer Choice. *Marketing Science, 27*(1), 15-25.

Thanh, P., & Thanh, T. (2015). The Interconnection Between Interpretivist Paradigm and Qualitative Methods in Education. *American Journal of Educational Science, 1*(2), 24-27.

Toyota. (2017). Powering the future. Retrieved from http://www.toyota-global.com/innovation/environmental_technology/fuelcell_vehicle/

Toyota Motor Corporation. (2017). Toyota Aims for Sales of More Than 5.5 Million Electrified Vehicles Including 1 Million Zero-Emission Vehicles per Year by 2030. Retrieved from https://newsroom.toyota.co.jp/en/corporate/20353243.html

Toyota South Africa Motors. (2017). *About TSAM*. Retrieved from

United Nations. (2017). Goal 13: Take urgent action to combat climate change and its impacts. Retrieved from http://www.un.org/sustainabledevelopment/climate-change-2/

van der Kuip, S. (2011). *The potential of electric vehicles amongst Dutch lease drivers* (Master of Economics), Tilburg University

Vassileva, I., & Campillo, J. (2017). Adoption barriers for electric vehicles: Experiences from early adopters in Sweden. *Energy, 120*, 632-641.

Volkswagen Group. (2017). The Volkswagen Group launches the most comprehensive electrification initiative in the automotive industry with “Roadmap E”. Retrieved from https://www.volkswagenag.com/en/news/2017/09/Roadmap_E.html#

Volvo. (2017). Global Electrification Strategy. Retrieved from https://www.volvocars.com/uk/about/our-innovations/plugin-hybrids/electrification

Wahyuni, D. (2012). The Research Design Maze: Understanding Paradigms, Cases, Methods and Methodologies. *Applied Management Accounting Research, 10*(1), 69-80.

Yi, M., Fiedler, K., & Park, J. (2006). Understanding the Role of Individual Innovativeness in the Acceptance of IT-Based Innovations: Comparative Analyses of Models and Measures. *Decision Sciences, 37*(3), 393-426.

Zeithaml, V. (1988). Consumer perceptions of price, quality, and value: A means-end model and synthesis of evidence. *Journal Of Marketing, 52*, 2-22.

Zhang, Y., Yu, Y., & Zou, B. (2011). Analyzing public awareness and acceptance of alternative fuel vehicles in China : The case of EV. *Energy Policy*(39), 7015-7024.

Ziefle, M., Beul-Leusmann, S., Kasugai, K., & Schwalm, M. (2014). *Public Perception and Acceptance of Electric Vehicles: Exploring Users’ Perceived Benefits and Drawbacks*. Paper presented at the International Conference of Design, User Experience, and Usability.