



UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG

FACTORS THAT INFLUENCE YOUNG CONSUMER'S ACCEPTANCE OF
ELECTRONIC CARS IN SOUTH AFRICA

THIS DISSERTATION IS PART OF REQUIREMENT FOR THE COMPLETION OF THE
MASTER OF COMMERCE IN MARKETING WITHIN THE SCHOOL OF ECONOMIC
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JANUARY 2017



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DECLARATION

I the author, Ramaano Isaac Sefora declare that this is my own original work and that no work used in this dissertation was left unrecognised or uncited. This dissertation was free of any misconduct regarding ethical procedures. Lastly, this research has not been previously submitted in any form whatsoever be it in academic journals or as a dissertation of a higher educational institution degree in partial or full fulfilment of that degree.

A handwritten signature in dark ink, appearing to read 'Sefora R.I.', is positioned above a horizontal line.

Ramaano Isaac Sefora

August 2017

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This research has been a long journey from the beginning of the year. Many people played a crucial role in ensuring that this research is at its best. I may not be able to mention everyone who participated immensely by their names, however I would like to recognise a few. I would like to specially thank my family in particular to have provided me with their unwavering support to do postgraduate studies. Let alone my friends, who helped me throughout my studies, as well as all the participants who took part in my research. Most importantly, I would like to make a special recognition to Mrs Irma Cheval, my supervisors, Mr Tinashe Chuchu and Dr Norman Chiliya for their unreserved support. They assisted me in times of need. Under their supervision and foresight in areas of research this dissertation was a dream that came true.

ABSTRACT

The purpose of the study was to investigate the factors that influence young consumer's acceptance of electronic cars in South Africa. A modified technology acceptance model was adopted in order to develop the research conceptual model that was used to test hypothesised relationships. The research examined the effect that perceived usefulness has on perceived trust and value. Further the relationship that potentially existed between perceived value and trust was also assessed. Lastly the effect of perceived trust, value and risk on the intention to potentially use electric cars was examined. The study was quantitative in nature whereby 380 surveys were self-administered to willing participants selected through probability sampling at the University of the Witwatersrand. To analyse research data structural equation modeling approach was adopted whereby AMOS 23 and SPSS 23 were utilised. A key finding of the study revealed that the perceived usefulness of electric cars was positively related to its perceived value and perceived trust. However it was important to note that the influence that the perceived usefulness had on perceived value was significantly greater than that of perceived trust. The main implication of this finding was that potential customers of electric car were of the notion that if they were to purchase the vehicle it would be based more on the potential value and less on their trust. The overall finding of the study was that all proposed hypotheses were supported whereby it was clearly indicated that the youths sample had favourable attitudes towards the use of electric cars. This TAM was indeed a model that could be used to predict users' acceptance of a new technology. The chief contribution of this study was introducing a unique approach through a modified TAM to assess youth's potential acceptance of electronic cars.

Keynote: *Perceived Usefulness, Perceived Trust, Perceived Value, Perceived Risk, Intention to use*

TABLE OF CONTENTS

Chapter	Page
LIST OF TABLES	viii
LIST OF FIGURES	ix
CHAPTER 1: RESEARCH OVERVIEW	1
1.1 INTRODUCTION.....	1
1.2 RESEARCH BACKGROUND.....	2
1.2.1 The Electric Motor Car Industry	2
1.3 PROBLEM STATEMENT	4
1.4 PURPOSE OF THE STUDY	5
1.5 RESEARCH OBJECTIVES	6
1.5.1 Theoretical objectives	6
1.5.2 Empirical objectives.....	6
1.6 RESEARCH QUESTIONS.....	6
1.7 RESEARCH LIMITATIONS.....	7
1.8 JUSTIFICATION AND CONTRIBUTION OF THE STUDY.....	7
1.9 OVERVIEW OF THE RESEARCH PROCESS	7
1.10 ORGANISATION OF THE RESEARCH THESIS	8
1.11 SUMMARY OF CHAPTER 1.....	9
CHAPTER 2: RESEARCH CONTEXT.....	10
2.0 INTRODUCTION	10
2.1 CAUSE AND EFFECT OF CLIMATE CHANGE.....	11
2.1.1 The African climate change view.....	11
2.1.2 High CO ₂ emissions from industrialization	13
2.2 ELECTRIC CARS	14
2.3 SUMMARY OF CHAPTER 2	18

CHAPTER 3: LITERATURE REVIEW	19
3.1 INTRODUCTION	21
3.2 GREEN MARKETING AND SUSTAINABLE DEVELOPMENT	21
3.2 THEORETICAL GROUNDING	23
3.2.1 Technology Acceptance Model	23
3.3 EMPIRICAL GOUNDING	32
3.3.1 Perceived Usefulness on electronic cars	32
3.3.2 Perceived Trust of an electronic car	32
3.3.3 Perceived Value	33
3.3.4 Perceived Risk	34
3.3.6 Intention to Use an Electric Car	35
3.4 SUMMARY OF CHAPTER 3	36
CHAPTER 4: CONCEPTUAL MODEL AND HYPOTHESIS STATEMENT	37
4.1 INTRODUCTION	38
4.2 HYPOTHESES STATEMENT DEVELOPMENT	38
4.2.1 Perceived Usefulness and Perceived Trust	38
4.2.2 Perceived Usefulness and Perceived Value	39
4.2.3 Perceived Value and Perceived Trust	40
4.2.4 Perceived Trust and Intention to Use	41
4.2.5 Perceived Value and Intention to Use	41
4.2.6 Perceived Risk and Intention to Use of Electric cars	41
4.3 SUMMARY OF CHAPTER 4	43
CHAPTER 5: RESEARCH METHODOLOGY DESIGN	45
5.1 INTRODUCTION	45
5.2 Research Philosophy	47
5.2.1 Positivist Paradigm	47
5.2.2 Ontology	47

5.2.3 Epistemology.....	48
5.2 Research Design.....	49
5.2.1 Quantitative Methodology.....	50
5.2.2 Advantages and Drawbacks of Quantitative Method.....	50
5.3 Sampling Design	52
5.3.1 Target population	52
5.2.6 Sample Frame.....	52
5.2.8 Sample Method	53
5.3 QUESTIONNAIRE DESIGN (MEASUREMENT INSTRUMENT).....	54
5.4 DATA COLLECTION	58
5.4.1 Data Collection Techniques	58
a) Primary Research.....	58
b) Secondary Research.....	58
5.5 DATA ANALYSIS.....	58
5.5.1 Structural Equation Modeling (SEM)	58
5.5.2 Reliability and Validity of Measurement Scales.....	60
5.5.3.1 Cronbach's Alpha Test.....	60
5.5.3.2 Composite Reliability.....	61
5.6.1 Path Modeling	63
5.7 ETHICAL CONSIDERATIONS	63
5.8 SUMMARY OF CHAPTER 5.....	64
CHAPTER 6: DATA ANALYSIS AND DISCUSSION OF RESULTS.....	65
6.1 INTRODUCTION	65
6.4.1 Sample Description	66
6.4.2 Questionnaire Results.....	72
6.5 VALIDITY TEST	77
6.5.1 Confirmatory Factor Analysis (CFA) models.....	78

5.6 CONCEPTUAL MODEL FIT ASSESSEMENTS.....	79
5.7 MODEL FIT RESULTS	82
5.8 DISCUSSION OF HYPOTHESIS TESTING RESULTS	82
SUMMARY OF CHAPTER 6	84
CHAPTER 7: FINDINDGS, CONCLUSIONS, IMPILICATIONS AND FUTURE RESEARCH.....	85
7.1 INTRODUCTION	85
7.2.1. Contributions of this Study	85
a) Contribution to Academic Knowledge	86
b) Contribution to Marketing Practice	87
7.3 Managerial/Practical Implications	87
7.4 FUTURE RESEARCH AND LIMITATIONS.....	88
7.5 SUMMARY OF CHAPTER 7	89
APPENDIX A: ETHICS CLEARANCE CERTIFICATE	91
APPENDIX B: RESEARCH QUESTIONNAIRE	92
LIST OF REFERENCES	99

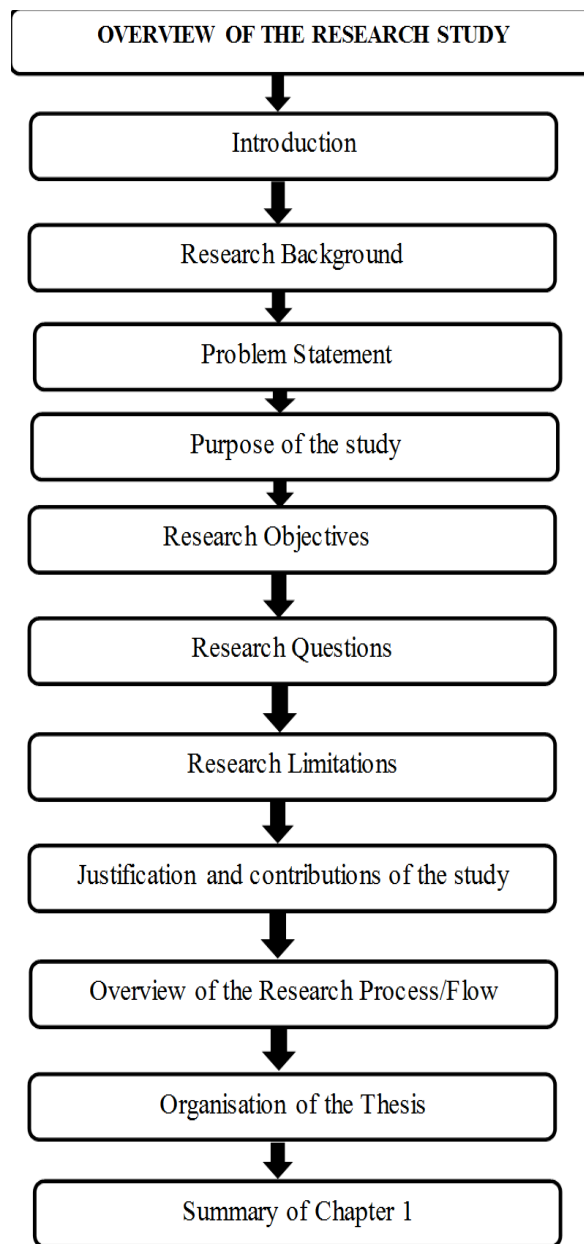
LIST OF TABLES

Table 1: Definition of Variables	35
Table 2: Summary of Hypothesis Statement	42
Table 3: Advantages and Disadvantages of Quantitative Research Methods.....	50
Table 4: Characteristics of Wits students.....	52
Table 5: Adapted Measurement Scales.....	55
Table 6: Data Analysis Stages	59
Table 7: Model Fit indices and their acceptable thresholds.....	61
Table 8: Sample Demographic Profile.....	67
Table 9: Gender Table	69
Table 10: Academic Level.....	71
Table 11: Accuracy Analysis Statistics.....	73
Table 12 Standardised Regression Estimates	74
Table 13: Diagrammatic Representation of Average Variance Extracted Calculations.....	76
Table 14: Correlations between Constructs	77
Table 15: Model Fit Results.....	79
Table 16: Structural Equation Model Analysis.....	81
Table 17: Results of Structural Equation Model Analysis.....	81

LIST OF FIGURES

Figure 1: Diagrammatic Representation of Chapter 1	x
Figure 2: Graphical Representations Costs of Batteries for Electric Vehicles	3
Figure 3: Climate Change Vulnerability in African Countries	12
Figure 4: Tesla Motors Display	17
Figure 5: Diagrammatic Representation of Chapter 3	19
Figure 6: Original TAM Model	25
Figure 7: TAM2 Model.....	26
Figure 8: Diagrammatic Representation of Chapter 4	37
Figure 9: CONCEPTUAL MODEL	38
Figure 10: Diagrammatic Representation of Chapter 5	45
Figure 11: Research methodology design building blocks	51
Figure 12: Statistical Analysis and Procedures for Chapter 6	65
Figure 13: The Bar Chart illustrates the Gender Presentation in sample:.....	68
Figure 14: Age Category.....	69
Figure 15: Pie Chart Illustrates the Distribution of Access to Car Sample	70
Figure 16: The Bar Graph Illustrate the frequency of using a Car	70
Figure 17: The Bar Graph Illustrate the frequency of using a Car	71
Figure 18: Confirmatory Factor Analysis	78
Figure 19: Structural Model.....	80

Figure 1: Diagrammatic Representation of Chapter 1



CHAPTER 1: RESEARCH OVERVIEW

1.1 INTRODUCTION

Climate change is the greatest global threat of our time and possibly the greatest challenge ever for the human species. In a study done by the European Free Alliance (EFA), it was confirmed that the global average temperature has risen by 0.8 from pre-industrial revolution (EFA, 2011; IEA, 2015). Climate scientists are urging the industrialized world to at least now strive to hold the temperature to less than a two-degree increase by the end of the century. This would, however, come with some difficulty, and considering the huge adjustments to be made for emissions especially in the motor industry.

The biggest contributor of carbon emissions in the world is the fuel combustion transportation and it is ranked second after electric powered vehicles (Ivan, Lai, Yide, Xinbo, Hao & Weiwei, 2015). In reducing these emissions, the motor industry has responded positively toward being environmentally friendly by producing the alternative to fuel combustion engines, electric powered vehicles (EFA, 2011). Some of these cars have both the fuel and electric powered engines (BMW, 2015). When companies enter a new market, the manner in which the customers will respond to the brand is uncertain and totally different from a well-known brand, especially in response to climate change (Kotler & Keller, 2009; Onanwa, 2012). Over the past few decades, previous studies investigated on numerous facets of technology for the transformation of sustainable low-carbon within the transport industry aimed at reducing carbon emissions [International Energy Agency (IEA), 2009]. For this reason, there are already a number of prospective options lined up for the betterment of the traditional fuel combustion engine (Ivan, *et al.*, 2015). The previous research has learnt that the most expedient way for enhancement of fuel efficiency and less on emissions is to present 'hybrid' electric vehicles (IEA, 2009). However, these vehicles (hybrid electric) may not be conducive to the environment. It has been discovered that most of these vehicles are furnished with diesel engines component of which further perpetuate 'carbon dioxide' and result in 'air pollution' (Ivan, *et al* 2015). For example, BMW i8 is a hybrid vehicle (i.e. electric or fuel component) could only utilise its electronic component to its full capacity for the maximum of 35 kilometres (Sunday Times Newspaper, 2016).

As stated above, the full electric vehicles is an alternative to carbon dioxide and air pollution (energy provided by a battery), and there is a zero-emission potential usually when the

electricity produced with the aid of renewable energy sources (Gerssen-Gondelach & Faaij, 2012). Onat, Kucukvar & Tatari (2014) shows that in reality charging electric vehicles through solar power stations could lessen the greenhouse gas (GHG) emissions caused by these vehicles up to 34%. While the emergence of full electric vehicles has been in play since the dawn of motoring in the early 1900, they were not that popular across the globe. The previous studies show the first electric car to have been introduced in the early 1900s, (Williamson, Emadi, & Rajashekara, 2007). Due to environmental concerns as well as climate change in the 21st century, the motor industry has been making a comeback for ‘fully’ electric vehicles (Ivan, *et al.*, 2015). Many car manufacturers have embarked on mass-production of full electric vehicles for this emerging the market. For example, a previous study conducted recently shows that the “Renault-Nissan alliance sold its 200,000th electric vehicle in early November 2014, about four years after the launch of the Nissan LEAF” (Ivan, *et al.*, 2015; International Press Website, 2014). In support of the predominant acceptance or reception of full electric vehicles, there is a need to examine the factors that influence the consumer acceptance of these vehicles because consumer acceptance is a key forerunner to the commercial success (or failure) of full electric vehicles (Long & Egbue, 2012). Moreover, Ivan *et al.* (2015) shows a number of factors that could spearhead ‘car-purchasing’ behaviour, includes, “actual situational” factors such as regulatory environments (Collins & Chambers, 2005; Ivan, *et al.*, 2015).

In addition to the actual situational factors, there are “psychological” factors, such as personal attitudes, which are equally essential (Choo & Mokhtarian, 2004; Laidley, 2013; Ivan *et al.*, 2015). Even though some empirical studies of the customer adoption of hybrid vehicles have been conducted (Gallagher & Muehlegger, 2011; Musti, & Kockelman, 2011), there is little research that considers the perception of full electric vehicles (Ivan, *et al.*, 2015). The previous studies showed that there is quite a little knowledge about the electronic vehicles in response to climate change particularly on young consumers.

1.2 RESEARCH BACKGROUND

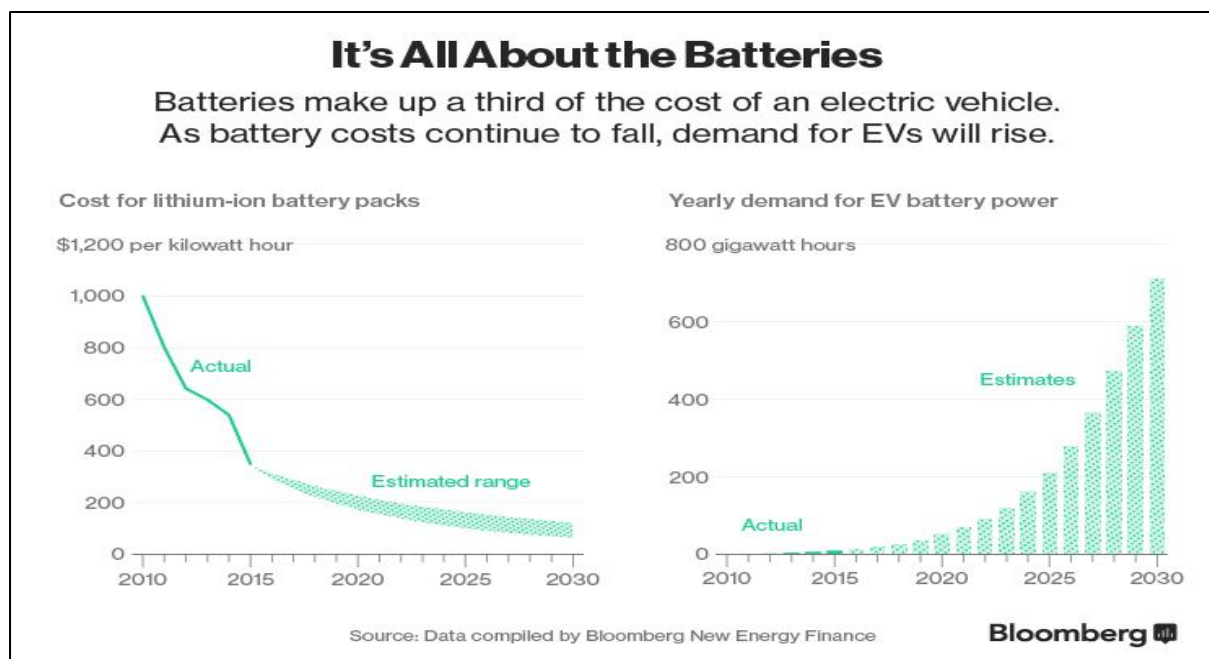
1.2.1 The Electric Motor Car Industry

Many of the car manufacturers have acknowledged the damage caused by emissions but have failed to address the issue of emissions for climate change across the globe. These car manufacturers for non-electric have now opted to being environmentally friendly. However, some of the most reputable car manufacturers such as VW were found to be cheating the

system for emissions of which did not resonate well with their emissions strategy (Alan & Tracey, 2015). And in the interest of climate change gap electric cars were reborn. For example, recently a South African born, Elon Musk and other car manufacturers have reinvented the idea of electric cars such as, Tesla Motors, BMW etc. The previous researchers have shown that the technology in the motor industry has changed over the period of time (Ivan et al, 2015). Due to the demands of modernization, which was the by-product of the 18th century industrial revolution, environmental sustenance was put to the background, while the growth of employment and environmental harm, such as the gas emissions soared (Patrick, 2014:p1-6). However, these developments have shown a negative impact of emissions over the years. They have marked a significant change in climate (IEA, 2011). The non-electric cars are said to contribute a larger portion towards emission. This is shown by the extent to which sea levels have risen beyond the normal scale (IEA, 2015). In the past the invention of electronic vehicles had a challenge of short-term battery lifespan and as such these cars could not be driven for longer distance (Ivan, et al., 2015; Williamson, Emadi, & Rajashekara, 2007). Figure 2 below is a graphical representation of the battery cost for electronic vehicles.

Figure 2: Graphical Representations Costs of Batteries for Electric Vehicles

Source: Bloomberg, 2016



Every vehicle produced into the market has to reach a specific target. In that case, value proposition becomes the most prominent factor to reach a specific target market (Kotler, 2006). Over the years marketers have displayed significant strategies that have proven that customers actually want value for the money when paying for a product (Kotler & Keller, 2009). This research study in particular seek to address a need for an ‘empirical study’ that will analyse the “psychological factors” together with the “situational factors” that influence on the young consumers’ acceptance of full electric vehicles, and tests relationships within the selected variables. The paper will identify the factors that influence the young consumer perceptions of full electric vehicles. The study wish to influence the young car consumers to choose full electric or hybrid electric vehicles over the gas emitting cars, since the latter are detrimental to the environment, and the former reduces the environmental dangers perpetuated by the non-electric cars.

1.3 PROBLEM STATEMENT

The emergence of electric cars in a South African market is completely something different compared to non-electric (fuel combustion) cars. In South Africa, the electric cars could raise concerns for profitability in response to climate change possibly because of factors such as electric supply and less knowledge on climate change. The study will focus on the youth. This is because South African population comprises of 66% youth, up to the age of 35 (Stats SA, 2016). The youth in this case would serve as the main users of the electronic vehicles in the near future. Due to the country’s power grid supply system that has been facing challenges in providing enough electricity nation-wide, the effectiveness of using an electric car could be little discouraging (Eskom, 2015).

In assessing the challenges that the country is facing, load shedding is just one factor to the stagnation point facing the economic growth, car users’ wants to spend less on fuel. The government has been working tirelessly to ensure the whole country is powered. The solar panels on the other hand have served as an alternative source of electricity to power some of the homes. However, in consideration to the implementation strategies deployed for new power stations and solar energy panels, a further delay could result in more load shedding and less installation of charging station for the electric vehicles (Tesla, 2016). This could mean some of the electric cars to go uncharged and not being utilized to their full capacity.

The electric vehicles provide environmental benefits for the good of the land, in this case green marketing and sustainable development for economic wellbeing. Electrical vehicles are known to emit no tailpipe emissions while driving (Ivan et al, 2015). Furthermore, the EVs simply have “no tailpipe and no local CO₂, nitrous oxide, or particle emissions” (Ivan et al, 2015). In his speech, the Nissan CEO spoke about reconciling transportation with the environment, and further outlines the benefits and/or usage of electrical vehicles, such as zero noise, zero carbon emissions and low maintenance (Nissan, 2016). Moreover, the analysis of previous studies reveal a winning strategy behind the electrical engines, which is favourable to ‘energy efficiency’, significantly cleaner than any other personal transport alternative today, regardless of where the power comes from (Ivan et al, 2015). Some of the benefits of using EVs are as follows: low cost of ownership (low maintenance), zero noise, zero emissions, cleaner (low CO₂, fun-to-drive (ability to adapt to driver, e.g. Tesla’s autopilot driving mode).

Due to emissions, the regulators continue to mount pressure on the motor industry to produce the environmental friendly vehicles (Ivan et al, 2015). A similar study on electric vehicles was conducted in most parts of Europe, America and Asia. However, at the time the research started this kind of study was never conducted in South Africa (Ivan et al, 2015). The study is based on green marketing and sustainable development. The study will look into the perceived usefulness, trust, value, and risk to determine customers’ intention to use a particular technology, in this case electric vehicles (Lai, Liu, Sun, Zhang, & Xu, 2015). In this study the selected variables will be utilized to measure technological adoption factors for the South Africa’s youth perspective to the use of electric cars. The perceived usefulness will be used as a predictor on perceived trust and perceived value; the perceived risk, trust and value will be used as mediators for the expected outcome, in this case customers’ intention to use the electric car. The acceptance of full electric vehicles is the long term project and most people are not that prepared to adopt them presently as compared to in the future (Bloomberg, 2016).

1.4 PURPOSE OF THE STUDY

The climate change has led to the emergence of electronic vehicles across the globe in order to curb gas emissions. The consumers are urged to move from carbon emissions vehicles to the use of electronic vehicles. The purpose of the study is to have a broader understanding of

factors that influence the young consumer's acceptance of electronic cars in light of technology acceptance model in South Africa.

1.5 RESEARCH OBJECTIVES

The following are the objectives

1.5.1 Theoretical objectives

The following are the theoretical objectives

- The first theoretical objective will be to evaluate literature on perceived usefulness for the electronic vehicles,
- Secondly to evaluate literature on perceived trust of the electronic vehicles,
- Third objective will evaluate literature on perceived value the electronic vehicles,
- Fourth objective will evaluate literature on perceived risk of the electronic vehicles,
- And lastly to evaluate literature on intention to use the electronic vehicles.

1.5.2 Empirical objectives

The following are the empirical objectives

- To investigate the influence of perceived usefulness on perceived trust of the electric car.
- To investigate the influence of perceived usefulness on perceived value of the electric car.
- To investigate the influence of perceived trust on intention to use the electric car.
- To investigate the influence of perceived value on perceived trust of the electric car.
- To investigate the influence of perceived value on the intention to use the electric car.
- To investigate the influence of perceived risk on intention to use the electric car.

1.6 RESEARCH QUESTIONS

1. Does the perceived usefulness have influence on consumers' perceived trust of the electric car?
2. Does the perceived usefulness influence consumers' perceived value of the electric car?

3. Does the perceived trust have influence on consumers' intention to use the electric car?
4. Does the perceived value influence consumers' perceived trust of the electric car?
5. Does the perceived value influence consumers' intention to use the electric car?
6. Does the perceived risk influence consumers' intention to use the electric car?

1.7 RESEARCH LIMITATIONS

This study has faced some challenging moments of which paused certain limitations. For instance data collection was restricted to only sampling student from the University of the Witwatersrand. This could have produced bias in the findings of the study. Other limitations were monetary and financial constraints that could have compromised the study.

1.8 JUSTIFICATION AND CONTRIBUTION OF THE STUDY

The study will contribute to literature and will have both practical and managerial implications in the motor industry. The study will add more knowledge in literature particularly on electric vehicles and give more light on the use TAM with the new variables added to the conceptual model (Davis, 1989).

The study will contribute on the practical implications and managerial implications. The society in general could get to know the risks and rewards in association with the electric vehicles especially for the wellbeing of the environment.

The study will give more light on the managerial implications in the sense that managers in the motor industry will make well informed economic decisions. This will assist managers if they want to venture into this new market, how to invest and which distribution channels to use for the electric vehicles.

1.9 OVERVIEW OF THE RESEARCH PROCESS

This thesis adopted a scientific research approach. It entails clarity of purpose or logical thinking, well thought out and vigorous structure of categorising problems, collecting data, analysing the data, and drawing valid conclusions. It all started with the motivation of the research and main purpose of the study. Secondly, research context for electric cars is explored in great detail. Thirdly, literature relevant to the problem of research interest is

reviewed. Fourth, drawing from the reviewed theoretical and empirical literatures, a conceptual framework was built, and research hypotheses developed. Fifth, the development of hypotheses was then followed by measure of methodology, and data was collected thereafter. Sixth, the conceptual research model and hypotheses proposed were empirically verified, using collected data, and the outcomes were discussed thereby. In conclusion, closing remarks were provided, theoretical and practical implications of the thesis drawn and suggestions for future research directions indicated.

1.10 ORGANISATION OF THE RESEARCH THESIS

This study is composed of the following seven chapters:

1. Chapter 1 provides an overview of the study with the introduction and explores the research background. Furthermore, the purpose of the study, objectives and research questions. It also illustrates the research process and thesis structure.
2. Chapter 2 provides research context, a review within the context of electric cars in America, Asia, Europe and Africa particularly in South Africa.
3. Chapter 3 contains literature review for theories and empirical studies related to the core values of the thesis. The theoretical aspect encompasses theories such as technology acceptance model (TAM) with an added feature for the theory of reasoned action. On the empirical aspect of this thesis, empirical studies regarding research constructs, i.e. perceived usefulness, perceived trust, perceived value, perceived risk and intention to use.
4. Conceptual model and hypothesis development in Chapter 4, where, based on the research constructs grounded in theory, a conceptual model is built and research hypotheses developed.
5. Research methodology, data analysis and results in Chapter 5 provide research sampling, measures and data collection procedure.
6. Data measurement results in Chapter 6 details statistical techniques used to check for the measurement reliability, validity and the research model fit (confirmatory factor analysis - CFA) using SPSS 23 and AMOS 23 software. Hypotheses testing, where structural equation modelling (SEM), is used to empirically test the proposed research hypotheses. Finally, research findings are interpreted and presented.
7. Conclusions, implications and overall thesis contributions are covered in Chapter 7: The overall concluding remarks informed by the findings of this thesis are thereafter provided.

Practical recommendations to the practice of distribution channel management are provided. Finally, future research directions are indicated, and the overall thesis contributions provided.

1.11 SUMMARY OF CHAPTER 1

Chapter 1 is made up of ten sections. The first section set into motion the introduction of the research, which focuses on the intention to use electric cars, and thereafter explores the various definitions of electric cars. The second section looked at the research background and a closer look at the emergence of electric car/motor industry. The third section discusses the problem statement that the study seeks to solve. The fourth section then provide briefly about the purpose of the study. The fifth section outlines the research objectives. This is divided into theoretical and empirical objectives. In the sixth section, research questions are explored. The seventh section is made up of the limitations and challenges of the research. The eighth section provides proper reason for justifying the study, as well as its intended contributions to the broader literature. The ninth section explores the overview of research, or the flow of research, of which was used for this thesis. The tenth section shows in great detail how the dissertation is going to be arranged, and finally the eleventh section provides a conclusive summary of Chapter 1.

CHAPTER 2: RESEARCH CONTEXT

2.0 INTRODUCTION

As stated above, the study main objective is to expand knowledge by thoroughly looking into those factors that influence the young consumer's acceptance of electronic cars in South Africa. This chapter will introduce the context of the study (research context). It is important to present the context of the study. This requires identifying the research problem or issue, framing this problem within the existing service climate change and service quality literature, pointing out deficiencies in the precise literature, and targeting the study for its audience: supervisors, examiners, colleagues and future researchers. The world has been challenged with the global warming which is triggered by the increase in the "Earth's average surface temperature" primarily caused by the rising levels of "greenhouse gas emissions from the burning of fossil fuels and land use change" (George Mason University, 2014).

The context of the study is green marketing under sustainable development. Previous researchers postulate that managers and activists perceived the context of "green marketing" not have lived up to their hopes and dreams/expectations (Ginsberg, & Bloom, 2004). Furthermore, in the public opinion they believe that the customers are caught up in a situation where they are to choose the green products over the less friendly environmental products (Ginsberg, & Bloom, 2004; Sheth, Sethia, & Srinivas, 2011). For example, when the customers are faced with compromises between product features or saving the environment, the environment usually never suffice. In 2002 Ford had to lay-off the production of a two-seater electric car, Ford Think; most consumers have shown that they were not willing to sacrifice the satisfaction of their needs or desires, just to be simply green (Ginsberg, & Bloom, 2004). This was understandable back then in the 1900s the electric cars could only travel about 50 miles and it only required about six hours to fully charge the battery (Ginsberg, & Bloom, 2004). The motor industry saw a niche market and thus responded positively to the production of hybrid and full electric powered vehicles with a long battery life usage at a reasonable price (Ivan, *et al.*, 2015). This chapter is designed to fully explain the context of electric cars. The chapter will start by addressing the cause and effect of climate change from African perspective, and the emergence of electric vehicles across the globe particularly Africa.

2.1 CAUSE AND EFFECT OF CLIMATE CHANGE

2.1.1 The African climate change view

The global warming has an upper hand among African countries in relation to the economic development and environmental sustainability. Ibrahim, Sylvia & Kesegofetse (2011) postulate how African countries have addressed the issue of climate change in their many environmental summit and the manner in which developed countries have advanced or developed at the expense of developing countries, in what was called the “brown way of economic growth”. This was at the time of the birth of the industrial revolution (MDG Report, 2010). Developing countries in assessing their developmental plans are on the verge of following the same example as set by developed countries to industrialize and reach their desired levels of advancement for economic growth. Consequently, this could be in conflict with the best interest of climate change and global warming strategy to reduce green gas emissions (Delgado-Ramos, 2015). However, it could raise some concerns in that there is still a huge gap economically and environmentally Africa compared to developed nations and it may not be the perfect example to follow, for example, there is still an issue of electricity in most parts of Africa (Ulla, 2015).

Climate change at its best level is the global threat for economic growth (IEA, 2015). Climate change affects agricultural sectors in the most extreme ways, and usually not favourable, such as extreme weather conditions, e.g., “changes in average temperatures and rainfall (heat waves or tornados); changes in pests and diseases; changes in atmospheric carbon dioxide and ground-level ozone concentrations; changes in the nutritional quality of some foods” (MDG report, 2010). In reducing rising carbon emissions, developing countries have called for some aspects to be met in order to comply with the demands of the developed countries. The debate requested financing structures for “adaptation, mitigation, capacity building and technology transfer” (MDG, 2010). These are the difficulties that the western countries have faced over a period of time and been reluctant to finance them. Moreover, the debate has shown some shortfalls for climate change negotiations among African countries. On the other hand, the emerging economies, (e.g. BRICS) coming in to play its role, there is high likelihood that there would reach a consensus on climate change negotiations unless they can make compromises. The report shows that the motion is with developing countries, to use forums such as the G77 and for countries like China to push for an amicable solution in the course of climate change negotiations.

In assessing the future of Africa, millennium development report (MDG) shows, the continent is advancing in terms of meeting the environmental goals (MDG, 2014). Many African countries are reducing their carbon dioxide (CO₂) emissions and use of “ozone” lessening elements and amassed the protection of regional and marine zones. For example, in 2010, the report shows that the world has reached the MDG target for drinking, except 20 countries from Africa are still lagging and were yet to meet their target as by 2015. The low baseline of 1990 in combination with a high population growth increases the challenges of meeting the expected target. On average, these countries had to increase drinking water coverage by 26 percentage points, but for some countries this meant doubling their 1990 coverage levels (WHO & UNICEF, 2014).

Figure 3: Climate Change Vulnerability in African Countries

Source: Afrolehar (2015)

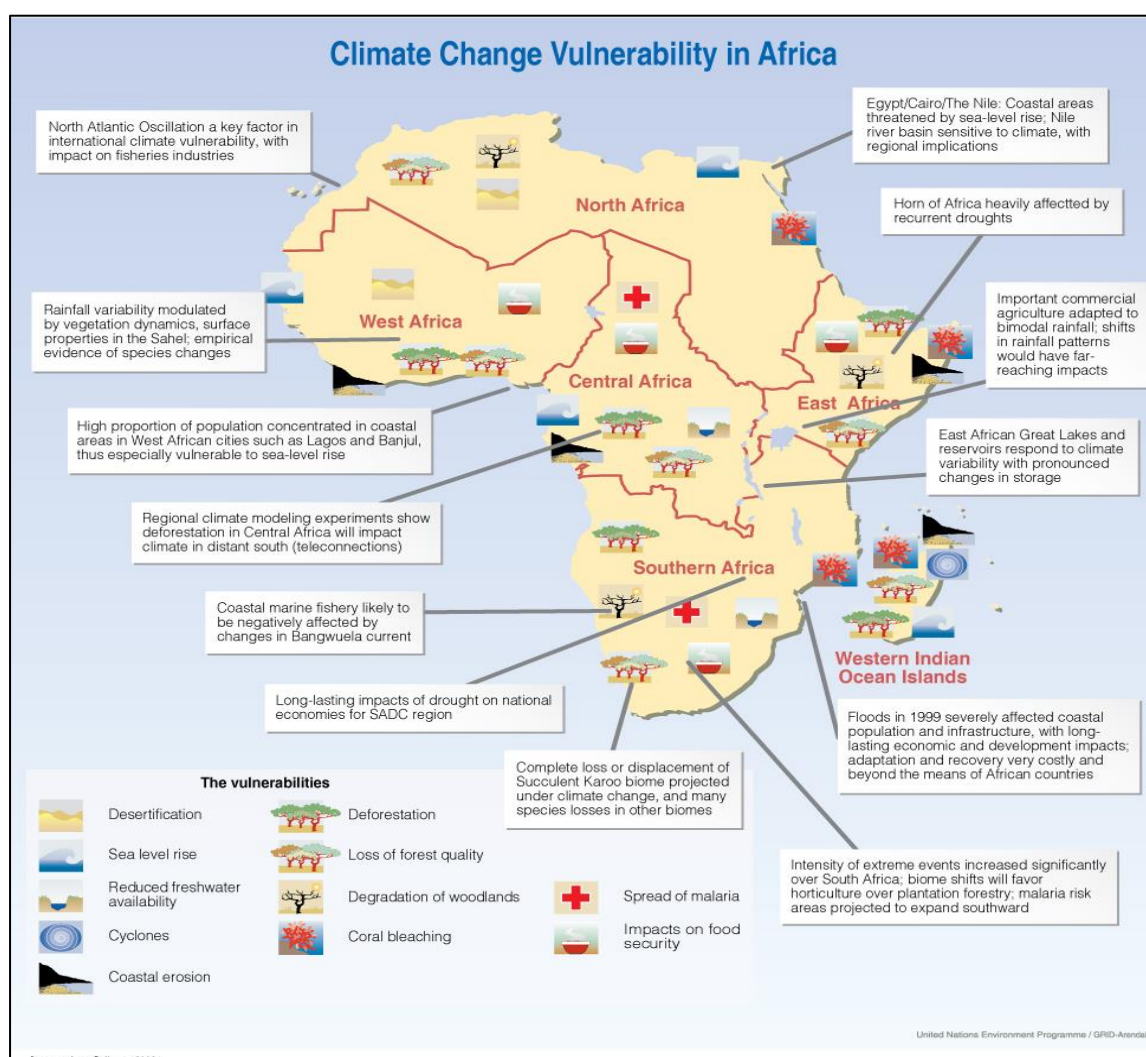


Figure 6 above shows the number of countries that are greatly affected by climate change, e.g. loss of forest quality, sea level rise, spread of malaria, drought, impact on food security etc.

2.1.2 High CO₂ emissions from industrialization

In assessing the impact of emissions across Africa, the continent alone accounts for about 20 percent net of CO₂ emission for land usage world-wide; this is a small portion to the world's total carbon dioxide (CO₂) emission per year. MDG (2014) shows that six African countries such as “Libya, South Africa, Seychelles, Equatorial Guinea, Algeria and Mauritius emitted the most CO₂, whereas Lesotho emitted the lowest”. And over the past years six countries namely: Gabon, Zambia, Guinea, Rwanda, Mauritania, and Democratic Republic of Congo were able to reduce their CO₂ emissions (MDG report, 2010). However, a significant increase in emissions was recorded in Angola, Nigeria and Algeria in 2010 (MDG report, 2010).

Although the African countries contribute the least in carbon emissions around the world with a growing trend, the countries that are highly industrialized emit more CO₂ than the less industrialized sectors (MDG report, 2014). Global CO₂ emissions are making the organic and fertile soil into a decomposition, soil degradation and erosion. The end result for emerging climate change is that Africa will fall short of productivity land and less competitive on a global scale, but this could be avoided by reducing carbon emissions globally. The predictions postulate that failure to address these carbon emissions, the land for African continent will continue to become drier and warmer, and detrimental to the health of the economy (Odusola & Abidoye, 2012).

As a result, it is imperative that the proper structures put in place for monitoring carbon emissions must continue to allow for the advancement of locally adapted systems in the reduction of global emissions. Moreover, the progressive realisation to reduce carbon emissions has to impel one to increase the level of investment for renewable energies and promotion of efficient of resource and cleaner production practices. However, as a result of Africa's limited contribution to greenhouse gas (GHG) emissions and the high costs of investment in relation to renewable energies, developed countries are admonished to play a key fundamental rule that could lead and guide the continent in achieving a more efficient energy mix (MDG report, 2014).

The likelihood of ‘green economy concept’ to subjugate the sustainable development agenda in future is essential for the developing countries to collectively have an influence on the outcome of the CO₂ debates. It has been noted well developed economies (developed countries) through industrialization, they emit more than developing countries. Therefore, African countries can learn from the mistakes of West for industrialization (Ulla, 2015). The implementation of the electric vehicles would be vital to curb pollution for future economic growth and sustainability.

2.2 DIFFERENT CLASSES OF ELECTRIC CARS DISCUSSED

The modern cars have added features for information and entertainment and a larger number of mechanical components are being replaced with computing systems (Pfleging, Schneegass, & Schmidt, 2012). These electric cars have enhanced technology to such an extent that it is becoming more like an interface with the ability to detect the environment, identify of potential risks around it, and provide services by networking with other devices (Choi, Kim, Lee, & Kwon, 2015). Due to climate change the motor industry to continue to adapt to the changes. This has triggered different kinds of electric cars to be produced, such as full electric and hybrid cars (Mohammad, Michael and Christian, 2012; Ivan, *et al.*, 2015).

Plug-in Hybrid Electric Vehicles Technology (PHEVs)

PHEVs retain the entire ICE system, but add battery capacity to enable the extended operation of the electric motor, as compared to HEVs. PHEVs have an advantage of being less dependent on recharging infrastructure and possibly less expensive (depending on battery costs and range) than EVs, and therefore might be targeted for higher volumes in early years. While PHEVs need far less battery capacity than pure EVs, they will likely need at least five times the battery capacity of today’s HEVs. PHEVs will also have to be capable of repeated deep discharges, unlike today’s HEVs, which typically are operated in a near-constant “state-of-charge” mode and are prevented from experiencing deep discharge-recharge cycles. Further, since the battery capacity levels are still far below those of pure EVs, more power-oriented battery configurations are needed to deliver power at levels required for operating the vehicle when the engine is idle or during bursts of acceleration. Additionally, power-oriented batteries can be much more expensive per kWh capacity than energy-oriented batteries. The IEA publication *Transport, Energy and CO₂: Moving Toward Sustainability* (2009) estimates battery costs for PHEVs to be 1.3 to 1.5 times higher per kWh than for EVs,

although total battery costs for PHEVs will likely be lower than for EVs because the total battery capacity for PHEVs is significantly lower.

Assuming near-term, mass production estimates for lithium-ion batteries close to USD 750/kWh of capacity, medium-range PHEVs (*e.g.*, a driving range of 40 km with 8 kWh of energy storage capacity) would require roughly USD 6 000 to cover battery costs. PHEVs may also need a larger motor, adding to their cost. Without discounting, a vehicle driven 200 000 km over its lifetime might save USD 4 000 in fuel costs; this saving is not enough to offset such a high battery cost. However, if battery costs for PHEVs can be reduced to around USD 500/kWh in the future, the resulting battery cost per medium range vehicle (around USD 4 000 for an 8 kWh system) could be competitive. Cost competitiveness will also depend on future electricity and oil prices, and consumer willingness to pay more (or possibly less) overall for PHEVs than similar ICE vehicles (IEA, 2011).

Battery Electric Vehicles Technology (BEVs)

Battery-powered EVs benefit from the removal of the entire ICE system, the drivetrain and fuel tank, giving savings of up to USD 4 000 per vehicle as compared to PHEVs;² however, EVs require much greater battery capacity than PHEVs in order to have a minimum acceptable driving range and peak power. EVs provide a substantial energy efficiency advantage, with up to three times the engine and drivetrain efficiency of conventional ICE vehicles and over twice that of HEVs (hybrid electric vehicles). At typical retail electricity prices, the fuel cost per kilometre for EVs can be far below that for ICE vehicles.

Battery cost

Energy storage requirements create major hurdles for the success of EVs. For example, if drivers demand 500 km of range (about the minimum for today's vehicles), even with very efficient vehicles and battery systems that are capable of repeated deep discharges, the battery capacity will need to be at least 75 kWh. At expected near-term, high-volume battery prices of approximately USD 500/kWh, the battery alone would cost USD 35 000 to USD 40 000 per vehicle. Thus, to make EVs affordable in the near-term, most recently announced models have shorter driving ranges (50 km to 200 km) that require significantly lower battery capacities.

This roadmap assumes that EVs have a typical range of 125 to 150 km with 30 kWh of batteries, which reflects an average efficiency of 0.15 kWh/km to 0.2 kWh/km, with some

additional reserve battery capacity. This translates to a battery cost for such a vehicle of USD 15 000. There would be a savings of up to USD 4 000 from eliminating the ICE and its transmissions system (depending on the engine size and the transmission type), which partially offsets the cost of the battery. However, if the battery needs to be replaced during the life of the vehicle, the lifetime battery costs will be significantly higher.

Recharging infrastructure

Many households around the world already have parking locations with access to electricity plugs. For many others, such access will require new investments and modifications of electrical systems. Cost estimates for EVs, PHEVs, and batteries in this section are based on analysis presented in IEA (2009). If charging components such as converters are located on board vehicles, many vehicles should be able to use standard outlets and home electrical systems, at least for slow recharging (such as overnight).

For daytime recharging, public recharging infrastructure (for example at office locations, shopping centres and street parking) will be needed. Currently, public recharging infrastructure for EVs is very limited or non-existent in most cities, though a few cities have already installed significant infrastructure as part of pilot projects and other programmes. To enable and encourage widespread consumer adoption and use of EVs, a system with enough public recharging locations to allow drivers to recharge on a regular basis during the day will be necessary. Such infrastructure will effectively increase the daily driving range of EVs (and PHEVs range on electricity).

Public charging infrastructure could include opportunities for rapid recharging, either via fast recharge systems (with compatible batteries) or via battery swapping stations that allow quick replacement of discharged battery packs with charged ones. While a battery swapping system would require a way to ensure full compatibility and similar performance between all batteries, it also has the potential to help decrease battery ownership costs for EV consumers via innovative business models where swapping charges cover both electricity and battery “capital” costs on an incremental basis. Even for home recharging-oriented systems, the cost of batteries could be bundled into the daily costs of recharging, allowing consumers to pay for batteries over time. Decoupling battery costs from vehicle purchase costs could enable EVs to be sold at more competitive prices – but doing so may be closely linked to the development of infrastructure and the associated business models adopted.

Abdulmalik and Bo (2015) describes electric cars to have a significant presence of cyber and intelligent components, this includes: intelligent driver assistance, vehicle to vehicle communication, automated driving (e.g autopilot driving for Tesla Motors). In the United States Tesla motors have been the leading car in terms of an autopilot driving mode. Autopilot operates more like an aeroplane it combines a forward looking camera, radar, and 360 degree sonar sensors with real time traffic updates to automatically drive on the open road and in dense stop and go traffic (Mohammad, et al., 2012). Tesla motors autopilot feature is progressively updated with enhanced software. Model S autopilot allows steering within a lane, changing lanes with the simple tap of a turn signal, and managing speed by using active, traffic-aware cruise control.

Digital control of motors, brakes, and steering helps avoid collisions from the front and sides, and prevents the car from wandering off the road. Autopilot also enables the car to scan for a parking space and automatically park itself on command. There are some of the features designed to entertain the driver, a new Summon feature lets the driver to "call" his/her car so from the mobile phone it can come straight at the front door in the morning (Tesla Motors, 2016). Standard equipment safety features are constantly monitoring stop signs, traffic signals and pedestrians, as well as for unintentional lane changes (Tesla Motors, 2016).

In case of autopilot (Tesla Motors), the driver can decide to have a total control over the car or let the car do all the driving. This is designed to reduce the efforts of the driver when he/she is driving. However, it does not replace a responsible driver it is only a driver's aide. In case the car malfunctions, to reduce the risks, the system can alert the driver to take over usually in cases where the lanes are not clear. These components are designed to enhance the lifestyle of the user as they directly link with the physical world (Tesla Motors, 2016). Figure 4 below is an example that displays Tesla Motors features.

Figure 4: Tesla Motors Display





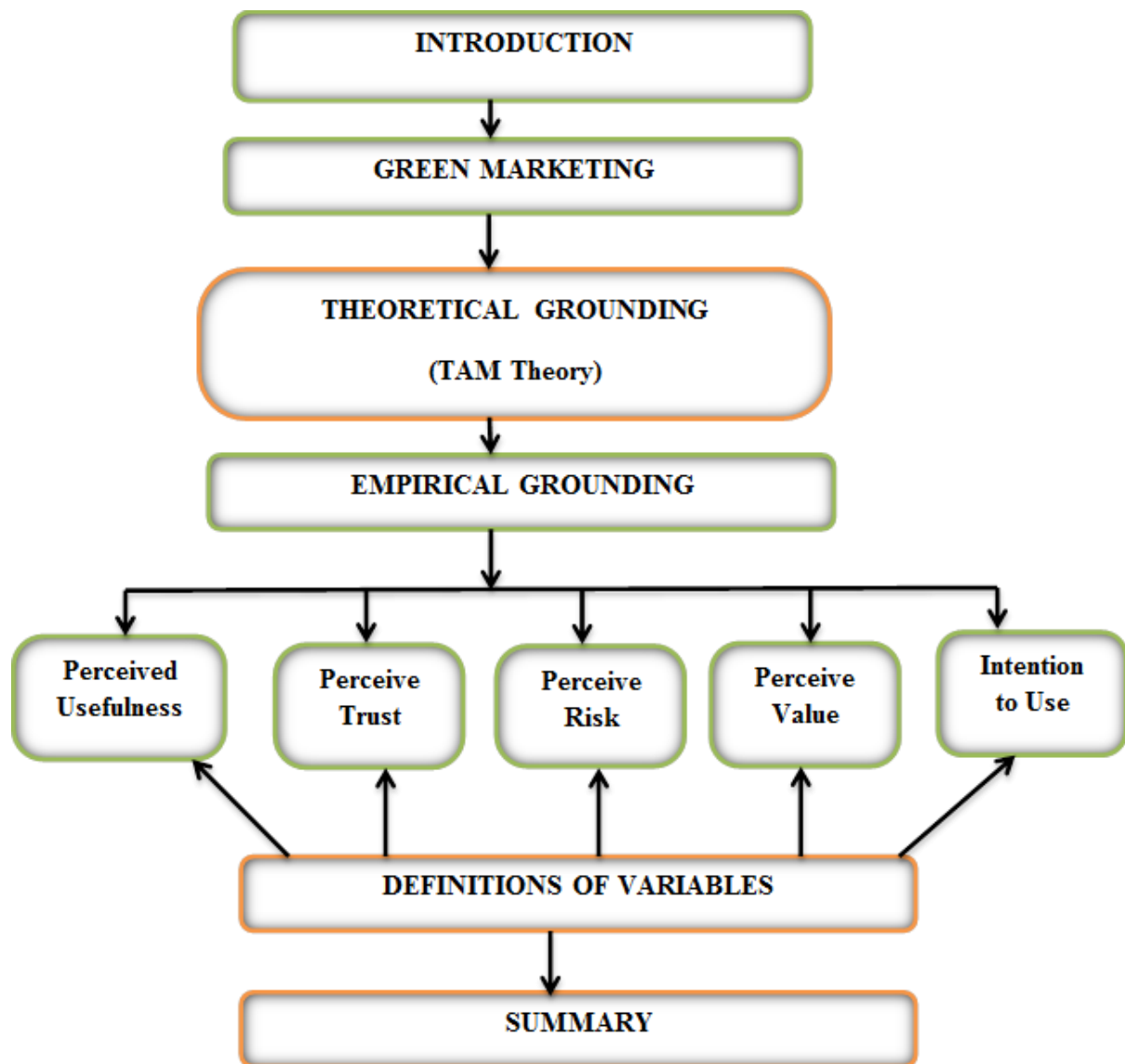
Modern cars have the intelligence for the driver as well as the environment, they are perceived to drive autonomously and fully electric, for example this could assist the driver's drowsiness and traffic sign recognition and pedestrians (Mohammad, et al., 2012; Ruiz, Juez, Schleiss, & Weiss, 2015). In Asia, they invented one of the powerful systems for autonomous driving called, Mobilieye (Mobilieye, 2016). In as much as the use of electric cars enhances the lifestyle of the user, there are some of the disadvantages attached to it. The previous researchers posit that these technologies installed on the electric cars is more interactive, it makes the drivers to perform multiple tasks, as such it is challenging to concentrate while driving (Schmidt, et al., 2010; Choi, *et al.*, 2015).

2.3 SUMMARY OF CHAPTER 2

Chapter 2 outlined a research context by providing brief background discussions of the impact caused by the greenhouse gas carbon emissions in Africa. This was followed by the impact of carbon emissions (CO₂) in Africa. Moreover, a discussion is drawn with an overview of the electric vehicles around the world.

CHAPTER 3: LITERATURE REVIEW

Figure 5: Diagrammatic Representation of Chapter 3



3.1 INTRODUCTION

In this chapter the key and/or fundamental issues, theoretical grounding and empirical literature in relation to the current study will be discussed. The chapter will review definitions, concepts and theories, to have a proper foundation for the understanding of ‘factors that influence young consumers’ acceptance of electronic vehicles in South Africa’. The Technology Acceptance Model (TAM) was consulted and further discussion will be detailed. The observed literature review will be thoroughly discussed, whereby all the selected variables for this study are explored, namely: perceived usefulness, perceived risk, perceived value, perceived trust, and intention to use.

3.2 GREEN MARKETING AND SUSTAINABLE DEVELOPMENT

Green marketing is the marketing concept of goods or services that are acknowledged as friendly to the environment and superior to others thereby (Chen, 2012). *Green marketing is a part of the social marketing concept; in other words, it can be defined as the way to understand the needs of customers by means of product, price, promotion and distribution activities and the relationship between planning, practicing and supervising policies which realize the objectives of the organization by minimizing their negative effects on natural environment (Maziriri & Chinomona 2016).* As such, green marketing integrates some wide-ranging activities, including product adjustment, deviations to the manufacturing processes, sustainable packaging, as well as changes in marketing. The idea of consumer environmentalism has gained reputation globally, since more users are taking heed to the rise of eco-friendly safety events and impact of toxic substances (Chen, 2012). This has progressed in consumers’ willingness to acquire more green products that are user friendly to the wellbeing of the atmosphere (Chen, 2010). The popularity of ‘going-green’ and the emergence of well monitored or environmental regulations, has led most companies to rethink their business models that can get a hold of green market opportunities (Chen, 2012).

The development of Green Marketing has been extensively intended to gratify a green consumer needs and wants within the field of the marketing. According to Jain and Kaur (2004), all the marketing activities are established to prompt as well withstand consumers’ conservational attitudes and behaviours within the process of green marketing. Moreover, businesses can implement the concept of green marketing by having strategies that could differentiate green product that match up consumer’s environmental needs or desires (Chen

2012, 2008). The previous literatures postulate that in order for companies to successfully implement green marketing strategies, there is a need to draw up a marketing plan. The marketing plan should include, green customer needs, introduce a green product into selected market segments, address it to relevant target market, convey green marketing strategies, and also implement a green marketing mix program (Chen, 2012).

According to literature in sustainability, green marketing is viewed as “marketing practices, policies, and procedures that explicitly account for concerns about the natural environment in pursuing the goal of creating revenue and providing outcomes that satisfy organizational and individual objectives for a product or line” (Kotler, 2011). Accordingly, green marketing programs can be conceptualized as those that are designated to execute organisational goals that are strategic and financial, aimed at minimizing negative (or enhancing positive) potential impact on the natural environment. The consistency of green marketing programs for 4P’s is usually tailored in ways that are more or less detrimental to the wellbeing of natural environment (Dahlstrom 2011; Kotler, 2011).

Since global warming is a threat economically, the modern societies have become more worried about the environment, these has shown over the years most customers are willing to acquire green products that are more favourable to the environment and less harmful (Peattie, 1995; Chen 2012). This has served as the guideline for green market opportunities. For example, in USA most of the market segments have shown some willingness to pay more for green products aimed at reducing emissions and even more if these reductions of carbon emissions are from renewable energies (Chen, 2012). Moreover, according to Chen (2012), in USA previous researchers instigated consumer purchases through the proposition of future renewable energy generation capacity. Accordingly, this shows that there is need for companies to revisit and scrutinise their business models so as conform to consumer conservationism (Chen, 2012). The motor industry has come on board for the implementation of electric vehicles that will curb the ‘cheating’ emission systems. Furthermore, prior literature suggests that in obtaining the competitive advantage companies within the environmental era needs to develop green marketing strategies (Chen et al., 2006, Chen, 2012). Green marketing strategies means that customers are obliged to compromise between product “attributes” and product “greenness”, and many customers are not about to sacrifice their needs just to “go green” (Chen, 2012). This could also be affected by brand loyalty, satisfaction or brand attachment to the fuel combustion vehicles (Keller, 2013). On the other hand, green marketing strategies are usually productive and profitable under different market

segments and competitive conditions ranging from the more “passive and silent ‘lean green’ approach to the relatively reactive and visible ‘extreme green’ approach – with ‘defensive green’ and ‘shaded green’ approaches in between” (Chen, 2012). This kind of response by customers might be the same when it comes to the use of electric vehicles, because some young consumers are well informed about ‘going green’ to safeguard wellbeing of the environment while others are yet to be more concerned or well informed. The next section will discuss the Technology Acceptance Model (TAM) in great detail.

3.2 THEORETICAL GROUNDING

For the purpose of this study the following theoretical framework will be employed.

The study has adopted the Technology Acceptance Model to better review the literature. In order to adopt the TAM the study will start by explaining the following theories as they relate to TAM: Theory of Planned Behaviour, Theory of Reasoned Action, and unified theory of acceptance and use of technology (UTAUT).

3.2.1 Technology Acceptance Model

The two key questions put Technology Acceptance Model (TAM) into perspective: 1) what encourages users to try and use new technologies? 2) What discourages users from trying new technologies? In this study, these questions could be rephrased: firstly, what encourages users of traditional cars to want to try and use new and enhanced technologies or electric vehicles? Secondly, what could possibly discourage the users from trying new technologies or electric vehicles? These questions could serve as the underlying factors for understanding the importance of TAM in relation to electronic vehicles. The TAM theory was developed by Davis (1986) as an extension to Theory of Reasoned Action (Fishbein & Ajzen, 1975). In their theoretical model, Fishbein and Ajzen suggested that a person’s actual behaviour could be determined by considering his or her prior intention along with the beliefs that the person would have for the given behaviour as the behavioural intention of that person and defined is as a measure off one’s intention to perform a behaviour (Fishbein and Ajzen, 1981). Moreover, they proposed that behavioural intention could be determined by considering both the attitude that a person has towards the actual behaviour, and the subjective norm associated with the behaviour in question (Fishbein and Ajzen, 1981; Chuttur, 2009). This was in response to a need to assess users’ emotional satisfaction rate, and to assess such rates as a predictor for the success of a system or emerging technology (Salovaara & Tamminen,

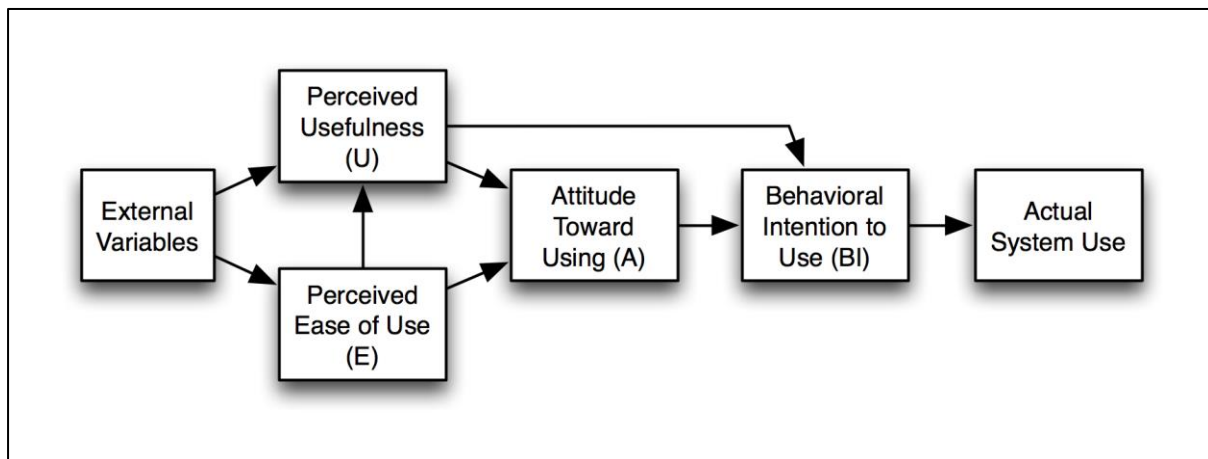
2009; Davis 1986; Ajen, 1975). The theory of planned behaviour is the enhanced version of the TRA.

The TAM was developed as an extension for TRA and TPB to predict individual adoption and use of new information technologies and is “the single, most important factor in determining success or failure of information systems and technologies” (Osswald, Wurhofer, Trösterer, Beck & Tscheligi, 2012). The concepts arising from TAM research are not always fruitful in design, although they are applicable for evaluation purposes in certain specified work settings, especially if quantitative measures are needed to prove one’s point. Although Davis et al. (1989, p. 1000) originally envisioned that TAM could be used in the early stages of product design, ultimately it has been found that the concepts presented do not seem to be able to drive design, they can be used only to verify it (Salovaara, & Tamminen, 2009).

It posits that individuals’ behavioural intention to use an information technology is determined by two beliefs: (1) perceived usefulness, defined as the extent to which a person believes that using an information technology will enhance his or her performance and (2) perceived ease of use, defined as the degree to which a person believes that using an information technology will be free of effort (Osswald, Wurhofer, Trösterer, Beck & Tscheligi, 2012). It further hypothesises that the effort of external variables (e.g. EVs design characteristics) on behavioural intention will be mediated by perceived usefulness and perceived ease of use.

TAM is capable of portraying customer beliefs and attitudes in relation to the use of ‘new technologies’, for example human interaction with electronic devices, such new electronic vehicles (Davis, 1989). Moreover, Davis (1989) posit that TAM was mainly developed and founded on two salient features that could lead or determine one’s intention to use a technology. Firstly, perceived usefulness, defined as “the extent to which a person believes that using a particular technology will enhance his or her job performance”. In the context of this study, perceived usefulness could be viewed as to what extent a person’s believes of using an electronic vehicle would advance his/her job performance (i.e. economic wellbeing), zero emissions, zero noise, reduced costs of maintenance etc. Secondly, perceived ease of use, defined as “the degree to which a person believes that using an information technology will be free of effort”.

Figure 6: Original TAM Model



Source: Davis (1989)

Figure 8 depicts the original model modified by Davis (1985) for Technology Acceptance Model. Perceived Usefulness (PU) is grounded on the fact that a person's belief of using a particular system will result in enhanced performance behaviour. Perceived Ease Of Use (PEOU) on the other hand is based on the subjective norm that appeals to the mind as to how much it will cost him or her to use information system (Davis, 1989). As informed by the literature, these two salient features or dimensions are different in nature but related conceptually. Based on the model above, these two dimensions PEOU and PU are directly linked to each other (see figure 8). In addition, it has been proposed that these variables (PEOU and PU) are directly linked to the attitude towards using an information system (Davis, 1989). However, Davis et al (2003) on the second model depict a different idea, that the mediating variables, PU and PEOU from external factors (e.g. design characteristics) are now directly related to intention to use information technology (see figure 9), this analogy completely deviates TRA theory (Fishbein & Ajzen, 1975). TAM was originated on the main idea of describing external factors that will help determine the internal factors, of which in turn will elicit a certain behaviour, the intention to use or accept an information system (Davis, 1989). Thus, according to TAM, a user's acceptance of an information system is dependent on two salient factors: PU and PEOU. These factors determine the attitude toward using the technology collectively. This in turn affects the behavioural intentions of use, which then leads to actual use (Davis et al., 1989).

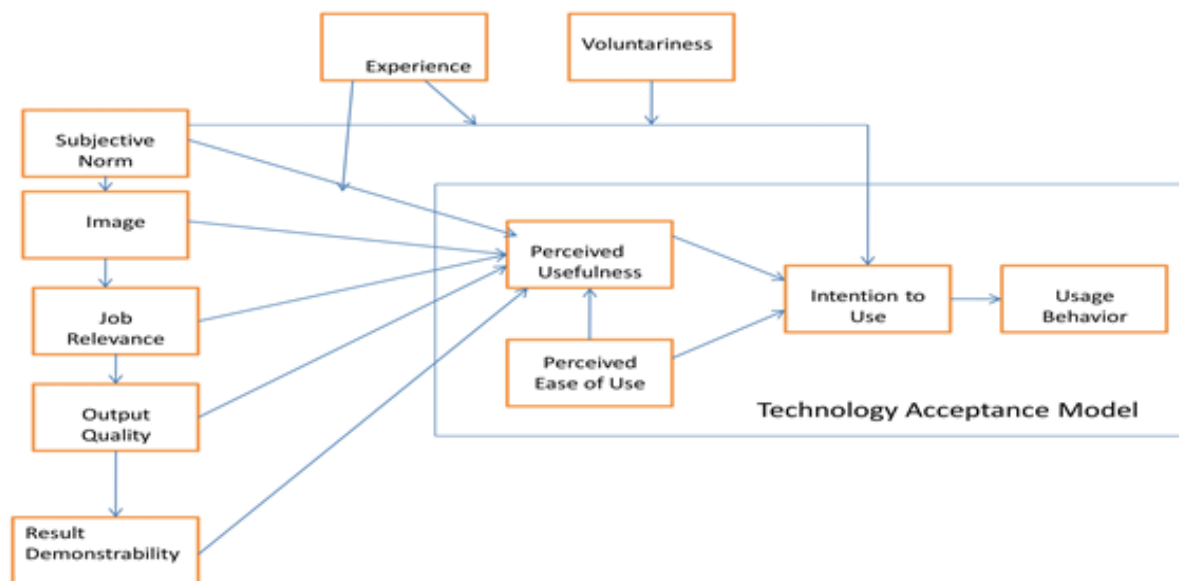
In this study TAM envisage the idea a person's beliefs and attitudes on climate change relate towards using Electric (Smart) cars, and whether or not the enhanced technology will be used

as intended (Yiu, Grant, & Edgar, 2007). The previous studies postulate the power of TAM to have discovered a relatively consistent results on customer's acceptance behaviour of information technology (Venkatesh, Thong & Xu, 2012, Venkatesh & Davis, 2000; Horton, Buck, Waterson, & Clegg, 2001). Moreover, these researchers have concurred on the premise and validity that TAM is accurate in predicting one's acceptance of a number of information systems, in this case 'electronic vehicles' (Chin & Todd, 1995; Segars & Grover, 1993). In summary, TAM has provided users with enough reasons to want to trust and accept a wide range of information technologies around the globe (Davis et al, 1989).

However, to date, there has been limited knowledge in factors that might the influence acceptance of automated vehicles such as Automated Road Transport Systems (ARTS). To better reflect the interest of the motor industry, Osswald et al (2012) developed the Car Technology Acceptance Model (CTAM), which incorporated the Unified Theory of Acceptance and Use of Technology (UTAUT) along with a lot of other attitudinal constructs, e.g. safety. Osswald et al (2012) presented the reliability or trustworthiness of TAM and other theories' scales, and exposed the weaknesses of which did not incorporate the impact of the factors on behavioural intentions towards information technology systems (i.e. emerging technology on motor vehicles). In addition, Adell (2010) investigated driver acceptance of a "Safe Speed and Safe Distance" function. She found there is some support for the use of UTAUT within a driving context, accompanied by both performance expectancy and social influence affecting intentions to use the system, while effort expectancy did not. Furthermore, the model only accounted for 20% of the variance in behavioural intentions, which was quite low compared to the 70% variance in usage intention of IT models within an organisational context (Venkatesh et al., 2003).

In this study TAM will be assessed on the basis that electronic cars (as an emerging technology) will be beneficial to the intended purpose with regard to climate change or carbon emissions (Yiu, Grant, & Edgar, 2007). Climate change could be a hindrance force for future economic growth, if customers could perceive that the usage of an electronic car would enhance their lifestyle or driving skills, it will result in certain behaviours, favourable to intentions to use technology. In addition, the model indicated that system usage was indirectly affected by both PEU and PU.

Figure 7: TAM2 Model



Source: Davis, Bagozzi & Warshaw (2000)

Although several of empirical studies have been conducted over the last two decades in favour of TAM, there is some criticism in relation to its shortcomings or limitations from the original model (Osswald et al., 2012). Davis (1989) in his original scope of the model, there is a display on outcome that is acquired through the measuring of users' personal evaluations that can provide reliable estimates of technology acceptance both when the customers are very acquainted with the system (e.g., having experience of six months of usage) and also when they have had only half an hour's experience of using it (e.g., car test drive). The original TAM model did not openly test or include voluntariness (Venkatesh, Morris, Davis, & Davis, 2003). The premise of TAM was based on individual opinions of workers in organisation and therefore, and it did not take into consideration effects of the social organization, such as distribution and delegation of work, different worker roles, emerging technologies or joint work routines at the workplace (Davis, 1989).

The study found it fit to include TAM2 to have a better reflection of the original model. TAM2 came to light in order to better address some of the loopholes or shortcomings in TAM1. TAM2 is an extension to the technology acceptance model (TAM) by Venkatesh and Davis that outlined perceived usefulness and usage intentions as it related to the processes of social influence and cognitive instrumental. Figure 7 shows a graphic overview of Venkatesh and Davis's proposed model, referred to as TAM2. The TAM2 model added, "theoretical constructs involving social influence processes (subjective norm, voluntariness, and image) and cognitive instrumental processes (job relevance, output quality, result demonstrability, and perceived ease of use)".

Venkatesh and Davis reported that perceived usefulness is based on usage intentions in many empirical TAMs. It is important to understand the determinants of the perceived usefulness construct because it drives usage intentions and how these determinants influence changes over time, with increasing system usage. Although the original TAM model was based on the determinants of perceived ease of use, the determinants of perceived usefulness enabled organizations to design organisational interventions that would increase user acceptance and usage of new systems. For this reason, Venkatesh and Davis conducted a study published in 2000 to extend TAM that examined how the perceived usefulness and usage intention constructs change with continued information system (IS) usage.

TAM is one of the best theories of technology acceptance, but it has not been utilized to its full potential, and perhaps, this is due to its not having developed further to understand changing processes within its realm, but this does not mean it is pardonable that it has been overlooked or underappreciated over the recent years (Salovaara & Tamminen, 2009). As such the criticism emerged and has sparked some light on the constraints TAM has in some studies and research studies in general (Osswald et al., 2012). One of the criticisms is on the research design from the previous studies (Salovaara & Tamminen, 2009). For instance, previous reviews on over 100 published articles, point out that many studies based their measures on users' self-reported amounts of use and short exposures with the technology in question (Lee, Kozar & Larsen, 2003; Benbasat & Barki 2007). Moreover, Salovaara & Tamminen (2009) proposed something of which previous researchers (Lee et al and Benbasat & Barki) coincide with the concerns raised (e.g lack of longitudinal studies) of which are worth noting and that the existing model, in a statement "does not adequately capture or describe the dynamic interplay that usually occurs between the various user behaviours" (Benbasat & Barki, 2007). For the purpose of this study perceived usefulness, intention to use, perceived trust, perceived value, and perceived risk will be adapted for the consumers' acceptance of electronic cars.

Table 1 Source: Rezvani, Jansson, & Bodin, (2015)

<i>Overview of studies and results for Electric Vehicles</i>								
Study details					Results			
Authors (year)	Sample	EV	Method	Main theory	Technical factors	Contextual factors	Cost factors	Individual and social factors
Egbue and Long (2012)	481 students, staff and teachers of a technical university (technology enthusiasts, potential buyers of EVs who own ICEs) in USA	PHEV BEV	Quantitative online survey	Theory of Planned behaviour	Safety, performance, range, decreased use of oil and emissions	Charging infrastructure	Purchase cost	Environmental awareness, technology awareness, experience with EVs, sustainability of EVs, interest in EVs
Schuitema et al. (2013)	2,700 driving license holders in the UK who had purchased a new car (less than 2 years old) within the last 5 years so they are the	PHEV BEV	Quantitative online survey	Consumer innovativeness, self-image congruency theory	Performance, practicality and range, perception of PHEV attributes are more positive than for BEV		Purchase cost	Pro-environmental identity, hedonic attributes (pleasure of driving, excitement of new technology) and symbolic attributes (fit to lifestyle, feeling

	potential buyers of EVs in the next five years				attributes, especially as main car of household			proud, feeling embarrassed) of EV
Moons and De Pelsmacker (2012)	1,202 Belgian drivers	EV	Quantitative online survey	Theory of planned behavior, emotions	Range, performance		Purchase price	Emotions, subjective social norms, environmental concern, perceived behavioral control, education, age
Krupa et al. (2014)	911 residents in the USA	PHEV	Quantitative online survey	Rational choice theory	Carbon emissions	Tax incentives, manufacturer rebates	Purchase cost, potential fuel costs saving	Political beliefs, concern for energy independence and climate change
Lane and Potter (2007)	UK residents (owners vs potential buyers, sample size not available)	BEV	Literature review, qualitative and quantitative, interviews and questionnaire	Theory of planned behaviour, Value-belief norm theory habits, innovation diffusion model	Performance, ease of use, safety, reliability, energy efficiency	Government environmental regulations, fuel prices, financial incentives for buyers of EVs, fuel infrastructure	Purchase cost, long payback time	Pro-environmental identity and lifestyle, knowledge of environmental problems, concern for environment, values, beliefs, personal moral norms and perceived social norms

3.3 EMPIRICAL GROUNDING

The empirical research review was conducted as follows

3.3.1 Perceived Usefulness on electronic cars

Perceived usefulness is the “extent to which an individual views the technology developed as superior than the existing one” (Shih, Chen, Shih & Su, 2012). The previous studies have shown that perceived usefulness has a direct influence on the attitudes towards actual usage of technology (Chen & Chang, 2012; Davis, 1989). It is believed that any work done can be efficient if the technology being used is perceived as useful by that particular user (Chang et al. 2012). Perceived usefulness is the most predominant feature for consumer’s acceptance and use of information technology, “the features of the technology, targeted users and the environment can also affect users' acceptance” of electronic or mobile application as an educational tool (Hong, Thong, Moon, & Tam, 2008). Therefore, the perceived usefulness was adapted for the study of electric cars.

3.3.2 Perceived Trust of an electronic car

Trust is defined as an emotional state that can be viewed from different angles with the impression that incorporates understanding and sentimental assurance (Chen et al, 2012; Chang & Chen, 2008; Johnson and Grayson, 2005). The previous researchers postulate that for one to have trust onto something there is a need for clear indication as to “why the object or thing of trust” must be trusted, or emotional trust that is inspired by the most robust confident for state of mind towards that which is to be trusted (Gefen, Karahanna & Straub 2003; Corritore, Kracher, & Wiedenbeck, 2003).

Chen et al (2012) in their argument differentiated between intellectual (cognitive) trust and emotional (affective) trust postulated that the intellectual trust is more typical at the macro level usually in larger societies, whereas sentimental or emotional trust is more typical in primary, crowded groups or situations. Johnson and Grayson, (2005) further suggest that trust is consumers’ confidence assurance or readiness to depend on a product’s competency and trustworthiness. Typically, cognition and affection usually go together. Chang et al (2008) established that consumer’s trust thus has both cognitive and affective elements. In this study the perception of one is imperative to that of the other based on cognitive and affective trust towards a particular brand, in this case electronic vehicles. Accordingly, in the conceptual

framework presented trust is considered a cognitive and affective state. Perception of trust will be adapted to the study of young consumer's acceptance of electric cars in South Africa.

3.3.3 Perceived Value

Warren Buffet in one of his famous quotes said “price is what you pay and value is what you get”. In the literature, perceived value (PV) has a broader concept of which denotes to an extensive assessment of the benefit that a consumer receives from coming in contact with a product or service, it is multifaceted in nature (Case, 2012; Sánchez-Fernández & Iniesta-Bonillo, 2007). In the context of this study, perceived value is defined as the customer's evaluation of beliefs verses the costs of making a particular purchase (Ponte, Carvajal-Trujillo & Escobar-Rodríguez, 2015). The theory of consumption value (TCV) is a consumer behaviour theory developed in the 1990s to accurately ground customers' perception of value (Shedth, Newman & Gross, 1991; Gallarza, & Saura, Case, 2012; Gabriel & Lang, 2015). The TCV is divided into five fundamental constructs that can regulate consumer behaviour, namely functional value, social value, epistemic value, and emotional value, and conditional value (Cai & Xu, 2011).

The TVC has evolved over the years to the theory of marketing, Information Systems (IS) and many other areas. The theory explains the manner in which consumers choose to buy or not to buy a product or service. In addition to the theory, four dimensions of perceived value are drawn from the previous literature, namely, functional value, monetary value, convenience value, social value and emotional value (Wen, & Noor, 2015). This study adapted the perceived value in order to understand how to regulate ‘young’ consumers' behaviour towards acceptance of electric cars. In assessing the previous researchers, the perception of cost and benefits towards a product or service will trigger customer attitude towards the usage of electronic vehicles (Cai & Xu, 2011). Moreover, it was discovered that value is not only the product itself, but also the setting in offer to give value to customers (Cai & Xu, 2011). Furthermore, Chew, Shingi & Ahmad (2006) suggest that perceived customer value is an important factor of the ‘acquisition transaction’ behaviour. This includes repeat usage of the product or service. The PV has also been introduced as one of the most important factor variable in determining usage (Chen & Dubinsky, 2003; Cretu, & Brodie, 2007; Hu & Chuang, 2012). Customer value for young acceptance of electric vehicles might be different from fuel combustion car counterpart. PV was adapted to the study of electric cars.

3.3.4 Perceived Risk

Bauer (1960) introduced Perceived Risk Theory (PRT) in the study of consumer behaviour. The PRT will be used to ground the perceived risk variable. According to the theory, consumers perception of risk is based on the uncertainty they might face of which could result in an undesirable consequences when using a product or service, with which could potentially persuade or dissuade the purchase and usage of that product or service (Bauer, 1960; Littlejohn & Foss, 2010; Mwenda, Muathe, & Thuo. 2014). The previous researchers have decomposed perceived risk into several dimensions: performance, financial, opportunity/time, safety, social, and psychological risk (King & He, 2006; Mwenda et al., 2014). These risks can affect a person's perception of a particular product or service (Kotler, 2006).

However, Bhatnagar, Misra & Rao, (2000) envisaged a different perspective, contended that only two types of risk exist: product risk and financial risk. These risks are believed to be in any chosen situation depending on the nature of the decision, but according to their varying degrees (Mwenda et al., 2014). In addition, different personalities have different measurement levels for risk acceptance or dislike (Bhatnagar et al., 2000). Perceived risk has been used in various research papers within the context of consumer information technology acceptance. For instance, a previous study by Cox and Rich (1964) on 'telephone shopping' unveiled that "consumers perceive higher level of risks in new innovative channel". This has proven the very idea of risk perception that the more risk consumers foresees toward a brand, the less likelihood to the purchase and usage for a product or service and vice versa (Kim, Ferrin, & Rao 2008). The perceived of risk concept derived from the perceived risk theory and will be adapted to the electric cars context.

Maziriri (2016) points out that perceived risk is a construct that measures beliefs of the uncertainty regarding possible negative consequences (dangers). In the domain of consumer behaviour, perceived risk has formally been defined as a combination of uncertainty plus seriousness of outcome involved and the expectation of losses associated with purchase and acts as an inhibitor to purchase behaviour (Maziriri, 2016). Furthermore, Maziriri and Chuchu (2017) describe perceived risk as the amount of risk that the consumer perceives in the buying decision and or the potential consequences of a poor decision. The evaluation of risk is highly reliant on one's "psychological and situational" physical appearance (Cho and Lee, 2006). It is certain that perceived risk negatively impacts shopping behaviour (Liebermann & Stashevsky, 2002). Therefore, the perceived of risk for customers in buying

or using electric cars will be based on the reliability and the extent to which a battery will perform while driving. This study adapts perceived risk as a predictor variable for consumers' intention to use an electric car.

3.3.6 Intention to Use an Electric Car

The theory of reasoned action (TRA) posits the extent to which consumer behaviour could be predicted from its corresponding intentions (Ajzen, 2005). The TRA provides a key fundamental concept for examining human conduct (Mishra, Akman and Mishra, 2014). Liao, Lin & Liu, 2009, postulate that the "TRA is a well-developed and validated intention model that has been established successfully in predicting and elucidating behaviour". Further, Davis et al (2003) proposed that a person's actual behaviour to use something could be determined by considering his or her prior intention to use along with the beliefs that a person would have for their given behaviour Ajzen (2005). A previous study shows the construct that gives the strength of a customer's intention to purchase (Cheng, Lam & Yeung, 2006; Wells, Valacich, & Hess, 2011). In a study done by Moons & De Pelsmacker (2012), people who are highly environmentally alarmed, with their strong environmental behaviour, "universalists", and "benevolents" were found to be segments of the population that are more strongly inclined to use the electric car once it becomes widely available. The study adapted intention to use as an outcome variable for young consumer's acceptance of electronic vehicles.

Table 2: Definition of Variables

Construct	Definition	Sources	Item
Perceived Usefulness (PU)	"The extent to which an individual views the technology developed as superior than the existing one."	Shih et al. (2012) David (1989)	PU - PU
Perceived Trust (PT)	"Trust is a psychological state and a multi-faceted concept that incorporates cognitive and affective trust."	Chang & Chen, (2008) Chen et al. (2012)	PT - PT
Perceived Value (PV)	"An overall evaluation of the benefit that a consumer receives from interacting with a	Case, 2012	PV – PV

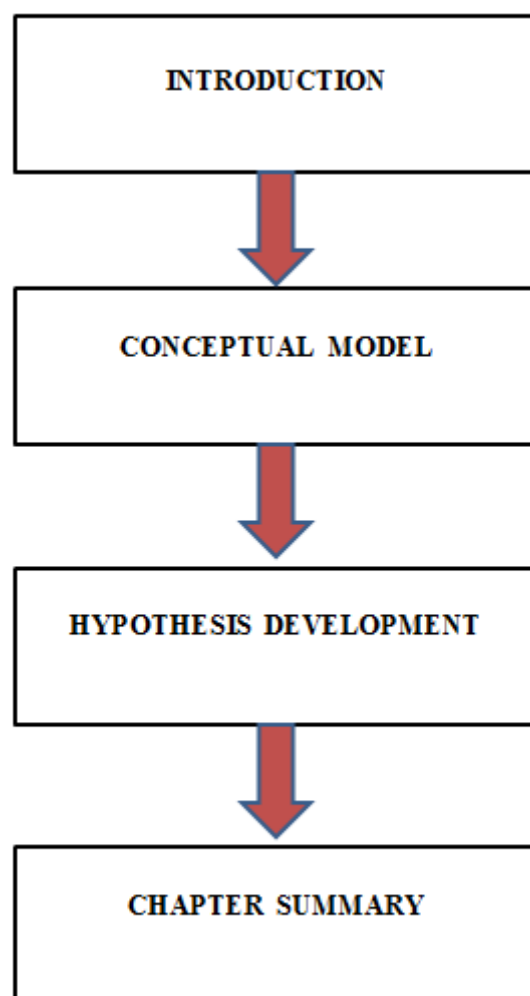
	product or service, in this case electric cars.”		
Perceived Risk (PR)	“The perceived risk is a consumer’s belief of the potential of positive and uncertain negative outcomes from purchasing a particular product.”	Kim, Lee, & Kim (2008)	PR - PR
Intention to Use (IU)	“A person’s actual behaviour to use something could be determined by considering his or her prior intention along with the beliefs that a person would have for their given behaviour.”	Ajzen (2005)	IU - IU

3.4 SUMMARY OF CHAPTER 3

The chapter had three main sections. The first section discussed the conceptual framework for green marketing and sustainable development. Secondly, theoretical foundation was explored in great detail for Technology Acceptance Model theory (TAM). Thirdly, the study explored on the empirical review where each of the research constructs was explored in great detail. The study used six research constructs namely: perceived usefulness, perceived trust, perceived value, perceived risk and intention to use of electric or electric products. Each research construct explored according to the relevant literature. Firstly, the perceived usefulness was defined as the extent to which an individual views the technology developed as superior than the existing one. Secondly, perceived value defined as an overall evaluation of the benefit that a consumer receives from interacting with a product or service. Intention to use, a person’s actual behaviour to use something could be determined by considering his or her prior intention along with the beliefs that a person would have for their given behaviour. Perceived trust defined as psychological state and a multi-faceted concept that incorporates cognitive and affective trust. And finally, the perceived risk was defined as a consumer’s belief of the potential of positive and uncertain negative outcomes from purchasing a particular product.

CHAPTER 4: CONCEPTUAL MODEL AND HYPOTHESIS STATEMENT

Figure 8: Diagrammatic Representation of Chapter 4

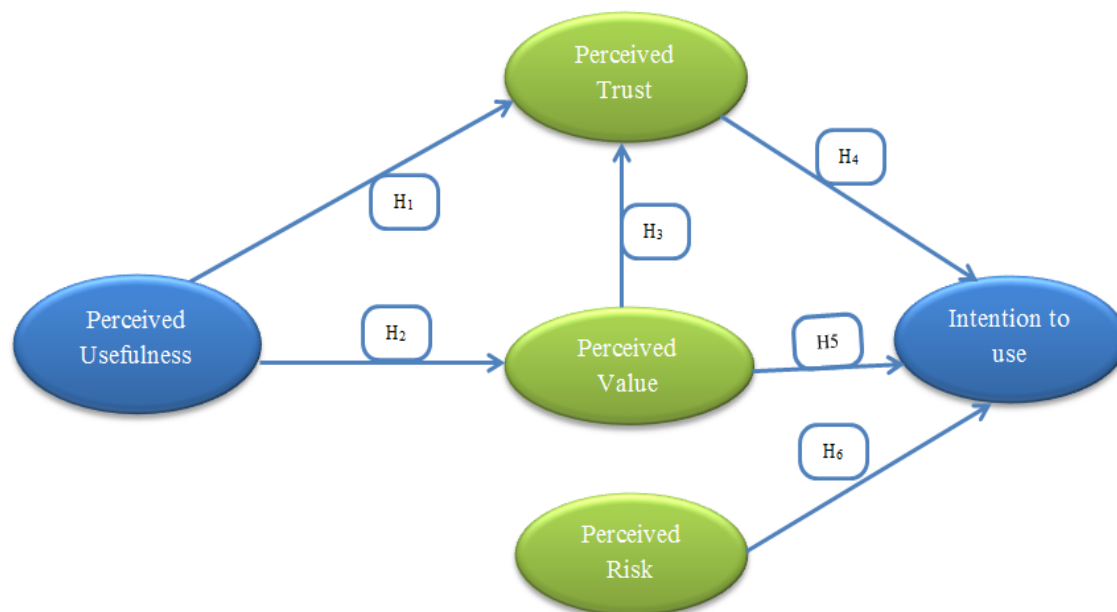


Presented in figure 10 above is the diagrammatic presentation of chapter 4 clearly illustrating the introduction, conceptual model, hypothesis development and lastly the chapter summary that will then concludes chapter 4.

4.1 INTRODUCTION

The literature review set into motion the variables to be used to develop the hypothesis statement. Drawing from the theoretical grounding in particular, the research model was conceptualized and hypothesised relationships were developed thereby. In the conceptualized model, the perceived usefulness is the predictor for perceived risk, perceived trust, and perceived values are the mediators and an intention to use is the outcome. Figure 1 below illustrates the proposed conceptual model. Figure 11 below illustrates the proposed conceptual model.

Figure 9: CONCEPTUAL MODEL



4.2 HYPOTHESES STATEMENT DEVELOPMENT

Based on the conceptual model, the following are the hypotheses developed in the following section.

4.2.1 Perceived Usefulness and Perceived Trust

Perceived usefulness is the “degree to which a person believes that using a particular system would enhance his or her job performance” (Davis, 1989; Mwencha *et al.*, 2014). This follows from the definition of the word useful: “capable of being used advantageously” (Lee, Xiong & Hu, 2012). This means the user’s perception could determine usefulness of the technology in performing his/her job tasks, this includes decreasing work period and ensuring

more accuracy and efficiency (Lee, Xiong & Hu, 2012). The empirical studies have proposed that TAM has a positive relationship on the information technology adoption (Davis et al., 1989; Yiu, *et al.*, 2007). In the context of the current study perceived usefulness would be view as the extent to which a person believes that using electric car technology will enhance user's driving performance (Chinomona, 2013; Ivan, et al., 2015). The electric cars have enhanced technology to cater for the interest of the user. However, different phases have been implemented for adding value through mobile commerce activities, which will ultimately lead to customer satisfaction and advancement (Wang & Lu, 2008).

In order for the user to fully engage with the brand there has to be an element of trust. In a study by Venkatesh and Davis (2000) the extended TAM (UTUAT) included social influence and cognitive instrumental processes as determinants of the user's formulation of perceived usefulness (Chinomona, 2013). However, the current study considers perceived usefulness of electric cars as a predictor or antecedent of perceived trust (i.e. the emotional and social aspect) and intention to use electric vehicles. The reasoning behind all these is that the more users tend to perceive electric cars to be useful for climate change. Lin and Wang (2006) have claimed that trust is an important factor in user's satisfaction and loyalty. Lee and Jun (2007) on the other have found that PU and PEOU are the most useful predictors of consumer trust. The previous empirical studies have proven that perceived usefulness had a positive linkage on perceived trust (Horst, Kuttschreuter, & Gutteling, 2007; Muslim, Sajad & Maryam, 2014), and therefore the first hypothesis is to test the relationship between perceived usefulness and perceived trust on adoption of electric/electric cars.

H₁: The perceived usefulness has a positive influence on consumers' perceived trust of electric cars.

4.2.2 Perceived Usefulness and Perceived Value

PU has been found to be a significant factor affecting initial usage and continued usage (Detlor *et al.*, 2013). Perceived value is the “perceived worth in monetary units of the set of economic, technical, service, and social benefits received by a customer's firm in exchange for the price paid for product's offering, and taking it into consideration, the available alternative of supplier's offerings and price” (Korda, Snoj, & Zabkar 2012). In this study, we define PU as the overall assessment and perception on the part of usability of electric vehicles (Ivan et al, 2015). Electric cars could bring much convenience and benefits to customers in terms of both financial and non-financial aspects such as zero noise, zero gas required, zero

emissions, safe to drive, popularity, cost effective, and low maintenance (Ivan, et al., 2015). The second hypothesis is to test the relationship between perceived usefulness and perceived value.

H₂: The perceived usefulness has a positive influence on consumers' perceived value of electric cars.

4.2.3 Perceived Value and Perceived Trust

In the literature, consumers make a decision to buy a product based on its perceived value (Mwenda, Muathe, & Thuo, 2014). The perceived value has four components: acquisition value is the benefit buyers believe they are getting in acquiring a product, transaction value is the pleasure of getting a good deal, in-use value is the utility derived from using the product, and redemption value is the amount of the product at the period of trade-in or end-of-life (Kim, Zhao, & Yang, 2008). Customer perceived value can lead to brand loyalty (Li, Xi & Li, 2005; Kim, Zhao, & Yang, 2008). Consumers buying patterns weigh the values differently, and are able to trade-off one value in order to obtain more of another.

According to Gimpel (2011), "TCV's strong point is its analytical strength, which helps practitioners to understand consumer decision making." This enables them to develop practical strategies that address real market conditions. A particular choice may be determined by one value or influenced by several values. Consumer values can influence decision making and contribute additively and incrementally (Mwenda, Muathe, & Thuo, 2014). The core concept of relationship marketing is based on trust and commitment (Abosag & Lee, 2013). Kim et al (2008) further explain that to reduce uncertainty and build customer trust in the form of reliable customer expectations, there has to be consistency between product attributes and positive perceived value. In the light of theory of reasoned action (Fishbein & Ajzen, 1975), the study speculates that a customer's positive perceived value of both products and service can lead to trusting beliefs and result in intentions to commit to a long-term relationship for using electric vehicles. The previous empirical studies have found a positive linkage between perceived value and trust (e.g. Sirdeshmukh, Singh, & Sabol 2002; Anderson & Srinivasan, 2003; Kim et al, 2008; Maria Correia Loureiro, Rüdiger Kaufmann, & Rabino, 2014) and therefore it can be proposed that:

H₃: The consumers' perceived value is positively associated with consumers' perceived trust and commitment on electric vehicles.

4.2.4 Perceived Trust and Intention to Use

According to Braun (2013), the relationship between trust and usefulness displayed a reliable estimate for intention to use technology. This shows that a person's intention to accept or use information technology, trust has to play a most prominent role. Morgan and Hunt (1994) postulate a commitment–trust theory in relationship marketing as a “basis for understanding the trust issue in marketing”. In a model proposed by Zampou *et al.* (2012) behavioural intention to use, PU, PEOU and trust are known to be the most determinant factors in exploring users' acceptance of emerging technologies (Muslim *et al.*, 2014). In this study, the perception of trust has to be in relation to the actual use of electric vehicles. The TAM is an extension of TRA theory, it showcases an indirect relationship of which envisages attitudes as a predictor for behavioural intentions to use a particular information technology modifies or positively influence consumer predominant beliefs, PU and PEOU (Kim, 2012). The TAM was originally developed in an effort to explain one's adoption to new information technology in an organizational setting (Zhu *et al.*, 2010; Hess *et al.*, 2014). The previous empirical studies have found a positive linkage between perceived trust and intention to use (Nicolaou, & McKnight, 2006); therefore, it can be proposed that:

H₄: The perceived trust has a positive influence on consumers' intention to use electric/electric cars.

4.2.5 Perceived Value and Intention to Use

Previous studies are of the view that customer perception of value should be measured in the lens of consumption experience framework (Maria *et al.*, 2014). However, Ho and Ko (2008) postulate a direct, and significant relationship between customer value and the intention to continue to use technology. The current study aims at extending this line of research to consider perceived value, and intention to use in the context of electronic vehicles. The previous studies have proven the positive linkage between customer perceived value and intention to use (Ho & Ko, 2008), hence the following hypothesis was formulated:

H₅: The perceive value has a positive influence on consumers' intention to use electric cars.

4.2.6 Perceived Risk and Intention to Use of Electric cars

The sixth hypothesis envisages the perceived risk over the consumers' intention to use electric cars. The concept of perceived risk as developed by Bauer (1960) was introduced on

the premise that if people perceive that the use of a particular product comes with uncertain risk, this will trigger a negative response to using or purchasing that particular product (Etgar, 2008). According to the theory, consumers perceive risk because of the uncertainty they face and undesirable consequences for the purchase or usage of products or services (Bauer, 1960; Littlejohn & Foss, 2010; Mwenda, Muathe, & Thuo, 2014).

The core values of the perceived risk theory (PRT) have been decomposed by researchers into numerous perceptions of risk proportions. However, the most popular ones include: “perceived risk: performance, financial, opportunity/time, safety, social, and psychological risk” (King & He, 2006; Mwenda et al., 2014). Therefore, if the customer perceives that the use of electronic or electric car will be detrimental to performance, financial, opportunity, safety and psychological risk, they will not intend to use the product or service. For example, the reliability of Tesla Motors’ car batteries and autopilot driving software is uncertain to customer’s expectation and intention to use. The negative relationship between perceived risk and intention to use is described by the PRT, TAM and TRA. Therefore, drawing from the empirical evidence from literature mentioned above, this study proposes a negative relationship between the perceived risk and the intention to use electric cars (Rouibah, Lowry, & Hwang, 2016). The study hypothesises that:

H₆: The perceived risk negatively influences consumers’ intention to use electric or electric cars.

Table 3: Summary of Hypothesis Statement

SUMMARY OF HYPOTHESES		
H/No.	Hypothesis Statement	Hypothesized Relationship
H1	The perceived usefulness has a positive influence on consumers’ perceived trust of electric cars.	PU → PT (+)
H2	The perceived usefulness has a positive influence on consumers’ perceived value of electric cars.	PU → PV (+)
H3	The perceived value has a positive influence on	PV → PT (+)

	consumers' perceived trust of electric cars.	
H4	The perceived trust has a positive influence on consumers' intention to use electric cars.	PT → IU (+)
H5	The perceive value has a positive influence on consumers' intention to use electric cars.	PV → IU (+)
H6	The perceived risk negatively influence consumers' intention to use electric or electric cars.	PR → IU (-)

Key:

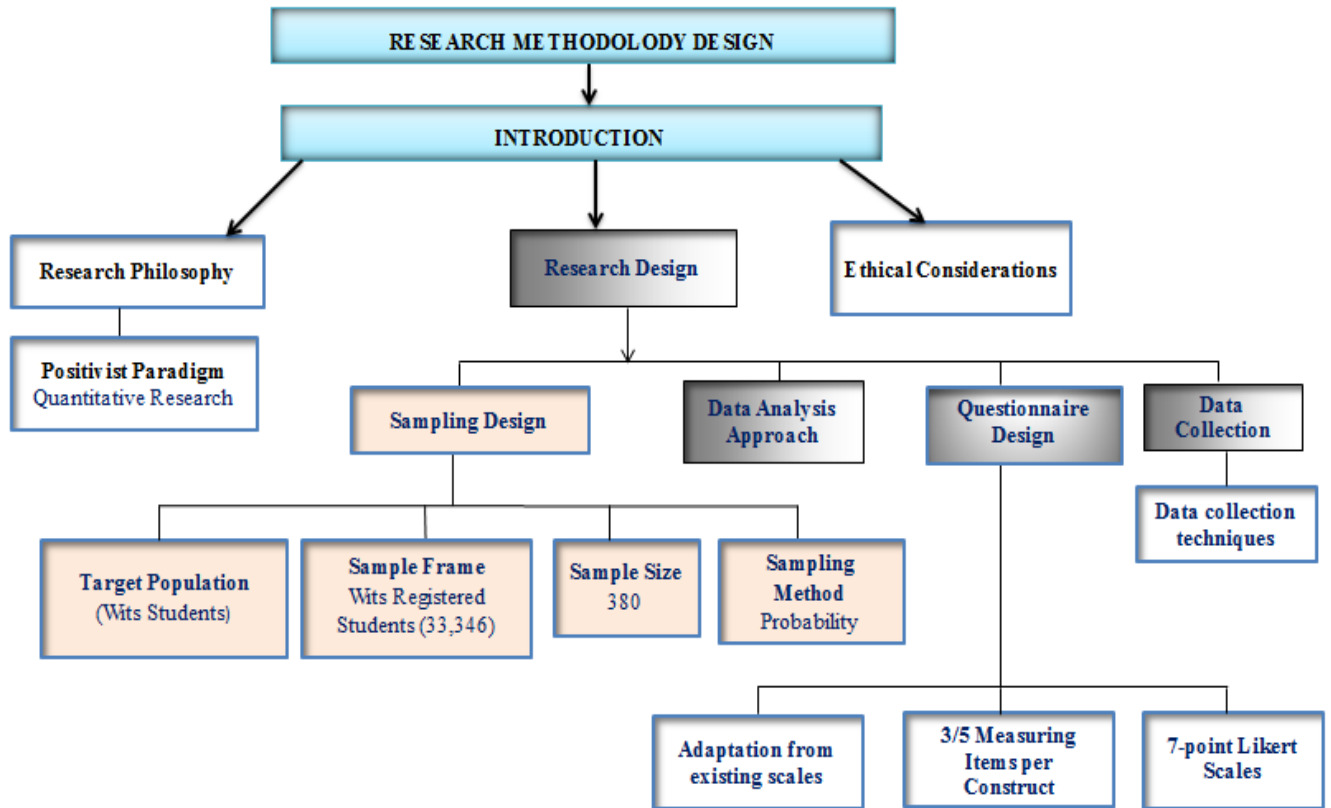
- PU = Perceived Usefulness
- PT = Perceived Trust
- PV = Perceived Value
- PR = Perceived Risk
- IU = Intention to Use

4.3 SUMMARY OF CHAPTER 4

Chapter 4 shows the conceptual model used in the thesis. Furthermore, in relation to the conceptual model, hypotheses are being made to answer questions raised by the paper. These hypotheses are within the existing literature which helps to answer the questions the research is asking. This chapter is divided into two sections: section one and section two. In section one the research model is explained and from it hypotheses are made. Section two deals with understanding the hypotheses made and instead of treating the hypotheses as heterogeneous the hypotheses are treated as being intertwined and impacting the decisions of the consumer (for this study), the consumer of the electric cars as opposed to the non-electric cars.

CHAPTER 5: RESEARCH METHODOLOGY DESIGN

Figure 10: Diagrammatic Representation of Chapter 5



5.1 INTRODUCTION

Figure 11 above represents the overall methodology for this study. There are two underlying aspects of the research namely: research philosophy and research design. Research methodology will be explored in great detail. It outlines the multiplicities from “hypothetico-deductive, inductive and/or co-operative inquiry” approaches. Moreover, it plays a very crucial role in ensuring that the study’s objectives and credibility are maintained (Ates, 2008). A research philosophy helps the researcher to have clarity in making relevant choices of the research design. Ates (2008) outlines the importance of research philosophy usually that in cases where the research's philosophical nature is deficient of courtesy, the quality of the findings may be seriously affected.

The study uses deductive research approach which is usually applicable in the positivist research paradigm approach. The study will be spearheaded on quantitative research design.

The research design is divided into three groups namely: questionnaire design, sampling design and data collection technique. In terms of the questionnaire design, the measurement instruments were purely adapted from previous scales and there were 3 or 5 measuring items per research construct (Yu-Shan Chen & Ching-Hsun Chang, 2012; David, 1989).

In assessing the users' best predictor for intention to use electronic vehicles as per the demands of climate change, the researcher faced some challenges in selecting an appropriate philosophy and research design for the current study. However, after careful examination of research aims and objectives and the available methods, this study ended up replicating a deductive approach, which is positivistic in nature. As it is distinctive for any deductive study, theoretical propositions were established and will be put to test at a later stage. The research philosophy and research design are the two sections of the study that make up a research methodology. Denscombe (2014) describes research methodology as a "system of clear rules and procedures upon which a study is based and against which claims for knowledge are evaluated". It signifies the procedures used to obtain and to carefully examine data to produce emerging or latest information (Petty, Thomson & Stew, 2012). A research methodology plays a crucial role for the advancement of knowledge and thus might positively affect its rationality and synopsis of the study (Yang, Wang & Su, 2006).

The sampling design shows that the study participants were drawn from the University of Witwatersrand, Johannesburg from registered students who usually attend classes on a regular basis. Non-probability convenience sampling method was employed in arriving at a sample size of 380 participants. The most appropriate technique to be considered for this study was convenience sampling through an interactive approach. Due to time constraints, the respondents (students) were approached during their fifteen-minute class break or lunch hour in places such as Matrix, or when they were leaving their classes, Wits residences, and/ or Wits CNS computer laboratory. A researcher chose to use self-administered survey questionnaire as is known to be the most appropriate method for collecting data. The reason for this in a deductive approach was that a researcher is perceived as distinct from the study and can hardly have prejudiced the answers of the respondents. Undeniably, the likelihood that the data collection technique could have carried some potential biases was very high. In order to diminish or lessen the likelihood of biases, participants were asked to express their views with all honesty when completing the survey and they were guaranteed of their confidentiality, also that their responses were going to be used and presented collectively.

The next section makes available a thorough account of the research methodology as depicted in Figure 12 above.

5.2 Research Philosophy

Research philosophy relates to the development and nature of knowledge (Collins, 2010). A paradigm can be described according to the lens which the world is viewed (Collins, 2010). Various lenses govern the manner in which diverse norms relate to the nature of the world and behaviours in which humanity should attempt to draw a meaning (Collins, 2010). The lenses with which the world can be viewed, includes positivism, constructivism, critical theory, interpretivism, and phenomenology. For the purpose of the study positivist paradigm will be utilized.

5.2.1 Positivist Paradigm

Positivism is a philosophical system recognizing only that which can be scientifically verified or which is capable of logical or mathematical proof and therefore rejecting metaphysics and theism (Dictionary.com). Collins (2010) views positivism as a “philosophy in accordance with the empiricist view that knowledge stems from human experience”. He further stated that “positivism is an atomistic, ontological view (nature of reality) of the world comprising discrete, observable elements and events that interact in an observable, determined and regular manner” (Collins, 2010). In addition, Collins (2010) shows that positivism fails to accept the common or unbiased grounds for ethics or morals, and goes on to contend that they can be acceptable only on “arbitrary, normative, technical or utilitarian grounds”. The paradigm put in place approvals for societal transformation on the basis of fact claims and certainty (Collins, 2010). Quantitative research is based on a positivist philosophy with the assumption that there are societal facts with an objective reality apart from the opinions of certain individuals.

5.2.2 Ontology

Greece has marked a historical event in playing the most prominent role in debating the ontology within the field of philosophy (Killam, 2013). The term or word “ontology” was founded from the Greek word for “to be”. Ontology therefore refers to the chronological events and beliefs about the nature of reality (Killam, 2013; Guba & Lincoln, 1994). In philosophical terms, it refers to the study of our existence and the fundamental nature of reality or our being. Beliefs about the nature of reality, therefore, determine of what can be

known about them (Killam, 2013). Questions that relate to ontology include: What exists? What is true? What is real? And how can we sort existing things? Ontology in this study is described as an individual's view (either claims or assumptions) about the nature of what is truth or certainty of existence – an unbiased reality that truly comes into play, or only a reality subject to emotions, i.e. shaped by individuals' thoughts (Bongani, 2016). Therefore, each individual has well-grounded ontological norms of which could propel or repel their positive views on what is known or truth (Killam, 2013).

5.2.3 Epistemology

Epistemology is more philosophical in nature than methodology. It examines the relationship between knowledge and the researcher during the time of discovery or research process. It, therefore, refers to how we come to know what we know. For example, how we come to know that climate change that it is caused by carbon emissions and it can be addressed or reduced by green products. Moreover, similar aspect has been observed by Blaikie (1993) as “the theory or science of the method or grounds of knowledge growing this into a set of assumptions relating to the techniques or procedures that are likely to improve knowledge about reality” (Flowers, 2009). One person's ontological beliefs will dictate how objective the relationship between the researcher and what can be known should be (Flower, 2009). As in this study, at the data collection stage, survey questionnaires were used, the researcher distanced himself from the respondents. The possibility of getting objective and positive results can be guaranteed thereby. As a result, such data for this study was deemed to have resulted in objective epistemology, which is consistent with the positivist research paradigm.

5.2.4 Justification: Why a Philosophical Underpinning is Important for a Study

It has become a norm that the research method to be employed in any study need to closely linked to the research philosophical point of view. The literature envisages that there has been twofold outcome of a philosophical review (Holden & Lynch, 2004; Hughes & Sharrock, 1997). This could be an eye opener for the researcher into other areas that might effectively give rise to the researcher's capabilities. And also to give the researcher's confidence assurance on the applicability of the research methods to be selected to solve the problem at hand. Moreover, the researcher needs to be cautious that there might be some inconsistencies with the finding of the study if the research methods employed are deviating from the problem at hand. Therefore, it for this reason that the research philosophy is employed in

order to assist the researcher to be aware of the setback if proper methods are not followed fully. The researcher need to familiarize himself with the following questions: “How to research?”; “What to research?” and furthermore deliver an answer as to “Why research?”

In light of the discussion above, the study has maintained an objective view of ontology, consistent with a “positivist paradigm” and a “quantitative methodology”. However, it is worth noting that in practice, it may be hard for a researcher to follow a pure account of objectivist paradigm (Ates, 2008).

5.2 Research Design

Research design provides a procedural plan and framework from which data will be collected and analysed to provide relevant answers to questions asked and solution to the study as a whole (Malhotra & Birks, 2007). The research design emanates from the research methods. As noted by Creswell (2014), there are three methods that can be used for research, namely, qualitative, quantitative and mixed methods, however for the purpose of the study, quantitative methods will be utilized. Alternatively, research design can be viewed as “a set of guidelines and instructions to be followed when addressing a research problem” and/or “a strategy, a plan, and a detailed structure or outline of how the research project will be conducted” (Carriger, 2000:87). It shows a road map for collecting data, analysing and provide solution to the project. It includes, sampling design, data collection, questionnaire design and data analysis approach (Malhotra & Birks, 2007; Creswell, 2014). This will be explained in great detail later in the chapter. Sampling design provides a conceptual framework or methods from which a selected sample can accurately represent (Malhotra & Birks, 2007). For example, in this study 380 participants or respondents is the best representation of the 33346 target population at the University of the Witwatersrand. In the data collection section, research design set out appropriate methods with which data can be collected from the given target population (Creswell, 2014). Questionnaire design draws out the measurement instruments from adapted scales according to their respective research construct (Malhotra & Birks, 2007). And finally, data analysis approach outlines the most efficient and trusted methods that accurately process the raw data so as to give it a meaning (Malhotra & Birks, 2007; Chinomona, 2012).

5.2.1 Quantitative Methodology

A quantitative methodology was considered an appropriate measure to meet the objectives of the study while providing “solutions” to the research problem. This is actually consistent with the determination put in place behind this study. Furthermore, as the current study wanted to determine the correlation amongst variables, thorough consideration was given to the usage of a quantitative method. As stated by Hair, Money, Samouel and Page (2007), “quantitative research design allows for the analysis of data to determine and validate or reject relationships between variables of interest”. This technique follows the following steps: Theory Hypothesis Testing Confirmation / Refutation, the practicality of quantitative research design can be demonstrated by classifying the features accredited to “quantitative and qualitative”. Consequently, before explaining on why a deductive approach was chosen over an inductive approach, it may be beneficial to primarily appreciate the changes, features, discussion on the two methods as well as the strengths and weaknesses of each research method.

5.2.2 Advantages and Drawbacks of Quantitative Method

In conducting a research, there is no method that is free from inadequacies. A quantitative approach has its own shortcomings. Quantitative research at times “induces” responses or individuals into classifications that may not be “appropriate” so as to create meaning (Bongani, 2016). Accordingly, the advantages and disadvantages of the quantitative method are presented in table 3 below.

Table 4: Advantages and Disadvantages of Quantitative Research Methods

Quantitative Method	
Advantages	Disadvantages
Capacity to provide larger sample sizes; increases generalisability of the outcome	Challenge in developing accurate survey instruments
Capacity to differentiate minor variances	Restrictions to the in-depth detail of data structures
Ease of administering and recording questions and answers	Lack of control over timeliness, and potentially low response rates
Competencies of using advanced statistical analysis package	Challenges in determining whether participants are answering honestly

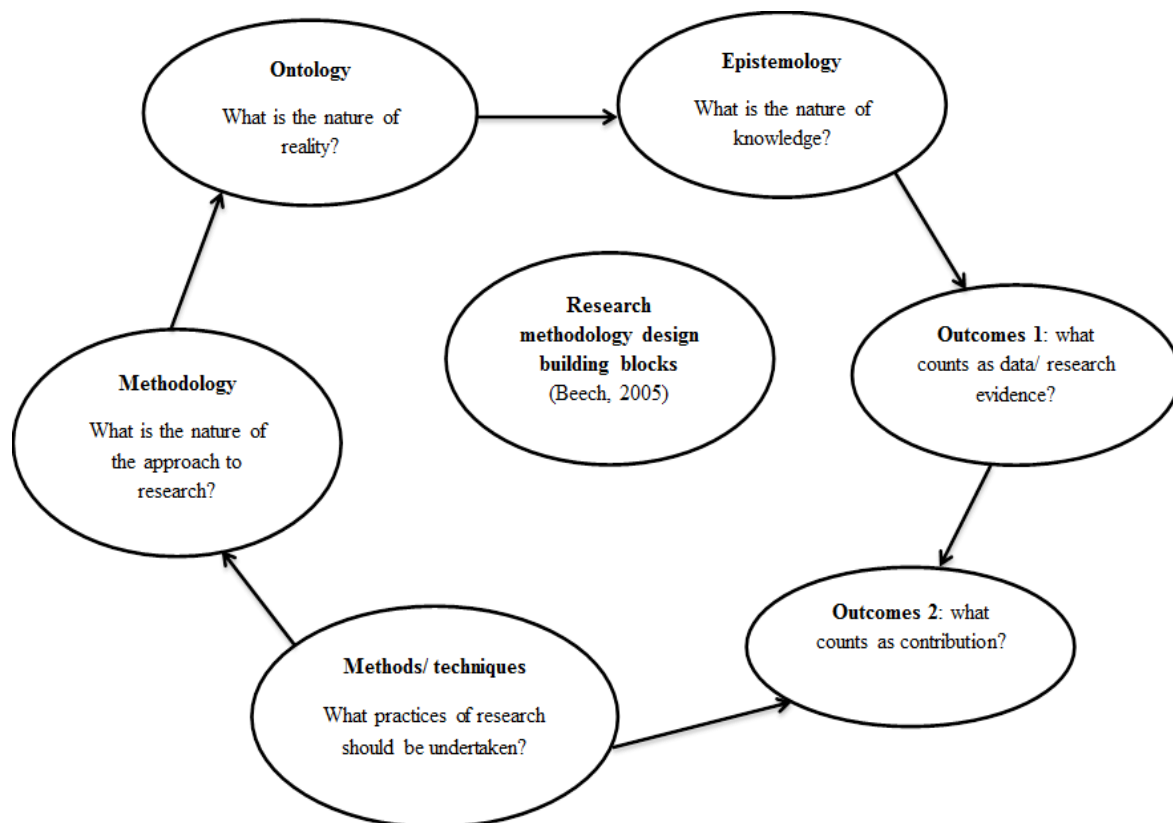
Abilities of tapping into elements and associations measurable indirectly	Misinterpretations of the outcome for results and incorrect use of data analysis procedures
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Source: *Hair et al., 2003*

The quantitative methods make the researcher to be viewed as an external influencer that carefully selects the respondents in an unbiased manner (Bongani, 2016). This kind of selection criteria has the capability to make the results to be consistent even when the study is conducted by someone else (Creswell, 2014). In comparative to qualitative methods, quantitative methods are more structured in nature and the collection of data is less bias and less time consuming (Donald & Pamela, 2014). Therefore, there is a high chance of producing the most accurate and reliable results for the study (Bongani, 2016).

Figure 11: Research methodology design building blocks

Source: Ates (2008)



5.3 Sampling Design

Sampling design is a procedure where a percentage of the data is grouped from a larger population in order to draw conclusions from the sample to the entire group (Teddle & Yu, 2007). A sampling design should be able to cover various approaches to measure a sample to be generally valid, efficient and easier to implement (Aad, Abat, Abbott, Abdallah, Abdelalim, Abdessalam, & Abreu, 2010). Aspects like the target population (i.e. the scope of the study as defined by the geographic location), sampling frame (i.e., all cases from which the sample is selected), sampling method (i.e., making a choice between two main approaches: probability and non-probability methods) and sampling size (i.e., the total number of respondents) are typical elements of a sampling design (Collins, Onwuegbuzie & Jiao, 2007). According to Collins et al. (2007) a sampling design provides two key elements namely, sampling method and estimator.

5.3.1 Target population

Defining the target population may be specious to the research questions for the study. Therefore to identify a target population is of necessity especially for the construction and running of any kind of experiment (Klein & Meyskens, 2001; Murthy, Mukherjee, Ray, & Ray, 2009). To accurately define the target population the researcher needs to label and/ or set out those features that can provide a proper solution to the study. For example in this study, the City of Johannesburg was selected and utilized as the target population because it is a highly centralized area for traffic congestions for the motor industry. Below is a table illustrating statistics on the characteristics of students of the University of the Witwatersrand based on a survey conducted in 2013/14.

Table 5: Characteristics of Wits students

Wits Student Population	33,346
--------------------------------	---------------

Source: Adapted and modified from (University of the Witwatersrand, 2013/2014).

5.2.6 Sample Frame

Sampling frame is narrowly linked to the target population. Donald & Pamela (2014) define sample frame as the list of element from which the sample is actually drawn. In an ideal world it is a complete and correct list of population members only. However, as a practical matter the population is different from the “theoretical population”. The sample utilised for data collection was obtained from a list of registered students of the University of the

Witwatersrand. A randomised sample of 380 participants studying at the University of Witwatersrand from the age 18 and above was utilized for data collection in this study. The Gauteng province is one of the most populous, diverse and industrious provinces in South Africa with 7, 3 million residence hence it can be assumed that the findings obtained while studying this area may to some degree be representative of the entire country (Stats SA, 2011). Gautrain in doing feasibility study for their target market, they have released an article few years ago. In the article they discovered that there are over 300000 cars per week, from Pretoria to Johannesburg highway (Gautrain, 2013).

5.2.7 Sample Size

The determination of sample size is critical and could be challenging in planning a statistical study (Ang, Bekaert, & Wei 2007). In probability sampling the larger sample is determined by the variation of the population within the study. Donald and Pamela (2014) outline some principles that influence sample size:

- The greater the dispersion within the population, the larger the sample size to provide estimation accuracy
- The larger the desired accuracy of the estimate, the larger the sample
- The smaller the sample error range, the larger the sample
- The higher the confidence interval in the estimate, the larger the sample
- The greater the number of subgroups within the area of interest, the greater the sample size, each subgroup must meet the minimum requirements for sample size

In determining the accurate sample size various statistical software calculators can be utilized. In this study Calculator.net was employed to determine a sample size. Calculator.net assisted the research to take into the following factors; “account the margin of error”, “the confidence level”, “the population size” and “the response distribution”. The researcher chose the default settings on Calculator.net which had a margin of error at 5%, confidence level at 95% population size at 33,346 and a response distribution of 50%. Calculator.net then calculated that the sample size needed for the survey would be 385 respondents.

5.2.8 Sample Method

The researcher faces a dilemma in choosing between the probability sampling and non-probability sampling techniques appropriate for the given study. The probability sampling is the most appropriate method for this research. A probability sampling method assures

researcher's probability-based confidence intervals of various parameters (Donald & Pamela, 2014). Simple random sample was applied every component within the population will be given an equal chance to be sampled (Gaplin, 2015).

$$\text{Probability of selection} = \frac{\text{Sample Size}}{\text{Population Size}}$$

5.3 QUESTIONNAIRE DESIGN (MEASUREMENT INSTRUMENT)

Measurement instrument is the most prominent feature to accurately examine factors that govern the theoretical research constructs (Shimabukuro, Alexandre, Coluci, Rosecrance, & Gallani, 2012). The questionnaire was developed by the researcher from the previously existing scales. The researcher reached out to the willing participants who are registered students at the University of the Witwatersrand. The questionnaire will comprised of two sections A and B.

Section A looked into the respondents' demographical and biographical information. These includes, gender and age, academic level, access and usage of a car, and occupation. Section B, adopted a 7 point Likert scale to ask the respondents' questions as per research constructs. Five variables were measured namely, perceived usefulness, perceived trust, perceived value, perceived risk and intention to use. The first construct measured the customer's perception on the usefulness on the electric cars. Secondly, the researcher from the adapted scales asked the respondents' perceived trust on the electric cars. Thirdly, the researcher surveyed the participants' perception on the value for electric cars. The fourth construct measured the customers' perception of risk should they want to buy and use the electronic vehicles. And finally, the researcher asked respondents of their intention to the actual usage of electric cars. The researcher decided to employ questionnaires in collecting data because it has been seen as the most accurate appropriate method of collecting data. The questionnaire design was based on the research construct from the conceptual model.

Table 6: Adapted Measurement Scales

Research Concept		Adapted Measurement Item	Original Measurement Item
Perceived Risk (PR) Sources: Yu-Shan Chen & Ching-Hsun Chang, (2012); Murphy and Enis (1986); and Sweeney et al. (1999).	PR1	There is little chance that there could be something wrong with the environmental performance of electric cars in the future	“There is a chance that there will be something wrong with environmental performance of this product.”
	PR2	There a low chance that electric cars will not work properly with respect to its environmental design	“There is a chance that this product will not work properly with respect to its environmental design.”
	PR3	There is a chance that you would get an environmental penalty fee (charge) if you do not use an electric car in the future	“There is a chance that you would get environmental penalty or loss if you use this product.”
	PR4	There is a chance that using electric cars will negatively affect the environment.	“There is a chance that using this product will negatively affect the environment.”
	PR5	Using electric cars in the future could promote my reputation	“Using this product would damage your green reputation or image.”
Perceived Trust (PT) Sources: Chen (2010); Yu-Shan Chen &	PT1	I feel that this car’s environmental reputation is generally reliable	“You feel that this product’s environmental reputation is generally reliable.”
	PT2	I feel that this car’s environmental performance is generally	“You feel that this product’s environmental performance is

Ching-Hsun Chang, (2012).		dependable	generally dependable.”
	PT3	I feel that this car’s environmental claims are generally trustworthy	“You feel that this product’s environmental claims are generally trustworthy”
	PT4	I think this car’s environmental concern meets my expectations	“This product’s environmental concern meets your expectations.”
	PT5	I think this car keeps promises and commitments for environmental protection	“This product keeps promises and commitments for environmental protection.”
Perceived Value (PV), Sources: Patterson & Spreng, (1997); Yu-Shan Chen & Ching-Hsun Chang, (2012)	PV1	I feel that this car’s environmental functions would provide very good value for me	“This product’s environmental functions provide very good value for you.”
	PV2	I think that this car’s environmental performance would meet my expectations	“This product’s environmental performance meets your expectations.”
	PV3	I would probably purchase an electric car because it is more environmentally friendly as compared to fuel combustion cars	“You purchase this product because it has more environmental concern than other products.”
	PV4	I would use an electric car because it would protect the environment	“You purchase this product because it is environmental friendly.”
	PV5	I think I would purchase an electric car because it has more benefits as compared to traditional cars	“You purchase this product because it has more environmental benefit than other products.”
Intention to	I1	I intend to use electric car because	“I avoid buying products which

Use (I) Kanchanapibul, Lacka, Wang, & Chan, (2014)		it has a low carbon footprint	are potentially harmful to the environment”
	I2	I expect to use electric car in the future because of its performance	“I have changed my principal products for ecological reasons”
	I3	I am willing to use electric car because my family uses it	“When I have to choose between two similar products, I choose the one that is less harmful to the environment”
	I4	I am willing to recommend an electric car to a friend	“I make a special effort to buy paper and plastic products that are made from recycled materials”
	I5	I am willing to pay for new features of an electric car	“Will not consider environmental issues when making a purchase”
Perceive Usefulness (PU) Sources: Davis (1989); Hannu, Carolina, Francisco, & Harry (2009)	PU1	I feel that smart car technology increases the efficiency of using a car	“The service is useful in my work/Studies”
	PU2	I think electronic car technology enhances my ability to use a car	“The service improves my efficiency”
	PU3	I think electronic car technology is useful in terms of helping me use a car	“Using the service saves time”

5.4 DATA COLLECTION

A pilot study was conducted for this research. The purpose of the pilot study is usually to find out from the population group the appropriate questions to be asked and presented in the final questionnaire.

5.4.1 Data Collection Techniques

The primary and secondary data collection techniques were utilized for this research. Primary data is the data that is collected to address the research problem at hand (Hox & Boeije, 2005; Malhora & Birks, 2007). Secondary data on the other hand is data that is already been published and readily available for further processing rather than the problem at hand (Hox & Boeije, 2005). The survey questionnaire on electric cars was distributed randomly to the students of The University of the Witwatersrand.

a) Primary Research

Primary research is usually undertaken to address a new research problem using an unprocessed data (Driscoll, 2011). A data was collected from a sample of 380 participants using self-administering surveys, “registered students of the University of the Witwatersrand.”

b) Secondary Research

Secondary research is secondary information on record (published) ready to be used as a guide for matters that might be presented in due time (Baines, Fill & Page, 2011). The previous and recognised academic journals relevant to the present study were referred. The search engines such as Google Scholar™, Wits Library Website was used to obtain the appropriate theories in a secondary research.

5.5 DATA ANALYSIS

5.5.1 Structural Equation Modeling (SEM)

Structural equation modeling approach was adopted to accurately analyse the research data. This is usually done in order to scrutinize the association of the variables within the research model. Structural equation modeling is a statistical technique that combines elements of traditional multivariate model, such as “regression analysis”, “factor analysis and

simultaneous equation modelling” (Chinomona, 2011; Nusair & Hua 2010, Liao & Hsieh 2013; Venter, Chuchu & Pattison, 2016). At first stage confirmatory factor analysis (CFA) was conducted where scales adapted from previous studies were tested in order to check if they consistent for future study.

In assessing the confirmatory factor analysis (CFA), the reliability test was conducted through the use of Cronbach’s alpha and item to total using SPSS 23 statistical software. The outcomes for reliability measurement will be displayed at a later stage in the study. Once the reliability is done validity test follows, it includes calculating the ‘average variance extracted’ and ‘inter-construct correlation matrix’. Tinashe (2014) suggest that to “check for discriminant validity the highest shared variance was compared against the average variance extracted in which a lower highest shared variance as compared to the average variance extracted would confirm the existence of discriminant validity”. The inter-construct correlation matrix was also used to check discriminant validity within which all correlations are to fall lower than 1.0 to confirm that scales were completely measuring distinct aspects of the research from each other. The table 6 below illustrates the key stages that were followed in the approach to analyse research data.

Table 7: Data Analysis Stages

Data analysis stage	Reason
Data coding	To enter the data so that analysis can commence
Data cleaning	To ensure that there are no errors or inconsistencies in the data set
Accuracy Analysis Statistics	To ensure that before analysis commences necessary reliability and validity checks have been conducted
Descriptive statistics	To provide an overall picture of the sample profile in which the number of respondents is provided, gender and age breakdowns were also provided.
Structural Equation Modeling	Two part process involving confirmatory factor analysis and hypothesis testing

5.5.2 Reliability and Validity of Measurement Scales

The Cronbach's alpha is conducted in order to assess the reliability of each measurement scale. Cronbach alpha values that reach or exceed 0.6 are considered to be reliable according to (Uta, 2015). For validity purposes the average variance extracted was conducted and in addition to that the highest shared variances among the research model's model were also calculated so that comparisons between the two indicators could be conducted. In the following chapter these comparisons are observed in the accuracy analysis statistics table.

5.5.3 RELIABILITY TESTS

In this study only three ways and means were used to assess reliability measures, namely average variance extracted (AVE) test, composite reliability test (CR), and the Cronbach's alpha test (Cronbach α). Donald & Pamela (2014) define reliability as the degree or extent to which a measure provides results which are consistent and usually this is prepared statistically, with an acceptable marginal level of coefficient greater than 0.6 for a Cronbach's alpha. Moreover, Donald & Pamela (2014) stated that the term 'internal consistency' has been used lavishly in traditional psychometrics often referred to as 'split-half' technique which is used when the measurement construct has a lot of similar questions to which a participant can respond. The high correlation shows there is similarity or homogeneity among construct. The possible correction to high correlation is to use Spearman-Brown correction formula to adjust the effect of the test length and estimate reliability of the whole test. According to Dunn, Baguley and Brunsden (2013) the "coefficient alpha is the most commonly used measure of reliability, and certainly of internal consistency reliability reported in psychological research".

5.5.3.1 Cronbach's Alpha Test

Lee Cronbach developed the Cronbach's alpha in early 1950s to propose a measurement test or scale for the internal consistency, and it is a number conveyed between 0 and 1 (Tinashe, 2014). In this study, the standardised Cronbach's coefficient alpha was used to measure the internal reliability for each measurement instrument. The previous studies postulate the most effective and reliable measure for internal consistency through Cronbach's coefficient α (Dunn, Baguley and Brunsden, 2013). According to Chinomona (2011), "a higher level of Cronbach's coefficient alpha signifies a higher consistency or reliability of the measurement scale". For the purpose of this research study, the Cronbach's Alpha, Composite reliability

(CR) and Average Variance Extracted (AVE) will be employed as the most significant tools to measure reliability.

5.5.3.2 Composite Reliability

An acceptable Composite reliability value to show reliability must be greater than 0.7 (Yang & Lai, 2010). The internal reliability of each hypothesis was also evaluated using the Composite Reliability (CR) index test. The following formula was utilized to calculate CR:

$$(CR): CR_{\eta} = (\sum \lambda_{yi})^2 / [(\sum \lambda_{yi})^2 + (\sum \epsilon_i)]$$

Composite Reliability = (square of the summation of the factor loadings) / {(square of the summation of the factor loadings) + (summation of error variances)}.

5.5.3.3 Average Variance Extracted

The average variance extracted (AVE) was shown in order to demonstrate the overall amount of difference that point out that they were accounted for by the underlying construct. Values for the variance put in higher than 0.4 exemplify that the pointers adequately symbolized the hidden variable (Fraering & Minor, 2006).

The following formula presented below was employed to calculate average variance extracted (AVE):

$$V_{\eta} = \sum \lambda_{yi}^2 / (\sum \lambda_{yi}^2 + \sum \epsilon_i)$$

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

Table 8: Model Fit indices and their acceptable thresholds

Model Fit Index	The acceptable measurement level	Description
Absolute Fit Indices Chi-Square χ^2	Low χ^2 relative to degrees of freedom with an insignificant p-value ($p > 0.05$)	Chi-Square is useful to check if hypothesis accurately fit the proposed model in a sample (Donald & Pamela, 2014:445. The acceptable level of the Chi-Square should be less than 3 (Chinomona, 2011).

Goodness Fit Index (GFI)	Acceptable threshold should be values > 0.95 (Daire, Joseph & Michael, 2008)	Targeted within a scale of 0 and 1, however values higher point toward a much better model fit. This fit index should be used with restraint.
Incremental Fit Indices (NFI)	Acceptable threshold for model fit index > 0.95 (Daire, Joseph & Michael, 2008)	It measures a fit comparative to a standard model which undertakes no covariance among the perceived variables. A propensity to overemphasize model fit in small samples.
Comparative fit index (CFI)	Acceptable threshold for this fit model index > 0.95 (Daire, Joseph & Michael, 2008)	Executes well in imitation studies (Sharma et al, 2005; McDonald and Marsh, 1990) Normed, 0-1 range.
Root Mean Square Error of Approximation (RMSEA)	Acceptable threshold for this fit model index is less than 0.07 (Steiger, 2007)	It has a well-recognised dissemination. Assists thriftiness. Usually values less than 0.03 signify an exceptional fit.

Source: (Developed by researcher)

5.6.1 Path Modeling

Path modeling describes the associations between pragmatic or measured variables and hypothetical paradigms (Roche, Duffield & White, 2011) and checks the essential paths of the conceptualized research model. Once the model fit has been evaluated by means of confirmatory factor analysis (CFA), the study will go on to execute Path Modelling using AMOS 23.0 software package. The structural equation modeling (SEM) technique determines and assesses the theoretical substructures of a proposed study and the importance of the associations between models' hypotheses. SEM requires a technique where isolated associations are permitted for each set of dependent variables and provides an approximation procedure for a series of dispersed multiple regression equations to be estimated simultaneously. Tinashe (2014) suggest that SEM encompasses dualistic instruments namely, the structural model, which in essence is the path where independent, and dependent variables are being interrelated and the measurement model enables this study to use several indicators for a single independent variable. In this study, a number of characteristics are to be recognised as ensuring an influence on performance. The multi-item scales for each paradigm can be established. Therefore by assessing each association concurrently rather than isolate, combine altogether the multi-scale items to account for measurement errors with each scale.

5.7 ETHICAL CONSIDERATIONS

The researcher adhered to the ethics requirements from the University of the Witwatersrand, ethics clearance certificate was applied for and obtained for the enablement of data collection. This was because the study involved human beings, and according to universal rights of which are also enshrined in South African Constitution, "everyone has the right to privacy" (s14). There are precautionary measures put in place to keep up with such policies to safeguard people's confidentiality and the status of the University of the Witwatersrand. The University of the Witwatersrand ethics committee decides on granting ethical clearance for the research, and if to some extent untruth, forging or twisting of research data take place the committee will take proper measures.

The data was obtained in the most appropriate manner no one was put under duress to participate in the study. There were no inducements or enticements such as money were given to decoy people to take part in the study. The participants were allowed to pull out without cost at any particular phase. The researcher believes to have followed all protocols as

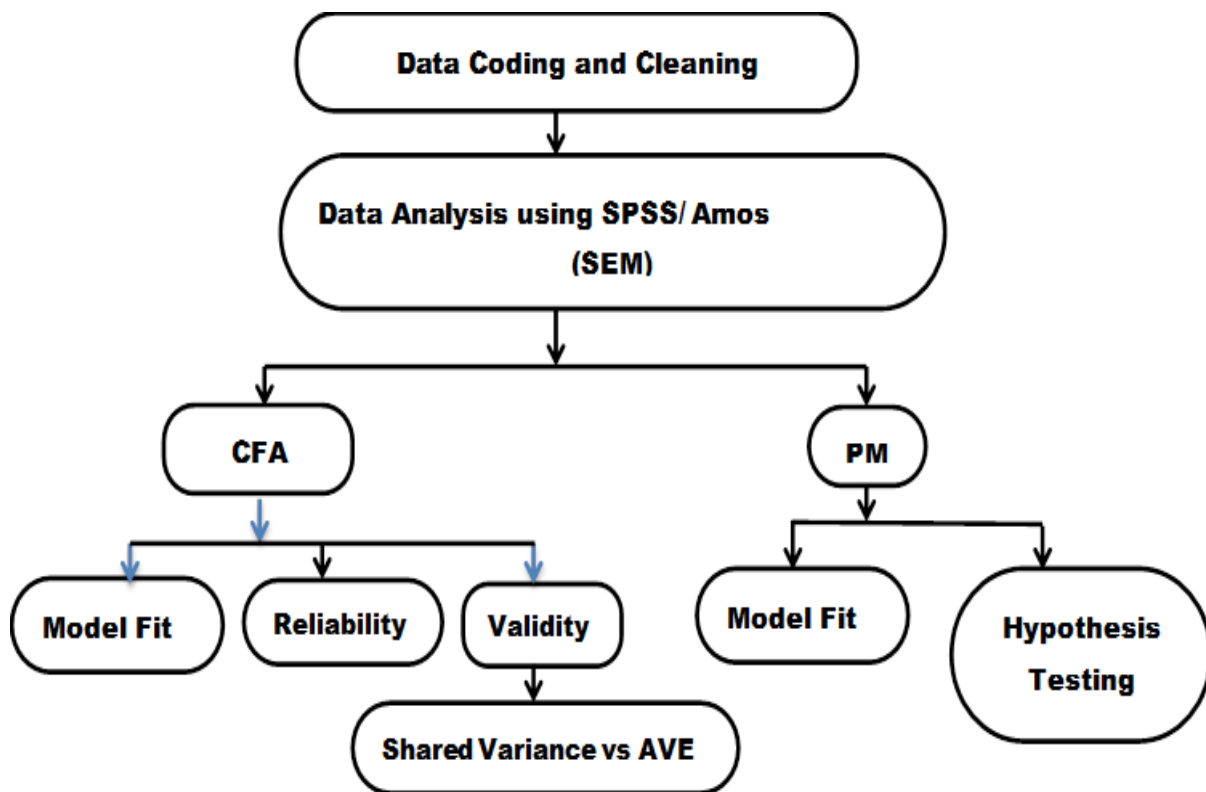
far as the ethical conduct is concerned. The researcher will store the collected data strictly confidential and only use it for the purpose of the research within the period of five years.

5.8 SUMMARY OF CHAPTER 5

Chapter 5 employed the research methods and designs for quantitative research study. It started with the introduction, followed by quantitative research discussion, thirdly, a sampling design was also put in place, the fourth section explored on sample size and the fifth section discussed sampling methods. The chapter also discussed the research philosophy. The study followed a positivist paradigm. Chapter 6 explores the data analysis process as well as discusses the results of the study.

CHAPTER 6: DATA ANALYSIS AND DISCUSSION OF RESULTS

Figure 12: Statistical Analysis and Procedures for Chapter 6



6.1 INTRODUCTION

Chapter 6 discussed the ways and means used to acquire the results to be presented within this chapter. The findings obtained will be discussed in great detail in the chapter. The chapter showcase the statistical examination of the collected data through the research questionnaire (data collection tool). In analysing the data, the Statistical Package for the Social Sciences (SPSS) was employed. The descriptive statistics and reliability of the research constructs within the model to develop the questionnaire was also explained in great detail. Structural Equation Modeling was also discussed; this is where Path Modeling and Confirmatory Factor Analysis are conducted. In Confirmatory Factor Analysis (CFA) Model Fit was checked, the Reliability and Validity of the measurement scales used in the research construct. The comparative between Shared variance and average variance extracted (AVE) was conducted to assess the validity of the scales, Path Modeling (PM) on the other hand was directed at checking the model fit, and to assess hypothesis of the study.

As shown in figure 14 above, the chapter will begin by going through the data coding and cleaning processes, followed by the arrangement of data analysis procedures as per the study. Subsequently, the sample depiction will be conveyed. Following the sample description, a test of measures and accuracy analysis statistics is provided. This section of the chapter primarily tests for the reliability and validity measures, various methods to establish truthfulness will be used. As stated in chapter five, for reliability measure, “the Cronbach’s Alpha, the Composite Reliability (CR) value, and the Average Value Extracted (AVE)” were used; whilst for validity, confirmatory factor analysis was used to check convergent validity and correlation matrix and chi-square, where CFA modification was applied to assess for evidence of discriminant validity. This section is followed by a presentation of the research models fit. Various pointers such as the chi-square value, Goodness of Fit Index (GFI), Normed Fit Index (NFI), Incremental Fit Index (IFI), Comparative Fit Index (CFI) and Root Mean Square Error of Approximation (RMSEA), were used to ascertain whether the research model fit the data. In conclusion, a summary of Chapter 6 is provided.

6.4.1 Sample Description

Table 9 provides a demographic profile of the respondents. The total target population of 33,346 is from the University of Witwatersrand (University of the Witwatersrand, 2014), this was also used as a sample frame, and registered students of the University of the Witwatersrand were suitable and appropriate for the study. The demographic profile signifies that the fraction of males to females and was almost evenly split, and ‘prefer not to say’ has taken on the least portion. Males represent 46.6% of the total sample, females accounted for 52.68% and ‘prefer not to say’ has taken 0.8% of the total sample. Most of the respondents were from the age group of (20-25 years) with 66.6% and the age group with the least number of respondents (18-19) was the represented by 33.4% of the total sample. In terms of access to car or motor vehicle, the results show that most of the respondents did not have access to a car, a group comprising 64.74% of the total sample, as compared to those respondents with access to a car, who only comprised 35.26% of the total sample, this might be as a results of the living standard (Low to Middle income group) at most do not own a car in South Africa. All those participated in the study were registered students, where 55.8% indicated that their frequency of using a car was mostly on a seasonal basis. On academic level, the results showed that most of the respondents indicated a high school education as their highest qualification, most of the respondents are still in their undergraduate degree

indicated by 59.5% of the total sample. In the following section the gender distribution is presented in figure 6.2 and table 6.1.

Table 9: Sample Demographic Profile

Gender	Frequency	Percentage
Male	177	46.6 %
Female	200	52.6 %
Prefer not to say	3	0.8 %
Total	380	100 %
Age	Frequency	Percentage
18-19	127	33.4 %
20-25	253	66.6 %
Total	380	100 %
Access to car	Frequency	Percentage
Yes	134	35.26 %
No	246	64.74 %
Total	380	100 %
Frequency of Car Usage	Frequency	Percentage
Monthly	4	1.1 %
Seasonally	212	55.8 %
Annually	27	7.1 %
Other (Specify)	137	36.1 %
Total	380	100 %
Highest Academic Achievement	Frequency	Percentage

High School	226	59.5 %
Diploma	54	14.2 %
Degree	70	18.4 %
Post Graduate	13	3.4 %
Other (Specify)	17	4.5 %
Total	380	100 %
Occupation	Frequency	Percentage
Student	243	63.9 %
Employed	56	14.7 %
Self-employed	54	14.2 %
Unemployed	27	7.1 %
Total	380	100%

Figure 13: The Bar Chart illustrates the Gender Presentation in sample:

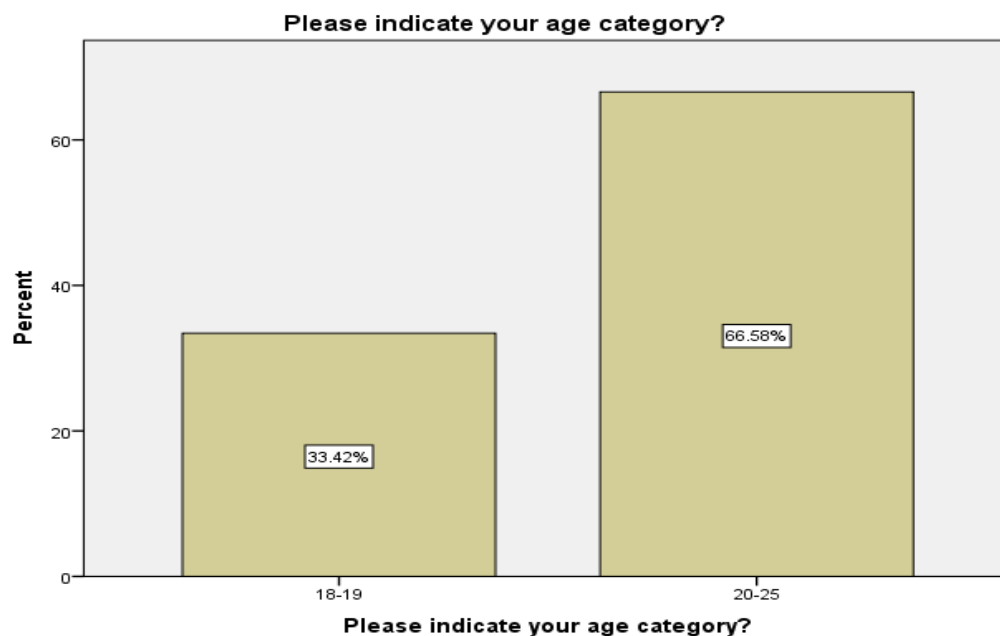


Table 10: Gender Table

Please indicate your gender?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	177	46,6	46,6	46,6
	Female	200	52,6	52,6	99,2
	Prefer not to say	3	0,8	0,8	100,0
	Total	380	100,0	100,0	

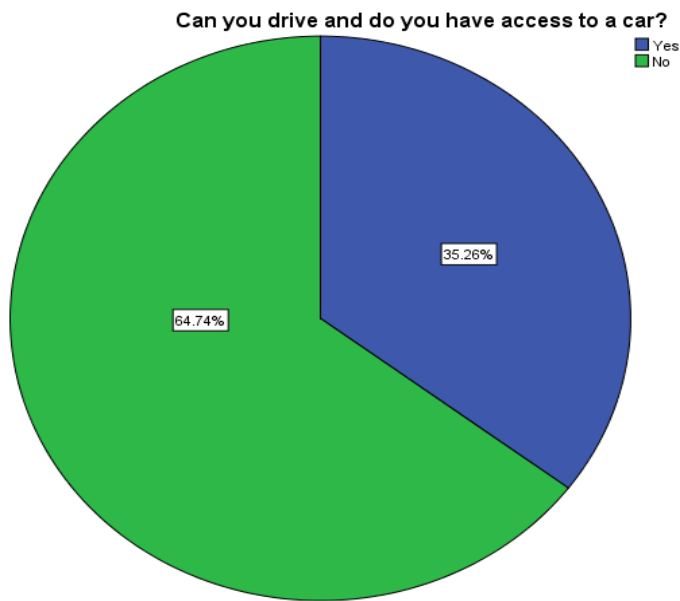
Indicated in the graph and table 6.2 above female participants had more representation as indicated by 52.6% while males were represented by 46.6%. Finally those who stated that they would prefer not to state their gender only represented 0.8%.

Figure 14: Age Category



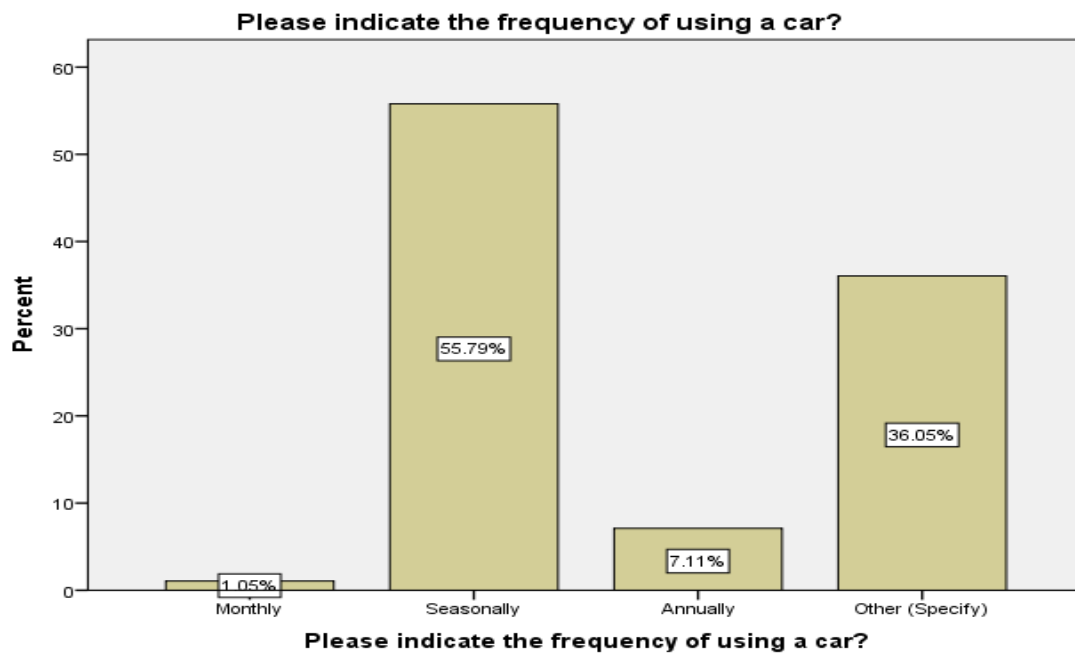
The bar graph represents the age category for the respondents ranging from '18 to 19', '20 to 25', and 'prefer not to say'. The majority of the respondents were within the age category of '20 to 25', represented by 66.58% out of the total sample, and the least at 33.42% ranging from '18 to 19' out of total sample of 100% and 0% out of total sample for 'prefer not to say', of which it was not represented graphically.

Figure 15: Pie Chart Illustrates the Distribution of Access to Car Sample



The pie chart above show the distribution of participants that had access to a car in comparison to those that did not have access to a car. Most of the participants did not have access to a car as indicated by the 64.74% out of the total 100% while those participants that had access to a car were represented by 35.26%.

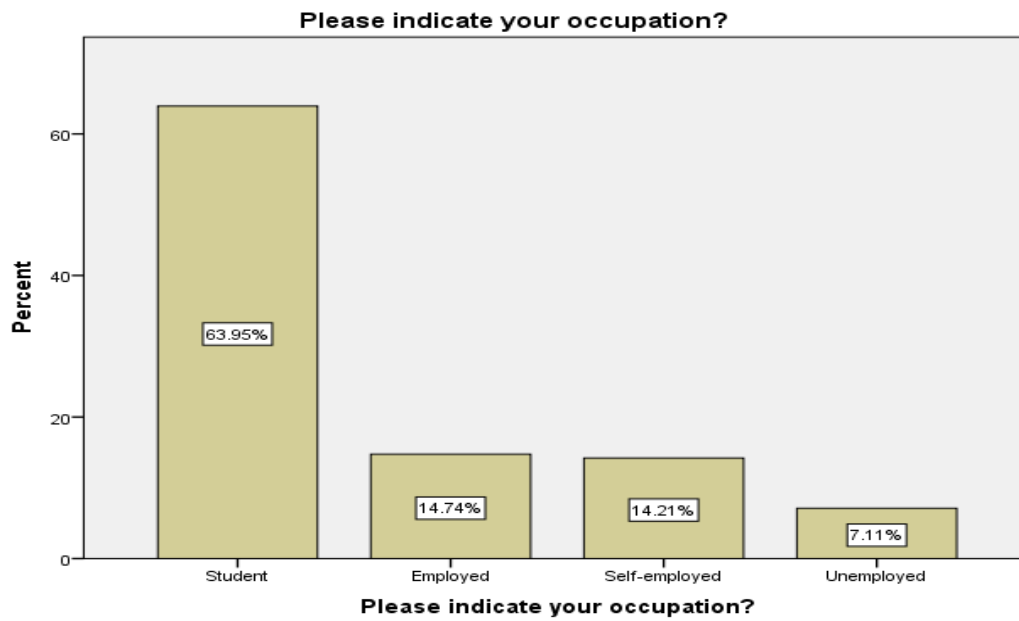
Figure 16: The Bar Graph Illustrate the frequency of using a Car



The bar graph above illustrates the frequency of car usage by the participants. The group of participants that used cars the most was that of seasonal usage indicated by 55.79%, followed

by the “other” that was represented by 36.05%. The third most represented group accounted for 7.11% and these were annual users followed by the smallest represented group (monthly) in terms of car usage represented by 1.05%.

Figure 17: The Bar Graph Illustrate the frequency of using a Car



The bar graph above illustrates the distribution of participants in terms of their occupation. The most represented group was that of students indicated by 63.95%, followed by employed participants indicated 14.74%, this was then followed by self-employed participants indicated by 14.21% and finally unemployed participants where represented by 7.11%.

Table 11: Academic Level

Please Indicate your Academic level					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	226	59.5	59.5	59.5
	2	54	14.2	14.2	73.7
	3	70	18.4	18.4	92.1
	4	13	3.4	3.4	95.5
	5	17	4.5	4.5	100.0
	Total	380	100.0	100.0	

The table above indicates the distribution of participants in terms of their academic level. Most of the respondents were in possession of a school leaving qualification, indicated by 59.5%, followed by participants with an undergraduate qualification as indicated by 18.4%, this was then followed by those participants in possession of diploma with 14.2%, then ‘other qualification’ at 4.5% and finally postgraduate participants where represented by 3.4%.

6.4.2 Questionnaire Results

All research constructs were measured on a 7-point Likert-type scale. The total numbers of 380 respondents were recorded. The first observed variable “perceived usefulness (PU)” was measured with three items, ranging from PU1 to PU3. The second variable, “perceived trust (PT)” was measured with five items, PT1 to PT5. The third variable “perceived value (PV)” also measured with five items, ranging from PV1 to PV5. Fourth variable “perceived risk (PR)” measured with five items, PR1 to PR5. Fifth variable “Intention to use (I)” was measured with five items ranging from I1 to I2. In assessing the measurement construct “Perceived Usefulness” with three items, the results show that the respondents were neutral in their response. This is evident in the following responses for PU: PU1 obtained 176 (46.3), PU2 had 186 (48.9%), PU3 reached 186 (49.2%). The second variable “Perceived Risk” in a scale of 1 to 7 indicates that most of the respondents were recorded to be leaning towards neutral or slightly agreeing with the measurement instruments. For example, PPR2 and PR4 obtained the highest neutrals with 198 (52.1%) and 194 (51.1%), respectively. Out of the possible 380 agreeing with the statement, this was significantly more than the other responses for the same statement, such as two respondent (0.5%) and respondents (0.8%) strongly disagreeing and slightly disagreeing, represented by 4 and 5 option.

Table 12: Accuracy Analysis Statistics

Research Construct		Descriptive Statistics				Cronbach's Test		CR Value	AVE Value	Factor Loading
		Mean Value		Standard Deviation		Item-total	α value			
PU	PU1	3.884	3.914	0.833	0.799	0.727	0.855	0.837	0.632	0.773
	PU2	3.884		0.797		0.752				0.770
	PU3	3.974		0.768		0.702				0.840
PR	PR1	3.839	3.869	0.811	0.800	0.774	0.916	0.914	0.680	0.808
	PR2	3.895		0.775		0.808				0.861
	PR3	3.905		0.810		0.803				0.848
	PR4	3.879		0.780		0.777				0.821
	PR5	3.826		0.826		0.760				0.782
PT	PT1	3.858	3.876	0.776	0.771	0.934	0.949	0.951	0.802	0.975
	PT2	3.837		0.769		0.945				0.994
	PT3	3.855		0.753		0.930				0.935
	PT4	3.842		0.752		0.941				0.955
	PT5	3.987		0.804		0.579				0.534
PV	PV1	3.950	3.900	0.741	0.774	0.701	0.885	0.867	0.567	0.704
	PV2	3.908		0.758		0.722				0.744
	PV3	3.939		0.768		0.780				0.832
	PV4	3.889		0.785		0.711				0.742
	PV5	3.813		0.818		0.706				0.738
I	I1	3.934	3.916	0.754	0.763	0.708	0.877	0.858	0.547	0.773
	I2	3.982		0.746		0.732				0.766
	I3	3.976		0.739		0.713				0.756
	I4	3.847		0.781		0.714				0.712
	I5	3.839		0.798		0.674				0.687

* Scores: 1 – Disagree completely; 2 – Disagree; 3 – Slightly Disagree, 4 – Neutral; 5 – Slightly Agree; 6 - Agree; 7 – Strongly Agree.

“C.R.: Composite Reliability; AVE: Average Variance Extracted; S.V.: Shared Variance.”

^a significance level $p < 0.05$; ^b significance level < 0.01 ; ^c significance level < 0.001

Measurement model fits: $\chi^2/df = 2.375$; GFI= 0.905; CFI= 0.969; TLI= 0.962; IFI= 0.970; RFI= 0.936; NFI=0.949; RMSEA= 0.06.

It can be noted that table 1, Cronbach Alpha coefficients is achieved at a range of 0.855 to 0.949; this means that all of the Cronbach's Alpha has exceeded the recommended threshold of 0.7 as per literature (Nunnally and Bernstein, 1994), thus confirming that the measures used in this study are reliable. The average variance extracted (AVE) of Perceived Trust (PT) is 0.802 is higher than the square of the shared variance. This proves the existence of discriminate validity. The current study uses the inter-construct correlation matrix and the Chi-square CFA Test methods to check on discriminant validity of the research constructs.

Table 13 Standardised Regression Estimates

Standardised Regression Estimates (all variables and instruments included)							
Composite reliability (CR)							
					Summation of error terms		$CR\eta = (\sum \lambda y_i)^2 / [(\sum \lambda y_i)^2 + (\sum \epsilon_i)]$
				$(\sum \lambda Y_i)^2$	ϵ_i	$\sum \epsilon_i$	CR
PU	<---	PU1	0,773	5,679	0,402	1,104	0,837
	<---	PU2	0,770		0,407		
	<---	PU3	0,840		0,294		
PR	<---	PR1	0,808	16,974	0,347	1,601	0,914
	<---	PR2	0,861		0,259		
	<---	PR3	0,848		0,281		
	<---	PR4	0,821		0,326		
	<---	PR5	0,782		0,388		
PT	<---	PT1	0,975	19,298	0,049	0,990	0,951
	<---	PT2	0,994		0,012		
	<---	PT3	0,935		0,126		
	<---	PT4	0,955		0,088		
	<---	PT5	0,534		0,715		
PV	<---	PV1	0,704	14,138	0,504	2,163	0,867
	<---	PV2	0,744		0,446		
	<---	PV3	0,832		0,308		
	<---	PV4	0,742		0,449		
	<---	PV5	0,738		0,455		
I	<---	I1	0,773	13,646	0,402	2,265	0,858
	<---	I2	0,766		0,413		
	<---	I3	0,756		0,428		
	<---	I4	0,712		0,493		
	<---	I5	0,687		0,528		

The reliability analysis provides an acceptable CR threshold that must surpass 0.7 (Fornell & Larcker, 1981; Yang & Lai, 2010). The evaluation of internal reliability of each construct was conducted using the Composite Reliability (CR) index test. The following formula was used for CR:

$$\text{(CR): } CR_{\eta} = (\sum \lambda_{yi})^2 / [(\sum \lambda_{yi})^2 + (\sum \epsilon_i)]$$

“Composite Reliability = (square of the summation of the factor loadings)/ {(square of the summation of the factor loadings) + (summation of error variances)}.” (Tinashe, 2015)

The results in Table above indicate that composite reliability (C.R.) indexes were between 0.837 and 0.951. According to the previous literature these values have surpassed the estimate criteria.

Using the results of the construct “Perceived Trust” to demonstrate, the calculation for Composite Reliability was conducted as follows:

$$\begin{aligned} \text{Step 1: } (\sum \lambda_{yi})^2 &= (0.975 + 0.994 + 0.935 + 0.955 + 0.534)^2 \\ &= 19.298 \end{aligned}$$

$$\begin{aligned} \text{Step 2: } \sum \epsilon_i &= (1-0.975)^2 + (1-0.994)^2 + (1-0.935)^2 + (1-0.955)^2 + (1-0.534)^2 \\ &= 0.990 \end{aligned}$$

$$\begin{aligned} \text{Step 3: } CR_{\eta} &= 19.298 / (19.298 + 0.990) \\ &= 0.95120268 \\ &= 0.951 \end{aligned}$$

Table 13 below presents the calculations for Average Variance Extracted.

Table 14: Diagrammatic Representation of Average Variance Extracted Calculations

			Estimate	λy_i^2	$\sum \lambda y_i^2$	ϵ_i	$\sum \epsilon_i$	$\sum \lambda y_i^2 / (\sum \lambda y_i^2 + \sum \epsilon_i)$
PU	<---	PU1	0,773	0,598	1,896	0,402	1,104	0,632
	<---	PU2	0,770	0,593		0,407		
	<---	PU3	0,840	0,706		0,294		
PR	<---	PR1	0,808	0,653	3,399	0,347	1,601	0,680
	<---	PR2	0,861	0,741		0,259		
	<---	PR3	0,848	0,719		0,281		
	<---	PR4	0,821	0,674		0,326		
	<---	PR5	0,782	0,612		0,388		
PT	<---	PT1	0,975	0,951	4,010	0,049	0,990	0,802
	<---	PT2	0,994	0,988		0,012		
	<---	PT3	0,935	0,874		0,126		
	<---	PT4	0,955	0,912		0,088		
	<---	PT5	0,534	0,285		0,715		
PV	<---	PV1	0,704	0,496	2,837	0,504	2,163	0,567
	<---	PV2	0,744	0,554		0,446		
	<---	PV3	0,832	0,692		0,308		
	<---	PV4	0,742	0,551		0,449		
	<---	PV5	0,738	0,545		0,455		
I	<---	I1	0,773	0,598	2,735	0,402	2,265	0,547
	<---	I2	0,766	0,587		0,413		
	<---	I3	0,756	0,572		0,428		
	<---	I4	0,712	0,507		0,493		
	<---	I5	0,687	0,472		0,528		

The average variance extracted from the estimates reveal the overall amount of variance in the indicators accounted for by the latent construct (Fraering and Minor, 2006). The higher values for the variance extracted estimate (greater than 0.50) reveal that the indicators well represent the latent construct (Fraering & Minor, 2006; Tinashe 2015).

To calculate Average Variance Extracted (AVE): he formula below is used to calculate

$$V_{\eta} = \sum \lambda y_i^2 / (\sum \lambda y_i^2 + \sum \epsilon_i)$$

“AVE = {(summation of the squared of factor loadings)}/{(summation of the squared of factor loadings) + (summation of error variances)}” (Tinashe, 2015).

Using the results of the construct PT to demonstrate, the calculation for AVE was conducted as follows:

$$\begin{aligned} \text{Step 1: } \sum \lambda y_i^2 &= (0.975^2 + 0.994^2 + 0.935^2 + 0.955^2 + 0.534^2) \\ &= 4.010 \end{aligned}$$

Step 2: $\Sigma \epsilon_i = (1-0.975)^2 + (1-0.994)^2 + (1-0.935)^2 + (1-0.955)^2 + (1-0.534)^2$
 $= 0.990$

Step 3: $V_\eta = 4.010 / (4.010 + 0.990)$
 $= 0.802$

The above has undergone certain steps when calculating the AVE of each of the research constructs. The graphical representation in table 13 is a noble representation of the hidden construct by the item is identified when the variance extracted approximation is above 0.5 (Fraering & Minor, 2006). The results from table of AVE range from 0.547 to 0.802 and thus validate an acceptable threshold for AVE. Generally, the construct consistencies (reliabilities) and the average variance extracted estimates suggest the scales are internally consistent. The average variance extracted estimate in this study has shown that the complete amount of variance in the indicators was accounted for by the hidden construct. All average variance explained (AVE) values alternated from 0.547 to 0.802, and were accordingly adequate for the construct (Fraering & Minor, 2006).

6.5 VALIDITY TEST

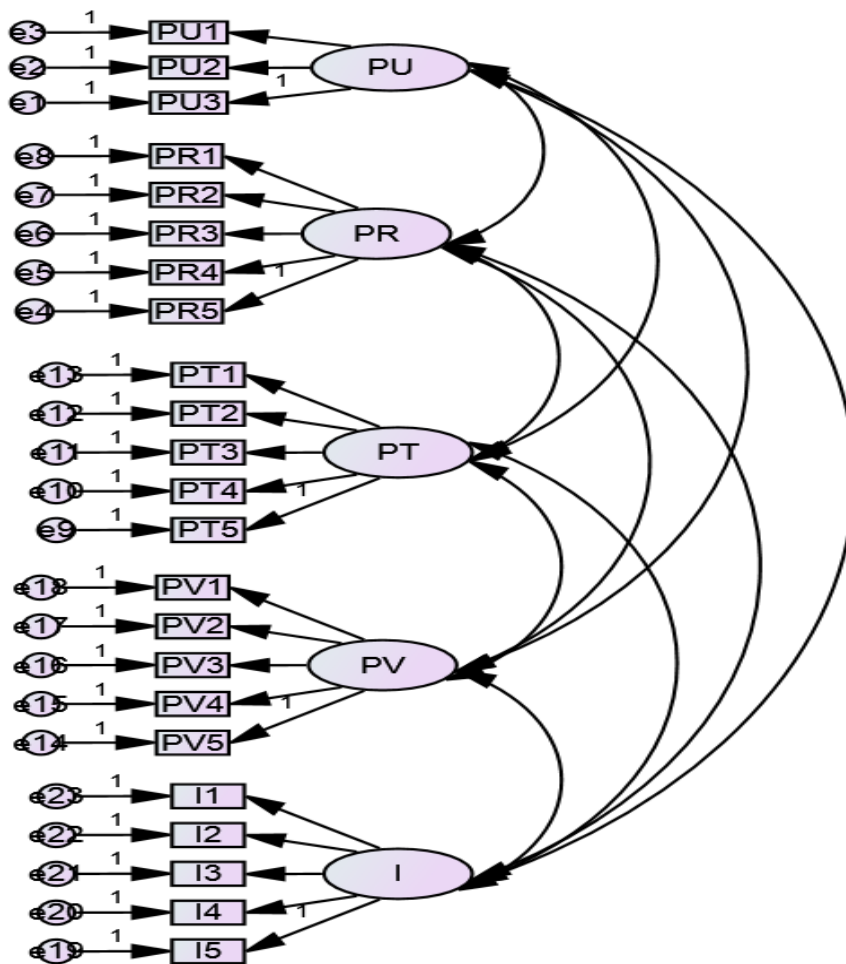
Table 15: Correlations between Constructs

Interconstruct Correlation Matrix					
	PU	PR	PT	PV	I
Perceive Usefulness - PU	1				
Perceived Risk - PR	0.734**	1			
Perceived Trust - PT	0.677**	0.889**	1		
Perceived Value - PV	0.718**	0.714**	0.734**	1	
Intention to Use - I	0.718**	0.734**	0.709**	0.757**	1
**. Correlation is significant at the 0.01 level (2-tailed).					

6.5.1 Confirmatory Factor Analysis (CFA) models

Figure 20 below is an illustration of the confirmatory factor analysis model.

Figure 18: Confirmatory Factor Analysis



Note:

- PU = Perceived Usefulness
- PT = Perceived Trust
- PV = Perceived Value
- PR = Perceived Risk
- IU = Intention to Use

The research model was run and had the following results.

Chi-square (χ^2/df) = 2.375, Goodness of Fit Index (GFI) = 0.905, Comparative Fit Index (CFI) = 0.969, Tucker Lewis Index (TLI) = 0.962, Incremental Fit Index (IFI) = 0.970, Relative Fit Index (RFI) = 0.936, Norm Fit Index (NFI) = 0.949, Random Measure of Standard Error Approximation (RMSEA) = 0.06.

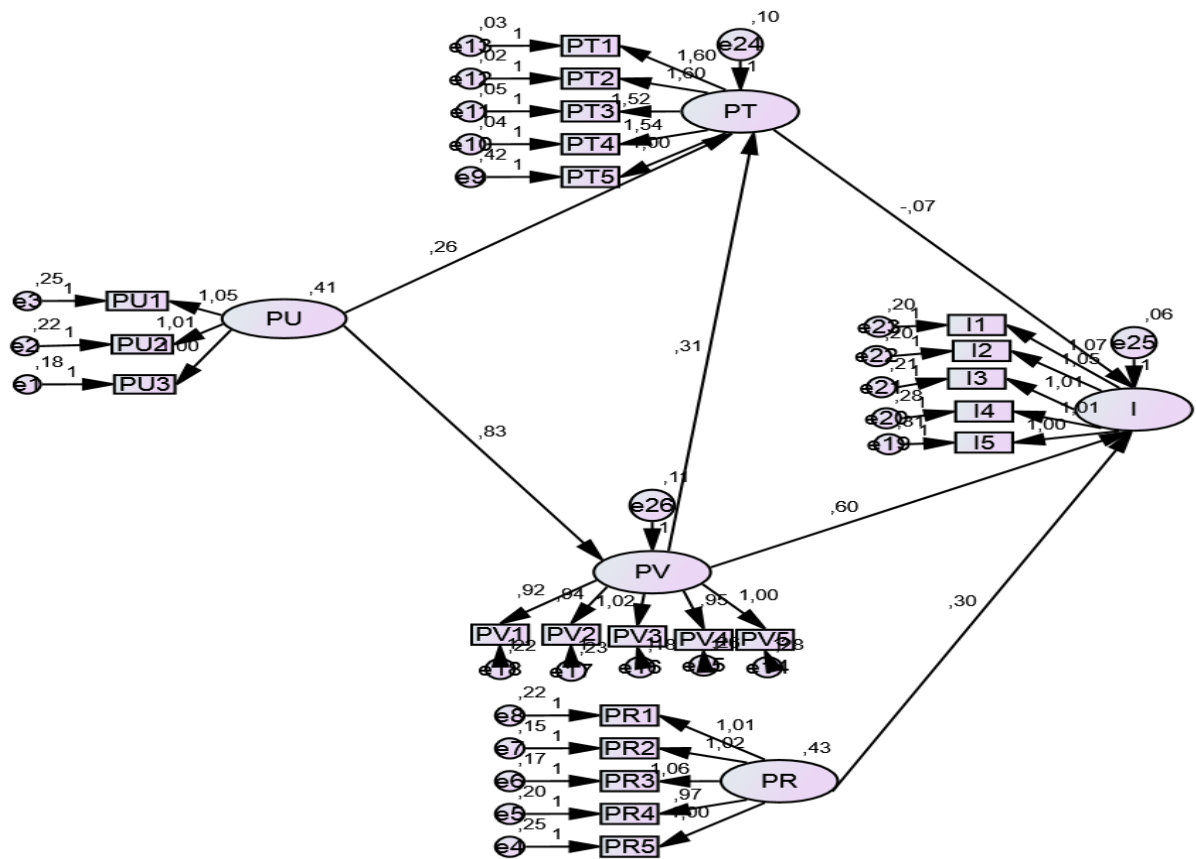
Table 16: Model Fit Results

Model Fit Criteria	Chi-Square (χ^2/DF)	GFI	NFI	RFI	IFI	TLI	CFI	RMSEA
Indicator value	2.375	0.905	0.949	0.936	0.970	0.962	0.969	0.06

6.6 CONCEPTUAL MODEL FIT ASSESSEMENTS

Confirmatory factor analysis (CFA) was primarily performed to examine scale accuracy (including reliability, convergent validity, and discriminant validity) of the multiple-item construct measures using AMOS 23. A confirmed two-way procedure for assessing model fit comprises of confirmatory factor analysis (CFA) and hypothesis testing (Anderson & Gerbing, 1988). The acceptable model fit for validity was indicated chi-square value over degree of freedom (χ^2/df) of value between 1 and 3, followed by the values of Goodness of Fit Index (GFI), Comparative Fit Index (CFI), Incremental Fit Index (IFI) Tucker Lewis Index (TLI), and equal to or greater than 0.90, and the Root Mean Square Error of Approximation (RMSEA) value to be equal to or less than 0.08. Recommended statistics for the final overall-model assessment revealed acceptable fit of the measurement model to the data. All correlation values were less than 0.8, the measurement model produced a ratio of chi-square value over degree-of-freedom of 2,375, and GFI, CFI, TLI, IFI, RFI, NFI and RMSEA were 0.905, 0.949, 0.936, 0.970, 0.962, 0.969 and 0.06, respectively. Once an acceptable CFA measurement model fit was accomplished, the study went further to the hypothesis testing stage using structural equation modeling with AMOS 23 software programme.

Figure 19: Structural Model



Note:

- PU = Perceived Usefulness
- PT = Perceived Trust
- PV = Perceived Value
- PR = Perceived Risk
- IU = Intention to Use
- e = Measurement error

Table 17: Structural Equation Model Analysis

			Estimate	P
PV	<---	PU	0,826	***
PT	<---	PU	0,262	***
PT	<---	PV	0,312	***
I	<---	PT	0,069	0,249
I	<---	PV	0,605	***
I	<---	PR	0,298	***

Source: Amos Graphics 23

Table 18: Results of Structural Equation Model Analysis

Hypothesised Relationship	Hypothesis	Path Coefficient	P-Value	Results	Basis of Hypothesis
Perceived Usefulness (PU) → Perceived Trust (PT)	H ₁	0,262 ^c	***	Supported and significant	Supported by the literature
Perceived Usefulness (PU) → Perceived Value (PV)	H ₂	0,826 ^c	***	Supported and significant	Supported by the literature
Perceived Value (PV) → Perceived Trust (PT)	H ₃	0,312 ^c	***	Supported and significant	Supported by the literature
Perceived Trust (PT) → Intention to Use (I)	H ₄	0,069 ^c	0,249	Supported and but insignificant at (P<0.05)	Supported by the literature
Perceived Value (PV) → Intention to Use (I)	H ₅	0,605 ^c	***	Supported and significant	Supported by the literature
Perceived Risk (PR) → Intention to Use (I)	H ₆	0,298 ^c	***	Supported and significant	Supported by the literature

Structural model fits: $\chi^2/df= 2.375$; GFI= 0.905; CFI= 0.969; TLI= 0.962; IFI= 0.970; RFI= 0.936; NFI=0.949; RMSEA= 0.06

^a significance level $p < 0.05$; ^b significance level < 0.01 ; ^c significance level < 0.001

6.7 MODEL FIT RESULTS

The proposed conceptual model will be assessed from the same data set. The recommended threshold for chi-squared value is less than 3. The ratio of chi-square over degree-of-freedom was 2.375 and as such, confirms for the model fit (Venter, Chinomona & Chuchu, 2016). As stated above, the GFI, CFI, TLI, IFI, RFI, NFI and RMSEA values were 0.905, 0.949, 0.936, 0.970, 0.962, 0.969 and 0.06, respectively. The model fits measures exceeded the recommended and acceptable threshold of more than 0.8 for GFI, CFI, TLI and for RMSEA the model fit was lower than the acceptable threshold of 0.08 (Bentler and Bonett, 1980; Bollen, 1989; Baumgartner and Hombur 1996; Byrne 1998; Hu and Bentler, 1999; McDonald and Ho, 2002; Hooper, Coughlan and Mullen, 2008; Chinomona, 2011). These results suggest that the proposed conceptual model for the research came together satisfactorily and could represent the underlying empirical data structure collected at the University of the Witwatersrand. The model fit was acceptable and the study proceeded to test the research hypotheses.

6.8 DISCUSSION OF HYPOTHESIS TESTING RESULTS

As seen in figure or table 6.11, all hypotheses coefficients were at least at a significant level of $p < 0.01$, except H4.

Hypothesis 1 (H₁) and 2 (H₂)

Hypotheses one and two (H1 and H2) posited that Perceived Usefulness (PU) had a positive and direct relationship with Perceived Trust (PT) and Perceive Value (PV). Based on the results of this study, it has been confirmed that these relationships exist and are significant. The coefficient of H1 and H2 was, 0.262 and 0.826 respectively. These hypotheses were significantly supported, indicating that the degree to which a person's belief of using a particular system would enhance his or her job performance could lead to consumers' trust and value has a direct and positive impact, in this case on electronic vehicles.

Hypothesis 3 (H₃)

Hypothesis three (H3), the consumers' perceived value is positively associated with consumers' perceived trust (commitment) on electric vehicles. This hypothesis was supported thereby, indicating that to reduce uncertainty and build customer trust in the form of reliable customer expectations, there has to be consistency between product attributes and positive perceived value on electronic vehicles.

Hypothesis 4 (H₄)

Hypothesis four (H4) posited that the perceived trust has a positive influence on consumers' intention to use electric/electric cars. The hypothesis was supported but not significant at 'p>0.05 significant level', this point to that perceived trust and intention to use is supported but might be a significant and determining factor towards using electric vehicles.

Hypothesis 5 (H₅)

The hypothesis five (H5) stated, perceive value has a positive influence on consumers' intention to use electric cars. This was supported, indicating that a particular choice may be determined by one value or influenced by the several values. Therefore consumer values can influence decision making and contribute additively and incrementally towards intention to use electronic vehicles.

Hypothesis 5 (H₆)

Hypothesis six (H6) posits, the perceived risk negatively influence consumers' intention to use electric or electric cars. This relationship was supported and significant from the literature point of view. However, it was not supported on the negative, indicating that if the customer perceives that the use of electronic car will be detrimental to performance, financial, opportunity, safety and psychological risk, they will still intent to use such product or service with such risks. This could be partly because most of the participants were not the actual owners of these electric vehicles and they have never driven an electric vehicle.

SUMMARY OF CHAPTER 6

In summary the chapter has produced empirical results drawn from the study. It started off by introducing a brief outline and explored on the data screening and analysis procedures. The next section explored on the descriptive statistics of the current study which includes a detailed description of the sample together demographics of the respondents. It then progressed to the third section where the reliability tests were discussed as illustrated by the diagrams provided. Analysis accuracy statistics are also illustrated diagrammatically in the third section. The fourth section is comprised of the reliability test; the Cronbach's alpha (α), Composite reliability (CR) and the Average variance extracted (AVE). The fifth section is comprised of the validity tests; construct validity, convergent validity and discriminant validity. Also included in the fifth section is a diagrammatic illustration of the inter-construct correlation matrix, a comparison of the Average variance extracted (AVE) and the Shared variance (SV). Model fit is explored include a diagrammatic representation of model fit criteria and acceptable Fit Level. The Confirmatory Factor Analysis (CFA) Model is illustrated and discussed. Thereafter the model fit results are discussed and illustrated diagrammatically. An introduction to Structural equation modeling is provided followed by a diagrammatic illustration of the structural model. The structural model is followed by hypothesis testing and a discussion of results of structural equation model analysis. In chapter 6 the proposed hypothesis for the study was a test which required conducting Structural Equation Modeling (SEM) using the AMOS 23 software program and then discussion the research findings. The study investigated the direct effects of perceived usefulness on perceived trust and perceived value and intention to use electric cars, perceived risk and intention to use electric cars.

CHAPTER 7: FINDINDGS, CONCLUSIONS, IMPILICATIONS AND FUTURE RESEARCH

7.1 INTRODUCTION

The chapter shares more light onto the contributions as per the finding of the study, shortcomings or limitations of the study, literature and managerial or practical implications and potential future research. The chapter will also provide a full conclusion for the entire study. The main purpose of this study was to examine the factors that affect young consumer's acceptance of electronic cars in South Africa. Structural Equation Modeling (SEM) was employed to assess the conceptually proposed research model and hypothesis formulated.

7.2 RESEARCH CONTRIBUTION

The current study provides benefits for the green marketing under sustainable development, particularly in South Africa, Johannesburg and this includes road users (consumers), manufacturers (e.g. motor industry), environmental policy makers and stakeholders among others. Theoretical contributions and/or implications are a prime objective of any academic investigation, but practitioners may propose or develop a set of associations that are interrelated and complex as an academically grounded theory. As a result, researchers from academia and practitioners from the motor industry can benefit from the contributions or ramifications derived from this study.

7.2.1. Contributions of this Study

Initially, the current study sought to be conducted quantitatively to determine the key factors that influence the young consumer's acceptance of electronic cars in South Africa. Based on this purpose, relevant questions were formulated and hypotheses were drawn thereby from the given objectives. By proving appropriate solutions to the given research questions and acceptance or rejection of hypotheses, the study contributes significantly to the body of knowledge within the motor industry. There was minimal inconsistent with the problem statement and the research gap thereof, if not many studies that have, so far, been conducted on the antecedents of consumer's perception to the usage of electronic vehicles in South Africa, and across the globe. Therefore, this study sought to address electronic vehicle-related issues in a South African context by determining the key antecedent factors among the youth,

presumably to combat emission produces. Consequently, the study tried to fill in the gap that existed within literature, which is, however, lacking in foreign studies. Moreover, this study undoubtedly contributed to the body of research within the area of climate change due to emissions in South Africa. Similarly, the study adds to the growing literature that supports the Technology Acceptance Model (TAM) as a worthwhile technological acceptance theory. In that case, this study presented the TAM as a valuable model to study consumers' perception to the usage of electronic vehicles.

As the main objective of a good study is its contribution to the knowledge of which this, in turn, adds value to what is already in existence from the previous studies. Beech (2005) outlines the contributions to academia summarised as follows: corroboration of existing theories, new associations between previously separate theories or areas of interests, advances in the application of techniques, new evidence or the generation of corroborated insights, refuting or invalidating a null-hypothesis. The contribution to academic knowledge and business practice will be discussed below.

a) Contribution to Academic Knowledge

The current study examined the experiences which were deemed to be factors that would likely influence young consumer's intention to use zero emission vehicles in South Africa. Furthermore, a conceptual model was developed and tested for fitness from the collected data. This distinctive conceptual model in figure 11 applied or integrated Davis's (1989) theoretical model – namely, the TAM. The findings provided a strong empirical validation to verify the applicability of this theory for consumers' perception of electronic vehicles toward climate change in South Africa. Academically, the current study contributes to existing literature on the relationship between perceived usefulness and perceived trust of electronic vehicles. The relationship between perceived usefulness and perceived trust was supported. The implication of this relationship means that marketers need to understand the perception of consumers in order to predict whether or not they are likely going to use electric vehicles. Secondly, it was observed that perceived usefulness's relationship with perceived value of electric vehicles was positive. This implied that consumer's perceived value of electric vehicles is directly impacted by consumers' perceived usefulness to make the actual use. Therefore marketers of genuine brands have to increase the perception of using genuine products in order to make the value of genuine products more attractive for potential consumers.

The relationship between perceived value and perceived trust was supported and positive. This implies that the perception of value and trust play a major role in getting the customer to intend to use electric vehicles. The relationship between perceived trust and intention to use was positive. This implies that a customer does not have to place too much trust in an electric vehicle that had never driven. Therefore perceived trust is not a determining factor to intend to use electronic vehicles. The relationship between perceived value and intention to use was positive. This implies that a customer has to place value on a brand in order to make intentions to use it. The relationship between perceived risk and intention to use is positive. Meanwhile, the argument was that the relationship would be negative. This implies that the perception of risk that potential customers have is not detrimental towards electronic vehicles. The researcher gained an in-depth understanding of South Africa's urban consumers – in Johannesburg (the country's economic hub). A final best-fit model table 15 was created and this model included different predictor elements together with their inter-relationships with the outcome variable. It is assumed that the best-fit model in table 15 above would demonstrate its benefits to both academics and practitioners.

b) Contribution to Marketing Practice

This study contributes to practice by aiding marketers and policy makers to devise appropriate marketing strategies and policies that are favourable to the environment. The empirical evidence of this study put forward fresh and contemporary evidence for marketing practitioners and policy makers in South Africa. The findings of this study provide marketers, policymakers, and other stakeholders (though related to the contributions above) to make informed decisions, supported by reliable information within motor industry in South Africa. This discussion attempts to leverage on these findings by educating potential and existing users of electronic vehicles and to subsequently test drive them.

7.3 Managerial/Practical Implications

This study has gone all out to conduct research in the most remote areas, usually a segment that is neglected, yet important for the economic wellbeing of the consumers worldwide. The awareness of the harmful effects of environmental pollution, degradation, and climate change has created new opportunities and/or challenges for policy makers and motor industry retailers (dealerships). The motor industry can take advantage of the challenges that face our society economically. Marketers can position themselves for the future of the technology in a motor industry. The respondents in this study displayed positive attitudes toward climate

change – i.e., it shows that they are environmentally concerned like one could have never thought. In this view, the findings of the current study were more likely to offer valuable practical implications to marketing practitioners. Moreover, it contributes significantly towards practical insights pertaining to the antecedents of consumer perceptions and intentions to use electronic vehicles. The managerial implications are detailed below.

According to the findings, the perceived usefulness is seen to have the highest influence on perceived value which in turn 'intention to use' of electronic vehicles. Davis (1989) defined perceived usefulness as the "degree to which a person believes that using a particular system would enhance his or her job performance." This follows from the definition of the word useful: "capable of being used advantageously." Within the motor industry context, consumers are generally reinforced to use a new technology if its performance makes their lives much better than normal vehicles. In this case, electronic vehicles propose the benefits such as zero emissions, zero noise, reduced costs of running the vehicles. These benefits would certainly give value for the users of electric vehicles. The managers have to make the customers be aware of the fact that the same comfort and leisure they get from the traditional cars will not be compromised from the electric vehicles.

7.4 FUTURE RESEARCH AND LIMITATIONS

The current study leaves room for further future research in the field of emerging market for electronic vehicles. There are opportunities for researchers to either explore the same variables of this study in greater depth or to add new variables that could possibly predict the actual usage or purchase of electric vehicles. The study could have potentially received results that are biased since all the data was drawn from one institution, the registered students from the University of the Witwatersrand. Due to financial constraints, the majority of respondents did not have experience of using electric vehicles and emerging technology thereby. Moreover, the study focused on young consumers. The researcher would recommend that similar studies be conducted on a larger scale, that is, with a larger sample size and within larger geographic regions, so as not to be limited to respondents of a certain demographic profile. For example, the current study only used students from one university, and recommendations for future research would be for researchers to consider larger populations, possibly surveying respondents from more than one university, city or province. As for future research in this area, the following suggestions can be made. The study can be broadened to people who are in possession of traditional cars (fuel combustion) and aspiring

to use electronic vehicles. This could be an overall experience they had using the fuel combustion cars and their perception towards the electronic vehicles. This would allow for more diversity in the sample and for more informed results. The study experience challenges greatly from financial and time constraints, and if this could be addressed in futures studies, the possibility of producing more informed results is very higher.

7.5 SUMMARY OF CHAPTER 7

The purpose of the study was to investigate the relationship of the following variables: perceived usefulness on perceived trust and perceived value, perceived risk, trust and value on intention to use the fully electric cars in South Africa. This was done in order to check consistency from literature that the former variables are the best predictor for the latter variable. A conceptual research model was developed from the above-mentioned variables (see Figure 11). This final chapter provided four concluding sections, presenting a solid conclusion for the study that sums up this thesis, noting the implications of these findings for study. The Chapter further suggested directions to be undertaken should the study be taken further in the within the field of electric vehicles and closed with an overall conclusion, noting the contributions made to a broader enquiry.

APPROVAL OF TITLE

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31 August 2016
Person No: 364490
PAG

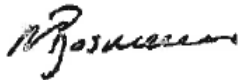
Mr RI Sefora
Po Box 4453
Ga-kgapane
Bojobedu
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Dear Mr Sefora

Master of Commerce: Approval of Title

We have pleasure in advising that your proposal entitled *Factors that influence young consumer's acceptance of electronic cars in South Africa* has been approved. Please note that any amendments to this title have to be endorsed by the Faculty's higher degrees committee and formally approved.

Yours sincerely



Mrs Marike Bosman
Faculty Registrar
Faculty of Commerce, Law & Management

APPENDIX A: ETHICS CLEARANCE CERTIFICATE



Research Office

HUMAN RESEARCH ETHICS COMMITTEE (NON-MEDICAL)

R14/49 Sefora

CLEARANCE CERTIFICATE

PROTOCOL NUMBER: H16/07/34

PROJECT TITLE

Factors that affect influence young consumers's acceptance of electronic cars in South Africa

INVESTIGATOR(S)

Mr I Sefora

SCHOOL/DEPARTMENT

Economics and Business Science/

DATE CONSIDERED

22 July 2016

DECISION OF THE COMMITTEE

Approved unconditionally

EXPIRY DATE

15 August 2019

DATE

16 August 2016

CHAIRPERSON

(Professor J Knight)

cc: Supervisor : Mr T Chuchu

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10005, 10th Floor, Senate House, University.

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

Signature

04, 11, 2016

Date

PLEASE QUOTE THE PROTOCOL NUMBER ON ALL ENQUIRIES

APPENDIX B: RESEARCH QUESTIONNAIRE



Good day,

My name is Ramaano Isaac Sefora (364490) and I am currently completing my Masters in Marketing at the University of the Witwatersrand, Johannesburg. The title of my research is **“Factors that Influence Young Consumer’s Acceptance of Electronic Cars in South Africa”**. Through my research, I aim to explore the perceived usefulness of the electric cars in South Africa from the youth perspective. The findings of this study will contribute to the literature in green and sustainable development marketing. I am inviting you to be a participant in my current research study.

Your participation in this study is voluntary and you can be assured that your personal details will remain anonymous throughout this study. You as the participant have the right to withdraw from this study if in any instance you feel uncomfortable. By being a participant in this study you will not receive payment. The information you disclose will be used in the research report.



Should you require a summary of the study; the researcher can make it available to you. This research will be written into Master of Commerce in marketing dissertation and will be available through the University’s website. Should you require a summary of the research; the researcher can make it available to you. I appreciate your assistance in completing the attached questionnaire. It will take you approximately 8 minutes to complete the questionnaire.

Should you have any further questions or queries you are welcome to contact the researcher or the Supervisor, Mr Tinashe Chuchu at any time at the contact details provided below.

Researcher

Mr Ramaano Isaac Sefora
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Supervisors

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Consent Form for completing the research questionnaire

I acknowledge that I understand the research and that the research has been fully explained to me. I also understand that the information which I give to the researcher will be used in the research report.

I further acknowledge that the researcher has promised me the following:

- That my participation in this research is voluntary
- That my personal details will remain anonymous throughout the research study as well as in the research dissertation
- That I can refuse to answer any questions which I feel uncomfortable with

I hereby consent to completing the questionnaire provided for the research study,

“Factors that Influence Young Consumer’s Acceptance of Electronic Cars in South Africa”

Signature ☐ (Please Sign with an X)

Date Signed _____



Researcher

QUESTIONNAIRE

Please answer the following questions by marking the appropriate answer(s) with an X. This questionnaire is strictly for research purpose only.

Section A: General Biographical Information

This section is asking about your background information. Please indicate your answer by ticking (X) on the appropriate box.

A1 Please indicate your gender?

Male	1
Female	2
Prefer not to say	3

A2 Please indicate your age category?

18-19	1
20-25	2
26+	3

A3 Can you drive and do you have access to a car?

Yes	1
No	2

A4 Please indicate the frequency of using a car?

Monthly	1
Seasonally	2
Annually	3
Other (Specify)	4

A5 Please indicate your highest academic level?

Diploma	1
Degree	2
Post graduate degree	3
Other (Specify)	4

A6 Please indicate your occupation?

Student	1
Employed	2
Self-employed	3
Unemployed	4
Other (Specify)	5

SECTION B

Please indicate the extent to which you agree/disagree with each statement as the statement relates to your perceptions toward the electric/electric cars. Place a tick (✓) in the block that best corresponds to your answer from “Strongly Disagree” to “Strongly Agree”.

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree

B1: Perceived Risk on Electric Cars

1 = Strongly Disagree; 4 = Neutral and 7 = Strongly Disagree

1	There is little chance that there could be something wrong with the environmental performance of electric cars in the future	1	2	3	4	5	6	7
2	There a low chance that electric cars will not work properly with respect to its environmental design	1	2	3	4	5	6	7
3	There is a chance that you would get an environmental penalty fee (charge) if you do not use an electric car in the future	1	2	3	4	5	6	7
4	There is a chance that using electric cars will negatively affect the environment.	1	2	3	4	5	6	7
5	Using electric cars in the future could promote my reputation	1	2	3	4	5	6	7

B2: Perceived Trust on Electric Cars

Please rate each item on a scale of “1= Strongly Disagree to 7= Strongly Agree”

1 = Strongly Disagree; 4 = Neutral and 7 = Strongly Agree

6	I feel that this car’s environmental reputation is generally reliable	1	2	3	4	5	6	7
7	I feel that this car’s environmental performance is generally dependable	1	2	3	4	5	6	7
8	I feel that this car’s environmental claims are generally trustworthy	1	2	3	4	5	6	7
9	I think this car’s environmental concern meets my expectations	1	2	3	4	5	6	7
10	I think this car keeps promises and commitments for environmental protection	1	2	3	4	5	6	7

B3: Perceived Value

The following questions relate to the perceived value of electric cars. Please rate each item on a scale of “1= Strongly Disagree to 7= Strongly Agree” for the electric cars.

1 = Strongly Disagree; 4 = Neutral and 7 = Strongly Agree

11	I feel that this car’s environmental functions would provide very good value for me	1	2	3	4	5	6	7
12	I think that this car’s environmental performance would meet my expectations	1	2	3	4	5	6	7
13	I would probably purchase an electric car because it is more environmentally friendly as compared to fuel combustion cars	1	2	3	4	5	6	7
14	I would use an electric car because it would protect the environment	1	2	3	4	5	6	7
15	I think I would purchase an electric car because it has more benefits as compared to traditional cars	1	2	3	4	5	6	7

B4: Intention to Use

Please rate each item on a scale of “1= Strongly Disagree to 7= Strongly Agree.”

16	I intend to use electric car because it has a low carbon footprint	1	2	3	4	5	6	7
17	I expect to use electric car in the future because of its performance	1	2	3	4	5	6	7
18	I am willing to use electric car because my family uses it	1	2	3	4	5	6	7
19	I am willing to recommend an electric car to a friend	1	2	3	4	5	6	7
20	I am willing to pay for new features of an electric car	1	2	3	4	5	6	7

B5: Perceived Usefulness

Please rate each item from “1= Strongly Disagree to 7= Strongly Agree.”

21	I feel that electric car technology increases the efficiency of using a car	1	2	3	4	5	6	7
22	I think electronic car technology enhances my ability to use a	1	2	3	4	5	6	7

	car							
23	I think electronic car technology is useful in terms of helping me use a car	1	2	3	4	5	6	7

Please provide a comment below if necessary

Thank you

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