Green Marketing and Customer Behaviour in Saudi Arabia: An Examination of Eco-Friendly Electric Cars Purchase Probability

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Abstract

The concept of green marketing is a modern and revitalised marketing approach deemed essential for business models. Electric automobiles aim to cause less harm to the environment. This research examines a model to determine how consumers' green self-identity, caring for environmental repercussions of consumption, green moral responsibility, innovativeness, perceived value and perceived risk affect attitudes to electric vehicles and purchase probabilities. In addition, the structural model tests whether the relationships are moderated by green self-congruity. Extant studies have examined customer intention and behaviour, concentrating on environmentally friendly purchases. There continues to be a deficiency in the existing body of literature, particularly in estimating the purchase probability. A model is empirically tested in Saudi Arabia using a sample of 822 respondents who completed an online questionnaire. Partial least squares structural equation modelling analysis using Smart-PLS 4 was performed to evaluate the hypothesised model paths.

Results illustrate that green self-identity, attitude towards electric cars, perceived value and innovativeness directly affect Saudi Arabian consumers' purchase intentions. Additionally, innovativeness, perceived risk and purchase intention directly affect the purchase probability of electric cars. Furthermore, the study found evidence of moderation effects involving green self-congruity. Findings indicate that green self-congruity positively and significantly moderates green self-identity, attitude towards adopting electric cars, purchase probability and purchase intention. Finally, advanced analyses using a finite mixture partial least squares approach revealed heterogeneity in the data. This analysis identified two consumer segments with different attitudes, values and behaviours towards adopting electric cars in Saudi Arabia.

The current study has contributed theoretically and practically to this specific research area. It has made theoretical contributions by developing and testing an electric car adoption model, providing insights into green customer behaviour. Moreover, from a practical standpoint, communication strategies in Saudi Arabia should emphasise the potential for consumers to strengthen their green self-identity through electric car adoption and highlight the environmental benefits, increasing the demand for eco-friendly vehicles.

Declaration of Authenticity

I, Mohammed Alsuwaidan, declare that the PhD thesis entitled ‘Green Marketing and Customer Behaviour in Saudi Arabia: An Examination of Eco-friendly Electric Cars Purchase Probability’ is no more than 80,000 words in length, including quotations and exclusive of tables, figures, appendices, bibliography, references and footnotes. This thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work.

I have conducted my research in alignment with the Australian Code for the Responsible Conduct of Research and Victoria University's Higher Degree by Research Policy and Procedures.

Signature: Date: 24 August 2023

[redacted]

Ethics Declaration

All research procedures reported in the thesis were approved by the Human Research Ethics Committee (Approval Number: HRE21-186).

Signature:

Date: 24 August 2023

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List of Abbreviations

AVE	average variance explained
CR	composite reliability
EFA	exploratory factor analysis
EV	electric vehicles
GDP	gross domestic product
ICE	internal combustion engine
KSA	Kingdom of Saudi Arabia
MGA	multiple-group analysis
NGO	non-governmental organisations
PIF	Public Investment Fund
TERM	transport and environment reporting mechanism
UAE	United Arab Emirates
UK	United Kingdom
UN	United Nations
US	United States
VUHREC	Victoria University Human Research Ethics Committee

Chapter 1: Introduction

1.1 Research Background

The increasing consciousness of environmental concerns and social obligations has led to a predicament for consumers in determining their purchase decisions. As a result, many companies aim to address environmental concerns through marketing activities (Starik & Marcus, 2000). Green marketing entails promoting products to businesses to ensure compliance with local and international environmentally friendly legislation and to adopt this strategy to reduce the global warming (Nekmahmud & Fekete-Farkas, 2020). The phenomenon of 'green marketing' is gaining momentum in the market and being recognised as a contemporary area of research (Witek & Kuźniar, 2020). Despite extensive research on green marketing, a universally accepted definition for this concept is yet to be established. Existing definitions of green marketing are subject to variations because of the individuality of researchers' interests (R. Y. K. Chan, 2004).

According to Ottman (2017), green marketing is a combination of marketing aspects and ecological concerns. Peattie (2001b) defined marketing as 'the holistic management process responsible for identifying, anticipating, and satisfying the needs of customers and society, in a profitable and sustainable way' (p. 141). Furthermore, green marketing is the practice of product development and advertisement framed on environmental sustainability (Fernando, 2021).

The concept of green marketing comprises the environmentally conscious and sustainable characteristics of production and the positive perception of said production by consumers (Barbarossa et al., 2015). This approach aims to appeal to consumers who prioritise sustainability and communicate the importance of sustainable products to a wider audience. The ultimate goal of green marketing is to meet the needs of environmentally conscious consumers while promoting sustainable practices (Ottman, 2017). According to the literature reviewed in Chapter 2 and Alsmadi (2007), the definition is:

> Green marketing is conducting all marketing activities within a framework of environmental responsibility … is a comprehensive and systematic process that seeks to

> influence consumer preferences in a way that encourages them to demand environmentally friendly products, and help them adapt their behavioral consumption patterns accordingly. (pp. 342–345)

In other words, green marketing is a way to trade services or products with less harm to the environment (Nedumaran & Manida, 2020).

Similarly, green marketing assists in the 'brand differentiation of companies', which focuses on those customers who are aware of environmental concerns and prefer to buy environmentally sustainable products (R. Y. K. Chan, 2004). Additionally, Elkington (1994) stated that a consumer who uses environmentally sustainable products is known as a 'green consumer'. These types of consumers seek to use products obtained from green methods of manufacturing and production. These green consumers are appealing to companies to differentiate themselves by selecting green products and developing a new green segment in the market (Juwaheer et al., 2012).

The literature indicates that green purchases may be influenced by a consumer's value system, particularly the extent to which consumers self-identify as green individuals (Confente et al., 2020). Self-identity plays a crucial role in an individual's preference judgment and value formation process (Confente et al., 2020; Dermody et al., 2018).

Naturally, green consumers, who prioritise responsible consumption and support environmentally friendly companies, can be a profitable market segment for businesses that align with their values (Ottman, 2017). They are often willing to pay for sustainable and eco-friendly products or services. Therefore, an additional goal of green marketing is to transform conventional customers into green customers (Sesini et al., 2020). Responsible consumption has been growing prevalently in such sectors as food products, tourism, commerce and clothing. Certain areas of consumer activity remain under-represented, which is the case of eco-friendly transportation. The uptake of green products is unclear in markets such as Saudi Arabia (Khazaei & Tareq, 2021). Saudi Arabia is actively progressing towards a more ecologically sustainable state, undertaking steps in this direction (Alwakid et al., 2020). However, the challenge with green marketing lies in the unclear acceptance of the green concept among consumers in Saudi Arabia, including their willingness to choose eco-friendly products over less green alternatives and the role of self-identity in their judgment.

The objective of the current research is to investigate the green purchasing behaviours exhibited by consumers in Saudi Arabia. Specifically, the study aims to examine the probability of purchasing electric vehicles as self-reported by participants and explore the extent to which these purchasing decisions align with their self-perceived environmentally conscious identity, innovativeness, perceived value and perceived risk.

This chapter presents the study and highlights its significance to the literature and customer behaviour in the context of Saudi Arabia. Section 1.1 outlines the pertinent background for the research regarding the role of green marketing. Section 1.2 presents the research objective and research questions, while Section 1.3 provides the justification for the research. The research methodology is briefly discussed in Section 1.4. Section 1.5 presents the research significance and Section 1.6 outlines the structure of the thesis.

1.2 Research Objective and Questions

Given the scant research on green self-identity and green behaviour in oil-producing countries such as Saudi Arabia, this study aims to fill this gap (K. Alzahrani et al., 2017). The key objective of this study is:

To assess the extent of green self-identity and the way this influences the attitude towards and probability of adopting electric cars among Saudi Arabian consumers.

To achieve the main objective of this study, four questions are formulated:

• *RQ1:* To what extent do green self-identity, care for environmental consequences, green moral obligation, innovativeness, perceived value, perceived risk and attitude towards adoption influence the intention and probability of purchasing electric cars?

• *RQ2:* Do care for the environmental consequences of using cars, green moral obligation, perceived value and perceived risk mediate the relationship between green self-identity and the attitude towards adoption as well as the probability of purchasing electric cars?

• *RQ3:* Does self-congruity moderate the relationship between the constructs in the posited model?

• *RQ4:* Are there segments of customers with different attitudes, values and behaviours among potential consumers of electric cars?

Considering these research questions, several hypotheses were developed. These hypotheses were built from a literature review of green marketing (see Chapter 2). Table 2.1 lists the hypotheses and the thesis model is presented in Figure 2.4.

1.3 Justification for the Research

Saudi Arabia is a nation reliant on oil as its primary source of revenue, but the foremost producer of oil has implemented a multitude of measures to safeguard the natural environment (Alwakid et al., 2020). One of the proposed initiatives pertains to the reduction of carbon emissions and decrease of dependence on oil, to be achieved through investments in clean energy and a significant emphasis on the adoption of electric vehicles. It is of utmost importance to comprehend consumer behaviour in the context of an economy that is heavily reliant on oil (Alam et al., 2012), with a specific focus on environmentally sustainable products such as electric vehicles (Hildebrandt, 2021).

Although some green marketing customer studies have been conducted in Saudi Arabia (K. Alzahrani et al., 2017; Ammer et al., 2020; Rehman, 2017; Yusuf & Nasrulddin, 2021), research needs to be conducted regarding the level of customer attitude towards green purchase behaviour. Indeed, there is a substantial research gap regarding consumers' awareness associated with the concept of green purchase probability. The Saudi Arabian Government recently announced Vision 2030, which includes directives for environmental sustainability. This program includes recycling projects, waste management, reduced pollution and fighting desertification (Moshashai et al., 2020). In this initiative, in which the primary aim is to fight global warming by reducing greenhouse gas concentration in the atmosphere, various international memorandums of understanding, like the Kyoto Protocol, have been signed with different countries (Sohail, 2017). Moreover, as part of Vision 2030, the Saudi Government aims to enhance the electric automotive industry, with the goal of fulfilling approximately half of Saudi Arabia''s vehicle demands through local manufacturing. This initiative not only seeks to create job opportunities for the youth but also facilitates their acquisition of skills and technology, as encouraged by the government's efforts to establish a local automotive industry (ITA, 2019).

Given the limited availability of public transportation options and significant reliance on personal vehicles for transportation, particularly in light of the strong preference of customers for traditional petrol-fuelled cars, the investigation of consumers' behaviour and inclination towards adopting advanced electric vehicles is a compelling subject. This is especially relevant in the context of recent social changes, such as the 2018 legislative changes permitting Saudi Arabian females to drive. This study emphasises the importance of understanding customer purchasing behaviour towards green cars and provides insights that might be valuable for policymakers, marketers and sellers in boosting the adoption of green electric cars in Saudi Arabia. This study is focused on Saudi Arabia, the largest automotive market in the Middle East, and where there is a rising interest in establishing infrastructure for electric vehicles.

In the literature, there is a vigorous debate regarding intention surveys and their limitations in detecting shifts in probability among individuals who initially do not intend to purchase, but eventually make up the majority of actual purchases (J. Singh et al., 2012). Juster scale probability could provide a better estimate of intended purchases. There has been limited use of the probability of purchases construct in green behaviour research, which compelled this study to fill this gap by developing a research green self-identity model with intention and probability (Juster, 1966).

The present study draws upon consumption values theory and self-congruity theory (Sirgy, 1985), as presented in Confente et al.'s (2020) research, to establish a relationship between green self-congruity as a moderator and various constructs such as perceived value, perceived risk, innovativeness, purchase intention and their interplay with the green self-identity. The original study conducted by Juster (1966) demonstrated a strong correlation between purchase intention and purchase probability. The previous study by Confente et al. (2020) primarily focused on green bioplastic products. This study builds upon these findings and extends them by applying them to the context of green cars. Furthermore, previous studies focused on North American and Europe practices and approaches regarding environmental concerns, while Asia, Africa and South America are likely to have different approaches regarding environmental concerns (Barbarossa et al., 2015; Idris, 2018). This investigation conducted in Saudi Arabia aims to generalise and build upon previous research while addressing this gap in knowledge.

Considering the factors mentioned above, this study has proposed and tested a model to examine the impact of green self-identity on the probability of green car purchases. This model incorporates various constructs within the specific context of Saudi Arabia. The study findings are helpful for future researchers, Saudi authorities and government bodies, as well as manufacturers and dealers of green cars in Saudi Arabia.

1.4 Overview of the Research Methods

The current investigation employed a positivist research paradigm, which is predicated upon the collection of empirical, objectively verifiable data by the researcher (Creswell & Creswell, 2017). To rigorously validate and assess the proposed theoretical framework, a quantitative approach was employed. This approach involved examining the posited model. An online questionnaire facilitated data collection and analysis of the relationships and variables proposed in the model enabled progress. By utilising a quantitative methodology, the study aimed to obtain objective and measurable evidence to evaluate the nomological validity and significance of the model paths.

This research commenced with a literature review on green products, purchase behaviour and electric cars. Building upon the extensive literature review and previous studies (Barbarossa et al., 2015; Confente et al., 2020; Juster, 1966), the conceptual model was developed. Verification of the research model and quantitative testing of hypotheses was implemented on survey data (Bryman & Cramer, 2012). The discussion focused on the findings, after which conclusions were drawn.

The items were adopted and modified from earlier research to fit this study. In this research, the target population was Saudi adults aged 18 years and over. The present study utilised a non-probability sampling approach owing to the lack of a sampling frame in Saudi Arabia and inability to access every individual for the study purposes (Malhotra et al., 1996). The study employed non-probability sampling with a mixed-sampling method, specifically quota sampling paired with convenience sampling. The mixed-sampling method was complemented with a snowball sampling approach as a second stage. This methodology was utilised to conduct an online questionnaire targeting a specific age and gender demographic. An online questionnaire application, Qualtrics, hosted the questionnaire (Simsim, 2011).

The questionnaire was promoted and distributed via Twitter using top hashtags (#) to expose users from different parts of Saudi Arabia. Initial participants were asked to share the questionnaire link among their networks of followers on Twitter and their contact lists on WhatsApp and SMS. Prior to commencing the research, approval was sought from the Victoria University Human Research Ethics Committee (VUHREC) to ensure ethics approval.

The model was investigated using partial least squares structural equation modelling (PLS-SEM) analysis, which can be applied to complex models with many constructs incorporating moderation testing (Hair et al., 2014). Choosing PLS-SEM required a sample size that plays a crucial role in achieving statistical robustness (Ringle et al., 2022). Hair et al. (2021) presented a minimum sample size table on the basis of J. Cohen's (1992) statistical power theory. The number of respondents suggested by Hair et al. (2021) in this research was 157. Ultimately, the number of participants collected in this study was 822, which is substantially greater than the J. Cohen (1992) requirement. It was deemed large enough to be used in structural equation modelling (SEM) to attain reliable results.

1.5 Research Significance and Contribution

This research investigates the significance of the green self-identity framework in the context of electric vehicle adoption in Saudi Arabia. The subsequent sections delineate the diverse academic and practical contributions of the study.

1.5.1 Academic Contribution

This study developed and empirically validated the electric car green self-identity model, which provides a deeper understanding of what drives an individual to engage in specific green behaviours. This study's structural model tried to fill a gap in the literature by combining existing self-identity models and adding additional constructs and relationships between model constructs to propose a new conceptual model. Furthermore, the study examined the innovativeness and perceived risk in addition to the perceived value and added relationships between the different elements, especially self-congruity with several constructs.

This research studied the moderating role of self-congruity, highlighting its substantial efffect on shaping the investigated relationship. This research studied the intricate interplay of self-congruity in the context of green product adoption, which advances our understanding of consumer identity, preferences and decision-making dynamics, offering insights with implications for academic domains.

The study model used purchase probability as the dependent construct instead of intention, which dates back to the work of Juster (1966), who first hypothesised that purchase intentions underperform in predicting actual purchasing rates (J. Singh et al., 2012). This study hypothesised that purchase probability was as close as can be to the actual behaviour because the probability scale asked about the probability of purchase in a specific future period (Cecere et al., 2018). This gave the model a deeper understanding of the customer's purchase behaviour for eco-friendly car adoption. While Ajzen (1991) demonstrated that intention significantly influenced the probability of the decision to purchase, other studies have suggested that studies on consumer intentions to purchase inefficiently predict the purchase rates because they fail to offer accurate estimations of the mean purchase probability (Juster, 2015; J. Singh et al., 2012). Therefore, this study aimed to address the limitations of relying solely on consumer intentions by incorporating purchase probability as a more accurate and comprehensive measure of consumer behaviour.

1.5.2 Practical Contribution

Limited research is available regarding the level of buyers' environmental awareness in Saudi Arabia, prompting an examination of the topic to gain further knowledge (Rehman, 2017). The significance of developing knowledge in this area is relevant on several fronts. First, the study will establish a research base, paving the way for others interested in studying the Gulf region. Second, Saudi Arabian leadership has recognised the damaging impact of petroleum on the environment and the consequent need to reduce dependence on the industry and diversify the economy (Alwakid et al., 2020). Third, policymakers and other relevant stakeholders will be able to use the study's findings to draft policies that mitigate the negative effects on the environment. Establishing a benchmark of the products consumers in Saudi Arabia purchase is vital to understanding customer behaviours in the country. In effect, this would allow manufacturers and retailers to develop products that meet the preferences of their target market, particularly given the context of the country diversifying its economy.

The context of the study is one of the practical contributions. Indeed, there is a substantial research gap regarding consumers' awareness of the concept of green purchase probability in the region. In particular, for electric cars, it is remarkable to understand how the customer views new green vehicles when their country is the biggest global oil producer. In addition, this study includes several control variables in the model to test their impacts on the intention to adopt electric vehicles (EVs; Mohamed et al., 2016). The study uses demographic information as the control variables, such as gender. The importance of this contribution is unique to Saudi Arabia because females started to drive cars in 2018. It is important to ascertain if the new players are different from the old ones in their choices.

The findings of this study will have significant practical implications for various stakeholders involved in promoting the adoption of EVs among Saudi consumers in the future. The practical implications of this study will also inform policymakers, industry leaders and marketers in developing future strategies to promote green consumption among Saudi consumers. The understanding gained from examining the effects of green self-identity (GSI) on consumer behaviour will guide the formulation of effective interventions. By implementing proactive measures, disseminating information through statements and reports and organising auto shows and vehicle-sharing activities, stakeholders can foster positive attitudes towards eco-friendly EVs. These efforts will not only reduce the environmental impact associated with transportation choices but will also address consumer concerns and reduce risk.

This study explores the implications of investigating potential unobserved heterogeneity within the data by incorporating additional analysis using the FIMIX technique (Matthews et al., 2016). This technique identifies whether distinct consumer segments are present within Saudi Arabian data. This approach offers valuable insights into different consumer groups' diverse preferences and behaviours, contributing to a more comprehensive understanding of market dynamics and facilitating targeted strategies for effective decision-making (Hair et al., 2016). Overall, the practical implications derived from this study will provide valuable insights and guidance to promote the adoption of electric cars and encourage sustainable transportation practices in Saudi Arabia in the future.

1.6 Structure of the Thesis

This thesis comprises five chapters and is structured as follows. In Chapter 1, pertinent background information on the research topic is provided, along with an outline of the research motivation. The research aim and questions are then profiled, followed by an overview of the research methodology and its implications. The thesis structure is shown in Figure 1.2.

Chapter 2, the literature review, provides an overview of green marketing and green products. Subsequently, an analysis of the research setting pertaining to EVs in Saudi Arabia is presented. Furthermore, a comprehensive examination of the existing body of literature is introduced relating to GSI and various determinants that affect attitudes and purchase intentions. The chapter incorporates a comprehensive exposition of the process of formulating hypotheses.

Chapter 3 outlines the research methodology used to address and test the research hypotheses. The quantitative method research design was deemed appropriate to validate the SEM model and test the hypotheses. Given the nature of the research, a positivist research paradigm was adopted. The chapter commences with an overview of the research process and paradigm, as well as an explanation of the research design. It describes the questionnaire design, translation, pre-test and sampling process. Additionally, it covers data collection and various analysis techniques used to derive results.

Chapter 4 implements the data analysis and presents the results. Both descriptive and inferential statistics are used to analyse the data. This chapter has two main sections. The first section comprises a presentation of descriptive statistics, including a construct-by-construct item analysis, reliability analysis and correlation analysis. In addition to a preliminary data analysis for each construct, a correlation matrix is estimated to assess the correlations among items for each scale. A reliability analysis is presented for items comprising each scale to ensure that items are consistent and suitable for assessing the posited structural model. The second section estimates the structural model relations using Smart-PLS software v4.0.8.3 (Ringle et al., 2022). Using this approach, nomological validity is examined and tests of the hypotheses are undertaken. The model specifications are also explained in detail in this chapter. The last section of this chapter presents an additional FIMIX analysis to test for the presence of several explanatory segments.

The findings from Chapter 4 are discussed in Chapter 5, along with their implications for Saudi Arabia's adoption of green cars. In addition, it evaluates and discusses the findings relative to the literature outlined in Chapter 2. This chapter also summarises the research results, shows whether the hypotheses are supported and addresses the solution to the research questions. It presents the study's theoretical and methodological contributions along with a review of the main findings. It also recommends managerial implications that could assist decision-makers in formulating strategies to encourage consumer adoption of green cars. It also explores the limitations of this study, offers ideas for future research and provides conclusions.

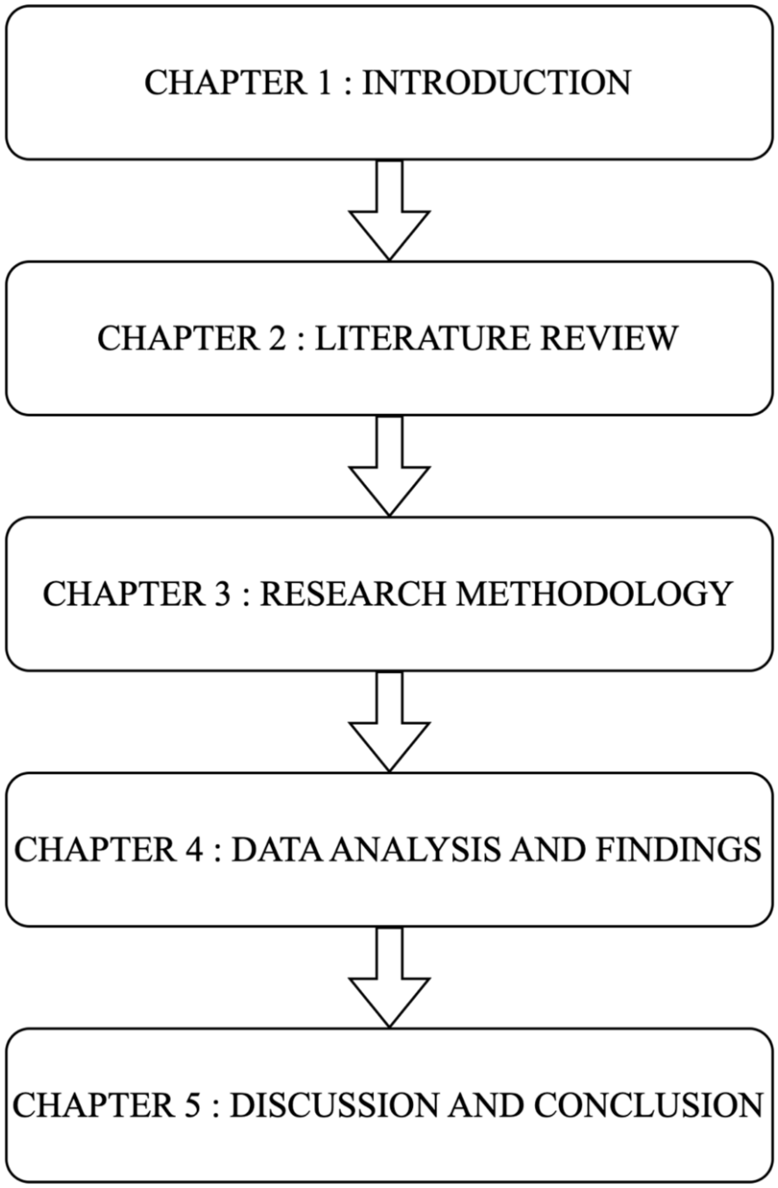

Figure 1.1 Thesis Structure

Source: Developed for this research.

Chapter 2: Literature Review

2.1 Introduction

This chapter outlines a literature review and the theoretical background of the domain. Section 2.2 presents the history and background of green marketing, while Section 2.3 discusses the Saudi Arabia context. Section 2.4 details information about electric cars and green marketing. Section 2.5 highlights relevant theoretical frameworks. Model development and hypotheses development are presented in Section 2.6 and Section 2.7, respectively. A summary of this chapter is presented in Section 2.8.

2.2 History and Background of Green Marketing

For several years, green marketing strategies have focused on expanding their implementation to encompass a diverse range of less-harmful environmental actions. These activities include making substantial changes to manufacturing processes, creating goods and marketing strategies and making changes to the packaging for consumable items. The phrase ‘green marketing’ began to become more widely used in the middle of the 1970s and continued to grow in use until the early 1990s. This trend persisted until the early 1990s. Simultaneously, in 1975, the American Marketing Association sponsored the very first workshop on ecological marketing, marking a milestone in the subject’s exploration (Trandafilovic & Blagojević, 2017). The war for global competitive advantage has been waged in the disciplines of ecology, environmental protection and sustainability ever since the first concerns about environmental protection were aired in the 1970s. According to Peattie and Ratnayaka (1992) and Gelderman et al. (2021), green marketing has allegedly spurred businesses to compete by emphasising their environmental efforts, revealing their diminished environmental effect and promoting eco-friendly services and commodities. This was believed to have occurred because green marketing has incentivised enterprises to promote their environmental efforts. As a direct result of this, corporations are increasingly becoming public with their commitments to preserving the environment. The years 1960–1990 are considered the ecological green marketing era (Peattie, 2001b). This is because these years reflect the beginning of the first stage in the expansion of green marketing activities all over the globe. As a direct consequence of this, these years have come to be recognised as the beginning of the age of ecological and green marketing (Peattie, 2001b). During this period, green marketing efforts focused on determining the environmental challenges to be tackled and developing innovative solutions to those difficulties, including concepts like the notion of a ‘green car’ (Groening et al., 2018; Trandafilovic & Blagojević, 2017). This included finding innovative solutions to those challenges, counting the notion that a ‘green car’ could be an option for consumers. This involved coming up with creative solutions to those problems, one of which was the concept that a ‘green car’ may be an alternative for customers. Therefore, the initial actions that were taken in the middle of the 1970s may be traced back to the basis for the present degree of success in green marketing, which originate in the first steps that were taken (Groening et al., 2018; Trandafilovic & Blagojević, 2017).

The aftermath of environmental catastrophes brought on by business practices that had a widespread impact on the lives and health of communities gave rise to the concept of ‘green marketing’. In the 1960s, environmentalists in the United States (US) began raising concerns about how to best preserve the environment from the effects of pollution. The international community is now in a perilous state because of the many environmental problems that currently plague the world. The continuous discussion over whether economic reasons should be prioritised above sustainability is a contentious issue that has been continually debated. Currently, people all around the world are struggling to come to terms with a variety of environmental unknowns (Woo & Kang, 2020). In the United Kingdom (UK), the *Clean Air Act of 1965* was the first attempt to reduce air pollution, while the US *National Environmental Policy* was enacted on 21 March, 1969. It also launched International Earth Day, conceived in the spirit of environmental protection. The US declared Earth Day on 22 April, with both these events’ missions being to raise people’s awareness of environmental issues. The influence of the heightened environmental concerns between 1960 and 1980 on green marketing was significant.

According to Peattie (2001a), some of the impacts on green initiatives during this time included identifying environmental issues such as natural resource exhaustion rates, air pollution, ozone layer depletion, harmful pesticide effects and global warming. This led to specifying remediation measures for corporations and their products that had harmful effects on the environment, as well as those who offered solutions to the problems. In addition, during this period, significant discussions arose concerning the future of industrial and commercial sectors, encompassing the growth of chemical and automotive industries, as well as oil exploration. Latapí Agudelo et al. (2019) asserted that, during this stage, sustainability was considered part of corporate social responsibility and enterprises in the US were considered militaristic since many of them served the purpose of supplying necessary equipment for the Vietnam War. The environmental and antiwar campaigns thereby went hand in hand, which expressed the societal mood of the 1960s. Latapí Agudelo et al. (2019) and Peters (2018), after the social protest movements had died down, reasoned that the concept of sustainability began to be operationalised in quantitative measures and the attitude of society towards it grew more realistic and practical. This was the case even though the notion of sustainability had been around for a considerably long time.

The decade between 1980 and 1990 marked the commencement of the second phase of green marketing. The contemporary epoch is widely recognised as the era of 'environmental green marketing' in the domain of marketing. During the designated period, marketing efforts concentrated predominantly on the integration of new and environmentally sustainable technology to meet manufacturing needs (Garg & Sharma, 2017). The activities mentioned above pertained to efforts associated with waste management. Notably, the 1985 Vienna Conference precipitated the commencement of discussions regarding the depletion of ozone or the ozone layer issue and the Montreal Protocol was then endorsed by signatory nations in 1987 (Trandafilovic & Blagojević, 2017). Peattie (2001a) uncovered several repercussions that resulted from environmentally conscious and green marketing strategies. These include a pronounced focus on resolving global environmental problems, such as the thinning of the ozone layer, and some acknowledgement of climate change. In addition, there was an increase in the creation of ecologically friendly goods, which called for new techniques and methodologies to be implemented throughout the manufacturing process. This has resulted in better recyclable packaging and new terminology that place greater emphasis on manufacturing processes, such as growing organic vegetables and items that are manufactured by hand. There has also been a rise in the level of collaboration between local communities and non-governmental organisations to workshop and advocate for environmental problems. A company's competitive edge emanated from the use of environmentally friendly manufacturing processes and marketing strategies. Finally, regulatory changes meant new standards for the information disclosure required for manufacturing/supply chain processes and their associated impacts on the environment. According to Ma et al. (2019), the era of green marketing that took place from 1980 to 1990 was a significant driver of the environmental agenda that was of core priority in the 21st century.

The third phase of green marketing occurred in tandem with a new developmental phase, which began in the late 1990s and is still underway now. This period is known as the 'sustainable green marketing' era (Trandafilovic & Blagojević, 2017). During the beginning of this period, many nations across the globe began adopting laws to advance environmental protection and conservation. Initiatives, such as the London Protocol 1996, were enacted to enhance the production of organic foods, prevent environmental accidents and lower air pollution, especially in urban areas (Véron, 2006). The United Nations (UN) Conference on Environment and Development of 1992 led to the implementation of the *Declaration on Environment and Sustainable Development*, the *Framework Convention on Climate Change* (UNFCCC), *Biological Diversity Convention* (CBD) and the *UN Convention to Combat Desertification and Land Degradation* (UNCCD). The Kyoto Protocol, developed to stabilise greenhouse gas emissions, was also passed during this period (M. Grubb, 1998). The key implications of this period on green marketing initiatives of the 21st century included increased awareness of genuine green products and production modalities, revamped corporate policies, especially on company social responsibility, and sustainable production mechanisms (Charter, 2017). The evolution of green marketing over the past few decades has primarily centred on achieving a competitive edge, reinforcing social responsibility, conforming to current and potential regulations, reducing production expenses and accommodating rising consumer demand for environmentally conscious practices. The utilisation of green advertising as a competitive strategy by marketers is closely linked to the promotion of sustainable consumption practices that prioritise the protection of the natural environment (Mahato et al., 2023).

2.3 The Saudi Arabia Context

2.3.1 Kingdom of Saudi Arabia

The Kingdom of Saudi Arabic (KSA) is a Western-Asian country, incorporating the majority of the Arabian Peninsula; it has a land area of about 2,150,000 km² (Harry, 2021). KSA is the second most populous country in the Arab region and the largest in terms of land area in the Middle East. The geographical location of the region in question is characterised by its adjacency to several neighbouring countries, including Iraq, Jordan, Qatar, Bahrain, Kuwait, United Arab Emirates, Yemen and Oman. Riyadh, the capital city, holds the distinction of being the most populous city. KSA is characterised by a predominantly arid desert landscape, with additional features such as mountains, lowlands and steppes. Notably, KSA is unique in that it possesses a coastline along both the Arabic Gulf and the Red Sea (Harry, 2021), as depicted in Figure 2.1.

Figure 2.1: Political map of Saudi Arabia

Note: Adapted from Baig et al. (2019).

The population of Saudi Arabia was reported to be about 33,413,660 in 2018. An estimated 37% of the population of Saudi Arabic are immigrants (General Authority for Statistics, 2019). The population growth rate is 1.63% per year (World Bank, 2021). Saudi Arabia is also an economically rich country with the largest economy in the Middle East and the twentieth largest economy in the world (World Bank, 2021). Saudi Arabia is the biggest petroleum exporter and has the second-largest proven reserves of petroleum (OPEC, 2021). The petroleum sector in Saudi Arabia is the country's most important contributor to gross domestic product (GDP) because of the profits it generates. According to Baig et al. (2019), the country views oil dependence as a problem and is now in the commencement stages of creating solutions to diversify sources of income.

2.3.2 The Saudi Green Marketing Context

The idea of ecological or green marketing highlights the need for businesses to adopt environmentally sustainable and morally responsible business practices in the modern period as they connect with a variety of stakeholders. This need was brought to light by the notion of ecological or green marketing. Labourers, clients, distributors and suppliers may be considered examples of the various stakeholders engaged in this scenario (Ammer et al., 2020). In recent decades, there has been a discernible shift in society's ideas of the promotion of ecologically friendly behaviours and businesses, including the birth of green entrepreneurship (Alahmari et al., 2019). This change in viewpoint has been accompanied by an increase in the prevalence of green entrepreneurship. Even though some nations are falling further behind in the implementation of environmental legislation, others are transitioning towards this developing norm and moving in the right direction. According to Alwakid et al. (2020), Saudi Arabia has been actively working to move its society towards a more ecologically sustainable state and has been taking steps in this direction. Thus, green marketing is considered a means of selling products and services on the basis of the ecological and environmental benefits that can be realised by the community (Rehman, 2017). The Saudi green marketing context is framed on global green production and consumption approaches.

Products and services are increasingly becoming more environmentally friendly (Agag & Colmekcioglu, 2020). The major assumption in the Saudi green marketing context is that consumers view and embrace the 'greenness' of a product or service in a way that benefits them directly since their judgement about the environmental issues implies that the outlined issues are a direct result of their 'behaviour towards the environment' (Sharma & Dayal, 2017). Berger and Nobbs (2013) outlined additional factors incentivising responsible consumption as the perception of information concerning responsible consumption as social currency. Finally, Čapienė et al. (2021) identified the role of marketers as those who foster pro-environmental and pro-social responses in their customers. The first type of response arises when the customers express 'the willingness to act for the benefit of environmental protection' Čapienė et al. (2021, p. 3), whereas the second type of response is linked to the customers' willingness to act for the benefit of society. Thus, sharing information about responsible consumption may be yet another incentive for consumption. This leads to Saudi citizens basing their purchasing decisions on this aspect (Sharma & Dayal, 2017). However, the major issue with green marketing in Saudi Arabia is that consumers have not fully accepted the green concept and may not be willing to pay extra for eco-friendly products rather than cheaper, less-green products.

The analysis of Hildebrandt et al. (2021) demonstrated that Saudi citizens are sufficiently aware of climate change, but most are only considering changing their lifestyles towards sustainability. Hildebrandt et al. (2021) measured the sustainability behaviours of Saudi citizens on the basis of such dimensions as willingness to limit water use at home, participation in community initiatives to reduce waste, purchase of eco-friendly products with natural ingredients and recyclable packaging, and travel to eco-friendly destinations. Across these dimensions, most Saudi citizens have only considered adopting the outlined behaviours. One contributing factor is that Saudis are dubious about the validity of green claims made by many firms, thereby making green marketing less popular than in other developed economies. The analysis of Kennedy (2021) clearly demonstrated the validity of such a perspective. After Saudi Crown Prince held the Middle East Green Initiative in October 2021, the Saudi Aramco company still promised to increase its production of crude oil from 12 to 13 million barrels a day. It is strange to believe that an economy built on extraction and combustion of fossil fuels can be 'circular' in any meaningful context (Kennedy, 2021).

Despite the current green marketing challenges in Saudi Arabia, companies are progressively advertising themselves as green enterprises (Alam et al., 2012; Rejikumar, 2016). The strategies involve public sector units under the Saudi Government's purview, which have increasingly prioritised addressing significant environmental issues like pollution and global warming. Moreover, many consumer companies across Saudi Arabia are now labelling their products according to energy efficiencies in their respective production or consumption modalities. The Energy Star Rating is used by Phillips and other electrical appliance manufacturers and distributors in Saudi Arabia because it allows for reducing the energy consumption of households (Rehman, 2017). Godrej Consumer Products has been promoting products through a green marketing initiative in Saudi Arabia by encouraging consumers to exchange old devices for the latest environmentally friendly ones.

According to Alahmari et al. (2019), for there to be a substantial change in the adoption of environmentally friendly products in Saudi Arabia, similar to that of developed nations, consumers need to be provided with increased transparency to verify the effectiveness of companies' efforts to implement sustainable production methods and embrace eco-friendly practices. This is required to effect a substantial change in the adoption of environmentally friendly products in Saudi Arabia, similar to that of developed nations. Additionally, educating consumers is needed to detail how such initiatives directly benefit them to increase the value of such products to them and motivate the purchase of green products and services (Alahmari et al., 2019). This can be done by increasing the transparency of the firm's environmental initiatives. As outlined by Delmas and Burbano (2011), more firms are engaged in greenwashing, which is the concept that describes providing misleading information about the environmental performance or environmental benefits of a product or service. One of the most efficient ways to prevent greenwashing, according to Delmas and Burbano (2011), is to increase the transparency of firms' environmental performance by providing full disclosure to relevant stakeholders, improving knowledge about greenwashing and aligning the firm's internal processes, structures and incentives with sustainability goals. According to Ammer et al. (2020), incorporating environmental sustainability has emerged as a crucial strategy for companies seeking to improve their competitive edge and reputation. The above statement demonstrates that providing education to end consumers about a company's environmental performance and the phenomenon of greenwashing has the potential to increase customers' trust in environmentally sustainable products. Knowledge is aided by gaining a comprehension of how environmentally sustainable goods can have a beneficial effect on ecological circumstances.

2.3.3 The Saudi Arabia Car Market

The Middle East is the region where the automotive industry is booming; Saudi Arabia is the biggest nation to sell automotive and its spare parts within the Middle East market. As is forecast, Saudi represents about 40% of the region's sales (International Trade Administration, 2019). In 2016, Saudi Arabia imported about one million automobiles, including light trucks, passenger cars and other commercial vehicles. KSA is a major hub for US automakers because, for the US, the Middle East is the biggest export market and Saudi Arabia is the fifth largest. Furthermore, Saudi Arabia has a huge potential market for luxury vehicles like sport utility vehicles and off-road vehicles (Yusuf & Nasrulddin, 2021). Nowadays, there are a few plants that produce local auto parts and production of trucks, but there is no local production of passenger vehicles. The Saudi Government is seeking to create a local automotive industry and encourage the global manufacturer of vehicles to inaugurate local production, which will create jobs for youth and help them learn skills and technology (ITA, 2019).

The current automobile market in Saudi Arabia holds significant potential for growth. In June 2021, the Saudi vehicle market experienced a notable increase in sales, with a growth rate of 78%. Even after COVID-19, the automotive market is improving. The leading brand in Saudi Arabia is Toyota, after posting an increase of 10.2% in sales, and the second brand is Hyundai, which increased its sales by 7% (Focus2Move, 2023). Toyota has a Saudi market share of about 27.8%, followed by Hyundai with a market share of at 17.8% (Statistica, 2021).

The Saudi Government implements policy with the aim of diversifying the Saudi economy, which is mainly dependent on oil reserves. A diversified industry will create jobs for new generations. This plan is known as Vision 2030 (Moshashai et al., 2020). The Saudi Government decided to upgrade the automotive industry under Vision 2030; about half of the vehicle requirements of Saudi Arabia should be fulfilled by locally manufactured vehicles. In this regard, the government discussed with global automakers the establishment of production bases within Saudi Arabia (AlOtaibi et al., 2020). The Saudi Government is also keenly interested in capitalising on demand for EVs. Vision 2030 aims to cultivate the production of 'internal combustion engine' vehicles and EVs. Demand for EVs by 2030 will help this progress, as per the predictions of global bodies.

The incorporation of EVs is a crucial element of the comprehensive strategy to address the issue of climate change. EVs possess the capacity to exhibit energy efficiency up to four times greater than that of traditional automobiles equipped with internal combustion engines (Elshurafa & Peerbocus, 2020). The investigation of end-users' perceptions of EVs and the barriers hindering their widespread adoption is a compelling research topic (Khazaei & Tareq, 2021), particularly in the context of KSA (Yusuf & Nasrulddin, 2021). The country has historically held a significant position as a global oil producer. However, it has recently adopted ambitious measures to reduce its carbon footprint with the ultimate objective of achieving carbon neutrality by 2060. To achieve this goal, a substantial uptake in the utilisation of public transportation and the widespread adoption of EVs will be required. Furthermore, the country aims to establish itself as a hub for the manufacturing of EVs within the region (Alotaibi et al., 2022).

The Saudi Government is involved in talks with the US-based automaker Lucid Motors to develop a production house of EVs (Albukhari, 2021). The Public Investment Fund (PIF) of Saudi Arabia is an anchor investment along with the private group comprising Neuberger Berman, BlackRock, Winslow Capital Management, Wellington Management, Franklin Templeton and Fidelity Management & Research. These firms combined to inject $US24 billion into Lucid Motors. PIF made public its investment of one billion dollars in Lucid Motors in September 2018, when it declared the investment. According to Dudley (2021), the organisation will have supplied around 20,000 autos by 2022; it is predicted that this number will climb to 251,000 cars annually by 2026. However, the current rate of adoption of EVs in Saudi Arabia is quite low and inadequate. The number of EVs in Saudi Arabia is not specified in the article 'Electric car sales in Saudi Arabia to witness growth by 2025' and the author does not offer any specific estimation of volume. *Asharq Al-Awsat* ('Electric Car Sales', 2021) noted that the number of EVs in Saudi Arabia is expected to grow to 32,000 by 2025 out of a total projected 577,000 vehicles, which implies that the current number of EVs in the country is much lower.

2.4 Electric Cars and Green Marketing

2.4.1 Introduction to Electric Cars

Electric cars are a modern type of automobile that is propelled by one or more motors; these motors are powered by electricity stored in lithium batteries. It offers an alternative to conventional internal combustion engine vehicles, having no exhaust emission and less noise (Helmers & Marx, 2012). Two terms are used interchangeably; 'EVs', which represents any vehicle that can use electricity to operate, and 'electric cars', which specifically refers to EVs that are capable of driving on the highway (PMR, 2019). In addition, EVs that have low speed and limited power or weight are termed neighbourhood EVs within the US (NHTSA, 1998) and electric motorised quadricycles in Europe (PMR, 2019). According to Ortar and Ryghaug (2019), the transportation system has the potential to be more effective, affordable and environmentally friendly through the introduction of electric cars. However, there is still a great deal of ambiguity about the way such a transition from one driving platform to another may take place and the locations in which it may take place within the framework of Europe.

There are three different types of EVs; plug-in electric, which is totally run on electric energy and does not require any sort of conventional fuel. For this car, the power is stored in the battery while plugged into the charging unit. There is not any exhaust emission from the tailpipe and it does not contain any sort of fluid fuel components like a fuel tank, fuel line or fuel pump.

The second type of electric vehicle is the plug-in hybrid, which mainly operates on electric energy, but these vehicles also have a conventional fuel engine, so are capable of using conventional fuel if the electric charge fails. When these vehicles run on electric energy, they do not cause emissions, but when they start consuming conventional fuel like diesel or gasoline, they produce emissions into the environment. EVs of this type can also be recharged by connecting them to an electrical charging source. These vehicles also have conventional fluid fuel equipment that is absent in plug-in electric type of EVs.

The third type of electric vehicle is hybrid-electric, which is operated with conventional fuels like diesel or gasoline, but these vehicles also have an electric battery. The batteries of these

EVs are recharged through 'regenerative braking' and do not need an external electrical source for recharge. The energy supply for these vehicles' batteries relies entirely on diesel or gasoline.

According to Breetz and Salon (2018), introducing electric cars has the potential to enhance the transportation system, making it more efficient and environmentally friendly. Nevertheless, there is still a great deal of ambiguity about how such a transition from one kind of engine to another may take place.

2.4.2 Electric Cars and the Environment

The transportation industry is responsible for around 23% of the world's greenhouse gas emissions and uses approximately 26% of the primary energy produced (Helmers & Marx, 2012). These gases are one of the primary contributors to both global warming and climate change and pose a significant threat to the ecosystem (Holmberg & Erdemir, 2019). To fulfil the mobility needs of the future along with performing reduction in the health and climate harmful emission, it is required to replace today's environmentally harmful technologies with more efficient and environmentally friendly technologies. The alternative is EVs (Helmers & Marx, 2012). There is increased adoption of electric cars worldwide (Khazaei & Tareq, 2021). However, this has been inadequate to fully address the negative impact of internal combustion engine vehicles on climate. According to Pavlović et al. (2020), electric cars are mostly utilised in Canada, Japan, China, Norway, the US, France, Great Britain, Sweden, Germany and the Netherlands. The US is the largest electric car market, followed by China (Pavlović et al., 2020).

According to Santos et al. (2021), internal combustion engines are the primary contributor to urban pollution. According to Serrano et al. (2019), there will be no exhaust gas emissions from electric cars, which means that their usage may significantly contribute to the reduction of air pollution. In addition, there is no noise produced by EVs when they are being driven in comparison to internal combustion engine automobiles; this results in a reduction in the amount of noise pollution produced. Electric cars do not depend on fossil fuels, which burn/ignite, and the thermal cracking emits carbon dioxide, NOx and Sox. This leads to destruction of the ozone layer. The result will be climate change and global warming

(Pavlović et al., 2020). That is the most prevalent benefit of an electric car; it can be operated on electricity that can be obtained from clean energy resources/renewable energy like hydropower, wind, solar, geothermal energy and nuclear energy. These electric cars are energy efficient and ecologically clean and are accepted as the alternatives in countries like Germany, Japan and the US, which have included them in energy policies (Pavlović et al., 2020).

According to the U.S. Department of Energy (n.d.-a), tank-to-wheel energy efficiency refers to the percentage of energy from the fuel tank or battery of a vehicle that is converted into useful work at the wheels. For conventional cars, this efficiency ranges from 12% to 30%, while green cars achieve a higher wall-to-wheel efficiency of about 77%. Furthermore, the internal combustion engine has a limitation; it is unable to make the green vehicle less noisy and reduce noise pollution on the roads. There will be no release of exhaust gases from the tailpipe because of the lack of fossil fuel use. This will make zero contribution to air pollution. A medium-sized green car produces 60% lesser emissions per kilometre compared with conventional cars. If it is charged using 80% renewable energy, it will reduce greenhouse gases by 85%, NOx and SOx by 75% and particulate matter by 40% (Keshav et al., 2021).

2.4.3 Electric Car and Green Marketing

Protection of the environment has emerged in recent years as one of the most significant issues to be discussed not only by businesses but also by marketers and customers (Biggemann et al., 2014; Schmuck et al., 2018). Environmental issues, including climate change, global warming and biodiversity loss, are the most pressing subjects (Guthrie et al., 2008). These environmental problems have an effect on the consumption pattern of customers. As a result, customers are moving towards ecologically friendly items, also known as 'green products' (Panzone et al., 2016; Tu & Yang, 2019). Green products are not harmful to the environment or living bodies (Y. S. Chen & Chang, 2012). As consumer habits change, marketing and advertising must change to appeal to consumers if green consumption is to be achieved. The solution to this problem is green marketing.

Green marketing is an environmentally friendly idea to achieve the desired product, with premium quality and affordable pricing, without having a negative impact on the environment (Groening et al., 2018). It shows that a product is manufactured in a way that is sustainable. In other words, green marketing is a way to sell services or products on the basis of their environmental benefits (Nedumaran & Manida, 2020). The definition of green marketing can be derived from Stanton and Futrell (1987): Green and environmental marketing consists of 'all activities designed to generate and facilitate any exchanges intended to satisfy human needs or wants' (p. 45), but with a minimal negative impact on the natural environment (Stanton & Futrell, 1987). For this study, and using Alsmadi's (2007) definition:

> Green marketing is conducting all marketing activities within a framework of environmental responsibility… is a comprehensive and systematic process that seeks to influence consumer preferences in a way that encourages them to demand environmentally friendly products and help them adapt their behavioral consumption patterns accordingly. (pp. 342–345)

According to K. Lee (2008), green marketing is established in three stages; one is the emergence of green marketing in the 1980s, when the idea of green marketing was newly originated within the industry. The second stage of green marketing began in the 1990s when consumers showed a positive attitude towards environmentally friendly green products and successfully translated it into purchasing behaviour. Roberts (1996) noted that the number of green product introductions grew to 810 in 1991 compared with 24 in 1985 and that 61% of the customers from his nationwide sample would not have bought the product if a company that produced it was ecologically irresponsible. Furthermore, at the third stage of green marketing, a new momentum of green marketing had developed; advanced technologies were implemented, governments enforced stricter environmental regulations and the public gained better awareness of global environmental concerns (K. Lee, 2008). Another vision of green marketing focuses on the 'efficiency of cognitive persuasion strategies' and is built on the idea that customers have a high understanding of environmental problems, which creates concern about climate issues (Hartmann & Apaolaza Ibáñez, 2006). This view of green marketing contrasts with the first impression, which emphasises the 'effectiveness of emotional persuasion strategies'.

The internal combustion engine (ICE) automobile is still the prevailing platform, but the electric car is an ecologically beneficial alternative to this kind of vehicle. Electric cars' green marketing makes them more valuable to green consumers, businesses, organisations and governments (Gelderman et al., 2021). Several studies have been conducted on the topic of the marketing of the environmentally friendly aspects of ICE automobiles and EVs. First to be examined will be a study on conventional car eco-friendliness as a marketing strategy. In qualitative work, Leite (2010) established that such aspects as re-use, reduce, recycle, green training and green marketing are even more eco-oriented for their customers, which directly affects their sales in a positive manner. However, Leite (2010) showed that the effectiveness of eco-friendly marketing depends on the sensitivity of customers to green issues. Thus, the effectiveness of eco-friendly marketing depends on the firm's ability to communicate value and increase the overall perception of value created. Higueras-Castillo et al. (2019) demonstrated that the most important factors that force customers to choose traditional vehicles are quality and social value. While EVs are chosen for their low noise, low price, good acceleration and customers' emotions, Higueras-Castillo et al. (2019) established that traditional vehicles are marketed on the basis of different behavioural characteristics of potential consumers.

Another point to consider while assessing the environmental marketing of traditional cars is the lifecycle of electric and traditional vehicles. BMUV (2021) compared traditional and EV useful life and established, when assessing the environmental impact from that perspective, the manufacturing of EVs has a greater environmental impact. This is because they use more steel and coloured metals for the production of batteries, notably cobalt and lithium. Instead, traditional cars can be powered with e-fuels, which are synthetic fuels produced using electricity from renewable sources. Although the efficiency of such fuels is significantly less than that of traditional petroleum and diesel, the rationale for their use can be introduced as an argument for the potential environmental friendliness of traditional cars. Additionally, BMUV (2021) noted that the production of traditional vehicles has become more environmentally friendly in general owing to the increased share of renewables in manufacturing.

As a final argument concerning the green marketing of traditional cars, a Deloitte (2020) report indicated that environmental friendliness is not a priority for traditional vehicle shoppers. Instead, buyers try to minimise the drawbacks of electric cars, which are their driving range, purchase price, residual value and sometimes poorer quality.

Traditional vehicle buyers prefer social status value and higher quality in a vehicle (Higueras-Castillo et al., 2019). These perceptions reinforce that green marketing for traditional cars is significantly less important as a decision priority. The perception of electric car customers' green marketing influences on decision-making is more pronounced. That is, the level of environmental performance and eco-friendliness of electric cars are the top priority benefits when purchasing an electric car (Deloitte, 2020; Petrauskienė et al., 2021; Tu & Yang, 2019).

Further, it gives an idea of the intensive results of green marketing for electric cars. Yusof et al. (2013) investigated the intentions of consumers to purchase eco-friendly automobiles. The study assessed levels of responsibility, environmental values and environmental knowledge. The findings revealed that while environmental values and responsibility positively influence environmental advertising perceptions, this did not necessarily result in a corresponding willingness to purchase a green automobile. A novel result showed that eco-labelling did increase the stated purchase likelihood for green car. Therefore, it is possible to deduce that environmental advertisement and education of customers can generate purchase intentions. However, that such environmental advertisements should make the eco-friendly benefits of electric cars more explicit since the perception of environmental advertising may not necessarily translate into purchase intentions of green automobiles (Yusof et al., 2013).

Ang et al. (2017), in their Malaysian study, investigated the impact of consumption value dimensions such as functional value, social value, emotional value, epistemic value and conditional value, on the purchase intention of electric cars. The findings indicated that among these dimensions, emotional value, conditional value and epistemic value had the most significant influence on the purchase intentions of EVs. These findings complement the findings of the Deloitte report (2020) and Higueras-Castillo et al. (2019). Ang et al. (2017) established that the emotional component is especially prominent and is similar to the emotional issues component forming purchase intentions, according to Higueras-Castillo et al. (2019). Conversely, Yan et al. (2019) identified such positive attributes of EVs like low pollution, low cost, low emissions and support policies from governments will make improve consumers' attitudes towards buying electric cars. All positive attributes are delivered to the consumer with the help of green marketing. The influence of green marketing demonstrates an increase in purchase intention in consumers (Yan et al., 2019). Both Yan et al. (2019) and Ang et al. (2017) concurred that lower prices of EVs is often a function of governmental policy subsidies. Tu and Yang (2019) and Petrauskienė et al. (2021) agreed that buyers value the low pollution and low emission benefits as drivers of purchase intention. For traditional vehicles, Higueras-Castillo et al. (2019) found that customers perceived a better quality-to-price ratio, whereas Deloitte (2020) added that customers generally perceive EVs to have a higher price and eventually a lower residual value, as currently compared with traditional vehicles.

He et al. (2018) took an alternative approach to analyse Chinese purchase intentions of EVs using the personality perception-intention framework. The researchers examined characteristics such as perceived monetary value, perceived environment and perceived symbol value. They observed that these constructs had a direct positive impact on the intention to purchase EVs. Simultaneously, perceived fee and the perceived risk had a negative impact on consumers' intentions to purchase an EV. Further, personal innovativeness had a positive impact on the perceived monetary benefit and intention of consumers to purchase an EV, while it was hypothesised to have a negative impact on the perceived risk of EV adoption. In addition, environmental concerns are assumed to have a positive impact on EV purchase intention and the perceived environment to purchase a green vehicle, but it is assumed to have a negative impact on the perceived fee to adopt an electric vehicle. He et al.'s (2018) conceptual model results were supported with the exception of the positive influence of perceived value on consumer purchase intention. He et al.'s (2018) findings are novel because the study adopted an explicitly interpretive stance on the construction of independent variables. By emphasising the perception of green car customers, He et al. (2018) implied that these perceptions may be changed given the right external circumstances, whereas such scholars as Higueras-Castillo et al. (2019), Yan et al. (2019) and Petrauskienė et al. (2021) adopted a more objective perspective of the constructs affecting purchase intentions.

Additionally, Mohamed et al. (2016) discussed the intention to adopt EVs in Canada. Their model was built on the relation between environmental concerns affecting adoption behaviour of green cars. They supposed that environmental concerns have a direct positive impact on behavioural intention to adopt EVs, which subsequently has a positive influence on adoption behaviour. Subsequently, environmental concerns have a direct influence on behavioural intention to adopt the electric car via attitude to adopt, subjective norms, personal moral norms and perceived behavioural control. The study results confirmed all suppositions of the research model (Mohamed et al., 2016). In contrast to Yusof et al. (2013), which uncovered that although environmental knowledge and responsibility positively affects the perception of environmental advertising, this does not necessarily translate into purchase intentions. Hence, the mediating role of willingness to adopt an EV arising from environmental concerns, as identified by Mohamed et al. (2016), may be low.

K. Alzahrani et al. (2017) studied the intention to adopt EVs among the people of Saudi Arabia. Their model proposed that environmental concerns have a positive impact on attitude and subjective norms, which both have a further positive impact on the intention for EV adoption. The results of this study showed that all hypotheses of their research model were supported by the analysis, while there was no evidence demonstrating the positive impact of environmental concerns on intentions to adopt EVs (K. Alzahrani et al., 2017). This aligns with the findings of Yusof et al. (2013), in which the results indicated that the exalted environmental concerns among respondents in the sample of K. Alzahrani et al. (2017) did not necessarily translate into actual purchases of EVs. However, the fact that beneficial environmental outcomes are linked to positive purchase intentions of EVs mirrors the findings of Deloitte (2020) and Higueras-Castillo et al. (2019).

Furthermore, Degirmenci and Breitner (2017) posited that the level of environmental performance, range confidence and price value affects the level of purchase intention of green vehicles via attitude towards green vehicles. Their significant results found that the level of environmental impact represents a stronger influence on purchase intention compared with price value and range confidence (Degirmenci & Breitner, 2017). Complementing Tu and Yang (2019) and Deloitte (2020), they also reported that the perception of the cars' eco-friendliness was a powerful driver of purchase intentions. However, Degirmenci and Breitner

(2017) found that price was not a high priority driver, whereas Deloitte (2020) and Higueras-Castillo et al. (2019) observed that price was among of the most important considerations.

Finally, Cecere et al. (2018) studied the intention to purchase EVs in Europe. They found that consumer intentions to purchase an EV is linked with the price, quality and recharging. If manufacturers can deliver a price reduction with improved driving range and the possibility to economically charge their vehicle at home, Europeans will have higher intentions to purchase green cars (Cecere et al., 2018). Here, it is possible to draw a clear parallel with the report of Deloitte (2020) because the driving range was among the main concerns of the customers considering the purchase of an EV rather than a traditional vehicle.

2.4.4 Future of Green Car

The future for green cars is bright since it helps decarbonisation (BMUV, 2021), which has a meaningful impact on climate change. For this reason, electric cars are soon to be adopted even in an Arabic country that globally exports vast volumes of crude oil products (Albukhari, 2021). The adoption of electric cars is good for the environment for several reasons. First, EVs are superior to conventional ICE cars because the induction motor of the green car has higher efficiency. Green cars are beneficial for the industry because car manufacturing giants responding to climate change and pronounced sales of green cars is expected. Global EV sales reached a milestone of 7.2 million in 2019; 2.1 million units were added in 2020, which is forecast to increase by 9 million units by 2025. It is estimated that by 2030, there will be 26 million sales of green cars. After this, gasoline and diesel-based cars will begin phasing out and sales will decline (Keshav et al., 2021). Motor car giants claim that they will stop the production of combustion engine cars soon. Jaguar is planning to sell only electric cars by 2025; Lotus also wants to sell only electric cars from 2028. Rowlatt (2021) observed that all of Ford's vehicle production in Europe and Volvo will only sell green vehicles from 2030. General Motors will also sell only green vehicles by 2035.

Wang et al. (2018) reported that the environmental situation has encouraged both public and private organisations to investigate methods to expand the use of public bicycle-sharing systems. Nevertheless, utilisation rates in many cities continue to fall short of forecasts. In addition, the public's inclination to embrace environmentally friendly practices is highly affected by how they view the functional, conditional, environmental and social values associated with these practices. In addition, opinions of 'greenness' are held both individually and collectively in any given society.

In Emanović et al.'s (2022) discussion on the evolution of EV in the automotive industry, they proclaim that it marks both a revolution and the beginning of a new age. There is a steady increase in the number of charging stations as well as the total number of passenger EVs. Battery EVs (BEVs) have a multitude of benefits, such as a lower contribution to urban air pollution, a lower contribution to emissions of greenhouse gases, an absence of noise and a reduced reliance on oil as a fuel. The authors concluded that these factors drive consumers towards adopting electric cars in the future.

Danielis et al. (2018) discussed that even in the absence of government subsidies, industry analysts anticipate that EVs will capture a larger portion of the market by 2025. The deciding factor may be a reduction in the retail price of the vehicles, which would be made feasible by the falling prices of battery packs and a potential change in the taxes levied on diesel.

In conclusion, the global adoption of green EVs, specifically electric automobiles, is anticipated to rise owing to their favourable influence on decarbonisation and the mitigating impact on the environment. EVs are more efficient than traditional ICE automobiles and are anticipated to supplant them in the forthcoming years. Several prominent automobile manufacturers have announced their intention to exclusively offer environmentally friendly vehicles in the coming years, with many companies having already established timelines for this transition. An increased expansion of charging infrastructure and availability of battery-powered electric vehicles are incentivising consumers to embrace the adoption of electric automobiles. The potential rise in the market share of EVs could be attributed to the decrease in retail prices and taxes on diesel and petrol.

2.5 Theoretical Framework

The theoretical framework of this study revolves primarily around the concepts of self-identity, perceived value, self-congruity and consumption values, building upon the foundations laid by Khazaei and Tareq (2021), He et al. (2018) and Juster (1966). In fact, most of this study's theoretical framework follows the previous self-identity studies of Barbarossa et al. (2015) and Confente et al. (2020). These two articles explore the topic of self-identity as described by Rosenberg (1989) in general and Vesely et al. (2021) in particular. Rosenberg (1989) highlighted that perceiving a phenomenon through a lens of self-identity is not new and stems from a behavioural paradigm in sociology and psychology. Vesely et al. (2021) used self-identity to demonstrate that eco-friendly behaviour has been a dominant climate change paradigm since the beginning of the 2000s. GSI began to become more prominent in the 2010s.

Stryker and Burke (2000) proposed that the main 'motivation of behaviour' is self-identity. Furthermore, self-identity is a set of meanings attached to roles individuals occupy in the social structure and unique ways they view themselves in these roles (Stets & Burke, 2003). As stated by E. L. Grubb and Grathwohl (1967), when an individual assumes a particular role, they develop expectations associated with that role and then strive to fulfil and represent those expectations. Individuals maintain consistency with the standards of self-identity through their actions of behaviour. Thus, the self-identity of the individual has been shown to be an independent predictor of consumption behaviours and attitudes (Arnocky et al., 2007). GSI is referred to as a motivational model of marketing that encourages the individual consumer to become involved with particular environmentally friendly behaviours (Stets & Biga, 2003; van der Werff et al., 2013a).

Self-identity primarily reflects the specific attitudes, norms and behavioural intentions within the context of the eco-friendly consumptions (van der Werff et al., 2013b). Self-identity is the primary motivation for environmentally friendly attitudes and consumption behaviours like recycling, when a person recycles his or her own bag and brings it to the market to shop and buy further environmental-friendly items (R. Y. K. Chan et al., 2007; Mannetti et al., 2004). Sparks and Shepherd (1992) reported that besides other significant drivers of behaviour related to the adoption of green products, GSI plays a crucial role in promoting green behaviour.

Indeed, prior research has reported that self-identity is a strong predictor of a variety of green behaviours (Barbarossa & De Pelsmacker, 2016). For individuals who consider themselves green consumers and environmental savers, these types of individuals quickly develop positive attitudes towards environmentally friendly behaviours because of their self-identity (Rise et al., 2010). Therefore, it can be inferred that individuals who identify as green consumers are more likely to embrace environmentally friendly choices, such as green electric cars, owing to their positive attitude towards eco-friendly vehicles that produce fewer emissions and are better for the environment. Ultimately, this GSI influences their decision to purchase an electric car (Barbarossa et al., 2015).

However, there is another important theoretical concept known as self-congruity, which can be defined broadly as an evaluation of the match or mismatch between customers' views of a brand/product and themselves (Salsabila & Hartono, 2023). In contexts such as the food or cosmetics industry, when there is a strong brand/product match, it tends to result in more favourable views and behaviours towards that particular brand/product (Aguirre-Rodriguez et al., 2012; N. R. Khalid et al., 2018; Shamah et al., 2018). Shamah et al. (2018) discovered that self-congruity boosts brand loyalty. Conversely, Jena and Sarmah (2015) identified no direct link between self-congruity and actions such as recycling. That research investigated the function of congruity between an individual's self-image and the image of an item. Then it established a relationship with behaviour directed towards that same object. The study's context was generally a well-known (green) product or brand.

On the basis of the discussion above on the theoretical foundations of the research, the current study selected identity theory (Stryker & Burke, 2000), self-perception theory (Bem, 1972) and theory of planned behaviour (Ajzen, 1991). These were the focal theories referred to in Barbarossa et al. (2015). Barbarossa et al.'s (2015) model identified and tested GSI as a driver of eco-friendly consumption. Furthermore, a person's GSI influences the level of consumer intention to engage in specific environmental consequences, both directly and indirectly. The latter through the development of positive attitudes towards such behaviours, then green moral obligation has direct influences, influences intention to buy green products.

Morover, according to the self-congruity theory (Sirgy, 1985), which posits that individual's behaviour and choices are influenced by their desire to maintain consistency between their self-concept and the image of products or brands they consume, this study explores the role of self-congruity as a moderator (Confente et al., 2020) in understanding consumer preferences and behaviours towards green cars.

Value creation is one crucial concept within marketing and management literatures (Lepak et al., 2007). The perception of a consumer regarding the value of the product is termed perceived value (Ashton et al., 2010). Overall value is derived with a trade-off between the level of benefits versus sacrifices (or the negative mitigating aspects) in consumers' interactions with the goods (Payne & Holt, 2001). V. Kumar and Reinartz (2016) referred to value as a driver of consumer behaviour that serves as a criterion for defining preferences and making evaluations. Self-identity has emerged as a prominent consumer value in both theory and practice, surpassing several other values (Johe & Bhullar, 2016).

In the consumption values theory (Sheth et al., 1991), various aspects of perceived value may be discovered that may affect customers' views of green goods, their correct functioning and the advantages they bring. According to this theory, consumer choice is a function of various consumption values. Specifically, functional, conditional, social, emotional and epistemic value and decision-making can be affected by any or all of the five consumption values (Papadas et al., 2019; Sheth et al., 1991; Sweeney & Soutar, 2001). The consumption values literature exhibits conflicting findings concerning the distinct influence of different aspects of value on other constructs. For example, C. J. Huang et al. (2019) advised that the emotional, conditional and epistemic value perceived for green products are the primary determinants of customers' choices for green products over traditional ones.

Conversely, Khan and Mohsin (2017) proposed that functional, social and environmental value have the greatest beneficial influence on customers' attitudes towards green products. Despite disagreements on the precise role and number of value aspects, there is widespread agreement that the overall construct of perceived value may influence the level of green product uptake. Similarly, in areas other than, but related to, green marketing, perceived value has recently been discovered to be a key predictor of behavioural intentions, for the purchases of recycled and upcycled items (H. J. Park & Lin, 2020).

To conclude, as highlighted in the preceding discourse, the theoretical framework of this present study was developed in the light of these theories. Drawing upon identity theory

(Stryker & Burke, 2000), self-perception theory (Bem, 1972), theory of planned behaviour (Ajzen, 1991), consumption values theory (Sheth et al., 1991) and self-congruity theory (Sirgy, 1985), the study's framework encompasses a comprehensive perspective. By aligning with these theories, this study seeks a holistic comprehension of the underlying motivations propelling individuals towards environmentally conscious actions, extending beyond just the adoption of eco-friendly electric cars to various contexts.

2.6 Model Development

After the above discussion about the future prospects of green cars, their value, associated risks and growing adoption of green products and EVs, this study wanted to develop a model to explain EV adoption. Several studies have investigated customer green behaviour using different models. However, there remains a gap for further investigation.

Barbarossa et al. (2015) and Confente et al. (2020) provided valuable insights into the impact of GSI on purchase behaviour. Barbarossa et al. (2015) specifically focused on the concept of self-identity in the context of green car purchasers, while Confente et al. (2020) explored the influence of self-identity attitudes on purchasing behaviour, revealing a significant impact on purchase intentions. Despite their contributions, both studies have certain limitations that can be overcome by incorporating additional constructs related to green issues. Thus, to address these gaps, this study aimed to develop a conceptual model that combines both studies' models and introduces additional constructs for our research, thereby shedding light on the effect of self-identity on the purchase probability of green products.

In this section, both studies are concisely summarised. Then, their model is combined to develop a new model with additional constructs and relationships for this study, which will explain the effect of self-identity on the purchase probability of green products.

2.6.1 Summary of the First Adopted Model's Study

Barbarossa et al. (2015) conducted a cross-cultural study on the model of self-identity to purchase an electric car. According to the authors, GSI is an important component in green marketing; sometimes, it directly has a positive impact on the attitude toward the adoption of environmentally friendly electric cars and occasionally it operates through the indirect route of care for environmental consequences of using electric cars and green moral obligation. Once the GSI affects the consumer and influences their attitude towards the adoption of the eco-friendly electric car, this attitude positively affects the consumer's intention to adopt an electric car. The Barbarossa et al. (2015) model is presented in Figure 2.2.

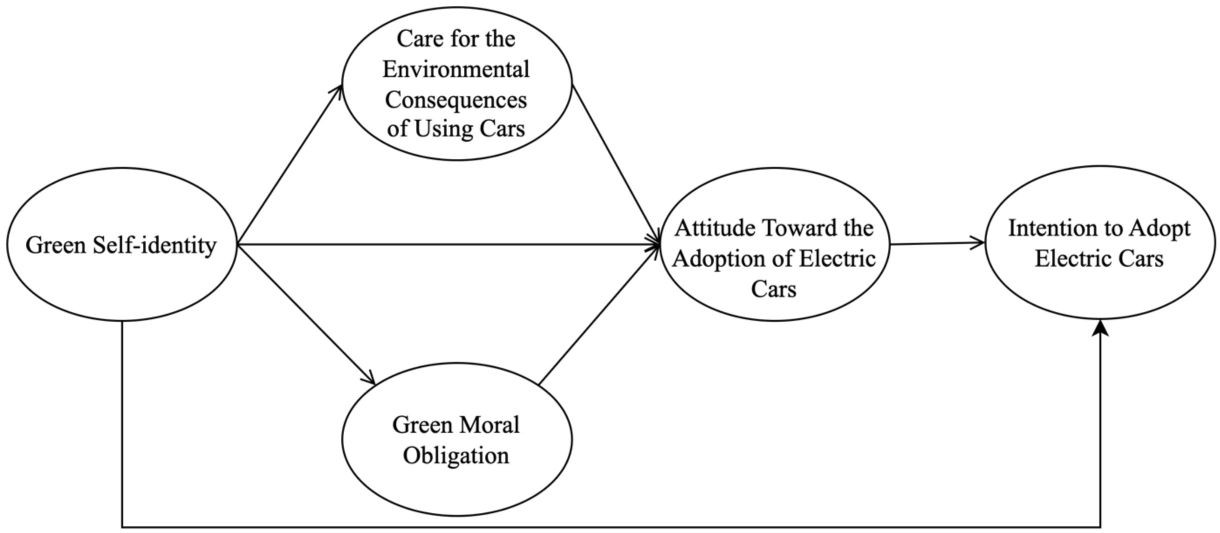

Figure 2.2: Conceptual Model of First Study

Note: Adapted from Barbarossa et al. (2015).

This study was conducted on licensed drivers in Italy, Belgium and Denmark. In total, 2,005 respondents participated, out of which 611 were from Denmark, 600 from Belgium and 794 from Italy. The study involved an equal percentage of male and female participants. Barbarossa et al. used the self-identity scale of Sparks and Shepherd (1992) to measure GSI. The authors used the environmental consequences scale of Follows and Jobber (2000) to measure the environmental consequences of using cars. Furthermore, the authors adapted the perceived moral obligation scale (Sparks & Shepherd, 2002) to measure the green moral obligations. The attitude of the consumer to adopt the electric car was measured by using the attitude towards green purchase scale of Taylor and Todd (1995); they also used the intention to use the electric car scale of Moons and De Pelsmacker (2012) to measure the intention to adoption the electric car. The hypothesis study conducted by Barbarossa et al. (2015) revealed that for Denmark and Belgium, all hypotheses except two were supported. All hypotheses were supported in the Italian sample. The findings of the study indicated strong support for the conceptual model across all three countries. Additionally, the results demonstrated significant differences among the countries examined.

Barbarossa et al. also had some limitations, such as the investigation's sole focus on GSI. Future research might benefit from including the function of multiple identities in social situations and their impacts on pro-environmental purchasing decisions, given that EVs offer a scenario in which various social identities and the influence of relevant people may play a critical role in influencing consumer decisions (Barbarossa et al., 2015).

2.6.2 Summary of the Second Adopted Model's Study

In the second study by Confente et al. (2020), the researchers worked on eco-friendly bioplastic and introduced some green marketing of bioplastic by focusing on the perceived value, GSI and green self-congruity. According to Confente et al.'s (2020) model, GSI has a positive impact on the perceived value of the green product. Furthermore, the perceived value of green products has a positive impact on the purchasing intention of green products. In addition, the conceptual model further studied self-congruity as the moderating agent of the relationship between perceived value and GSI. In the end, the conceptual model enforces the idea that GSI has a positive impact on the intention to purchase green products. Figure 2.3 shows the conceptual model of Confente et al. (2020).

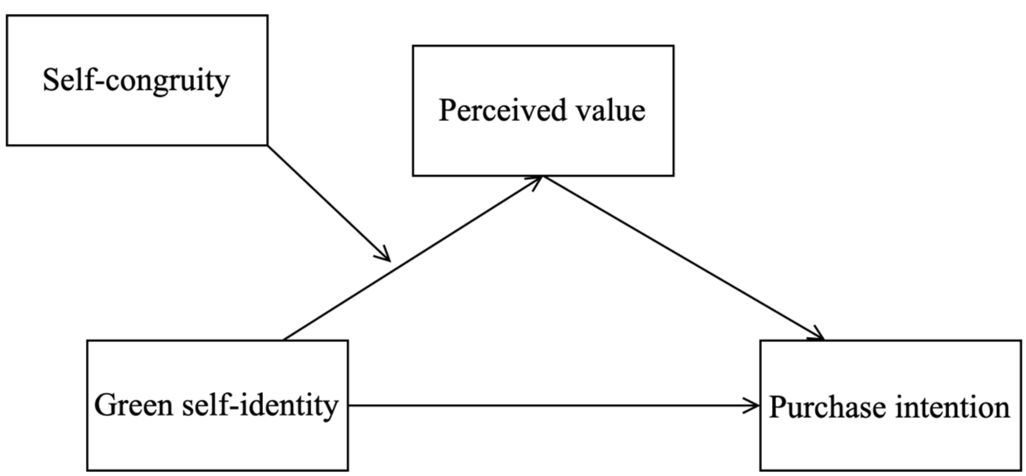

Figure 2.3: Conceptual model of second study

Note: Adapted from Confente et al. (2020).

Analyses established that all hypotheses were supported. The level of GSI had a positive impact on the level of perceived value. Further, a strong perceived value led to a positive impact on intention to purchase green products. It was also confirmed that GSI not only indirectly (via perceived value), but also directly, affects intention to purchase. Nonetheless, there is a positive impact of self-congruity acting as a moderator of the relationship between GSI and perceived value.

This study focused on a single product type (bioplastics products); it could be improved by working on multiple green products (Confente et al., 2020). Furthermore, the study was conducted on North American participants and may only reflect approaches regarding environmental concerns for that region, while Europe, Asia, Africa and South America are likely to have different approaches to address environmental concerns (Barbarossa et al., 2015; Idris, 2018). This study could be improved by covering other regions (Confente et al., 2020).

2.6.3 Development of the Conceptual Model

The current study proposes a new conceptual model. While the previously proposed models have made significant contributions to the field, there is still ample opportunity for improvement. Barbarossa et al. (2015) and Confente et al. (2020) recommended generalising the model and including other relevant constructs in future research. The conceptual framework for the electric car self-identity model developed for this research draws on identity theory (Stryker & Burke, 2000), self-perception theory (Bem, 1972), theory of planned behaviour (Ajzen, 1991), consumption values theory (Sheth et al., 1991) and self-congruity theory (Sirgy, 1985). By aligning with these theories, this study seeks a holistic comprehension of the underlying motivations propelling individuals towards environmentally conscious actions, extending beyond just the adoption of eco-friendly electric cars to various contexts.

The current study aims to fill the research gap by introducing a new green car purchase behaviour study model with constructs from the previous study models introduced by

Barbarossa et al. (2015) and Confente et al. (2020). To enhance the uniqueness and significance of the current model, the study has incorporated additional relevant constructs from other studies, such as perceived risk (He et al., 2018) and innovativeness (Khazaei & Tareq, 2021). Assimilating related models and adding relevant constructs in a conceptual model expands understanding of the topic domain and enhances the contribution of the current study. Further, this study conceptualises new relationships between the models and newly introduced constructs. The moderating role of green self-congruity within the larger structural model is introduced. The rationale will be addressed in the model development section, which features each hypothesis. Moreover, the conceptual model includes an intention to purchase an electric car but uses a probability to purchase an EV as the dependent construct.

He et al. (2018) highlighted that their research model's dependent variable was EV purchase intention rather than actual behaviour and suggested that investigating actual behaviour would yield more satisfying results for future researchers. In line with this, the present study adopts purchase probability as the dependent construct because it closely approximates actual behaviour. Purchase probability aligns more closely with actual behaviour compared with purchase intention, as outlined by Juster (1966). The dependent probability of purchase construct departs from the traditional approach of simply utilising a purchase intention scale. Individuals are assessed by rating a probability of purchase which ranges from 0 to 10. The scale dates back to the work of Juster (1966), who first hypothesised that purchase intentions underperform in predicting actual purchasing rates because they do not account for movement among non-intenders, which constitute the vast majority in the case of innovative products (Cecere et al., 2018). Wright and MacRae (2007) recommended employing the Juster model of purchase probability scales because they asserted that the study on intentions lacked empirical evidence.

In the proposed model, GSI has a positive direct effect on the care for the environmental consequences of using cars (ER; Barbarossa et al., 2015), green moral obligation (GMO) (Barbarossa et al., 2015), attitude towards the adoption of eco-friendly electric cars (AEC) (Barbarossa et al., 2015), green cars purchase probability (Juster, 1966), perceived value to purchase green car (Confente et al., 2020) and perceived risk (He et al., 2018). Furthermore, GMO and EC have a direct positive impact on the AEC; these two also mediate the relationship between GSI and AEC. This construct order preference featured in Barbarossa et al. (2015). The model further highlights the direct positive impact of AEC on green car purchase probability. In addition, the level of green self-congruity is supposed to be a relationship moderator among GSI—perceived risk (He et al., 2018), GSI—perceived value (Confente et al., 2020), GSI—EC (Barbarossa et al., 2015) and GSI—AEC (Barbarossa et al., 2015). Also, within the conceptual model, the level of perceived risk has a negative impact on green car purchase intention and purchasing probability (He et al., 2018); the perceived value has a positive impact on AEC and green car purchase probability. Alternatively, the perceived value and perceived risk appear to mediate the relationship between GSI and green cars purchase probability. Furthermore, GSI has a positive impact on the innovativeness (Khazaei & Tareq, 2021) and innovativeness has a positive impact on AEC, purchase intention and purchase probability. Finally, the proposed model will assist in determining the effect of GSI on the probability of green car purchasing through the constructs in the model. Figure 2.4 illustrates the conceptual model, which combines the models and new constructs.

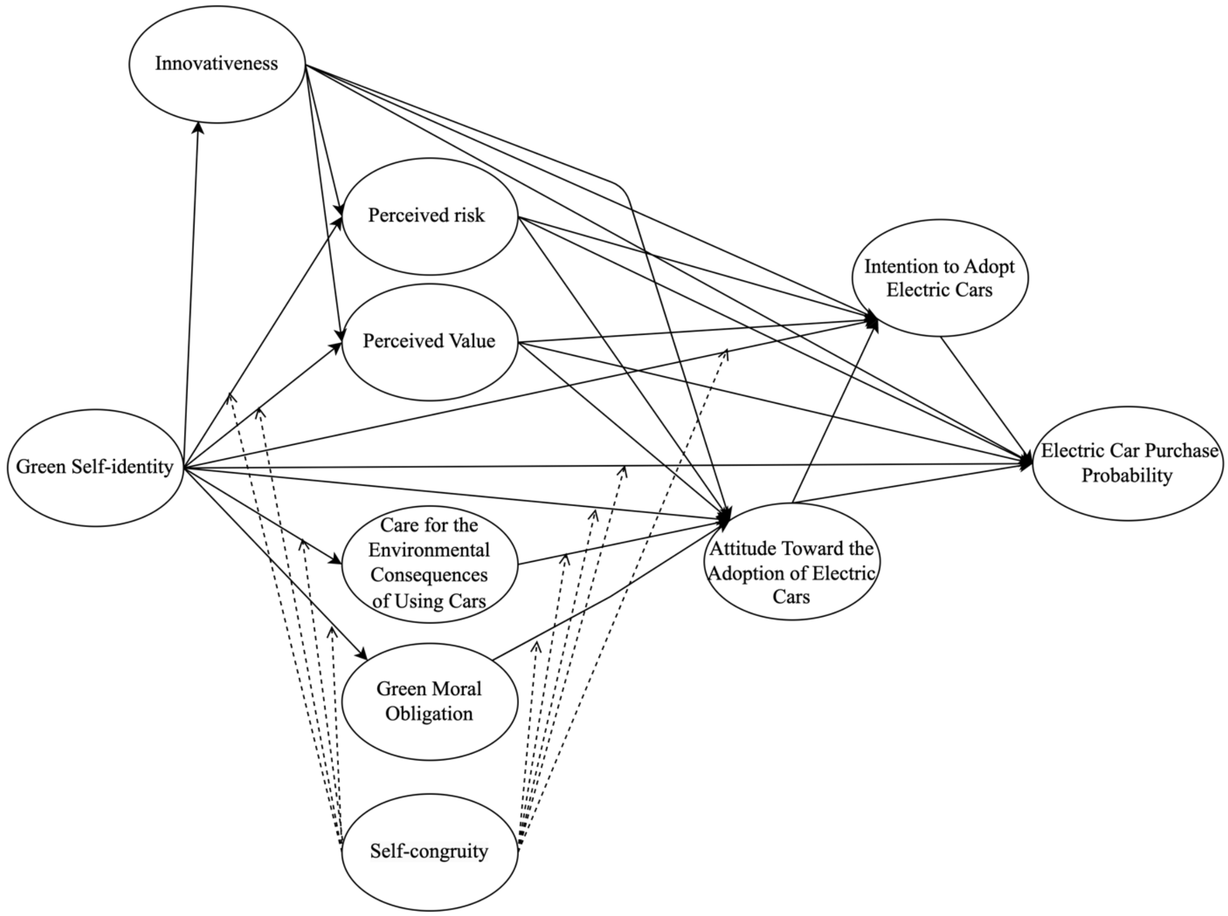

Figure 2.4: Conceptual model

2.7 Hypotheses Development

The hypotheses for the conceptual model are featured in Table 2.1. There are 10 main hypotheses in this study with sub-hypotheses.

Table 2.1 Research hypotheses

	Description	Path
	Direct (causal) effect hypotheses	
$H1_a$	GSI has a positive direct effect on EC.	GSI →EC
$H1_b$	GSI has a positive direct effect on GMO.	GSI →GMO
$H1_c$	GSI has a positive direct effect on AEC.	GSI →AEC
$H1_d$	GSI has a positive direct effect on the green cars PP.	GSI →PP
$H1_e$	GSI has a positive direct effect on the PV.	GSI →PV

	Description	Path
$H1_{f}$	GSI negatively influences the perceived risk of adoption (PR).	GSI →PR
$H1_{g}$	GSI has a positive direct effect on innovativeness.	GSI →INN
$H1_{h}$	GSI has a positive direct effect on the green cars purchase intention (IA).	GSI →IA
$H2_{a}$	The care for EC has a positive direct effect on the attitude towards the AEC.	EC →AEC
$H2_{b}$	GMO has a positive direct effect on AEC.	GMO →AEC
$H4_{a}$	The attitude towards the AEC has a positive influence on green cars purchase intention (IA).	AEC→ IA
$H4_{b}$	The attitude towards the AEC has a positive influence on the green cars PP.	AEC→ PP
$H5_{a}$	The perceived value (PV) of electric cars has a positive effect on the PP of green cars.	PV→ PP
$H5_{b}$	The PV of electric cars has a positive effect on the intention to purchase (IA) green cars.	PV→ IA
$H5_{c}$	The PV of electric cars has a positive effect on the attitude towards the AEC.	PV→ AEC
$H6_{a}$	PR negatively influences green cars PP.	PR→ PP
$H6_{b}$	PR negatively influences green cars purchase intention (IA).	PR→IA
$H6_{c}$	PR negatively influences the attitude towards the AEC.	PR→ AEC
$H9_{a}$	Innovativeness has a positive direct effect on the attitude towards the AEC.	INN→ AEC
$H9_{b}$	Innovativeness has a positive direct effect on green cars PP.	INN→ PP
$H9_{c}$	Innovativeness has a positive direct effect on green cars purchase intention.	INN→ IA
$H9_{d}$	Innovativeness has a positive direct effect on PV.	INN→ PV
$H9_{e}$	Innovativeness negatively influences the perceived risk of EV adoption.	INN→ PR
H10	Green cars purchase intention (IA) has a positive influence on green cars PP.	IA→PP
	Mediation effect hypothesis	
$H3_{a}$	EC is expected to mediate the relationship between GSI and AEC.	GSI→EC→AEC
$H3_{b}$	GMO is expected to mediate the relationship between GSI and AEC.	GSI→GMO→AEC
$H8_{a}$	PV is expected to mediate the relationship between GSI and green cars PP.	GSI→PV→PP

	Description	Path
$H8_b$	Perceived risk is expected to mediate the relationship between GSI and green cars PP.	GSI→PR→PP
	Moderation effect hypotheses	
$H7_a$	Self-congruity (SC) with green products positively moderates the relationship between GSI and PV for electric cars.	(SC*GSI) → PV
$H7_b$	SC with green products negatively moderates the relationship between GSI and perceived risk (PR) for electric cars.	(SC*GSI) → PR
$H7_c$	SC with green products positively moderates the relationship between GSI and EC.	(SC*GSI) → EC
$H7_d$	SC with green products positively moderates the relationship between GSI and AEC.	(SC*GSI) → AEC
$H7_e$	SC with green products positively moderates the relationship between GSI and GMO.	(SC*GSI)→ GMO
$H7_f$	SC with green products positively moderates the relationship between EC and AEC.	(SC*EC) → AEC
$H7_g$	SC with green products positively moderates the relationship between GMO and AEC.	(SC*GMO)→ AEC
$H7_h$	SC with green products positively moderates the relationship between GSI and PP for electric cars.	(SC*GSI) → PP
$H7_i$	SC with green products positively moderates the relationship between GSI and purchase intention for electric cars.	(SC*GSI) → IA

2.7.1 Green Self-Identity

Self-identity is defined as an individual's perception of himself or herself and how he or she decides to adhere to the values and behaviours of the group of people to which he or she wishes to belong or considers himself or herself to belong (Whitmarsh & O'Neill, 2010). The increasing criticality and specificity of environmental issues are rendering the self-identity convert into an eco-friendly or GSI (Barbarossa et al., 2017; Y. S. Chen & Chang, 2012; Confente et al., 2020; Whitmarsh & O'Neill, 2010). GSI is defined as an individual's self-perception about supporting pro-environmental initiatives (Clayton, 2007). GSI is strongly regarded as a principal motive for predicting environmentally responsible decisions/behaviours (Barbarossa et al., 2015; Moisander, 2007). The proposed model predicts both an indirect relationship between GSI and consumer attitudes towards adopting electric cars through the mediating role of teleological and deontological ethical motives to adopt electric cars (i.e., concern for environmental consequences) and a direct positive relationship between GSI and consumer tendencies towards and motives to adopt electric cars (Barbarossa et al., 2015; Sharma et al., 2022). Teleology refers to how much consumers rely on the perceived consequences of their actions (i.e., teleological evaluation is framed on the estimated goodness or badness of a specific behavioural alternative's consequences; Barbarossa et al., 2015), whereas deontology refers to internalised ethical and moral principles (i.e., deontological evaluation is framed on the inherent morality of a specific behavioural alternative (Chan & Chen, 2008). Empirical evidence suggests that GSI influences consumer intention to engage in specific green behaviours both directly and indirectly, with the latter occurring through the development of positive attitudes towards such behaviours (Barbarossa et al., 2015).

Environmentally friendly, or green, products are those that are meant to have the least amount of negative influence on the environment when they are used (M. Y. Bhutto et al., 2022; Y. Li et al., 2021). Companies are interested in green products because customers are growing more concerned about environmental concerns and social responsibility. In general, customers will give a company's efforts toward social responsibility, including environmental sustainability, a higher rating than they will items from less responsible businesses (Brown & Dacin, 1997). Since EVs have fewer negative environmental effects, EV adoption is also a pro-environmental behaviour. Consumers who are more concerned about the environment are more likely to purchase EVs (Sinnappan & Rahman, 2011). As a result, the study's first contribution is the development of a model of self-identity-based eco-friendly formation, which reinforces a deeper understanding of consumers' motivating processes for adopting environmentally friendly durables by combining the two models (Barbarossa et al., 2015; Confente et al., 2020).

H_{1a}: *GSI has a positive direct effect on EC.*

Consumers' attitudes towards and intentions to engage in certain eco-friendly actions are influenced by their GSI, according to their ethics (Hunt & Vitell, 1986). Consumers rely on the moral philosophies of teleology and deontology in developing their assessments (attitudes) in circumstances containing ethical issues (Vitell et al., 2001). A personal norm is defined as a moral obligation (Barbarossa et al., 2015), so moral perception can increase the intention to make climate-friendly choices (M. Chen, 2020). Hojnik et al. (2021) reported that consumers who consider themselves green consumers tend to exhibit greater concern for the environmental consequences of specific consumption behaviours (consumer concern). Additionally, Shang and Wu (2022) found that these individuals are more inclined to view environmentally unfriendly consumption behaviours as unethical conduct, which green consumers should avoid (GMO). Consumers' attitudes about a certain eco-friendly activity, as well as their desire to adopt it, are influenced by concerns for the environmental implications of consumption and a green moral duty (Barbarossa et al., 2015). Moral obligation was defined by Shaw et al. (2015) as a deontological expression of guilt or personal obligation to engage in or refrain from engaging in a given behaviour. Han (2015) and M. Chen (2020) posited that GMO are the ways people responsibly participate in eco-friendly actions as a perceived sense of obligation. People who have a strong environmental self-identity are more likely to feel morally obligated to act in favour of the environment (Han et al., 2021; Higueras-Castillo et al., 2020). The study proposes that environmental self-identity influences behaviour by eliciting feelings of moral obligation to do so (van der Werff et al., 2013a). The hypothesis for studying the impact of GSI on GMO is:

H_{1b}*: *GSI has a positive direct effect on GMO.

According to extant research on green purchase behaviour (Laroche et al., 2001), a specific type of behaviour demonstrates indications of influencing consumers' green purchase intentions. The study gauged customer awareness of environmental concerns and measured whether consumers avoid supporting polluting firms and those that use non-environmentally friendly packaging during their purchase decisions. Obviously, EVs are more ecologically friendly and cost more than their non-electric equivalents (Oliver & Lee, 2010). Conforming with self-image congruency theory (Sirgy, 1982), consumers who perceive a product's image to be consistent with their self-image are more likely to have a positive attitude towards the product and are thereby more likely to purchase the product (He et al., 2018). According to the theory of reasoned action (Fishbein & Ajzen, 1977), the attitude, which is determined by salient beliefs regarding the consequences of performing the behaviour, is the most immediate antecedent of intention. Attitude represents the perceptual evaluation of a specific action at hand (Ajzen & Kruglanski, 2019). Green marketing is a process that encompasses all marketing activities designed to elicit and sustain consumers' environmental attitudes and behaviours (S. K. Jain & Kaur, 2004).

Consumer desire to engage in certain green activities is influenced directly and indirectly by GSI, the latter through the development of favourable attitudes towards such actions. According to Oliver and Lee (2010), a consumer's GSI is strongly linked to their attitude towards buying hybrid automobiles. Madrigal (2001) investigated the impact of identity on the belief attitude–intention hierarchy and highlighted that an individual's attitude towards the action mediates the identity–purchase intentions relationship findings in the linked area of environmental identity support this identity-attitude-behaviour hierarchy (Clayton, 2003). According to Hinds and Sparks (2008), consumers are more likely to engage in environmentally friendly behaviours when their environmental identity is stronger, as are attitudes towards these behaviours. Shaw and Shiu (2003) discovered that a greater identification with the organic consumer has a positive effect on behavioural intentions for brands or products of organic food. They suggested that GSI is an additional, direct independent predictor of green behavioural intentions in the context of buying organic food (Armenio et al., 2022; Rise et al., 2010). As a result, the more customers view themselves as green consumers (H. Singh et al., 2023), the more favourable an attitude they will acquire towards adopting eco-friendly electric automobiles and the more eager they will be to embrace this product (Asadi et al., 2021; Gulzari et al., 2022; Tarigan, 2019). Drawing upon the previous work of Barbarossa et al. (2015), the present study hypothesises that:

H_{1c}**:** *GSI has a positive direct effect on the attitude toward the AEC.*

Purchase intention is defined as the probability that the consumer will purchase the product (Mohd Sam & Tahir, 2009). Y. S. Chen and Chang (2012) defined green purchase intentions as 'the likelihood that a consumer would buy a particular product resulting from his or her environmental needs' (p. 507). Eco-friendly features in EVs are most likely to influence the purchase intentions of people who are still undecided about buying one (He et al., 2018; Neves & Oliveira, 2021). Consumers might be able to guide the improvement in processes and products, which may enhance the competitive positioning of the firms as a whole in the market (Chng et al., 2019). The important question is whether EVs lack performance or whether manufacturers should only focus on environmental damage reduction. The intention is the commitment to implement action(s) in the future; it is a plan or determination to do something (Y. Joshi et al., 2021). A consumer's goal, aim or purpose is their intention, whether they decide to do it or not. Thus, purchase intention is the antecedent that stimulates and influences the consumer's purchase of services and products (Hawkins et al., 2012; Mou et al., 2020).

This research examines the intention to purchase an electric car in terms of probability as the dependent construct. It departs from the traditional approach by utilising purchase intent, as revealed by individuals in the form of a probability ranging from 0 to 10. The concept dates back to the work of Juster (1966), who first hypothesised that purchase intentions underperform in predicting actual purchasing rates because they do not account for movement among non-intenders, which constitute the vast majority in the case of innovative products (Cecere et al., 2018). Although Ajzen (1991) argued that intention significantly influences the probability of the decision to purchase, others (Juster, 2015) have suggested that studies on consumer intention to purchase inefficiently predict the purchase rates since they fail to offer accurate estimations of the mean purchase probability.

Consumers with GSI or their tendency to be eco-friendly may affect the purchase probability of the users. The main reason might be the fact that once a consumer is more careful or sensitive to environmental issues, his or her self-identity may become incongruent with the product if the product is not eco-friendly, thereby changing the mind of the consumer to switch to alternatives. If there is no alternative present, the purchase probability of the consumer may reduce or even diminish to a very unnoticeable level (Zhao et al., 2018). The higher the GSI and the more the product is environmentally friendly, the greater will be the purchase probability of the eco-friendly product. According to the discussion of Confente et al. (2020), this research proposes the following relationship between GSI and the purchase probability of eco-friendly cars:

H_{1d}**:** *GSI has a positive direct effect on green cars purchase probability.*

Previous research has focused on PV because it has a positive impact on marketing performance (Y. S. Chen & Chang, 2012; Sweeney et al., 1999). Patterson and Spreng (1997) described green PV as a consumer's overall assessment of the direct benefit of a product or service on the basis of the consumer's environmental desires, sustainable expectations and green needs. Y. S. Chen and Chang (2012) defined PV as 'a consumer's overall appraisal of the net benefit of a product or service between what is received and what is given based on the consumer's environmental desires, sustainable expectations, and green needs' (p. 505). In other words, it is a set of characteristics related to consumers' perceptions of the value of a product (Ashton et al., 2010; M.-K. Kim et al., 2018). The advantages obtained from the adoption of a product or service are referred to as the perceived benefits (Agag & Colmekcioglu, 2020). The more advantages a person perceives in a product or service, the greater value he or she will place on it. Value can act as a precursor to people's preference judgements and help define what 'value' means to them (Confente et al., 2020; M. Kumar & Noble, 2016; V. Kumar & Reinartz, 2016; Sánchez-Fernández & Iniesta-Bonillo, 2007).

The value of technical breakthroughs is positively influenced by perceived advantages. Economic and non-economic components of perceived advantages of breakthroughs such as EVs can be separated (Forsythe et al., 2006). In terms of the former, EVs can save money on operating costs such as gasoline and maintenance because they use less energy and have fewer components than ICE vehicles (Loaiza-Ramírez et al., 2022). In terms of the latter, EVs are ecologically benign since they emit few greenhouse gases. Furthermore, because EVs generate less noise and vibrations than ICE vehicles, they provide a more enjoyable and convenient driving experience (Barbarossa et al., 2017; M.-K. Kim et al., 2018). The literature suggests that the PV of green products may be influenced by a consumer's value system, specifically the degree to which consumers self-identify as green people (Confente et al., 2020). Self-identity can be viewed as an important component of an individual's preference judgement and value formation process (Confente et al., 2020; Dermody et al., 2018).

Consumers with GSI or a tendency to be eco-friendly may affect the PV of an eco-friendly product. The main reason coming into play might be the fact that is mentioned in the literature review of the previous hypothesis. This research proposes the following relationship between GSI and the PV of eco-friendly cars:

H_{1e}*: *GSI has a positive direct effect on perceived value for electric cars.

PR is defined as the consumer's perception of the uncertainties that may arise when purchasing an EV (He et al., 2018). Y. Chen and Chang (2013) defined green PR as 'the expectation of negative environmental consequences associated with purchase behaviour' (p. 71). According to PR theory, buyers are more likely to minimise their PR rather than maximise their expected green purchase intentions pay-off (Mitchell, 1999). Customers' purchase decisions are influenced negatively by the level of the PR (Y. S. Chen & Chang, 2012; Harridge-March, 2006; L. Li et al., 2022; Murphy & Enis, 1986). Consumers may reduce the possible risk of adopting EVs, such as range anxiety caused by restricted cruising range and insufficient charging infrastructure (He et al., 2018). In actuality, there is a trade-off in the PR of EV adoption (Featherman et al., 2021). The same consumer may feel good about buying an environment-friendly vehicle, but the same consumer may feel reluctant to buy the same vehicle if there are other factors, like those mentioned earlier about the product features or pertaining to infrastructure (N. K. Jain et al., 2022).

Consumers with GSI or their tendency to be eco-friendly may affect the consumer's PR about an eco-friendly product. The main reason might be the point that once a consumer is more careful or sensitive to environmental issues, his or her self-identity may become incongruent with the product if the product is not eco-friendly, thereby changing the mind of the consumer (Rotaris et al., 2021; Thøgersen & Ebsen, 2019; Wang et al., 2018). If there is no alternative present, the consumer may back off from the decision or intent to purchase any item altogether that is not eco-friendly (Giansoldati et al., 2020). On the basis of the current discussion, this research proposes the following relationship between GSI and the PR of eco-friendly cars:

H_{1f}*: *GSI negatively influences the perceived risk of EV adoption.

People are becoming increasingly interested in adopting sustainable habits as they become more conscious of the harmful impact of human activities on the environment. Driving green automobiles, which are ecologically beneficial and minimise carbon emissions, is one such activity. However, the decision to use green automobiles is affected not just by environmental advantages, but also by the innovativeness of a product (L. Huang et al., 2022).

The term GSI refers to a person's sense of themselves as environmentally conscientious and responsible. People who identify as having a strong GSI are more likely to recycle, reduce waste and use environmentally friendly items (Confente et al., 2020). In contrast, innovativeness refers to a person's readiness to try new and innovative items or ideas. According to studies, people who are more inventive tend to accept new technology, goods and services sooner than those who are less innovative (R. Liu et al., 2021).

It may be claimed that people with higher GSIs are more inclined to drive green automobiles. This is because they view green cars as a more ecologically friendly and sustainable alternative to typical gas-powered automobiles. Furthermore, their GSI may persuade engagement in behaviours that are consistent with their environmental values, such as purchasing green automobiles (Flores & Jansson, 2022). According Mutum et al. (2020), those with a high GSI are more likely to engage in ecologically beneficial actions such as minimising trash and saving energy. Individuals with a high GSI may be more aware of the issue of environmental sustainability and more willing to embrace green vehicles. The adoption of green automobiles is a perfect example of a technical breakthrough that has the ability to contribute to sustainable development. As a result, people with a high GSI, who are more likely to participate in ecologically responsible behaviour, are more inclined to choose green automobiles owing to their innovativeness (Khazaei & Tareq, 2021). Thus, the current study hypothesised that:

***H_{1g}**: GSI has a positive direct effect on innovativeness.*

Other elements that can affect the adoption of ecologically friendly products have been found in previous studies in the field of green marketing (Barbarossa et al., 2015; He et al., 2018; Wijekoon & Sabri, 2021). GSI is one such feature that has been demonstrated to be a strong predictor of ecologically responsible behaviour (M. H. Bhutto et al., 2020). Individuals who firmly identify as recyclers, for example, are more likely to participate in recycling practices, whereas those who identify as 'green' are more likely to indicate a desire to acquire EVs (L. Li et al., 2022).

Given these findings, it is expected that GSI is likewise related to green automobile purchasing intent. Individuals with a strong sense of GSI (Sharma et al., 2022), in particular, may be more likely to acquire eco-friendly items, especially green automobiles (Barbarossa et al., 2017). Overall, GSI is viewed as a significant motivator of environmentally friendly behaviour. This study proposes a direct positive association between GSI and green car purchase intentions. Thus, the study adopted the hypothesis developed by Barbarossa et al. (2015) in the current study:

H_{1h}: *GSI has a positive direct effect on green car purchase intention (IA).*

2.7.2 Care for Environmental Consequences of Using Cars and Green Moral Obligation

Care for environmental consequences refers to 'people's mindfulness towards harmful consequences, which particularly include actions that entail potential environmental harm' (Han et al., 2021, p. 249). Individuals who view themselves as green consumers may consider purchasing eco-friendly products because these things meet their self-definitional requirements and provide personal happiness, according to the SC theory (Quester et al., 2000; Sirgy, 1985; Yusof et al., 2011). In terms of teleological concerns, ecological care refers to how concerned people are about the negative consequences of their consumption choices on the natural environment (Sirgy, 1985). The more customers view themselves as green consumers, the more concerned they are about the environmental repercussions of their purchasing decisions and the more likely they are to engage in environmentally beneficial behaviour. (Barbarossa et al., 2015).

In the context of choosing renewable energy, van der Werff et al. (2013a) discovered that having a GSI had a favourable influence on moral duty. Furthermore, Sparks et al. (1995) discovered that customers' desire to adopt gene technology is significantly influenced by moral obligation. Barbarossa et al. (2015) found that the greater a person's GSI, the more value they place on the environmental consequences of driving (Cruz-Jesus et al., 2023). Consumers who consider themselves green consumers are more likely to sense a moral duty to do (or refrain from performing) ethical (unethical) behaviours and are more inclined to choose green alternatives (L. Li et al., 2022; Schultz, 2000; Yeung, 2004).

Customers who purchase green products and have a positive attitude towards the adoption of green cars tend to be environmentally conscious and care about the environmental consequences of using electric cars. There is evidence of a positive correlation between attitude and care for the environmental consequences of EV adoption. The purchase of green products is related to the fact that customers are aware of environmental issues (Barbarossa et al., 2015; Dash, 2020). Current research posits the same stance posed in Patyal et al. (2021) and Schwartz (1977), stating individuals' experiences and how they associate norms and rules with specific behaviour might dictate their behaviour and actions because they feel they are responsible for it. Also, regarding this study, the values that promote pro-environmental behaviour are activists, good citizens and healthy customers. Furthermore, Fonseca (2015) also justifies that the person with a positive attitude towards buying the green product has this attitude because of his or her environmental consciousness. It is widely assumed that customers' concern for environmental consequences by engaging in certain behaviours, as well as the GMO, are required to explain their environmental decision-making choices (Han et al., 2017; Han et al., 2021; Onwezen et al., 2013; Shim et al., 2018). The higher the care for the environmental consequences, the greater will be the attitude towards the adoption of eco-friendly electric cars.

***H_{2a}*:** *Care for the EC has a positive direct effect on the attitude towards the AEC.*

GMO is the way people responsibly engage in eco-friendly action as a perceived sense of obligation (Armenio et al., 2022; Han, 2015). Moral obligations have been found to predict attitudes and intentions involving moral dimensions, such as green purchasing (Barbarossa et al., 2015; van der Werff et al., 2013b). People who have a solid GMO are more likely to have a high attitude towards adopting eco-friendly electric cars (Chng et al., 2019; V. Singh et al., 2020). The higher the GMO, the greater will be the attitude towards the adoption of eco-friendly electric cars.

***H_{2b}*:** *GMO has a positive direct effect on the attitude towards the AEC.*

2.7.3 The Mediating Role of GMO and EC

Barbarossa et al. (2015) created a hierarchical identity-motivation-attitude-behaviour model in which they contended that GSI is a primary motivator for consumers to develop a positive attitude towards the adoption of eco-friendly electric cars. The deontological such as GMO and the teleological such as EC conceptualisations are the primary elements that affect the consumer's attitude towards a particular behavioural outcome or it is possible that there is an appraisal of the behavioural outcome in the consumption circumstances dealing with the ethical concerns (Barbarossa et al., 2015). Specifically, this notion points to the important aspect that consumers are cautious about the perceived consequences of their behaviours, encompassing ethical and moral issues (Chan et al., 2007; Hunt & Vitell, 2006). Moreover, studies by Barbarossa et al. (2015) and Han et al. (2021) posited that the model includes direct associations of several concepts, such as GSI and attitudes towards eco-friendly electric car adoption, while also acknowledging the mediating roles of environmental consequences concern and GMO. On the basis of the review of literature here, the current research proposes that care for the environmental consequences mediates the influence of GSI on attitude towards the adoption of eco-friendly electric cars.

H_{3a}*: *EC is expected to mediate the relationship between GSI and AEC.

Also, the current study proposes that GMO mediates the influence of GSI on attitudes towards the adoption of eco-friendly electric cars. In terms of the adoption of environmentally friendly EVs, this study hypothesis argues that customers who consider themselves 'green' are more likely to sense a moral need to refrain from ecologically destructive actions (Higueras-Castillo et al., 2020). This is thought to contribute to the formation of favourable views about environmentally friendly EVs and a higher propensity to acquire these goods (Barbarossa et al., 2017). This study offers a model that defines the interaction between hierarchical components such as identity, motivation, attitude and behaviour using prior research findings (Barbarossa et al., 2015; Barbarossa et al., 2017; Han et al., 2021). The current study argues that GSI is a main driver of customer desire to create positive attitudes (AEC) towards eco-friendly electric vehicles. The current study followed the previous study by Barbarossa et al. (2015) and adopted the hypothesis that:

H_{3b}*: *GMO is expected to mediate the relationship between GSI and AEC.

2.7.4 Attitude Towards the Adoption of Electric Cars

The theory of reasoned action proposed by Fishbein and Ajzen (1977) suggests that attitude, the most immediate antecedent of behavioural intention is determined by salient beliefs regarding the favourability of displaying a particular behaviour. Attitude represents a psychological inclination involving positive or negative evaluations of a specific object or behaviour (Ajzen & Cote, 2008; Coffman et al., 2016). The effects of identity on the belief-attitude-intention hierarchy and the discovery that an individual's attitude towards behaviour mediates the relationship between identity and purchase intention (Barbarossa et al., 2015; Madrigal, 2001). According to Y. Liu et al. (2018), when a person has a positive attitude towards a particular technology, their intention to accept that technology increases, and conversely. In fact, much research has identified a link between a person's attitude towards a product and their intention to use that product (T. Lu et al., 2020; Wang et al., 2018).

Individuals who have favourable opinions regarding EVs and view them as useful to the environment and their own lives are more likely to indicate a desire to purchase them (Westin et al., 2018). Individuals who have negative opinions regarding electric automobiles and consider them inconvenient or unreliable are less likely to express a desire to buy one (Liu et al., 2020). The adoption of EVs is a significant factor influencing consumers' decisions to adopt or reject these vehicles. Therefore, it is critical for automakers and politicians to work together to foster favourable views about EVs through effective communication tactics, education and awareness initiatives, and incentives that promote the benefits of environmentally friendly transportation. It is feasible to boost the desire to embrace EVs and accelerate the transition to a more sustainable future by fostering favourable views about them (Jaiswal et al., 2021; Shakeel, 2022). The attitude towards eco-friendly electric cars influences consumers' intentions to adopt them, according to Barbarossa et al. (2015). Thus, the current study hypothesised that:

$\boldsymbol{H_{4a}}$: *The attitude toward the AEC has a positive influence on green car purchase intention (IA).*

In terms of adopting eco-friendly electric cars, the earlier study contended that the more consumers perceive themselves as green, the more positive their attitude towards adopting eco-friendly electric cars will be and the more willing they will be to adopt this product (Barbarossa et al., 2015; Ling et al., 2021). According to previous research, it can also be deduced that when a consumer has a positive attitude towards electric cars, they are more likely to form an intention to adopt EVs. As a result, it is hypothesised that:

***H*$_{4b}$**: *The attitude towards the AEC has a positive influence on green cars PP.*

2.7.5 Perceived Value

In today's world, in which PV holds increasing importance, businesses have the opportunity to boost consumer interest in purchasing by augmenting the PV (Asadi et al., 2021; Steenkamp & Geyskens, 2006). PV can be defined as a set of attributes related to consumers' perceptions of the value of a product (Ashton et al., 2010; Confente et al., 2020). According to Sweeney et al. (1999) and Salsabila and Hartono (2023), PV is a collection of qualities linked to a consumer's impression of a product's value. The greater the PV, the more positive word-of-mouth is generated and the interest in purchasing grows. According to Chang and Chen (2008) and Da Costa et al. (2020), when consumers sense a high PV of the items they consume, they are more likely to desire to buy the product. Generally, consumers evaluate the product ahead of making a purchase decision. Evaluation by the consumer is framed on the specific conditions pertaining to the product, which may include pricing, quality and whether the product fulfils the consumer's need and is coherent with the overall self-identity of the consumer (Dixit & Singh, 2022).

Mosavi (2012) and Ghasri et al. (2019) investigated the PV and depicted it as the perception of the consumers about their sacrifice and expense in light of the advantages they obtain from the product. Confente et al. (2020) suggested that PV positively influences the purchase decision of consumers. It is thought that green PV is a significant factor influencing customers' willingness to purchase green products (Dhewi et al., 2018). This argument posits that when the PV in the mind of the consumer is higher, there is greater likelihood of the purchase to materialise. Priansa (2016) suggested that PV influences purchase decisions positively. Thus, green PV has a positive impact on consumers' purchase probability of green products. Product sales will rise when the product value is enhanced (Jenn et al., 2018). This research proposes that the higher the PV, the greater will be the probability of purchasing green cars. As a result, the study's fifth hypothesis was developed:

H_{5a}**:** *The perceived value of electric cars has a positive effect on the probability to purchase green cars.*

The desire to buy green automobiles is affected by a variety of constructs, including the PV of EVs. Individuals who believe that electric automobiles have a high value in terms of environmental sustainability, financial savings and technical innovation are more likely to indicate a desire to acquire them (W. Zhang et al., 2022). Individuals that value eco-friendliness in their shopping decisions are motivated by environmental sustainability (He & Hu, 2021). Saving money and technical progress are other major elements that affect people's desire to buy green cars, according to Higueras-Castillo et al. (2020). Car manufacturers and politicians should work to generate a positive impression of EVs to promote the intention to acquire green vehicles (Ng et al., 2018). This may be accomplished through effective communication techniques, education and awareness initiatives and incentives that promote the advantages of environmentally friendly transportation. Furthermore, enacting rules and providing incentives to make EVs more accessible and inexpensive can serve to boost the PV and desire to acquire this vehicle (Ng et al., 2018; Xie et al., 2022). Thus, current study hypothesised that:

H_{5b}**:** *The perceived value of electric cars has a positive effect on the intention to purchase green cars.*

In general, people develop an attitude towards behaviour on the basis of their perception. They will positively evaluate a behaviour if they have a positive perception and project a desirable outcome; as a result, they will form favourable attitudes towards the behaviour (X. Zhang et al., 2018). Consumers can easily understand and appreciate the environmental benefits of eco-friendly electric vehicles (Higueras-Castillo et al., 2020). These perceptions can lead to favourable attitudes towards the purchase of environmentally friendly cars. Consumer attitudes are influenced positively by PV (Broadbent et al., 2021; Kwun, 2011). As a result, this research expects that the higher the PV, the greater will be the attitude towards the adoption of eco-friendly electric cars.

***H_{5c}*:** *The perceived value of electric cars has a positive effect on the attitude toward the AEC.*

2.7.6 Perceived Risk

According to Y. Chen and Chang (2013) and Jiang et al. (2021), PR is the negative outcome of anything that is being purchased or used. As stated in a previous study, there is a negative correlation between PR and desire to buy green products (Chang & Chen, 2008; Koehn, 2003; Letmathe & Suares, 2020) as well as EVs (He et al., 2018). The negative association exists because people's perceptions of risk may influence their purchasing decisions (He et al., 2018). Someone who is concerned about environmentally friendly items will investigate whether the product has a specific flaw that might affect the environment. As a result, the green PR should be lowered to enhance interest in acquiring items (Y. Chen & Chang, 2013; Garretson & Clow, 1999). Previous research has found that PR has a negative impact on consumers' willingness to adopt new innovations (Oliver & Lee, 2010; Shu et al., 2022). Reducing the level of PR increases purchase probability and increases customer purchase intentions, so PR negatively affects purchase intentions (Chang & Chen, 2008; Y. S. Chen & Chang, 2012; Mitchell, 1999; Wood & Scheer, 1996).

Gerrard et al. (2006) reported that for PR of eco-friendly vehicles, there are various risks involved that shape the attitudes of consumers towards EVs. There are different types of PRs, which are elaborated on in detail in the earlier literature (He et al., 2018). One risk is physical risk. An example of physical risk is that if a person is walking on the road, he or she may not listen to the noise of the engine and ultimately may be hit by the EV in which there is no noisy motor (Shu et al., 2022; Thomas, 2009). An example of financial risk is that consumers already know that fossil fuel costs are higher than electric ones but considering the rising macroeconomic changes may compel governments to raise electricity costs, this may eventually increase the operating cost of eco-friendly vehicles. An example of a functional risk is that consumers are not well aware of the battery life of EVs and these batteries need uninterrupted charging. These batteries are, most of the time, less powerful and less efficient and may need future replacements (Turrentine & Kurani, 2007; Xie et al., 2022). Currently, the charging points are not available in abundance, so it may cause problems for mass public use (Wiedemann et al., 2013). An example of social risk entails that consumers may change their decision on the basis of peer pressure. The social circle of the consumer may negatively affect his or her attitude. Ultimately, many consumers may refrain from buying eco-friendly vehicles owing to the fear of societal reprimand, which makes them hesitant to stand out or feel left out (Axsen et al., 2010). This research expects that the higher the level of PR, the lower will be the probability of purchasing green cars. As a result, the study's hypothesis was developed:

***H_{6a}*:** *Perceived risk negatively influences the green cars purchase probability.*

The degree of uncertainty or negative effects associated with a certain behaviour or activity is referred to as PR (Lou et al., 2017). The level of PR may be a key element influencing an individual's purchasing intention for green automobiles in the context of green marketing. According to Jiang et al. (2021) and McLeay et al. (2018), many forms of PR, such as performance risk, financial risk, psychological risk and social risk, may influence an individual's purchasing intention for green cars. The anxiety that the green car would not perform as well as standard gas-powered automobiles is referred to several risk factors that have been discussed in the earlier hypothesises. Marketers and policymakers can provide consumers with information about the benefits of green cars, address performance and financial concerns, and create social norms that encourage the adoption of eco-friendly transportation options to reduce PR and increase purchase intention (Dhewi et al., 2018; Jiang et al., 2021). Furthermore, the provision of incentives such as tax exemptions or rebates can help reduce financial risk and increase the likelihood of individuals acquiring green vehicles. Thus, this hypothesis was developed:

***H_{6b}*:** *Perceived risk negatively influences the green cars purchase intention (IA).*

Previous research has established that perceived benefit is positively related to attitude, whereas PR is negatively related to attitude (Jayani et al., 2022; S.-I. Wu & Chen, 2014). A higher level of PRs will have an adverse effect on one's attitude towards electric cars (J. Wu et al., 2020; X. Zhang et al., 2018). This research expects that the higher the perceived risk, the lower will be the attitude towards the adoption of eco-friendly electric cars. As a result, the following hypothesis is:

***H$_{6c}$*:** *Perceived risk negatively influences the attitude toward the AEC.*

2.7.7 Green Self-Congruity

SC is termed as the coherence among the consumer's self-concept and brand image (Sirgy, 1985). SC is a psychological process and result in which customers compare and evaluate their perception of a brand image or product class with their own self-concept. Put another way, it is the process and outcome that is directly related to a consumer's identification with a brand or product class (Sirgy, 1985, 2018). SC also has a significant influence on consumers' value perception and pre-purchase behaviour, such as brand evaluation and brand choice (Gravelines et al., 2022; Hosany & Martin, 2012; Litvin & Goh, 2002). These studies mentioned before examined SC, whereas the current research only employs green SC in its entirety.

Confente et al. (2020) and Yusof et al., (2011) suggested that there is more of an indirect than a direct link between green SC and green product behaviour. Green SC, for example, has been shown to increase brand loyalty (Shamah et al., 2018). Conversely, Jena and Sarmah (2015) discovered no link between green SC and actions like recycling. That research examined the role of congruency between an individual's green self-image and the picture of an item, then found a relationship to conduct the research targeted towards the same item or object (R. R. Kumar & Alok, 2020). Those studies generally used a well-known (green) product or brand as their 'object' (Confente et al., 2020). It is noted in the earlier research that SC (actual, ideal, social and ideal social SC) influences consumers' pre-purchase and post-purchase behaviour (e.g., brand preference and choice, consumer satisfaction, word-of-mouth and brand loyalty; Han et al., 2019, 2021; Sirgy, 2018). Existing research consistently acknowledges that SC influences how consumers relate to and interact with products. However, previous research (Aguirre-Rodriguez et al., 2012; Yusof et al., 2011) appears to support an indirect rather than a direct relationship between green SC and green product behaviour.

Some studies have observed that SC has many direct and indirect relationships between green product-related behaviour and SC. Shamah et al. (2018) found that SC had brand loyalty enhancement effects, while Jena and Sarmah (2015) reported no relationship between behaviours and the SC. Confente et al. (2020) addressed SC and behaviour regarding green products. They worked on the indirect role rather than the direct role of self-congruency because when there is a higher degree of congruity between consumer and self-identity, it assists in establishing a better relationship between the PV of the green product and GSI (Gulzari et al., 2022). The green SC of the individual is the guiding principle for their decision-making since every decision they take is framed on the congruity of their self with the product. Once the level of congruity is established, the person may seek the achievement of their goals in terms of buying a product (Confente et al., 2020; Salsabila & Hartono, 2023). In lieu of this argument, the current research study examines the process that strengthens the PV of green products when customers have a GSI. This thesis includes green SC as a moderating construct (Chin et al., 2003).

The PV of green cars enhances the consumers' concept, enabling them to compare the green car with their improved self-image. This establishes a direct link between PV and SC, as individuals evaluate the product according to how well it aligns with their self-concept and self-identity (Han et al., 2019). The current research advances the notion that when consumers perceive high congruity between their self-identities and green products, it helps to tighten the relationship between GSI and the PV for green products, which in the case of current research is electric cars. The process of building or strengthening PV for green products should be facilitated when consumers already feel more connected to the broader family of green products.

(H_{7a}) *Self-congruity with green products positively moderates the relationship between GSI and perceived value for electric cars.*

As per the findings of Bockarjova and Steg (2014), individuals who have pro-environmental behaviour tend to perceive environmentally damaging products such as conventional cars to be harmful to the climate. The perceived risks of conventional vehicles result in these people having more positive perceptions of EVs. This results in stronger intentions to buy electric cars and a long-term acceptance of the use of EVs. Bockarjova and Steg (2014) also proposed the concept of response efficacy, which refers to the extent to which a person believes that problems concerning the environment can be reduced if they engage in pro-environmental behaviour. This response efficacy, when combined with SC of the reduced environmental damage caused by electric cars, results in an increase in the intention of purchasing EVs (Confente et al., 2020; Salsabila & Hartono, 2023). PR develops uncertainty about green cars to the consumer and will have an adverse impact on the concept of the consumer. The current research posits that when consumers perceive high congruity between themselves and green products, it helps reduce the relationship between GSI and risk (Gravelines et al., 2022). The process of reducing or minimising the PR for EVs should be facilitated when the consumers already feel more connected to the broader family of green products.

(H_{7b}) *Self-congruity with green products negatively moderates the relationship between GSI and perceived risk for electric cars.*

Care for environmental consequences (EC), according to Barbarossa et al. (2015), results from GSI attitude because of ethical motivations. Stets and Biga (2003) studied how a green consumer is motivated to engage in behaviours that are eco-friendly and people with high SC show a stronger relationship between motivation and eco-friendly behaviour. This might include purchasing products that are produced sustainably or those that help in attaining their personal objectives, according to Barbarossa et al. (2015). Van der Werff et al. (2013a) reported a positive correlation between a person's environmental SC and pro-environmental behaviour and a higher PV for environmentally friendly products. They referred to this behaviour as a biospheric value that influences these people to engage in environmentally friendly behaviour. Environmentally friendly, or green, products are those that are meant to have the least amount of negative influence on the environment when they are used (Y. S. Chen & Chang, 2012; Hojnik et al., 2021). Companies are interested in green products because customers are growing more concerned about environmental concerns and social responsibility (Almohaimeed, 2022). In general, customers will rate a company's efforts towards social responsibility, including environmental sustainability, higher than they will items from less responsible businesses (Brown & Dacin, 1997). Because EVs have fewer negative environmental effects, EV adoption is also a pro-environmental behaviour. Consumers who are more concerned about the environment are more likely to purchase EVs (Sinnappan & Rahman, 2011). The current research proposes that when consumers perceive high congruity between themselves and green products, it helps to strengthen the relationship between GSI and care for the EC of using cars. The process of building or strengthening care for the EC of using cars should be facilitated when consumers already feel more connected to the broader family of green products.

(H_{7c}) *Self-congruity with green products positively moderates the relationship between GSI and EC.*

The attitude of the consumer to embrace eco-friendly products is defined as the individual's drive to adopt environment-friendly products (Barbarossa et al., 2015). The GSI of the individual positively affects the adoption attitude towards eco-friendly products, (Han et al., 2021). This effect may be negative if the attitude towards the adoption of fossil fuel cars is considered instead of the eco-friendly ones. One such construct that may affect or moderate the relationship between GSI and adoption attitude towards eco-friendly cars is the green SC of the consumer, which is yet to be considered in the context elaborated here (M. Y. Bhutto et al., 2022). Jansson et al. (2010) and Ozaki (2010) held that the level of green SC with green products shapes consumers' attitudes towards adopting eco-friendly electric cars, thereby improving the strength of the relationship between GSI and adoption attitude.

Thus, the current research posits that when consumers perceive high congruity between themselves and green products, it helps to strengthen the relationship between GSI and attitude towards the adoption of eco-friendly electric cars (Barbarossa et al., 2017). The process of building or strengthening attitude towards the AEC should be facilitated when consumers already feel more connected to the broader family of green products.

(H_{7d}) *Self-congruity with green products positively moderates the relationship between GSI and AEC.*

Consumers' attitudes about a certain eco-friendly activity, as well as their desire to adopt it, are influenced by both concerns for the environmental implications of consumption and a green moral duty (Barbarossa et al., 2015). A personal norm is described as a moral obligation, so moral perception can increase the intention to make climate-friendly choices (M. Chen, 2020; Gravelines et al., 2022). If the consumer has a GMO, this obligation will lead them to consider the idea of electric cars; this will engage them to adopt these eco-friendly cars (Barbarossa et al., 2017). The current research proposes that when consumers perceive high congruity between themselves and green products, it helps to reinforce the relationship between GSI and GMO for green products (e.g., electric cars). The process of building or strengthening GMO should be facilitated when consumers already feel more connected to the broader family of green products.

(H_{7e}) *Self-congruity with green products positively moderates the relationship between GSI and GMO.*

AEC stands for the adoption of electric cars, which refers to the attitude that results in the purchase behaviour of customers. Confente et al. (2020) and Salsabila and Hartono (2023) explored how green identity results in a high-value perception of bioplastics. The current research asserts that when consumers perceive high congruity between themselves and environment-friendly cars, it helps to strengthen the relationship between care for the EC of using cars and their attitude towards the adoption of eco-friendly electric cars. The process of building or strengthening the attitude towards the AEC should be facilitated when consumers already care more about the EC of using cars (Gravelines et al., 2022). Thus, the current study hypothesised that:

(H_{7f}) *Self-congruity with green products positively moderates the relationship between EC and AEC.*

The GMO of the individual towards the overall society positively affects the adoption attitude towards eco-friendly products (Confente et al., 2020). This effect may be negative if the attitude towards the adoption of fossil fuel cars is considered instead of the eco-friendly alternatives. The most prominent construct that may affect or moderate the relationship between GSI and adoption attitude towards eco-friendly cars is the green SC of the consumer, which is yet to be considered in the context elaborated here (Salsabila & Hartono, 2023). The level of green SC with green product shapes consumers' attitudes towards adopting eco-friendly electric cars, thereby improving the strength of the relationship between GMO and the adoption of attitude (Barbarossa & De Pelsmacker, 2016; Jansson et al., 2010).

Therefore, on the basis of the previous discussion, the current research also proposes the notion that when consumers perceive high congruity between themselves and green products, it helps to enhance the relationship between GMO and attitude towards the AEC. The process of building or strengthening the attitude towards the AEC should be facilitated when consumers already feel more connected to the broader family of green products.

(H_{7g}) *Self-congruity with green products positively moderates the relationship between GMO and AEC.*

Green SC pertains to the degree to which an individual's self-image corresponds to environmentally conscientious activities and attitudes (Confente et al., 2020). The degree of congruence between an individual's self-concept and their judgements of green items can affect the association between GSI and electric car purchase likelihood (Barbarossa et al. 2017). Individuals are more likely to have a sense of belonging with other environmentally concerned customers if they believe their self-concept is aligned with their usage of green items. This can lead to an increased possibility of purchasing green items like electric cars (Han et al., 2021). However, even if an individual strongly identifies with a GSI, if their self-concept is not compatible with their opinions concerning green products, they may be less willing to acquire eco-friendly cars (X. Zhang & Yu, 2020). The idea of green SC is significant in determining the link between GSI and electric car purchasing likelihood. Thus, the current study hypothesised that:

(H_{7h}) *Self-congruity with green products positively moderates the relationship between GSI and PP for electric cars.*

Confente et al. (2020) established that an individual's SC with green items may considerably affect their purchase intention for eco-friendly products such as electric cars. Individuals who perceive a high level of SC with EVs are more likely to correspondingly have a good attitude towards these vehicles and a greater purchase intention towards them. The association between GSI and purchase intention for electric automobiles can be moderated by the level of SC with green items (Salsabila & Hartono, 2023). This indicates that people who have a strong feeling of environmental responsibility and a high level of self-congruence with green items are more likely to have a greater purchase intention for eco-friendly transportation solutions (Gravelines et al., 2022; Salsabila & Hartono, 2023). The relationship between GSI and purchase intention for electric cars is heavily influenced by SC with green items (Kristiyono & Anjani, 2021). Thus, the current study hypothesised that:

(H_{7i}) *Self-congruity with green products positively moderates the relationship between GSI and purchase intention for electric cars.*

The reason some of the relationships in the conceptual model adopted in the current research study are not moderated by green SC is that the person's self-concept affects the relationship ahead of shaping the attitude or influencing the purchase intent of the consumers. The relationships between PR and PV with GSI are shaped by green SC. Once these relationships are formed, the PR and value directly affect the attitude and the green car purchase intention of the buyers. Lastly, GSI directly affects green car PP of the consumer because once the green product aligns with the self-concept of the buyer, there is hardly any factor left for moderating the effect between the two constructs used in the current study.

2.7.8 The Mediating Role of PV and PR

Consumers will sense positive value from green products if they have strong sentiments of GSI. As a result, they will be more likely to buy green products in the future (Confente et al., 2020). Additionally, Khan and Mohsin (2017), in their study on consumer behaviour towards eco-friendly products, suggested that functional, social and environmental values have the most positive effects on behaviour. In the earlier literature, PV has been shown to be a mediating construct for the relationship between constructs (Hanaysha, 2018; Hapsari et al., 2016; Jhandir, 2012). Confente et al. (2020) established that there is general agreement that the overall construct of PV can affect the adoption of green products. The current study proposes a moderated mediation model (Hair et al., 2019) in which PV mediates the link between GSI and PP. Thus, it appears that:

H_{8a}: *Perceived value is expected to mediate the relationship between GSI and green car PP.*

Consumers' perceptions of risk are formed according to their assessments of the potential repercussions of poor actions. Because PR is a mix of undesirable consequences and uncertainty, consumer purchasing decisions are negatively influenced by PR (Han et al., 2021; Peter & Ryan, 1976). Consumer purchasing decisions and behaviours are influenced by PR, according to previous studies (Chaudhuri & Dayal, 1997; Dhewi et al., 2018). Consumers want to reduce their PR rather than maximise their benefit, according to PR theory. Consumers are less likely to trust a product if they believe it poses a large danger (Mitchell, 1999). Previous research has found that PR has a negative impact on consumers' willingness to adopt new technologies (Dhewi et al., 2018; Meuter et al., 2005; Oliver & Rosen, 2010). The current study proposes a moderated mediation model (Hair et al., 2019) in which PR mediates the link between GSI and PP. Thus, it appears that:

***H_{8b}*:** *Perceived risk is expected to mediate the relationship between GSI and green car PP.*

2.7.9 Innovativeness

As asserted by Khazaei and Tareq (2021), 'personal innovativeness is a characteristic feature of individuals related to their attitude towards new technologies of ideas' (p. 6). In general terms, innovativeness measures the time of adoption and the attitudes of existing and potential customers towards a particular innovative product or service. Goldsmith (1991) speculated on the difficulties linked to measuring innovativeness because earlier studies, such as Rogers (1983), regarded innovations as the adoption time of a particular product or service. Midgley and Dowling (1978) perceived innovativeness as the number of recently adopted innovative products or services by a specific customer. Personal innovativeness, according to Rogers (1983), refers to how quickly an individual embraces new idea compared with the average person in their social class. Individuals with strong feelings of curiosity and a need for novelty are built-in traits of innovative people. Openness to absorb new ideas is measured by the level of innovativeness. A higher level of innovativeness is linked to a higher likelihood of adopting innovation (Chao et al., 2021; Parveen & Sulaiman, 2008; Thakur & Srivastava, 2014). In the future, innovative individuals will be drawn to eco-friendly vehicles as modern transport technology because it satisfies their psychological need for novelty. Hurt et al. (1977) described innovativeness as a person's willingness to change, which was measured in their self-report scale, allowing them to tackle the willingness to innovate instead of adaptive behaviour. The benefits of the scale developed by Hurt et al. (1977) are that it allows measuring innovativeness in a systemic manner and considers interactive effects between the innovator and the innovation; the scale even provides a possibility to predict innovativeness (Goldsmith, 1991; Yang & Chen, 2021).

As pointed out earlier, GSI increases the probability of green car purchases, which increases their adoption. Barbarossa et al. (2017) clearly showed this by using the personal values of their sample group. Since innovativeness can be regarded as a type of personal value, as observed in Wijekoon and Sabri (2021) and Mutum et al. (2020), it is logical to hypothesise that innovativeness can directly affect green car purchase probability. Jansson et al. (2010) and Flores and Jansson (2022) noted that the main factors that affect the adoption of eco-innovations include values, beliefs, norms and habits.

Additionally, Cowart et al. (2008) and Tellis et al. (2009) highlighted that the tendency to adopt eco-innovations is similar to the traditional innovativeness trait. This fact, as well as certain theories for measuring innovation, such as the theory of Rogers (1983), which measures innovativeness as the adoption time, allow us to assume that innovativeness may have a significant role in green car adaptation (Shanmugavel & Micheal, 2022). Although Goldsmith (1991) pointed out that Rogers's (1983) measure of innovativeness was inferior to the self-reporting scale of Hurt et al. (1977) the questionnaire of Hurt et al. (1977) still contains questions regarding the time of adoption, which makes this construct significant and additionally links adoption to innovativeness and AEC (Chao et al., 2021). According to the literature, the following hypothesis was developed:

(H_{9a}) *Innovativeness has a positive direct effect on the attitude toward the AEC.*

Wijekoon and Sabri (2021) established eco-innovativeness among the determinants of green product behaviour. Mutum et al. (2020) measured the effect of innovativeness when predicting the purchasing patterns of customers. Mutum et al. (2020) found that customer innovativeness has a positive relationship with pro-environmental and customer values. Studying this factor can be especially promising in the context of Saudi Arabia, with its continuously increasing adoption of cars and government programs aimed at stimulating more frequent usage of EVs. Another point to consider, as expressed by Barbarossa et al. (2017), is that open-to-change customers tend to express their GSI directly in their intentions (p. 29). One such intention may be the purchase of a green car (Khazaei & Tareq, 2021), which is why the study of the direct effect of innovativeness on green car purchase probability is especially relevant.

(H_{9b}) *Innovativeness has a positive direct effect on green car PP.*

The degree to which people are receptive to and interested in trying out new items or ideas is referred to as their innovativeness. Innovativeness may have a substantial impact on an individual's purchasing intention for green automobiles in the context of green marketing, according to Al-Majali (2020). Green car buying intent is favourably associated with innovativeness (Fett et al., 2018; He & Hu, 2021). Individuals that are more inventive are more willing to test new things, including eco-friendly alternatives such as green automobiles (Y. Liu et al., 2018; Müller, 2019). These people are also more likely to be interested in the most recent technological advances and environmental improvements, which are frequently connected with green cars. The present study formulated this hypothesis:

(H_{9c}) *Innovativeness has a positive direct effect on green car purchase intention.*

Earlier research (Benzidia et al., 2021; Higueras-Castillo et al., 2019; Hong et al., 2017) on the role of consumer innovativeness in the relationship with PV suggested that the greater the consumer innovativeness, the more it can influence the relationship with the PV of a product. Thus:

(H_{9d}) *Innovativeness has a positive direct effect on perceived value.*

Personal innovativeness has a beneficial impact on perceived economic advantage (Noreña-Chavez, 2020; Noreña-Chavez & Guevara, 2020). De Kerviler et al. (2016) conducted a study on mobile payment service adoption and discovered a significant negative correlation between personal innovativeness and customers' PR of adopting the service. Consumers with high personal innovativeness are likely to believe that eco-friendly vehicles will be a trend in the future to replace non-eco-friendly cars (He et al., 2018; M.-K. Kim et al., 2018). Likewise, such buyers downplay the potential risks of eco-friendly vehicle adoption, such as range anxiety, battery replacement or failure.

(H_{9e}) *Innovativeness negatively influences the perceived risk of adoption.*

2.7.10 Green Cars Purchase Intention

B. Lin and Wu (2018) revealed that consumers' intentions to buy electric cars are influenced by network externality, price acceptability, government subsidies, vehicle performance, environmental concerns and demographic characteristics like gender, age and marital status. A stronger intention to buy green automobiles is linked to a higher possibility of actually buying a green car (Degirmenci & Breitner, 2017; J. Kim et al., 2016; Lashari et al., 2021), In contrast, a low intention to buy green automobiles is related to a reduced chance of doing so. Few previous studies have conceived and constructed scales and relationships between purchase intention and purchase likelihood (Juster, 1966; Morrison, 1979; Wright & MacRae, 2007). However, empirical research to measure the direct association is limited. On the basis of the above discussion, the current study developed the hypothesis:

(H_{10}) *Green cars purchase intention (IA) has a positive influence on green cars PP.*

2.8 Chapter Summary

In this chapter, the current literature was reconciled and explanatory studies were canvassed. Structural models and pertinent results were critically examined. This study primarily focuses on Saudi Arabia, both at the national level and within various government institutions. These entities are currently dedicated to developing new infrastructure to promote greater awareness and adoption of electric cars. Manufacturers and retailers are adopting a green marketing approach to boost their green orientation. People with green identities prefer to purchase green products, including green electric cars. Green marketing primarily works through GSI, PV and SC. It has been argued that all have a positive impact on the purchase of electric cars. Green SC has a proposed indirect impact by mediating the relationship between self-identity and the PV of the car, which will drive the PP of electric cars. It is posited other constructs have a direct positive impact on the PP of green products. The conceptual model has been developed and proposes nine hypotheses affecting the relationship between self-identity and green car purchase probability. Several constructs in the model facilitate the process, including PV, care for the EC of using electric cars, GMO, attitude towards the adoption of eco-friendly electric cars and SC. In totality, they facilitate the positive impact on the GSI and green car PP relationship.

Chapter 3 will outline the chosen approaches to conduct the research, encompassing the methodology, design, research paradigm and items representing constructs. Additionally, it will describe the procedures employed for data collection and analysis.

Chapter 3: Research Methodology

3.1 Introduction

This chapter presents the chosen research approach and methodology adopted for this study. Section 3.2 outlines an overview of the research design. The questionnaire design and development are provided in Section 3.3 and the translated questionnaire is in Section 3.4. The necessary pre-testing of the questionnaires is described in Section 3.5. The population and sampling design are detailed in Section 3.6. In Section 3.7, the data collection method is discussed and the time horizon is outlined in Section 3.8. The data preparation for the study is provided in Section 3.9. Ethical considerations and committee clearance are endorsed in Section 3.10. A discussion regarding the analytical methodology is provided in Section 3.11. A summary of this chapter is presented in Section 3.12.

3.2 Research Design

The research design guides the investigation and data collection necessary for evaluating the hypotheses (Zikmund et al., 2013). A research design is a logical plan addressing the conceptual scope of the investigation. It assists the investigator with decision-making procedures regarding data collection and analysis methodologies to focus on the study's central research problem (Corner, 2002; Verner & Abdullah, 2012). According to Creswell and Creswell (2017), the research design comprises three parts: the 'research paradigm' or 'philosophical worldviews', the strategies of inquiry and specific methods. These will now be covered in turn.

3.2.1 Research Paradigm

The three main social research paradigms (positivism, constructivism and pragmatism) are generally known as research methodologies (Bernard, 2013). First, the positivist paradigm employs logical reasoning or deductive logic to investigate, analyse and evaluate research objectives using a quantitative method, such as a survey (Bernard, 2013). Second, the constructivist paradigm employs qualitative research methods such as in-depth interviews, focus groups and participant observation. Constructivism adopts inductive logic to interpret individual meanings of participants' experiences and backgrounds (Creswell, 2014; Guba & Lincoln, 1994). The third paradigm is the pragmatist paradigm, which supports both qualitative and quantitative research methods. This paradigm, often referred to as mixed methods, allows investigators to employ various techniques to achieve their research objectives (Creswell & Creswell, 2017).

Bernard (2013) explained that the positivist paradigm relies on the quantitative method and deductive reasoning to analyse data to achieve the study's objectives. Thus, the study adopted a positivist research paradigm (Bernard, 2013), which depends on observable, objective scientific evidence gathered by the researcher to verify and test the research model and examine its hypotheses.

3.2.2 Quantitative Research Approach

De Vaus (2001) believed that a quantitative research design is most commonly adopted in the management disciplines and for social sciences research. Quantitative research is concerned with testing and confirming hypotheses using existing theories (Malterud, 2001). This study aimed to examine the effect of different constructs on consumers' green car PP. To examine the relationships in the posited conceptual model (see Figure 2.3), the quantitative approach was considered superior. The quantitative technique was selected since the proposed model (see Figure 2.4) focuses on testing relationships between constructs (Bernard, 2013; Zikmund et al., 2013). Quantitative research methods appropriately apply statistical techniques to test hypotheses, evaluate information and derive conclusions (Bryman & Cramer, 2012). In addition, the methodologies in question are defined by a set of guiding principles and presumptions that allow one to draw conclusions on the basis of their application (Creswell & Creswell, 2017). Quantitative research methods encompass a range of techniques such as experiments, surveys, content analysis and studies using existing data. These methods utilise predetermined techniques to collect data. The current study applied online questionnaire techniques to collect data (Creswell, 2014) in a Saudi context. The quantitative methodology included several steps: developing the online questionnaire with translations, conducting a pilot study, employing a sampling technique and analysing the data collected (Chien, 2019).

3.2.3 Research Process

The conceptual framework was formulated on the basis of a literature review, with a specific focus on the investigations of Barbarossa et al. (2015) and Confente et al. (2020). This study utilised a quantitative methodology to test the conceptual model and examine the study hypotheses. Below, the research process steps are discussed:

Step 1: A brief research background was conducted to identify the research gap and appropriate context. The main research objective and research questions were then developed (see Chapter 1).

Step 2: An overview of the relevant literature and focal constructs was presented and discussed. Following this, hypotheses were developed and the research model was introduced to address the research objective (see Chapter 2).

Step 3: A quantitative research methodology was selected using the positivist paradigm by employing a questionnaire to collect data. The online questionnaire was developed and pre-testing was conducted. Consumers in the KSA over the age of 18 years were sampled (see Chapter 3).

Step 4: Data were prepared and analysed using Smart-PLS software (Ringle et al., 2022). The analysis was essential to gauge the precision, consistency, accuracy and validity of the data. Additionally, it facilitated the evaluation of the study hypotheses and model (see Chapter 4).

Steps 5: The structural model outcomes were evaluated and interpreted. Subsequently, conclusions were formed about the research questions, highlighting the research contributions. The chapter also addressed identifying research limitations and proposed future research directions (see Chapter 5). Figure 3.1 presents a summary of the research processes used in this thesis.

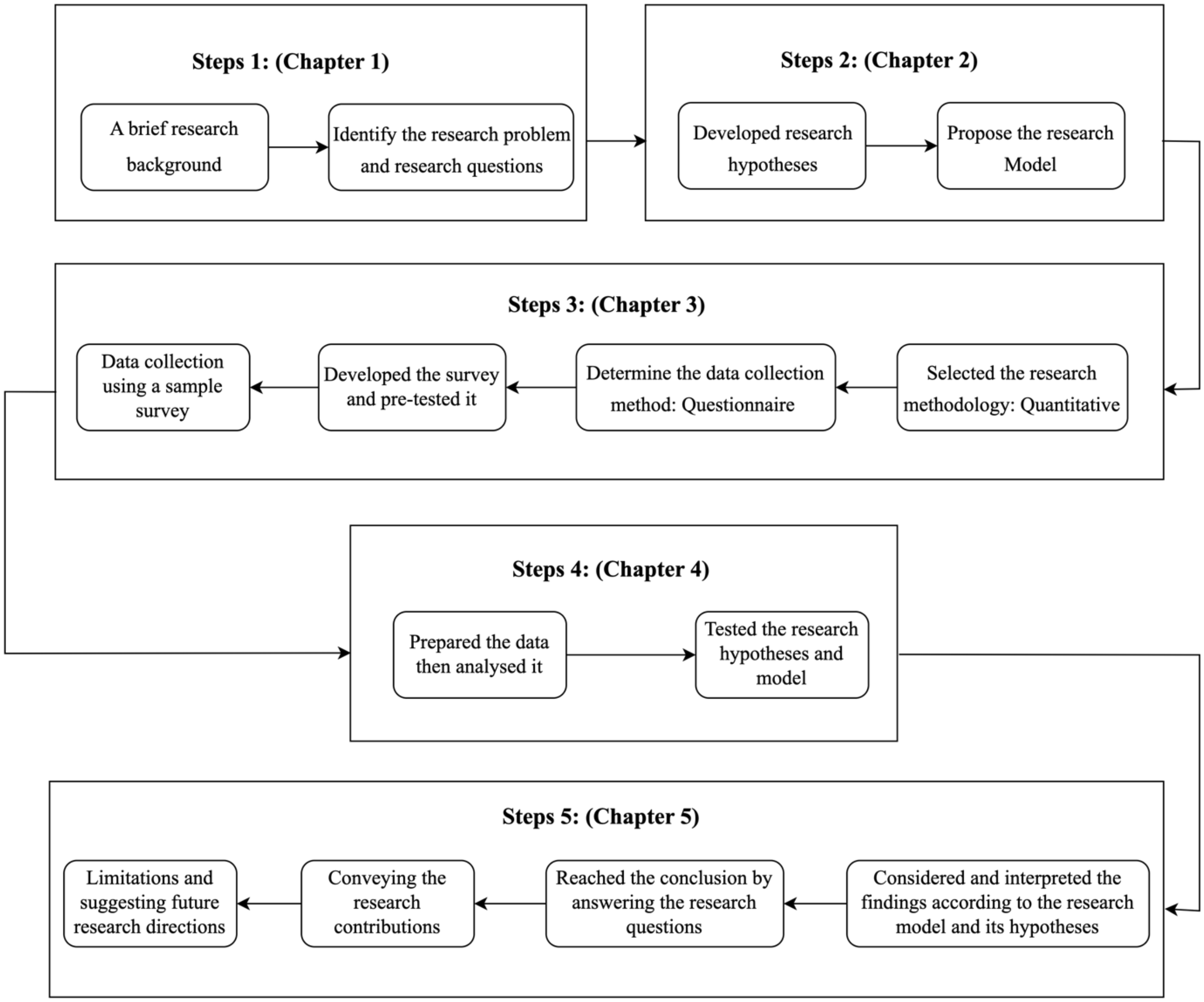

Figure 3.1: Research processes

Note: Adapted from Churchill (2001).

3.3 Questionnaire Design and Development

3.3.1 Measures

To gather information, the questionnaire was constructed according to the research questions and model hypotheses. This section describes the design of the questionnaire, including the questions to measure each construct.

3.3.1.1 Green Self-Identity

The measurement items of GSI were taken from Sparks and Shepherd (1992), in which the self-identity scale was originally developed. Previous studies have validated GSI in ethical consumption research (e.g., Barbarossa et al., 2015; K. Chan, 1999; Shaw & Shiu, 2003; Whitmarsh & O'Neill, 2010). The rationale for selecting this scale stemmed from the fact that the GSI and green consumerism measures were constructed using the theoretical frameworks of the theory of reasoned action (Fishbein & Ajzen, 1977) and the theory of planned behaviour (Ajzen, 1991), which are widely recognised as fundamental theories for investigating and elucidating human purchasing behaviour. These theories are considered the hallmark of the explanation of human purchase behaviour (Whitmarsh & O'Neill, 2010), which is why the measurement instrument developed by Sparks & Shepherd, (1992) was selected. The items are presented in Table 3.1.

Table 3.1: Questionnaire items for GSI construct

	Items	Scale	Previous applications
1	I think of myself as someone who is concerned about environmental issues.	7-point Likert scale	(Barbarossa et al., 2015; K. Chan, 1999; Shaw & Shiu, 2003; Sparks & Shepherd, 1992; Whitmarsh & O'Neill, 2010)
2	I think of myself as a "green" consumer.		
3	I would describe myself as an ecologically conscious consumer.		

3.3.1.2 Care for the Environmental Consequences of Using Electric Cars

The measurement items for care for the EC of using cars were adopted from Follows and Jobber (2000). The constructs considered in this study addressing environmental effects were chosen because they conveyed the consumer's concern for EC. It is believed that the items capture consumer responses regarding their environmentally friendly purchase decisions and behaviours (Ajzen & Cote, 2008; Barbarossa et al., 2015; Leonidou et al., 2010). Barbarossa et al. (2017) and Rotaris et al. (2021) also used these items to evaluate and predict consumer purchase intention and behaviours. The items are presented in Table 3.2.

Table 3.2: Questionnaire items for care for the EC construct

	Items	Scale	Previous applications
1	It is important to me how car usage may affect the environment.	7-point Likert scale	(Ajzen & Cote, 2008; Barbarossa et al., 2015; Follows & Jobber, 2000; Leonidou et al., 2010)
2	It is important to me whether cars cause the depletion of our natural sources such as petrol.		
3	It is important to me whether car usage causes air pollution.		

3.3.1.3 Green Moral Obligation

The measurement scale of GMO was adapted from Sparks and Shepherd (2002), who validated the construct. Many researchers used the items for the same construct also found to be significant in the context of green purchase decisions (Barbarossa et al., 2015; Barbarossa et al., 2017; Shaw & Shiu, 2003; Sparks & Shepherd, 1992). The GMO scale aligns with the research objectives since this study concentrates on consumers adopting eco-friendly electric cars. Another reason for considering these items is that they depict the thought process of the consumers towards society. Therefore, the inclusion of the GMO items was justified. The items are presented in Table 3.3.

Table 3. 3 Questionnaire items for GMO construct

	Items	Scale	Previous applications
1	I would feel guilty if I drove a car damaging the environment.	7-point Likert scale	(Barbarossa et al., 2015; Barbarossa et al., 2017; Shaw & Shiu, 2003; Sparks & Shepherd, 1992, 2002)
2	To buy a car that damages the environment would be morally wrong for me.		
3	Buying a car that affects the environment would go against my principles.		

3.3.1.4 Attitude Towards the Adoption of Electric Cars

The attitudes of consumers regarding the adoption of electric cars were tapped using the attitudes toward green purchase scale developed by Taylor and Todd (1995). Previous studies by Barbarossa et al. (2015) and Chan and Lau (2002) have applied the same scale. The rationale for selecting the instrument developed by Taylor and Todd (1995) is that participants on this topic have formed attitudes towards environmentally sustainable products, specifically in the context of green and eco-friendly cars. Moreover, the attitude of consumers towards green and eco-friendly car adoption is the first step when progressing towards actual purchase, which is why this instrument was included. The items are featured in Table 3.4.

Table 3.4 Questionnaire items for attitude toward the adoption of electric cars construct

	Items	Scale	Previous applications
1	I would feel satisfied with myself if I bought an eco-friendly electric car.	7-point Likert scale	(Barbarossa et al., 2015; R. Y. K. Chan, 2001; Chan & Lau, 2002; Taylor & Todd, 1995)
2	I take pride in owning an eco-friendly electric car.		
3	I like the idea to own an environmentally friendly electric car.		

3.3.1.5 Green Self-Congruity

The green SC construct was measured using items adopted from another study (Confente et al., 2020; Mazodier & Merunka, 2011). The SC of consumers with green products is a focal construct for this investigation. The concept of green SC was adopted from Confente et al. (2020), who validated the scale. Other reason for adaptation was that the same scale presented in Table 3.5 was utilised in Shin et al. (2018) and Sirgy et al. (2008).

Table 3.5 Questionnaire items for green self-congruity construct

	Items	Scale	Previous applications
1	I feel like I am part of the (green products) family.	7-point Likert scale	(Confente et al., 2020; Mazodier & Merunka, 2011; Shin et al., 2018; Sirgy et al., 2008)
2	People who buy (green products) are very similar to me.		
3	Buying (green products) reflects who I am.		

3.3.1.6 Perceived Value

The PV of electric cars was tapped using a scale derived from Y. S. Chen and Chang (2012) and Confente et al. (2020). The reliability and validity of these PV items have been demonstrated in prior studies on green products (J. Lin et al., 2017; Wei & Jung, 2017). The items presented in Table 3.6 were employed to measure the PV construct.

Table 3.6 Questionnaire items for perceived value construct

	Items	Scale	Previous applications
1	Electric cars' environmental functions provide very good value for you.	7-point Likert scale	(Y. S. Chen & Chang, 2012; Confente et al., 2020; J. Lin et al., 2017; Wei & Jung, 2017)
2	Electric cars show more concern for the environment than other cars.		
3	Electric cars are environmentally friendly.		
4	Electric cars have more environmental benefits than other cars.		

3.3.1.7 Perceived Risk

The measurement of PR in the current study was built on a scale adopted by Jansson (2011). These items align with the actual observation of PR as defined by Jansson (2011). Furthermore, similar measurement items have been employed in studies conducted by Anjam et al. (2020) and He et al. (2018). The current study adopted the measurement items listed in Table 3.7.

Table 3.7: Questionnaire items for perceived risk construct

	Items	Scale	Previous applications
1	Buying an environmentally friendly car means a financial risk for me.	7-point Likert scale	(Anjam et al., 2020; Jansson, 2011; He et al., 2018).
2	Environmentally friendly cars are risky since they often breakdown.		
3	Environmentally friendly cars mean a higher traffic risk for me.		
4	To own an environmentally friendly car means that others look down on me.		

3.3.1.8 Innovativeness

The innovativeness construct was measured using items adopted from Agarwal and Prasad (1998). The reason for adopting the scale was that the battery has been widely influential (Hwang, 2014; Khazaei & Tareq, 2021; Lewis et al., 2003; J. Lu et al., 2005; Xu & Gupta, 2009). The items are presented in Table 3.8.

Table 3.8: Questionnaire items for innovativeness construct

	Items	Scale	Previous applications
1	If I heard about new technology, I would look for ways to experience it.	7-point Likert scale	(Agarwal & Prasad, 1998; Hwang, 2014; Khazaei & Tareq, 2021; Lewis et al., 2003; J. Lu et al., 2005; Xu & Gupta, 2009)
2	Among my peers, I am usually the first to try out new technologies.		
3	In general, I do not hesitate to try out new technologies.		
4	I like to experience driving electric cars.		

3.3.1.9 Intention to Adopt Eco-friendly Electric Cars

The scale used to measure the intention to adopt an electric car was developed by Moons and De Pelsmacker (2012). This scale has been employed by several researchers in their studies, including Barbarossa et al. (2015), Barbarossa et al. (2017), He et al. (2018), Higueras-Castillo et al. (2019) and Moons et al. (2018). The scale was designed to assess individuals' intention to adopt eco-friendly cars, considering consumer purchase behaviour and the influence of intentions on reflecting consumers' state of mind. The scale was adopted to examine the purchase intentions of the study participants. Table 3.9 presents the items.

Table 3.9: Questionnaire items for intention to adopt electric cars construct

	Items	Scale	Previous applications
1	Next time I buy a car, I will consider buying an eco-friendly electric car.	7-point Likert scale	(Barbarossa et al., 2015; Barbarossa et al., 2017; He et al., 2018; Higueras-Castillo et al., 2019; Moons et al., 2018; Moons & De Pelsmacker, 2012)
2	I expect to drive an eco-friendly electric car in the near future.		
3	I have the intention to drive an eco-friendly electric car in the near future.		

3.3.1.10 Green Car Purchase Probability

All a priori constructs elaborated were hypothesised to affect directly or indirectly the actual green car PP of the consumers The endogenous construct in the model is green car purchase probability, measured using the Juster scale's standard form. Juster (1966) developed a three-item scale, which was used to assess the tendency to purchase cars. The Juster scale of PP was used to measure the prediction of purchases over a certain period, such as the next 6, 12 and 24 months (J. Singh et al., 2012). According to Day et al. (1991), several studies have confirmed the predictive ability of the Juster scale. The greater sensitivity of probability scales suggests that they may be useful, both as direct measures of likely behaviour and as a dependent construct in consumer behaviour research (Wright & MacRae, 2007). Previous research has highlighted the importance of green car PP research in academia and the practical field (Theil & Kosobud, 1968; Wright, 2002). The items are presented in Table 3.10.

Table 3.10: Questionnaire items for green car purchase probability construct

	Items	Scale	Previous applications
1	How probable is it that you or someone in the household will purchase an environmentally friendly electric car in the next year?	Juster scale probability ranging from 0 to 10	(Fritzsche & Oz, 2007; Juster, 1966; J. Singh et al., 2012; Theil & Kosobud, 1968; Wright, 2002)
2	How probable is it that you or someone in the household will purchase an environmentally friendly electric car in the next five years?		
3	How probable is it that you will or someone in the household purchase an environmentally friendly electric car in the next ten years?		

3.3.1.11 Demographics

According to Creswell and Creswell (2017), the control variables in social science research are crucial to comprehensive hypothesis analysis. This investigation includes several control constructs in the model to test their impacts on the intention to adopt EVs (Mohamed et al., 2016). The demographic variables help examine the effect on the relationships in the conceptual model developed in the research (Stern et al., 2016). The current study incorporates gender as a control variable in light of the changes in women driving rules in Saudi Arabia, where women began driving vehicles in 2018 (Nihal, 2021). The inclusion of these new buyers' choices in the study adds an interesting dimension to the research. Other demographic factors, such as age, income, education and marital status, may also affect how customers consider purchasing an electric car and their current situation in car use (V. Singh et al., 2020). These demographic variables are practical for this study of EVs (Khazaei & Tareq, 2021; J. H. Kim et al., 2019; X. Zhang et al., 2018). They assist the study in determining the target audience for EVs by supplying vital information such as age, gender, income, education level, location, car ownership, size of cars and their effect on the purchase behaviour of green cars (V. Singh et al., 2020). The current study employed the demographic variables shown in Table 3.11.

Table 3.11 Questionnaire demographic information

	Variable	**Options**
1	Gender	Female, male
2	Age	18–24/25–34/35–49/50–over
3	Education	High school or less/diploma/nachelor–graduate
4	Marriage status	Unmarried/married/married and have children
5	Monthly income (Saudi riyals)	6,000 or less /6,001–9,999/10,000–14,999/15,000–19,999/20,000 and over
6	Do you have a driver's licence?	Yes/no/I plan to have it during the next 10 years
7	Type of car usually driven?	Small car/medium-size car/large-size car/other/none
8	How many vehicles are currently owned?	1/2/3/4+/none

This section has presented the rationale behind the selection of measurement scales for this investigation. The questionnaires are featured in Appendix 1.

3.3.2 Scaling

Rating scales ask respondents to typically select from a list of verbal statements and/or numbers (Dawes, 2008). There are various types of rating scales, including Likert scales, semantic differential scales and visual analogue scales, each with its own characteristics and purposes. Fortunately, PLS-SEM allows for the use of several scales. According to Hair et al. (2021), PLS-SEM was utilised to quantify multi-scale variables in quantitative research. All indicators for a construct do not have to be of the same scale type, nor do various scale values have to be normalised (mathematically converted to a similar scale range) prior to employing SEM (Hair et al., 2019). Each indicator variable may be quantified using a distinct range of possible scale values (5 points, 7 points, 100 points, etc.; Hair et al., 2021).

A Likert scale is most appropriate in surveys designed to measure people's opinions and perceptions (A. Joshi et al., 2015). The seven-point Likert scale provides enough options, which increases the likelihood of meeting people's objective realities (Sekaran & Bougie, 2016). Because a seven-point scale allows more options for respondents to reply sensitively, it effectively appeals to the participants' faculty of reason (A. Joshi et al., 2015). All items in the study, except for the PP used in the original scale by Juster (1966), were assessed using seven-point Likert scales to gauge the strength of various responses, ranging from strongly disagree (1) to strongly agree (7) (Barbarossa et al., 2015; Confente et al., 2020; He et al., 2018). Consequently, subjects select from the range of possible outcomes.

The probability construct was measured using the standard form of the Juster scale (Juster, 1966). In the current research, the dependent construct is the green car PP, which was measured using the standard form of the Juster scale. Juster scale probabilities can provide an accurate estimate of purchases in a given period (J. Singh et al., 2012). Probability scales designed to analyse consumer purchase behaviour have demonstrated a successful history in both market research and academic settings (Befurt & Silk, 2019). The greater precision of probability scales suggests that they may be more beneficial, both as direct measures of likely behaviour and as dependent constructs in consumer behaviour research (Wright & MacRae, 2007).

This scale composed of a numerical scale ranging from 0 to 10, with each point of these 11 points being associated with a numerical and verbal probability statement: 10 certain, practically certain (99 in 100), 9 almost sure (9 in 10), 8 very probable (8 in 10), 7 probable (7 in 10), 6 good possibility (6 in 10), 5 fairly good possibility (5 in 10), 4 fair possibilities (4 in 10), 3 some possibility (3 in 10), 2 slight possibilities (2 in 10), 1 very slight possibility (1 in 10) and 0 no chance (1 in 100), almost no chance (Befurt & Silk, 2019; Juster, 1966). This section details the scaling used in the research and provides relevant information.

3.3.3 Questionnaire Layout

The questionnaires were created to facilitate adequate responses in a timely fashion (Lambert & Lambert, 2012). The questionnaire items were adopted on the basis of the literature review in Section 3.3.1. The online questionnaire for this study had three sections: an introduction, demographic information (including age, gender, income level, car ownership, family size and car size) and the main body of the questionnaire incorporating the construct scales. The opening statement in the questionnaire clearly explained the purpose and aim of collecting the data. Participants were assured of confidentiality regarding their demographic details and responses (Fowler & Cosenza, 2009). The questionnaires are featured in Appendix 1.

3.4 Questionnaire Translation

The questionnaire was developed in English because the original scales were in this language. This was then translated into Arabic since most respondents speak Arabic. The veracity of the translation was checked by employing licensed translators to ensure that both versions were matched or equivalent (Barbarossa et al., 2015; Yousef, 2001). Participants were given the option to complete the questionnaire in either English or Arabic. The type of translation implemented involved a conceptual translation (Brislin, 1970), which was accomplished using the back-translation technique (Barbarossa et al., 2015). The back-translation technique is most commonly used and its efficacy as a translation technique has been supported by Bernard (2013) and McKay and Wong (1996). The back-translation method can be employed by converting the text from English to Arabic and then reversing the language from Arabic back to its original form in English (Bernard, 2013). Brislin (1970) stated that back-translation should result in a conceptually identical version in both languages regarding grammar and wording. A certified translator translated the questionnaire via the National Accreditation Authority for Translators and Interpreters to ensure that incorrect grammar and unintended meanings were avoided when translating the questionnaire from English to Arabic (see Appendix 4). Both the English and Arabic versions of the questionnaire feature in Appendix 1. To ensure translation precision, an official translator translated the questionnaire back into English. Subsequently, the researcher worked with the official translator to identify and address non-identical phrases using the Delphi method (S. Y. Kim & Hong, 2000). Three academic English speakers from Australian universities compared and rated the original English version and back-translated questionnaire, confirming that the meaning of the original questions was sound.

3.5 Pre-Testing of the Questionnaire

Before implementing the questionnaire, it underwent pre-testing by several academics and English speakers from Australasian universities. The purpose was to ensure its content validity and precise transcription. Before administering the questionnaire to the participant, this is a necessary step because potential problems may be identified (De Vaus, 2013). Pre-testing helps to reduce measurement failures and determine whether respondents correctly interpreted questions (Delport, 2005). The benefits of pre-testing include confirmation that the wording is appropriate and assistance in identifying potential problems in the questionnaire and any barriers that respondents may face in understanding any of the items or their language. All 10 participants completed a one-on-one pre-test in which they examined the questionnaire and critiqued the clarity of items, the questionnaire structure and its design (Delport, 2005). The final corrected questionnaire was created considering the pre-test participants' feedback. The corrections involved a few minor wording changes, which enhanced the instrument's clarity. The participants were better able to understand the questionnaire after these changes.

3.6 Population and Sampling Design

3.6.1 Population

A population is a group of people or organisations of interest to the researcher (Zikmund et al., 2013). Sekaran and Bougie (2016) recommended defining the population in the initial stage of the research process. The target population must then be defined in terms of elements, geographical boundaries and time (Sekaran & Bougie, 2016). In this study, the target population was Saudi adults aged 18 years and over. According to the General Authority for Statistics (2020), the total population is 35,013,414, of which around 25,255,166 are 18 years old and over. A population of 18 years and over was used in this study on the basis of Icenogle et al. (2019). They stated that psychologically, people over 18 years are mature and of legal age to drive. They also exhibit ethical behaviour and can make more informed decisions than those younger than them (Regrut, 2021).

3.6.2 Sampling Design

A sample is a segment designed to represent the population as accurately as possible. According to Latham (2007), sampling is the capacity to select a population subset that accurately reflects the whole. Probability and non-probability sampling approaches are the two main sampling techniques. Probability sampling is unbiased and impartial (Suresh et al., 2011). It denotes that every subject has a known probability of being chosen from the population (Henry, 1990). Conversely, non-probability sampling employs judgement techniques to determine which elements to include in the sample. It entails locating individuals who are conveniently available and willing to participate in the study (Creswell, 2014). Moore et al. (2016) argued that probability sampling is only possible if every member of the population can be identified and has a known chance of being chosen as a sample.

On the basis of data type and research objective, both forms of sampling offer advantages and disadvantages. The dynamic nature of the population and absence of necessary information pose challenges in establishing a finite or complete sampling frame for this study. Considering the difficulty in acquiring consumers' contact details (email addresses, telephone numbers or home addresses) and the importance of respecting their privacy, a non-probability sampling design was selected for this research in Saudi Arabia. Owing to the absence of a sampling frame and inability to reach every individual within Saudi Arabia for the purposes of this study, a non-probability sampling method was utilised (Malhotra et al., 1996). This approach is suitable considering the country's vast geographical distribution and time and cost constraints, offering a quick and cost-effective means of gathering substantial data (Sekaran & Bougie, 2016). According to Bryman and Cramer (2012), non-probability sampling encompasses several techniques, including convenience sampling, purposive/judgemental sampling, snowball sampling and quota sampling.

Quota sampling is popular in applied forms of quantitative research, such as market research and has attracted even more attention in recent years (Ochoa & Porcar, 2018). Quota sampling assigns members of the sample population to different categories or, as was the case in this study, a combination of categories (Given, 2008). A quota sampling technique for age and gender was used to collect the data to ensure a proportional representation of these traits in the sample (Barbarossa et al., 2017). The current study deployed a quota system to categorise respondents into age and gender groups. The number of categories of gender by age quotas was eight (male 18–24, male 25–34, male 35–49, male 50 and above, female 18–24, female 25–34, female 35–49 and female 50 and above). When a sample was obtained above the minimum of 75 in each quota's category, it was retained for analysis. This choice of different categories in gender by age was made to represent the diversity in the Saudi adult population. Also, by including various age groups, the study aimed to avoid an over-representation of youth participants who are typically more active online (Price & Dalgleish, 2010) and on social media platforms (Alalwan, 2018). This approach allowed for a more comprehensive understanding of the attitudes and behaviours of different segments of the Saudi adult population, providing a more accurate reflection of the overall population.

According to Jager et al. (2017), instead of discouraging researchers from using convenience samples, experts have aimed to address the issues of bias and limited generalisability commonly associated with such sampling methods. Convenience sampling carries both advantages and disadvantages. On the positive side, convenience sampling is readily accessible, cost-effective and straightforward. However, this approach has several flaws, including data collection bias, the risk of sample errors, the problem of outliers and a lack of generalisability (Paluri & Mehra, 2016). The authors further argued that the problems inherent in convenience sampling, which contribute to bias and a restricted ability for generalisation, have sparked considerable scholarly interest in overcoming these deficiencies. As stated by Acharya et al. (2013), convenience sampling allows researchers to select participants on the basis of convenience and availability.

Snowball sampling is a non-probability sampling technique commonly employed in social science research (Goodman, 1961). It involves initially selecting a small number of individuals who meet specific criteria or have relevant knowledge and asking them to refer or 'snowball' additional participants who fit the study's criteria (Browne, 2005). This approach leverages participants' social networks and allows for the inclusion of individuals who may not be easily accessible through traditional sampling methods. Snowball sampling offers advantages such as cost-effectiveness, convenience and access to hidden or marginalised populations (Biernacki & Waldorf, 1981).

Previous research has indicated that employing the mixed-sampling method can effectively reduce non-response rates (Albihany, 2019; Kaplowitz et al., 2004). According to Schaefer and Dillman (1998), there is a positive correlation between the number of attempts made to recruit participants and the likelihood of receiving a response. The current study selected a non-probability sampling method with a mixed-sampling method (Albihany, 2019; Kaplowitz et al., 2004). Specifically, quota sampling and convenience sampling and the snowball sampling approach as a second stage were utilised to conduct an online questionnaire on very specific age and gender groups of people. The details of the mixed-sampling method employed in this study are further elucidated in Section 3.7 and illustrated in Figure 3.2.

3.6.3 Sample Size

Calculating the sample size is a critical step in any investigation. According to Sekaran and Bougie (2016), a large number of respondents can provide fewer errors in findings. They added that small sample sizes can introduce bias and weaken trust in research results. As a result, determining an adequate sample size given a complex structural model is key (Hair et al., 2019).

PLS-SEM provides some capabilities to explore complex relationships and model specifications (Sarstedt et al., 2016). Additionally, PLS-SEM works on the premise that adequate sample sizes can deliver requisite robustness (Ringle et al., 2018). The posited model in this research was investigated using PLS-SEM analysis. Hair (2017) recommended a regression-like provision referred to as the 'ten (10) times rule' for determining the minimum sample size in research using PLS-SEM analysis. The 'ten times rule' is a technique for calculating the minimal sample size for the PLS path model (i.e., 10 times the number of independent variables in the most complicated OLS regression in the structural or formative assessment model). The 10 times rule should only be regarded as a general guideline for determining the minimum sample size.

According to the study model shown in Figure 2.4, the construct with the most arrows is AEC. The study model demonstrates that AEC is affected by the constructs of GSI, PV, PR, EC, GMO and innovativeness. The current study model has six arrows leading to AEC. According to Hair et al. (2021) the minimum number of participants required for this research is 6 x 10 = 60. In the latest sample size determination approaches, Hair et al. (2021) added that in addition to the 'ten (10) times rule', it is recommended to calculate required sample size according to the statistical power analysis of J. Cohen (1992). For social sciences research, Hair et al. (2021) recommended that in determining sample size for PLS-SEM, the common 0.80 statistical power should be chosen. Hair et al. (2021) suggested a table using J. Cohen's (1992) statistical power theory, which can be explained in Table 3.12.

Table 3.12: Recommended sample sizes for PLS-SEM

Maximum number of arrows pointing at a construct	**Significance level**											
	1%				**5%**				**10%**			
	Minimum R2				**Minimum R2**				**Minimum R2**			
	0.10	0.25	0.50	0.75	0.10	0.25	0.50	0.75	0.10	0.25	0.50	0.75
2	158	75	47	38	110	52	33	26	88	41	26	21
3	176	84	53	42	124	59	38	30	100	48	30	25
4	191	91	58	46	137	65	42	33	111	53	34	27
5	205	98	62	50	147	70	45	36	120	58	37	30
6	217	103	66	53	**157**	75	48	39	128	62	40	32

7	228	109	69	56	166	80	51	41	136	66	42	35
8	238	114	73	59	174	84	54	44	143	69	45	37
9	247	119	76	62	181	88	57	46	150	73	47	39
10	256	123	79	64	189	91	59	48	156	76	49	41

Note: Source, J. Cohen (1992) and Hair et al. (2017).

The sample sizes suggested by Hair et al. (2021) in this research may be determined from Table 3.12. This research used the 5% levels of significance, which is often employed in social sciences. R^2 is set to a minimum of 0.10 in this research, with a maximum of six arrows pointing towards a construct. As a result, the suggested sample size for this research is 157. The number of samples collected in this study was 822 respondents, which exceeds the minimum requirement suggested in the above discussion.

3.7 Data Collection Method

The utilisation of online surveys dates back to the 1990s. However, the proliferation of mass social media in the past decade has resulted in the increased prevalence of online surveys (Branley et al., 2014). Wolfe et al. (2014) and Merolli et al. (2014) noted that the dissemination of online surveys through social media draws upon the principles of conventional survey techniques while also leveraging the capabilities of the internet for research purposes. Wolfe et al. (2014) found no significant statistical variances in the model fit between traditional paper-and-pencil data collection surveys and online surveys. However, the use of online data collection enabled access to a broader range of sample groups. This approach is valuable to this study for accessing diverse groups of car buyers and other consumers, given they belong to various demographic and geographic categories. By employing online data collection methods, the study can reach a broader representative sample of car buyers, enhancing the generalisability of the findings to different groups within the population.

The World Bank (n.d.) revealed that the current population of Saudi Arabia is 34.8 million individuals, of whom 97.8% are reported to be internet users. This implies that the number of active internet users in the country is no less than 34 million. Kemp (2021) highlighted that the number of active social media users in Saudi Arabia in 2021 was 27.8 million, representing 79.3% of the overall population. As per the Saudi Digitalization report, Twitter boasts a user base of 14.10 million in Saudi Arabia, positioning it as one of the most utilised social media platforms with a 71.9% share, trailing only behind WhatsApp and Instagram (Trend, 2022). Tashkandi (2021) mentioned that the number of active WhatsApp users in Saudi Arabia in 2021 was 26.3 million. WhatsApp is predominantly utilised as a messaging platform, whereas Twitter is frequently employed to disseminate an individual's musings to a broad spectrum of recipients (Twitter, n.d.). The social and political implications of Twitter were notably demonstrated during the Arab spring. Blank (2016) posited that individuals who utilise Twitter are more inclined to participate in online surveys than those who do not use the platform. Conversely, Saudi Arabia presently exhibits one of the most elevated rates of social media penetration globally, specifically for Twitter, YouTube and WhatsApp. Additionally, Saudi Arabia exhibits superior online intellectual efficacy compared with other Arab nations (Martin et al., 2016).

In this study, an online questionnaire was employed to achieve a nationally representative sample in real-time, thereby maximising efficiency in terms of time and cost. K. Alzahrani et al. (2017) distributed an online questionnaire in Saudi Arabia via Twitter. To enhance the ease of data collection, the study disseminated the survey invitation through social media platforms, which enabled them to reach a wider range of locations in Saudi Arabia. This approach augmented the diversity of the sample, as reported by Stern et al. (2016). The questionnaire was hosted on an online platform known as Qualtrics (K. Alzahrani et al., 2017), licensed to Victoria University.

The data collection process was conducted in two distinct stages, involving a dual approach. The procedure of the data collection and the mixed-sampling method is summarised in Figure 3.2.

The initial step in the process of collecting data involved the utilisation of convenience sampling to ensure that all necessary quotas were met. The process was initiated by establishing a Twitter account. Subsequently, the account was employed to disseminate the questionnaire link via Twitter by leveraging the most popular or trending hashtags in Saudi Arabia. Examples of tweets are listed in Appendix 2. The researcher conducted periodic assessments of the top hashtags in Saudi Arabia and utilised them for tweeting purposes at intervals of every one to two days. Over 100 popular 'trending' hashtags classified from Twitter, categorised by location, activity, news, sport, event, weather and other factors, were utilised in Saudi Arabia to effectively engage diverse participants of the defined population.

The second step of the data collection was snowball sampling Albihany (2019) to reach out to individuals who utilise diverse social media platforms and ensure the fulfilment of all necessary quotas. The study commenced by requesting all questionnaire respondents to disseminate the questionnaire link (see Appendix 2) to their acquaintances on WhatsApp, Twitter and contacts network list via SMS (from the end of the first month of the data collection). During this phase, the researchers employed a snowball sampling technique, which involved requesting participants to disseminate the questionnaire link to their Twitter followers and contact lists on WhatsApp and SMS. This approach was previously utilised by Alalwan (2018), Albihany (2019), Alqahtani (2020) and Walliman (2016).

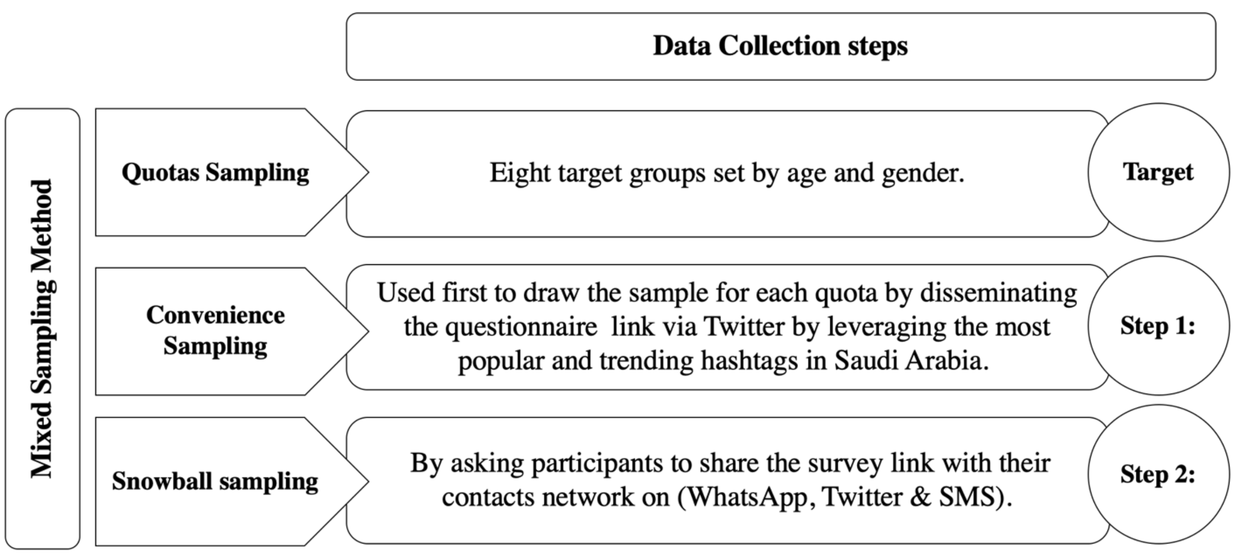

Figure 2. 3.2 The procedure of the data collection

Thus, the study employed a mixed-sampling approach. In the initial phase, the questionnaire was disseminated via Twitter, following which the respondents propagated it among their acquaintances through Twitter, SMS and WhatsApp communication channels. This approach facilitated the representation of diverse demographic segments within the sample population until all quotas pertaining to gender and age groups were fulfilled. Summary of the data collection procedure is outlined in Figure 3.2.

It took three months to finalise the web-based questionnaire. Participants were directed to an online questionnaire, where they were provided with introductory pages containing comprehensive details about the research, which were presented in a clear and straightforward manner. Prior to progressing through the questionnaire, informed consent was obtained from the participants (Jefford & Moore, 2008). The study utilised a strategy of distributing and redistributing the links to Qualtrics through various social media platforms to optimise participation rates.

3.8 Time Horizon

Data may be collected in two ways in research studies: cross-sectional and longitudinal. The data for this study were collected in a cross-sectional fashion (Zikmund et al., 2013). It is widely acknowledged to be the most popular type of survey owing to its low cost and ease of administration (Sekaran & Bougie, 2016). Data collection spanned a period of three months, commencing in the middle of February 2022 and concluding at the end of April 2022. Initially, participants exhibited a tendency to opt for responding to the digital questionnaire via Twitter. Participants were instructed to share the information with their contacts. Data were collected continuously through the use of chosen sampling techniques. However, the techniques for snow balling were initiated as early as the end of the first month. The weekends were found to be the most effective time to elicit responses owing to the absence of work-related responsibilities and a more relaxed mindset.

3.9 Data Preparation

After the online responses from participants were collected and the data for the analysis were prepared, there was a review of the data to identify and resolve any inconsistencies that may have been present in the dataset. According to Hair et al. (2021), the technique consists of conducting a comprehensive review of the data, during which the missing values are located and the identification of extreme values is carried out. This was done to prevent any potential distortion in the findings and conclusions. The online questionnaire received a total of 1,225 participants. However, 822 of submissions passed muster after being thoroughly examined. It was found that 403 of the responses were incomplete or lacked essential information, possibly owing to respondents leaving the questionnaire before completing it. To prevent duplicate results, the online poll only accepted responses from people who had their own unique IP addresses. SPSS was used to filter the data. Researchers may apply tests such as common method variance checks (Burns & Burns, 2008) to confirm that the sample was representative of the population and that there was no bias in the data collecting process. This would ensure that there was no bias in the data collection process. More details regarding the common method variance are discussed in Section 4.4.

3.10 Ethical Considerations

The VUHREC approval was obtained before beginning the research to ensure that the data collection process was ethically correct. According to the National Statement on Ethical Conduct in Human Research, researchers must gain ethical approval when primary data are involved (Holian & Brooks, 2004). Information categorised as preliminary data includes any details that can identify an individual and other sensitive content that participants perceive as confidential. The standards of ethics were observed during the data-gathering phase of this research thesis. First and foremost, respondents were informed of the research objective and their agreement was ascertained before responses were collected and analysed (Anderson & Schonfeld, 2014). They were assured that their responses would be kept private. Furthermore, data were collected in natural settings and respondents were able to respond in their own time. More importantly, the researcher made every effort to adhere and be flexible and adaptable to the practices of the people of Saudi Arabia. The researcher further guaranteed to participants that all the data collected via the online questionnaire would be confidential and not released to any third parties (Creswell, 2014). The Human Research Ethics Committee at Victoria University granted approval on 11 February 2022. The ethics application was approved by the committee with the ID number HRE21-186 (see Appendix 3). To ensure confidentiality, voluntary participation, data storage and security, the current study followed the standards specified by Victoria University’s Human Research Ethics Committee.

3.11 Analytical Methodology

3.11.1 Structural Equation Modelling SEM

SEM is one of the multivariate analysis techniques used to empirically examine the relationship between constructs, mainly used in the social and behavioural sciences (Hancock & Mueller, 2013). According to Byrne (2013), SEM can be deemed a statistical analysis technique that combines hypothesised causality and validation elements. In addition, Mehmetoglu and Venturini (2021) stated that causality analysis in SEM is an extension of regression analysis. A causal relationship occurs between several independent constructs with one dependent construct in regression analysis, but in SEM, a researcher hypothesises that the relationship between several independent and dependent constructs is casual and then tests the model to determine whether it is a fit for the data (Hair et al., 2019). Many latent variables in social sciences represent unobserved/constructs that cannot be measured directly (Chin, 1998). A latent variable is a variable that cannot be directly measured or observed but is inferred through a statistical model on the basis of its relationship with observable variables (Bollen, 2002). Constructs are often used in fields such as psychology, economics and social sciences to capture complex constructs such as intelligence, personality traits and attitudes (Gefen et al., 2000; Kline, 2023). For instance, in a study on job satisfaction, a researcher may want to measure the impact of job security, salary and job autonomy on overall job satisfaction. However, since job satisfaction is a complex construct that cannot be directly observed or measured, the researcher may use a latent variable model to estimate the underlying latent variable of job satisfaction on the basis of observable variables. A popular technique for modelling constructs is SEM, which allows researchers to specify and estimate relationships between constructs and observed constructs. In SEM, constructs are represented by circles, while rectangles represent observed variables.

Furthermore, Byrne (2013) highlighted some commonly unobserved constructs in social science include satisfaction, intention, loyalty and motivation. In the context of social science, the concept of ‘measurement’ is essential for quantifying abstract constructs (Chin et al., 2003; Esposito Vinzi et al., 2010; Hair et al., 2019). In research with primary data, measurement is generally in the form of question items posed to participants to measure their responses to the constructs studied (Byrne, 2013). SEM simultaneously confirms the 'measurement' used in the study and identifies the relationship between constructs (Hancock & Mueller, 2013). The data model fit in the 'measurement' model in the SEM is used to determine the validity and reliability of research instruments to explain a latent variable (Hair et al., 2019). An acceptable latent variable is measured through a valid and reliable measurement instrument. Accurate and reliable measurement instruments create models in empirical research that can be adopted in future studies (Hancock & Mueller, 2013). The constructs that have been validated are then analysed to determine the relationship between the constructs in the study.

3.11.2 Two Types of SEM (CB-SEM Vs PLS-SEM)

SEM is classified into two types: covariance-based SEM (CB-SEM) and PLS-SEM (Chin, 1998; Gefen et al., 2000; Werts et al., 1974). The primary use of CB-SEM is to validate hypotheses, which involves examining a series of structured associations between various constructs that can be empirically evaluated. This is achieved by model constructs using composite indicators rather than covariance-based approaches (Hu & Bentler, 1999). CB-SEM utilises composite indicators to model constructs, allowing for integration of these indicators to describe the phenomena under investigation. Using a covariance matrix, CB-SEM estimates measures of model goodness of fit such as GFI, AGFI, TLI, RMSEA and $\chi2$/cmin. The goodness-of-fit measure describes how well a theoretical model can describe observational data. CB-SEM is very robust against normality violation when sample sizes are sufficiently large (Hair et al., 2017).

Conversely, PLS-SEM has become an increasingly visible methodological approach in business research (Hair et al., 2014). PLS-SEM focuses on testing the extent to which independent constructs can predict dependent constructs in research (Ringle et al., 2018). Therefore, according to Henseler et al. (2015) and Hair et al. (2019), PLS-SEM is highly suitable for models with less-defined theory. PLS-SEM is ideal for development models, one of which is a model that combines several theoretical models to explain the relationship between constructs (Henseler & Fassott, 2009), such as in this study. Measures of goodness in the PLS-SEM model include R2, Q2 and f2, which show the significance of the role of independent constructs in predicting dependent constructs (Hair et al., 2021; Henseler et al., 2015). PLS-SEM is a flexible technique suitable for various types of data, both metric and non-metric. Therefore PLS-SEM can be used in studies with complex structural model (Hair et al., 2019; Ringle et al., 2018).

Moreover, PLS-SEM can analyse complex relationships such as mediation and moderation effects (Chin et al., 2003). The SEM technique is suggested to be preferable to regression techniques for testing mediation because SEM permits the modelling of both measurement and structural relationships and yields overall fit indices (Ringle et al., 2018) to assess the mediating effect. The mediation effect appears when the predictor variable can affect the response variable through the mediating variable. The influence of the predictor variable on the response variable through mediating constructs is called the indirect effect (Hair et al., 2019). Social studies often identify indirect effects, such as how service quality affects customer loyalty through satisfaction. Meanwhile, the moderating effect occurs when a moderating variable can affect the relationship between the response variable and the predictor (Dawson, 2013; Hair et al., 2019).

3.11.3 Rationale for Using PLS-SEM in This Study

The conceptual model was developed from a modified model of Barbarossa et al. (2015), which used CB-SEM or LISREL, and Confente et al. (2020), which used SPSS Process Macro, is a less-defined theoretical model, so the use of CB-SEM was not appropriate. This study explores the relationship between constructs and determines how independent constructs can explain dependent constructs well, which is suitable for analysis using PLS-SEM. The choice of the SEM tool is valid given the research data and model properties (Hair et al., 2014). PLS-SEM path modelling is considered the most developed and all-encompassing system among variance-based SEM methods (Sarstedt et al., 2016).

The decision to employ PLS-SEM as this study’s analysis method is justified for many reasons. The first reason is this research’s complex and exploratory nature; PLS-SEM provides the flexibility to explore complex relationships and model specifications (Sarstedt et al., 2016). In addition, the complex model of the study had many constructs and moderation analysis (Hair et al., 2019). Also, it is suitable for small sample sizes: PLS-SEM is highly applicable when addressing a limited sample size. Because this research involves a relatively small sample, PLS-SEM enables robust analysis and reliable results even with a restricted number of participants. This feature allows for accurate modelling and inference, enhancing the validity of this study's findings (Ringle et al., 2018). Considering the model complexity, the effective sample size obtained for this study is relatively small (Henseler & Sarstedt, 2012).

3.11.4 Concept of Measurement Model

In the context of PLS-SEM, a measurement model is a statistical model that describes the relationships between observed variables and constructs (Hair et al., 2011). The measurement model is a key component of SEM because it specifies how the observed variables are related to the latent constructs (Wilson, 2011). In other words, it outlines the relationships between the measured constructs and the underlying constructs they are intended to represent. The measurement model includes a set of indicators, which are the observed variables thought to measure the underlying construct (Ringle et al., 2018). The indicators can be either continuous or categorical variables and may be measured on different scales.

The measurement model can be assessed for its validity and reliability using a variety of statistical tests. Overall, the measurement model is an important aspect of SEM because it provides a framework for understanding how observed variables are related to unobserved constructs (Henseler & Fassott, 2009). By specifying the relationships between the indicators and the latent construct, researchers can test theories and hypotheses about the underlying constructs and gain insights into the nature of the relationships between constructs (Hair et al., 2019).

SEM has two main types of models: formative and reflective. In a formative model, the latent construct is defined by its indicators, which are presumed to cause the latent construct (Jarvis et al., 2003). This contrasts with a reflective model, in which the indicators are assumed to be caused by the latent construct. A formative model is appropriate when the indicators of the construct are not simply interchangeable measures of the same construct but rather represent distinct components that combine to create the construct (Jarvis et al., 2003). For example, if the construct is customer satisfaction, its formative indicators might include factors such as product quality and customer service (Chin, 1998).

A key feature of a formative model is that the observed variables are not considered interchangeable, meaning that the composition of the observed variables cannot be eliminated without affecting the conceptual meaning of the latent variable (Chin, 1998). This is different from a reflective model, in which the observed variables are assumed to be related to the latent variable in a fixed and consistent way (Diamantopoulos & Winklhofer, 2001). Hair et al. (2011) discussed using formative models in SEM, comparing formative and reflective models in the context of PLS-SEM. The authors argued that formative models are appropriate when the observed variables are used to construct the latent variable and they provide an example of using formative indicators to measure customer satisfaction. Overall, formative models are a useful tool in SEM when the observed variables are not simply indicators of a latent variable but instead are used to construct the latent variable. Researchers should carefully consider the theoretical underpinnings of their constructs and select the appropriate modelling approach, whether it be formative or reflective. All items used in this study's conceptual framework were assessed to be reflective in keeping with the initial mode for which they were specified and their nature (Jarvis et al., 2003; Podsakoff et al., 2003).

3.11.5 Steps of PLS-SEM Analysis

After the structural model was created, there were two main steps in the structural model evaluation process using PLS-SEM: 1) evaluation of the measurement model (outer model); and 2) evaluation of the structural model (inner model; Hair et al., 2021). This study was conducted using the Smart-PLS software 4 (Ringle et al., 2022). The outer model estimation was carried out to evaluate whether the questionnaire items measured the constructs studied adequately and reliably. The evaluation of the outer model contains two assessments: 1) convergent validity and 2) discriminant validity (Bong & Hong, 2010). Convergent validity assessment consists of outer loading inspections and internal consistency reliability assessment (Fornell & Larcker, 1981).

Outer loading refers to the correlation between a latent variable and its measured indicators (Hair et al., 2011). It represents the strength of the relationship between the latent variable and each of its observed indicators. The outer loading is an important parameter in PLS-SEM because it reflects how well each observed variable can capture the underlying construct that it is intended to measure. High outer loadings (above 0.7) indicate that an indicator is a good measure of the latent construct, while low outer loadings suggest that the indicator may not be a reliable or valid measure of the construct (Chin, 1998). Outer loadings are used to assess the validity of the measurement model in PLS-SEM. They can be evaluated using several criteria, such as a minimum threshold value or comparing the loadings across different indicators. Researchers can also examine the variance accounted for (AVE) by each indicator, which represents the proportion of the total variance in the observed variable that is explained by the latent construct (Rigdon, 2012).

Some statisticians believe the item has excellent convergent validity if the outer loading is more than 0.70 (Hair et al., 2021). Simultanously, an internal consistency reliability test was performed to test the instrument's trustworthiness. Internal consistency reliability is a measure of the degree to which items on a questionnaire are related to one another and measure the same underlying construct. It assesses how well the items that comprise a test are internally consistent with one another, meaning that they all measure the same concept. One common way to measure internal consistency reliability is through Cronbach's alpha coefficient, which is a statistic that measures the degree to which the items on a test are interrelated. Cronbach's alpha ranges from 0 to 1, with higher values indicating greater internal consistency reliability. A commonly accepted threshold for acceptable internal consistency reliability is an alpha coefficient of 0.70 or higher (Hair et al., 2010). PLS-SEM measures instrument reliability using composite reliability. Composite reliability is more accurate in evaluating internal consistency. If the value is more than 0.7, the research instrument is considered trustworthy (Field, 2013; Taber, 2018).

According to empirical criteria, discriminant validity demonstrates how distinct a construct is from other constructs (Hair et al., 2021). Discriminant validity emphasises that research tools should accurately measure distinct constructs without any overlap or confusion between them. In other words, discriminant validity ensures that each construct has a unique measurement. The square root of AVE is used to measure discriminant validity. If the square root of the AVE of a latent variable is greater than its correlation with the constructs of other latent variables, good discriminant validity is achieved (Hu & Bentler, 1999; Rigdon, 2012). Additionally, in line with the guidelines provided by Henseler et al. (2014), the heterotrait-monotrait (HTMT) ratio of correlations was employed to assess the discriminant validity.

3.11.6 Moderated and Mediation Model

PLS often applies the concepts of moderation and mediation in modelling relationships between constructs (Hair et al., 2014). The emergence of the idea of indirect influence owing to the mediating variable and the weakening or strengthening of the relationship between constructs because of the moderating variable is very commonly used in SEM (Hair et al., 2019). The indirect effect is obtained by multiplying the direct influence of the independent on the mediating variable with the direct effect of the mediating variable on the dependent (Chin et al., 2003; Hayes, 2017). Simultenaously, the moderating effect is obtained by testing the effect of the interaction between the independent and moderating variables on the dependent variable (Henseler & Fassott, 2009). By considering both mediator and moderator variables, researchers can gain a more comprehensive understanding of the underlying mechanisms and conditions that influence the relationships between variables in their research models (Baron & Kenny, 1986). This study adopted the model with one moderating variable with one or more mediating variables in the structural model (Chin, 1998).

3.11.7 Factor Analysis Process

Exploratory factor analysis (EFA) was used to establish the underlying traits or constructs on the basis of each scale set of items (Grace & O'Cass, 2004; O'Cass & Griffin, 2006). The main purpose of factor analysis is data reduction, reducing a large number of observed variables into a smaller set of underlying factors. Thus, factor analysis is framed on the ideas of linear relationships or linear combinations of items (P. Cohen et al., 2014; Pituch & Stevens, 2015). EFA is used when the researcher is trying to explore the underline factors from a set of items (Costello & Osborne, 2005). EFA is one of the most commonly used statistical techniques to explore the underlying traits of a set of items (Comrey & Lee, 2013). Generally, EFA is used when the purpose is to describe and summarise items by grouping interrelated items together (Costello & Osborne, 2005; Tabachnick & Fidell, 2013).

Considering the goal of the preliminary analysis, EFA was conducted to assess the constructs in the set of items in the current study (Grace & O'Cass, 2004).

The Kaiser–Meyer–Olkin (KMO) test is applied to confirm the factorability of the data. According to Tabachnick and Fidell (2013), a KMO value above 0.70 suggests good-for-factor analysis. Factor loading is an important consideration in inspecting the suitability of an item. Chin (1998) noted that most loadings should be at least 0.60 and, ideally, 0.70 or above. In this study, the researcher set the factor loadings to be 0.7 or more (Hair et al., 2010; Pallant, 2020).

3.11.8 Convergent Validity

Convergent validity is established when the construct is strongly correlated with the other similar construct (Ottenbacher & Barrett, 1990; C. W. Park et al., 2010; Siegling et al., 2015). The average variance explained (AVE) measure is used to assess convergent validity (Fornell & Larcker, 1981). Convergent validity is established when AVE is greater than 0.50 (Fornell & Larcker, 1981). The convergent validity could be measured by considering the size of factor loading, AVE and composite reliability (CR) among sets of items in the construct (Hair et al., 2019). Factor loading estimates with values of 0.5 or greater and extracted average variance of 0.5 or higher show adequate convergence among the items in the construct (Hair et al., 2010). CR should be 0.6 or higher to show adequate internal consistency (Bagozzi & Yi, 1988; Pervan et al., 2017). The CR is computed from the square sum of factor loading and the sum of error variance terms for a construct (Hair et al., 2013; Mertler & Vannatta Reinhart, 2016).

3.11.9 Outer Model Assessment

One of the features of PLS-SEM is that the researcher can assess the outer model and inner model separately (Rigdon et al., 2010). The superior model is one that has strong prediction power because the strength of the model is determined by its ability to strongly predict the endogenous constructs in the study (Hastie et al., 2009; Shmueli, 2010). Thus, a higher coefficient value indicates that the model has higher predicting power (Ringle et al., 2022). The coefficient of determination (R-squared) is an indicator of overall model prediction power (Hair et al., 2019). A higher coefficient value indicates that a particular variable has more power to predict than another one (Hair et al. 2010). The results of testing the unidimensional of each construct are presented using Smart-PLS 4 software v4.0.8.3 (Ringle et al., 2022). All constructs in this research model are first-order reflective (Jarvis et al., 2003).

3.11.10 Inner Model

The measurement model helps to assess the reliability and validity of the constructs, whereas the structural model helps to assess the relationship of constructs (Wilson, 2011). The structural equation model is the second main process of SEM analysis (Esposito Vinzi et al., 2010). Once the measurement model is validated, testing of the structural model can be conducted by specifying the relationships among the constructs (Chin, 1998). On the basis of the estimation, the path coefficients are estimated between the constructs to test research hypotheses (Chin, 1998). The inner model is evaluated by assessing the overall model fit values, followed by the size, direction and significance of the hypothesised parameter estimates (Hair et al., 2006). The final step involved validating the structural model of the study, which was conducted on the basis of the proposed relationships between the constructs (Chin, 1998).

3.12 Chapter Summary

In this chapter, the methodology used in this research was detailed, explained and described. It discussed the research's philosophical underpinnings and its embrace of the positivist paradigm. It described the quantitative methodology selected. After that, an explanation of the questionnaire design, the study population, the sampling strategy and the data collection procedures were provided. Additionally, ethical considerations essential for this thesis were addressed. This chapter presented the chosen data analysis procedures, which included the process surrounding data preparation and analysis. Chapter 4 will present the data analysis and findings.

Chapter 4: Data Analysis

4.1 Introduction

This chapter presents the data analysis and results. Descriptive and inferential statistics are used to analyse the data. This chapter has two main sections. The first section comprises a presentation of descriptive statistics, including the questionnaire measures, and factor analysis. In addition to preliminary data analysis for each construct, a correlation matrix is also calculated to assess the correlations among items for each scale. A reliability analysis is presented for items comprising each scale to ensure that items are consistent and reliable before testing the posited structural model.

The second section estimates the structural model using Smart-PLS software v4.0.8.3 (Ringle et al., 2022). Using this approach, nomological validity can be examined. This test of the actual hypothesises are undertaken. The last section of this chapter presents an additional analysis of the unobserved heterogeneity in the data.

The comprehensive chapter includes Section 4.2, which presents the respondent analysis, and Section 4.3, which reports the preliminary data analyses. Common method variance (see Section 4.4.), convergent validity (Section 4.5.) and discriminant validity (Section 4.6) are also outlined. Section 4.7 summarises the preliminary analysis. The PLS-SEM measurement model results are presented in Section 4.8. Section 4.9 presents the estimated PLS-SEM structural Model 1 and 2, Section 4.10 assesses the two SEM structural models and Section 4.11 estimates Model 3 incorporating some pertinent control variables. Section 4.12 presents an additional analysis testing for unobserved heterogeneity using FINITE MIXTURE (FIMIX). A summary of the findings is provided in Section 4.13.

4.2 Respondent Analysis

Data were collected via an online questionnaire hosted on the Qualtrics questionnaire platform. The target quota framed on gender and age group of participants was set at 75 per quota. In collection, all eight quotas were filled. When each quota was obtained above the 75 respondent threshold, they were retained for analysis with an emphasis on collecting more data for unfilled quotas. The online questionnaire received 1,225 responses. Upon inspection, 822 of the submissions passed muster. Overall, 403 of the responses were incomplete. There were an equal number of male (n = 411, 50%) and female participants (n = 411, 50%). Matching the demographic compositions with the General Authority for Statistics (2020), the census results showed that of Saudi Arabia's population who were over 18 years old, around 58% were males and 42% were females (General Authority for Statistics, 2020). This reflected quite the composition within the Saudi population, with a little over-representation of male respondents. There was an almost equal distribution of participants on the basis of age groups because quota sampling was employed. As far as participants' age is concerned, 23% of participants were aged between 18 and 24 years. Additionally, 31% of participants were aged between 25 and 34 years, 24% of participants were aged between 35 and 49 years and the remaining 23% of participants were aged above 49 years. In contrast, the census showed that 30% of people were aged 36–45 years. Further, 27% were aged 26–35 years, 19% were aged 46–55 years, 14% were aged 56 or above and around 23% were aged 50 years and above, according to the General Authority for Statistics (2020). This was supposed to represent a good mix of respondents from different age groups. The sample was considered adequate for further analysis. The demographic characteristics of the sample are presented in Table 4.1.

Table 4.1: Respondent profile and characteristics (n = 822)

Gender		
Male	411	50%
Female	411	50%
Age		
18–24	186	23%
25–34	251	31%
35–49	197	24%
50 and above	188	23%
Education		
High school or less	128	16%
Diploma	57	7%
Bachelor	468	57%

Postgraduate	169	21%
Marriage		
Unmarried/single	246	30%
Married	231	28%
Married and have children	345	42%
Monthly income (in Riyal)		
6,000 or less	179	22%
6,001–9,999	97	12%
10,000–14,999	141	17%
15000–19,999	92	11%
20,000 and over	129	16%
Prefer not to answer	184	22%
Do you have a driver's licence?		
Yes	506	61%
No	96	12%
No, but I plan to have a driver's licence within the next 10 years	220	27%
Type of car usually driven:		
Small car	137	17%
Medium-size car	255	31%
Large-size car	106	13%
None	8	1%
Does not have a licence	316	38%
How many vehicles are currently owned in your household:		
1	151	18%
2	145	18%
3	85	10%
4+	118	14%
None	7	1%
Does not have a licecse	316	38%

In regard to education, more than half of the participants had achieved a bachelor's education qualification (n = 468, 57%), 16% had high school diploma or lower, while 21% had a postgraduate qualification; 30% of participants (n = 246) were unmarried, 28% (n = 231) were married and the majority (42%) were married with children.

Participants were also asked about their monthly income in Saudi riyal currency. Around 22% (n = 179) participants had 6,000 or less monthly income, 17% (n = 141) earnt between 10,000 and 15,000 SAR monthly, while 16% (n = 129) of participants earnt 20,000 or more SAR monthly; 20% of participants (n = 184) preferred not to answer this question. More than 60% of participants had a driving licence, 12% did not have a driving licence and 27% (220) planned to have a driving licence in the coming years.

Information about participants' driving behaviours was also gathered; 17% of participants (n = 137) usually drove a small car, 31% of participants (n = 255) usually drove a medium-size car and 13% of participants (n = 106) usually drove a large-size car. Participants were also asked how many vehicles they currently owned for household use. According to Table 4.1, 18% of participants had one car, 18% had two cars, 10% had three cars and 14% of participants had four or more cars within their household.

4.3 Preliminary Data Analysis

Descriptive statistics are utilised for the preliminary analysis of data Using SPSS. The mean and standard deviation, skewness and kurtosis are calculated and presented. Initially, each variable was visually inspected for problems with normality assessed via skewness and kurtosis values. Data are considered normally distributed when the skewness and kurtosis values are within a range of –2 to +2 (Field, 2013; Mishra et al., 2019; Pituch & Stevens, 2015). Also, potential outliers were inspected. In the next phase, factor analysis was undertaken (Grace & O'Cass, 2004; O'Cass & Griffin, 2006). The appropriateness of the data for factor analysis depends on the inter-correlation of items. If items representing the same factors are weakly correlated, factor analysis may produce divergent results (Hair et al., 2019). There should be a strong correlation among the items. Tabachnick and Fidell (2013) suggested that the correlation matrix should be inspected and each item pair of correlation coefficients should be above 0.30. Furthermore, Hair et al. (2010) suggested Bartlett's test of sphericity and the KMO measure of sampling adequacy to test for inter-correlations among the variables to determine whether the items are suitable for factor analysis. A KMO value above 0.5 is considered acceptable to progress with factor analysis (Hair et al., 2010). Next, Bartlett's test assesses whether the correlation matrix is significantly different from an identity matrix, indicating the presence of relationships among the variables. The reliability for each scale is also presented. Reliability refers to the consistency of a measure (Chin, 1998). In the current study, the internal consistency method was used to determine the reliability of each construct. The most common method to assess internal consistency is Cronbach's coefficient alpha (Raykov, 2004). Cronbach's value ranges from 0 to 1. A value close to 1 indicates that the measure has excellent reliability (Taber, 2018). Generally for this present study, the Cronbach alpha value of 0.70 is considered acceptable. 0.80 is considered good and 0.90 is considered a very good reliability coefficient (Raykov, 2004; Werts et al., 1974). In Sections 4.3.1–4.3.10, summary results for each of the scales in the model are reported.

4.3.1 Preliminary Data Analysis of GSI Construct

The GSI scale contains four items (GSI1–GSI4) on a seven-point Likert scale. As Table 4.2 shows, the standard deviation of all four items was similar and within the acceptable range. The skews and kurtosis values ranged from –0.40 to –0.94 and –0.36 to 0.55, respectively. Both skewness and kurtosis values were around 0 and within the acceptable ±2 range (Tabachnick & Fidell, 2013), which indicates that these four items can be considered normally distributed (Mishra et al., 2019; Penny, 1996; Tabachnick & Fidell, 2013). Thus, the items for this scale can be used for factor analysis.

Table 4.2: Descriptive analysis of GSI items

Item code	Statement	Mean	Std. deviation	Skewness	Kurtosis
GSI1	Concerned about environmental issues.	5.31	1.43	–0.94	0.54
GSI2	Ecologically conscious consumer.	5.14	1.37	–0.74	0.18
GSI3	Myself as a "green" consumer.	4.52	1.47	–0.40	–0.36
GSI4	Feel like a green consumer.	5.16	1.43	–0.91	0.55

Bartlett's test was significant ($p < 0.001$) and the KMO measure of sampling adequacy was above the acceptable level (0.689). The correlation matrix for items is presented in Table 4.3, indicating that all pairs of correlations were moderate to strong and significant. The correlation coefficients ranged from 0.336 to 0.693. There was a strong correlation between GSI1 and GSI2, whereas item 4 (GSI4) had a relatively lower correlation with the other three items. Therefore, item 4, 'Buying an environmentally friendly electric car would make me feel like a green consumer', was deleted and EFA was analysed again with the remaining three items. The remaining three items' correlation ranged from 0.514 to 0.693. The EFA was conducted with four items and item 4 had a factor loading value lower than 0.5 (Hair et al., 2010) Thus, item 4 was removed and EFA was estimated again. The revised results indicated that the items suggest one component using the Kaiser rule (eigenvalue greater than 1; Kaiser, 1960), explaining 73.32% of the variance. The loading for items ranged from 0.661 to 0.889. The internal consistency measure using Cronbach's alpha was 0.82, which is above the recommended 0.80.

Table 4.3: Preliminary data analysis of GSI construct

Item wording	EFA loadings	Item code	Correlati correlations		
			GSI1	GSI2	GSI3
Concerned about environmental issues.	0.793	GSI1	1.00		
Ecologically conscious consumer.	0.829	GSI2	0.693**	1.00	
Myself as a 'green' consumer.	0.704	GSI3	0.514**	0.588**	1.00
Reliability	**0.82**	**KMO**	**0.689**		
Variance explained	**73.32%**	**Bartlett's**	**911.02 (3) = 0.000**		

** Significant at < 0.001

4.3.2 Preliminary Data Analysis of Care for the EC of Using Cars Construct

The scale to measure participants' level of care for the EC of using cars contained three items. As Table 4.4 shows, two items have a mean value above five, while the second statement has a mean value slightly below five. These mean values indicated that, in general, participants have a higher level of agreement on these statements. The standard deviation for these three items was almost equal, indicating similar participant responses. The skewness values ranged from –1.9 to –0.70, while the kurtosis values ranged from –0.14 to 0.64. These skewness and kurtosis values were also within ±2 ranges, which indicates that these statements were normally distributed. These items are sound and can progress for further analysis.

Table 4.4: Descriptive analysis of care for the EC

Item Code	Statement	Mean	Std. deviation	Skewness	Kurtosis
EC1	Usage of cars affects the environment.	5.13	1.48	–0.75	0.04
EC2	Cars cause the depletion of our natural sources.	4.98	1.58	–0.70	–0.14
EC3	Car usage causes air pollution.	5.39	1.53	–1.09	0.64

Bartlett's test was significant ($p < 0.001$) and the KMO measure of sampling adequacy was above the acceptable level (0.723). The inspection of the correlation matrix presented in Table 4.5 indicates that the three items (EC1–EC3) were significantly correlated and the correlation coefficients were approximately the same for the three correlational pairs. The EFA results indicated that three items reflect one factor with a total variance explained of 74.49%. The factor loadings for the three items ranged from 0.784 to 0.787. All three items had strong acceptable loading values. The internal consistency measure using Cronbach's alpha was also very good, with a reliability coefficient value of 0.83.

Table 4.5: Preliminary data analysis of EC of using cars construct

Item wording	EFA loadings	Item code	Correlations		
			EC1	**EC2**	**EC3**
Usage of cars affects the environment.	0.784	EC1	1.00		
Cars cause the depletion of our natural sources.	0.785	EC2	0.616**	1.00	
Car usage causes air pollution.	0.787	EC3	0.618**	.618**	1.00
Reliability	**0.83**	**KMO**	**0.723**		
Variance explained	**74.49%**	**Bartlett's**	**914.92 (3) = 0.000**		

** Significant at < 0.001

4.3.3 Preliminary Data Analysis of GMO Construct

The GMO construct was framed on three items (GMO1–GMO3). As Table 4.6 shows, the mean values ranged from 4.38 to 4.89. The standard deviation of all three items was almost the same. This subscale's item standard deviation was relatively higher than that of other scales. The skewness and kurtosis values of the three items were within the ±2 range, which concludes that data on these three items were normally distributed.

Table 4.6: Descriptive analysis of GMO items

Item code	Statement	Mean	Std. deviation	Skewness	Kurtosis
GMO1	Car damaging the environment.	4.89	1.78	–0.60	–0.58
GMO2	Damaging the environment is morally wrong for me.	4.43	1.89	–0.30	–1.05
GMO3	Affects the environment is against my principles.	4.38	1.86	–0.25	–1.04

Bartlett's test was significant ($p < 0.001$) and the KMO measure of sampling adequacy was above the acceptable level (0.723). The inspection of the correlation matrix presented in Table 4.7 reveals that all correlation coefficients were strong and significant with ranges between 0.748 and 0.859. The EFA results indicates that three items merged into one construct with a total variance explained of 86.47. The loading of the three items ranged from 0.784 to 0.787. All three items had strong loading values. The internal consistency measure using Cronbach's alpha was also satisfactory, with a reliability coefficient value of 0.92.

Table 4.7: Preliminary data analysis of GMO construct

Item wording	EFA loadings	Item code	Correlations		
			GMO1	**GMO2**	**GMO3**
Usage of cars affects the environment.	0.826	GMO1	1.00		
Cars cause the depletion of our natural sources.	0.947	GMO2	0.783**	1.00	
Car usage causes air pollution.	0.907	GMO3	0.748**	0.859**	1.00
Reliability	**0.92**	**KMO**	**0.742**		
Variance explained	**86.47%**	**Bartlett's**	**1922.61 (3) = 0.000**		

** Significant at < 0.001

4.3.4 Preliminary Data Analysis of Innovativeness Construct

The innovativeness scale contains four statements and the mean value of four statements ranged from 4.00 to 5.41 (see Table 4.8). The skews and kurtosis values of all four items were close to zero, which implies that data were close to being normally distributed. Thus, the data for this scale can be used for additional analysis.

Table 4.8: Descriptive analysis of innovativeness construct items

Item code	Statement	Mean	Std. deviation	Skewness	Kurtosis
INV1	I would look for ways to experience it.	4.98	1.34	–0.58	0.03
INV2	First to try out new technologies.	4.00	1.61	–0.04	–0.86
INV3	Do not hesitate to try out new technologies.	4.83	1.55	–0.61	–0.30
INV4	Like to experience driving electric cars.	5.41	1.40	–0.95	0.74

Bartlett's test was significant ($p < 0.001$) and the KMO measure of sampling adequacy was above the acceptable level (0.713). Inspection of the correlation matrix presented in Table 4.9 indicated that all items (INV1–INV4) were significantly related to other items. The correlation coefficient values ranged from 0.373 to 0.659. The factor analysis results revealed that these four items were converging with a total variance explained 73.96%. Three items had large loadings values ranging from 0.836 to 0.880. The loading for the fourth item (INV4) was below the 0.7 cut-off (0.573). Thus, it was removed and the correlation matrix for the remaining items and EFA was performed again. The Cronbach's alpha reliability coefficient was very good, with an alpha value above 0.82.

Table 4.9: Preliminary data analysis of innovativeness measure

Item wording	EFA loadings	Item code	Correlations		
			INV1	INV2	INV3
I would look for ways to experience it.	0.836	INV1	1.00		
First to try out new technologies.	0.880	INV2	0.602**	1.00	
Do not hesitate to try out new technologies.	0.864	INV3	0.567**	0.659**	1.00
Reliability	**0.82**	**KMO**	**0.713**		
Variance Explained	**73.96%**	**Bartlett's**	**902.931 (3) = 0.000**		

** Significant at < 0.001

4.3.5 Preliminary Data Analysis of PV Construct

Four items were included to measure participants' PV regarding the use of an electric car for the environment. As Table 4.10 shows, the mean values on four items ranged from 4.80 to 5.57. The standard deviation was almost the same for all four items, which were around 1.40. The skewness and kurtosis values for all four items were within ±2. Thus, data on these four items were also normally distributed and further analysis can be performed.

Table 4.10: Descriptive analysis of PV statements

Item code	Statement	Mean	Std. deviation	Skewness	Kurtosis
PV1	Provide very good value for you.	4.80	1.40	–0.49	0.02
PV2	Concern for the environment than other cars.	5.40	1.41	–1.03	0.80
PV3	Electric cars are environmentally friendly.	5.57	1.38	–1.13	0.98
PV4	More environmental benefits than other cars.	5.52	1.35	–1.04	0.89

Bartlett's test was significant ($p < 0.001$) and the KMO measure of sampling adequacy was above the acceptable level (0.803). An inspection of the correlation matrix (see Table 4.11) indicated variation in the correlation coefficients. For instance, item 1 (PV1) had a relatively lower correlation with other items ranging from 0.484 to 0.539, whereas the correlation coefficient among PV2, PV3 and PV4 ranged from 0.694 to 0.768. The EFA results revealed that these four items had merged into one factor with total variance explained at 71.28%. The loadings of all items were above 0.70. All items had acceptably high loading values. The Cronbach's alpha reliability coefficient was also excellent with a value of 0.86, which indicated that the scale was very good and reliable to measure the proposed construct.

Table 4.11: Preliminary data analysis of PV construct

Item wording	EFA loadings	Item Code	Correlations			
			PV1	PV2	PV3	PV4
Concerned about environmental issues.	0.719	PV1	1.00			
Ecologically conscious consumer.	0.876	PV2	0.539**	1.00		
Myself as a "green" consumer.	0.887	PV3	0.486**	0.700**	1.00	
Feel like a green consumer.	0.884	PV4	0.484**	0.694**	0.768**	1.00
Reliability	**0.86**	**KMO**	**0.803**			
Variance explained	**71.28%**	**Bartlett's**	**1699 (3) = 0.000**			

** Significant at < 0.001

4.3.6 Preliminary Data Analysis of PR Construct

Five items assessed participants' PR related to adopting electric cars. As Table 4.12 shows, the mean value on all five items was lower than five, which indicates that most participants did have not very high levels of agreement on these statements. Interestingly, statement 4. 'to own an electric car means that others look down on me', had a low mean score of 2.54, which indicates that most participants disagreed with this statement. The skewness and kurtosis values ranged from –0.42 to 0.90 and –0.61 to 0.08, respectively. Since these skews and kurtosis values were also within the ±2 range, it can be concluded that these five items were normally distributed and further statistical analysis can be performed.

Table 4.12: Descriptive analysis of PR items

Item code	Statement	Mean	Std. deviation	Skewness	Kurtosis

PR1	To buy an electric car means a financial risk for me.	4.78	1.65	–0.42	–0.61
PR2	Electric cars are risky since they often breakdown.	4.34	1.46	–0.12	–0.23
PR3	Electric cars have a lower resale value than other cars.	4.61	1.34	0.03	0.08
PR4	Owning an electric car means that others look down on me.	2.54	1.54	0.90	–0.02
PR5	Worried that the battery will go flat before I reach my destination.	4.89	1.66	–0.56	–0.46

Bartlett's test was significant ($p < 0.001$) and the KMO measure of sampling adequacy was above the acceptable level (0.757). The inspection of the correlation matrix presented in Table 4.13 indicates variation in the correlation coefficients. There were some weak correlations between items. For instance, there was a 0.10 correlation between item PR1 and item PR4 and a 0.16 correlation between items PR4 and PR5. Overall, the correlation coefficients were in the range of 0.10 to 0.477. Items PR1, PR2 and PR3 had a relatively stronger correlation than did item PR4. According to the EFA results, these five items reflect one factor with a total variance explained at 47.24%. The loading of the fourth item (PR4) was less than the threshold limit (0.390) of 0.7. Thus, item 4, 'to own an electric car means that others look down on me', was removed owing to the weak loading. The EFA for remaining items was performed again after removing item 4.

The revised results with four items (after removing PR4) revealed that all items were now loaded appropriately with a total variance explained of 56.71%. All loadings were above 0.70 with ranges from 0.708 to 0.821. The Cronbach's alpha reliability coefficient was also improved after removing item 4 and calculated as 0.74, which is above than acceptable range of 0.70.

Table 4.13: Preliminary data analysis of PR construct

Item wording	EFA loadings	Item code	Correlations			
			PR1	PR2	PR3	PR5
To buy an electric car means a financial risk for me.	0.744	PR1	1.00			
Electric cars are risky since they often breakdown.	0.821	PR2	0.477**	1.00		
Electric cars have a lower resale value than other cars.	0.708	PR3	0.370**	0.462**	1.00	
worried that the battery will go flat before I reach my destination.	0.735	PR5	0.395**	0.491**	0.332**	1.00
Reliability	**0.74**	**KMO**	**0.757**			
Variance explained	**56.71%**	**Bartlett's**	**708.97 (6) = 0.000**			

** Significant at < 0.001

4.3.7 Preliminary Data Analysis of Green SC Construct

Three items on a seven-point Likert scale measured participants' SC. As Table 4.14 shows, the mean value ranged from 4.32 to 4.51. The skewness and kurtosis values ranged from –0.26 to –0.44 and –0.61 to –0.67, respectively. This intimates that data on these three items were also normally distributed and further analysis can be performed on this data.

Table 4.14: Descriptive analysis of SC items

Item code	Statement	Mean	Std. deviation	Skewness	Kurtosis
SC1	Feel like I am part of the green products family.	4.51	1.61	–0.40	–0.65
SC2	People who buy green products are very similar to me.	4.32	1.59	–0.26	–0.61
SC3	Buying green products reflects who I am.	4.47	1.70	–0.44	–0.67

Bartlett's test was significant ($p < 0.001$) and the KMO measure of sampling adequacy was above the acceptable level (0.742). The inspection of the correlation matrix presented in Table 4.15 reveals that all items had a very strong and significant correlation. The correlation coefficients ranged from 0.713 to 0.804. The factor analysis results indicates that these three items have grouped into one with a total variance explained 84.08%. The loadings of the three items were above 0.80, ranging from 0.837 to 0.899. These are very strong loading values. The Cronbach's alpha value for this construct was 0.90, indicating excellent reliability.

Table 4.15: Preliminary data analysis of SC measure

Item wording	EFA loadings	Item code	Correlations		
			SC1	**SC2**	**SC3**
Feel like I am part of the green products family.	0.885	SC1	1.00		
People who buy green products are very similar to me.	0.899	SC2	0.804**	1.00	
Buying green products reflects who I am.	0.837	SC3	0.713**	0.766**	1.00
Reliability	**0.900**	**KMO**	**0.742**		
Variance explained	**84.08%**	**Bartlett's**	**1629.71 (3) = 0.000**		

** Significant at < 0.001

4.3.8 Preliminary Data Analysis of Attitude Towards the Adoption of Eco-friendly Electric Cars Construct

Three items were used to measure participants' attitudes toward the adoption of eco-friendly electric cars. As Table 4.16 shows, the mean values of all three items were above five, which indicates that on average, participants had a higher level of agreement on these statements related to the adaptation of eco-friendly electric cars. The skewness values ranged from –0.80 to –1.08 and kurtosis values ranged from 0 to 0.89. Both skews and kurtosis values were within the ±2 range, which concludes that data on these three statements were normally distributed.

Table 4.16: Descriptive analysis of attitude towards the adoption of eco-friendly electric cars items

Item code	Statement	Mean	Std. deviation	Skewness	Kurtosis
AEC1	Satisfied when buying an environmentally friendly electric car.	5.23	1.52	–0.85	0.27
AEC2	Take pride when I owned an environmentally friendly electric car.	5.16	1.60	–0.80	0.01
AEC3	Like the idea of owning an environmentally friendly electric car.	5.48	1.44	–1.08	0.89

Bartlett's test was significant ($p < 0.001$) and the KMO measure of sampling adequacy was above the acceptable level (0.752). The correlation matrix presented in Table 4.17 reveals that the correlation coefficients ranged from 0.740 to 0.796, which indicated that the three items (AEC1–AEC3) were strongly correlated with each other. The analysis showed that these three items converged with a total variance explained of 84.19%. The loadings for the three items were above 0.800, ranging from 0.837 to 0.899. The Cronbach's alpha reliability coefficient was also excellent, with a value of 0.92, which indicated that this study achieved reliability for this scale.

Table 4.17: Preliminary data analysis of attitude towards the adoption of eco-friendly electric cars construct

Item wording	EFA loadings	Item code	Correlations		
			AEC1	**AEC2**	**AEC3**
Satisfied when buying an environmentally friendly electric car.	0.885	AEC1	1.00		
Take pride when I owned an environmentally friendly electric car.	0.899	AEC2	0.796**	1.00	
Like the idea of owning an environmentally friendly electric car.	0.837	AEC3	0.740**	0.752**	1.00
Reliability	**0.92**	**KMO**	**0.752**		
Variance explained	**84.19%**	**Bartlett's 1615.45 (3) = 0.000**			

** Significant at < 0.001

4.3.9 Preliminary Data Analysis of Purchase Intention Construct

The purchase intention construct contained three statements on a seven-point Likert scale. The mean score indicates that the participants had a relatively positive attitude towards this construct. As Table 4.18 shows, the mean value for the three items ranged from 4.51 to 4.72. There was almost a matched variation in the responses for these items. The skewness values ranged from –0.44 to –0.52, while the kurtosis values ranged from –0.43 to 0.49. These skewness and kurtosis values were close to zero, which indicates that the data do not deviate from a normal distribution (Mishra et al., 2019). Hence, it can be concluded that these three items were also normally distributed and fit for further analysis.

Table 4.18: Descriptive analysis of purchase intention items

Item code	Statement	Mean	Std. deviation	Skewness	Kurtosis
IA1	Consider buying an environmentally friendly electric car.	4.51	1.64	–0.44	–0.44
IA2	Intention to drive an environmentally friendly electric car.	4.72	1.63	–0.54	–0.43
IA3	Expect to drive an environmentally friendly electric car.	4.63	1.63	–0.52	–0.49

Bartlett's test was significant ($p < 0.001$) and the KMO measure of sampling adequacy was above the acceptable level (0.737). An initial inspection of the correlation matrix of three items presented in Table 4.19 reveals that all items (IA1–IA3) were strongly correlated with each other. The correlation coefficients ranged from 0.682 to 0.776. This indicates that these three items were strongly correlated with each other. Table 4.198 shows the correlation matrix and EFA results. These three items represent a single component structure with factor loadings ranging from 0.80 to 0.91, explaining almost 82% of the variance. The internal consistency reliability measure computed using Cronbach's alpha was 0.89, which indicates that the set of three items was a very good and reliable scale to measure purchase intention.

Table 4.19: Preliminary data analysis of purchase intention construct

Item wording	EFA loadings	Item code	Correlations		
			IA1	IA2	IA3
Consider buying an environmentally friendly electric car.	0.80	IA1	1.00		
Intention to drive an environmentally friendly electric car.	0.91	IA2	0.730**	1.00	
Expect to drive an environmentally friendly electric car.	0.85	IA3	0.682**	0.776**	1.00
Reliability	**0.89**	**KMO**	**0.737**		
Variance explained	**81.98%**	**Bartlett's**	**1439.05 (3) = 0.000**		

** Significant at < 0.001

4.3.10 Preliminary Data Analysis of PP Construct

The green car's PP construct was measured by three items using the Juster scale on an 11-point scale (from 0 to 10). As Table 4.20 shows, the mean value of item (PP2) was higher than item (PP1) and the mean value of item (PP3) was higher, which indicates that participants had a higher PP to purchase an environmentally friendly electric car in the next six to ten years compared with the next year or the next two to five years. The standard deviation shows the variation in the responses. Participants' responses to the probability to purchase an environmentally friendly electronic car in the next year exhibited greater variation than the other two statements. The skew and kurtosis ranged from –0.10 to 0.49 and –1.24 to –0.56, respectively. These skews and kurtosis values were under the ±2 range, which indicates that these items were normally distributed (Penny, 1996). Thus, the items for this scale can be used for further analysis.

Table 4.20: Descriptive analysis of PP items

Item code	Statement	Mean	Std. deviation	Skewness	Kurtosis
PP1	Probability to purchase an environmentally friendly electric car in the next year?	4.66	3.45	0.49	–1.17
PP2	Probability to purchase an environmentally friendly electric car in the next two to five years?	6.05	3.18	–0.10	–1.24
PP3	Probability to purchase an environmentally friendly electric car in the next six to ten years?	7.70	2.85	–0.70	–0.56

Bartlett's test was significant ($p < 0.001$) and the KMO measure of sampling adequacy was above the acceptable level (0.670). A higher score indicated a higher level of agreement on the statement. An initial inspection of the correlation matrix of three items (PP1–PP3) revealed that all items were strongly positively correlated with each other. The correlation coefficients were in the 0.612 to 0.833 range and all correlation coefficients were significant ($p < 0.001$). This indicates that these three items were strongly correlated with each other. Table 4.21 presents the correlation matrix and loading results. The results indicate that these three items merged into a single construct with loadings ranging from 0.74 to 0.99, explaining approximately 82% of the variance. The internal consistency reliability measure computed using Cronbach's alpha was 0.87, which indicated that the set of three items was a very good and reliable scale to measure the proposed construct.

Table 4.21: Preliminary data analysis of PP construct

Item wording	EFA loadings	Item code	Correlations		
			PP1	PP2	PP3
Probability to purchase an environmentally friendly electric car in the next year?	0.74	PP1	1.00		
Probability to purchase an environmentally friendly electric car in the next two to five years?	0.99	PP2	0.744**	1.00	
Probability to purchase an environmentally friendly electric car in the next six to ten years?	0.83	PP3	0.612**	0.833**	1.00
Reliability	**0.87**	**KMO**	**0.67**		
Variance explained	**82.11%**	**Bartlett's**	**1631.37 (3) = 0.000**		

** Significant at < 0.001

This section has examined and presented the preliminary analysis results via descriptive statistics correlation analysis, EFA and reliability analysis. This stepped process served an essential function by ensuring that construct measures were reliable before further analysis.

4.4 Common Method Variance

Common method variance is referred to as variance characterised by the measurement method rather than by the constructs the measures represent (Podsakoff et al., 2003). In this study, data were collected through a single method (i.e., a questionnaire) using two scale types. Most constructs used seven-point Likert scales and the PP construct was an 11-point Juster scale. Harman's single-factor test (Campbell & Fiske, 1959) was performed to check whether common method variance existed. This test involves subjecting all items from the questionnaire to a single-factor analysis to determine the number of factors that accounted for the variance in the variables (Kock, 2021; Podsakoff et al., 2003). The findings of Harman's single-factor test revealed that the one-factor model explained 34.62% of the total variance, which suggests that common method variance was not a serious problem (Kock, 2015). The complete Harman's single-factor solution is presented in Appendix 5.

4.5 Convergent Validity

The next step involved assessing convergent validity. Before nomological validity could be evaluated it was necessary to assess convergent and discriminant validity (Sureshchandar et al., 2002b, 2002a). Convergent validity refers to the similarity in the degree of variance between the items which are the indicators of a specific construct (Hair et al., 2019).

Following the recommendations methodologists mentioned in Section 3.11.8 and using the results of preliminary data analysis, the calculation of AVE, CR and Cronbach's alpha reliability coefficient of each construct are provided in Table 4.22.

The values of AVE and CR provides sufficient evidence to establish convergent validity (Hair et al., 2010). Following the recommendations of Fornell and Larcker (1981), the majority of AVE values were above 50%, with the average AVE value of all constructs being 66.04%. The CR measure was also adequate to support the convergent validity, with a value ranging from 0.75 to 0.92 (Chin, 1998; Raykov, 2004). The Cronbach's alpha reliability coefficient for all constructs exceeded the acceptable range of 0.70. The Cronbach's alpha reliability ranged from 0.74 to 0.92. This means that issues related to convergent validity were not present in this study. Evidence of convergent validity is provided in Table 4.22.

Table 4.22: AVE, CR and Cronbach's alpha reliability of constructs

Construct	AVE	CR	Cronbach's alpha
PPP	73.89%	0.89	0.87
IA	73.02%	0.89	0.89
GSI	60.39%	0.82	0.82
EC	61.68%	0.83	0.83
GMO	80.06%	0.92	0.92
AEC	76.40%	0.91	0.92
SC	76.40%	0.91	0.90
PV	62.83%	0.87	0.86
PR	42.96%	0.75	0.74
INV	52.82%	0.81	0.81

4.6 Discriminant Validity

Discriminant validity refers to the issue of how truly distinct a construct is from other constructs (Hair et al., 2019). Discriminant validity can be assessed by comparing the square root of the AVE for two constructs and their correlations (Bong & Hong, 2010). Evidence of discriminant validity is when the correlation between constructs pairs is smaller than the square root of the AVE on the diagonal (see Table 4.24; Fornell & Larcker, 1981; Henseler et al., 2014). Furthermore, discriminant validity refers to the degree to which a measure is not similar or discriminates from other measures that theoretically should be dissimilar (Bong & Hong, 2010). Typically, when two different constructs have weak correlations, discriminant validity is established (Grobler & Joubert, 2018; C. W. Park et al., 2010).

A composite score was created for each construct. Following this approach, all items with loading values above 0.60 relating to the constructs were computed into composite measures (Bong & Hong, 2010; Pituch & Stevens, 2015). The mean and standard deviation of each composite measure are presented in Table 4.23. The mean value of measures ranged from 4.43 to 6.14. The standard deviation shows the variation in the dataset; it refers to the average distance from the mean value (Field, 2013; Tabachnick & Fidell, 2013). The standard deviation of measures ranged from 1.15 to 2.86, whereas the skews and kurtosis values were within the ±2 range.

Table 4.23: Descriptive statistics for all constructs

Measures	Mean	Std. deviation	Skewness	Kurtosis
PP	6.14	2.86	–0.04	–1.06
IA	4.62	1.48	–0.46	–0.27
GSI	4.99	1.22	–0.63	0.10
EC	5.17	1.32	–0.78	0.30
GMO	4.57	1.72	–0.36	–0.81
ACE	5.29	1.40	–0.80	0.18
SC	4.43	1.49	–0.33	–0.59
PV	5.32	1.16	–0.90	0.90
PR	4.66	1.15	–0.29	0.07
INV	4.81	1.18	–0.36	–0.06

Table 4.24: Correlation matrix of all measures

	Correlations matrix									
	PP	**AI**	**GSI**	**ES**	**GMO**	**AEE**	**SC**	**PV**	**PR**	**IN**
PP	**0.858**									
AI	0.648**	**0.854**								
GSI	0.287**	0.427**	**0.773**							
EC	0.263**	0.436**	0.629**	**0.789**						
GMO	0.342**	0.409**	0.551**	0.549**	**0.892**					
AEC	0.397**	0.572**	0.507**	0.604**	0.574**	**0.874**				
SC	0.351**	0.457**	0.696**	0.573**	0.635**	0.621**	**0.872**			
PV	0.328**	0.461**	0.410**	0.508**	0.431**	0.638**	0.528**	**0.775**		
PR	–0.239**	–0.228**	–0.096**	–0.054**	–0.101**	–0.180**	–0.150**	–0.126**	**0.647**	
INV	0.312**	0.392**	0.287**	0.238**	0.176**	0.332**	0.290**	0.306**	–0.061	**0.780**

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

Note: The square roots of the AVE values are listed diagonally and the correlations are in rows and columns.

The between construct correlation matrix is featured in Table 4.24. The inspection of the correlation matrix indicates a weak and negative correlation between two different constructs, which provides evidence of discriminant validity (Campbell & Fiske, 1959).

Furthermore, according to the guidelines of Henseler et al. (2014), the HTMT ratio of correlations was performed to determine discriminant validity. The HTMT ratio of correlations was estimated in the Smart-PLS 4 software. According to Hair et al. (2019), an HTMT value of less than 0.85 indicates good discriminant validity. Other researchers suggest a threshold of 0.90 as a critical point for determining discriminant validity (Henseler et al., 2014; Teo et al., 2008). Table 4.25 shows the HTMT of correlation ratios. All values ranged from 0.08 to 0.807, with the average across all correlation values being 0.431. Since all values were below the conservative critical HTMT threshold of 0.85, it can be confidently concluded that discriminant validity has been established.

Table 4.25: HTMT of correlations

	AEC	**EC**	**GMO**	**GSI**	**IA**	**INV**	**PR**	**PV**	**PP**	**SC**
AEC										
EC	0.698									
GMO	0.627	0.631								
GSI	0.588	0.769	0.633							
IA	0.638	0.509	0.452	0.500						
INV	0.398	0.299	0.207	0.357	0.468					
PR	0.220	0.080	0.119	0.120	0.273	0.095				
PV	0.722	0.601	0.483	0.486	0.525	0.377	0.154			
Pp	0.445	0.307	0.376	0.332	0.732	0.372	0.288	0.377		
SC	0.684	0.663	0.696	0.807	0.510	0.343	0.179	0.595	0.388	

Extending the HTMT analysis further as is recommended by Hair et al. (2019), a 95% confidence interval using bootstrap criteria was calculated. Discriminant validity is established when the upper confidence level is less than 1 (Henseler et al., 2014; Shen, 2017). According to the estimated confidence interval values, the upper confidence values ranged from 0.169 to 0.852. Thus, all values were less than 1 (Hair et al., 2017). Because the test did not exceed the cut-off values, it can be concluded that discriminant validity is sound.

4.7 Summary of Preliminary Analysis

In this section, preliminary data analyses are conducted, including descriptive analysis, factor analysis, reliability analysis, correlation analysis and convergent and discriminant validity analysis. The results of the descriptive analysis indicate that the data are normally distributed and are appropriate for conducting parametric statistical tests (Mishra et al., 2019). The skew and kurtosis values of all items were in the acceptable range. Factor analyses were performed for each construct (Grace & O'Cass, 2004; O'Cass & Griffin, 2006) and results indicates that items were loaded clearly on their respective construct. Three items from three different constructs had a lower loading than acceptable (0.70). Items with a loading below 0.70 were discarded and analyses were performed again. Subsequently, with the re-runs, all items were strongly loaded on their hypothesised constructs. In addition, reliability was calculated through Cronbach's alpha internal consistency method and all were above the acceptable range of 0.70. The HTMT ratio of correlations was performed to determine discriminant validity. All values were below the threshold of 0.85, which is the most conservative critical HTMT value. The results indicated no common method variance in the pooled data. Lastly, convergent and discriminant validity were assessed and results indicated that sufficient evidence existed to establish convergent and discriminant validity.

After completing the preliminary data analyses and validating the constructs' validity and reliability, the next step was to proceed with the actual data analysis to estimate the structural model and test the hypotheses. In this study, the PLS estimation procedure was employed to test the conceptual model.

4.8 PLS-SEM Measurement Model Assessment

In PLS-SEM the desire is to have strong predictive utility because the strength of one model relative to another is determined by its ability to strongly predict the endogenous constructs in the study. All constructs in this research model were first-order reflective. After completing the initial analysis, 32 items emerged to measure 10 first-order constructs. They were GSI with three items, EC with three items, GMO with three items and AEC with three items. Moreover, there were SC with three items, PV with four items, PR with four items, INV with three items, IA with three items and green car PP with three items. The factor loading values of these items are presented in Table 4.26.

Table 4.26: Factor loadings of 32 items representing 10 constructs

	AEC	EC	GMO	GSI	IA	INV	PR	PV	SC	PP
AEC1	0.923									
AEC2	0.925									
AEC3	0.904									
EC1		0.885								
EC2		0.848								
EC3		0.854								
GMO1			0.909							
GMO2			0.946							
GMO3			0.934							
GSI1				0.863						
GSI2				0.885						
GSI3				0.819						
IA1					0.885					
IA2					0.922					
IA3					0.908					
INV1						0.860				
INV2						0.867				
INV3						0.851				
PR1							0.811			
PR2							0.799			
PR3							0.608			
PR5							0.751			
PV1								0.775		
PV2								0.862		
PV3								0.865		
PV4								0.862		
Pp1										0.852

	AEC	EC	GMO	GSI	IA	INV	PR	PV	SC	PP
Pp2										0.953
Pp3										0.911
SC1									0.915	
SC2									0.935	
SC3									0.900	

4.9 PLS-SEM Structural Models Assessment

Estimating the relations and predictive capacity of the model is the second stage of PLS-SEM analysis. The relations between constructs were investigated to test the research hypotheses.

4.9.1 Hypothesis Testing of Direct Effect (Model 1)

Table 4.27 reports the coefficient beta values for the paths and significance figures from the bootstrapping. This provides t statistics too. See Figure 4.1 for the graphic path coefficients for the model.

$H1_a$ evaluates whether GSI has a positive direct effect on EC. The results indicated that GSI has a significant positive direct effect on EC ($B = 0.436$, $t = 10.36$, $p < 0.001$). Hence, **$H1_a$ (GSI -> EC)** was supported.

The findings regarding $H1_b$ demonstrated a statistically significant positive direct impact of GSI on GMO ($B = 0.219$, $t = 5.11$, $p < 0.001$). Hence, **$H1_b$ (GSI -> GMO)** was supported.

$H1_c$ was framed on whether GSI has a positive direct effect on AEC. Results showed that GSI has no significant direct effect on AEC ($B = -0.018$, $t = 0.448$, $p = 0.655$). Moreover, GSI has no significant negative effect on AEC. Thus, **$H1_c$ (GSI -> AEC)** was not supported.

$H1_d$ tested whether there was any positive direct effect of GSI on green car PP. Results showed that GSI has an insignificant direct effect on green car PP ($B = -0.026$, $t = 0.573$, $p = 0.567$); this effect is negative and very low. Hence, **$H1_d$ (GSI -> PP)** was not supported.

The results of $H1_e$ and $H1_f$ also showed poor results. The findings revealed that GSI has a non-significant positive direct effect on PV for electric cars ($B = 0.093$, $t = 1.822$, $p = 0.069$). GSI has no significant negative effect on PR ($B = -0.006$, $t = 0.118$, $p = 0.906$). Thus, **$H1_e$ (GSI -> PV)** and **$H1_f$ (GSI -> PR)** were not supported.

It was revealed that there is a significant positive direct effect of GSI on innovativeness ($B = 0.250$, $t = 6.82$, $p < 0.001$) and a significant positive direct effect of GSI on IA ($B = 0.151$, $t = 3.072$, $p = 0.002$). Thus, **$H1_g$ (GSI -> INV)** and **$H1_h$ (GSI -> IA)** were supported.

$H2_a$ was framed on the care for the environmental consequences of using cars (EC) positively affecting AEC. Results supported this hypothesis ($B = 0.209$, $t = 5.76$, $p < 0.001$). **$H2_a$ (EC- > AEC)** was supported.

$H2_b$ was framed on GMO having a positive direct effect on AEC. Results revealed a significant positive direct effect ($B = 0.171$, $t = 5.21$, $p < 0.001$). Thus, **$H2_b$ (GMO -> AEC)** was supported.

$H4_a$ and $H4_b$ assessed if AEC has a positive influence on green car purchase intention and PP. Results indicated that AEC has a significant positive influence on green car AI ($B = 0.362$, $t = 8.113$, $p < 0.001$). Thus, **$H4_a$ (AEC ->IA)** was supported. However, there is no significant direct effect of AEC on PP ($B = 0.012$, $t = 0.0.265$, $p = 0.791$). Thus, **$H4_b$ (AEC -> PP)** was not supported.

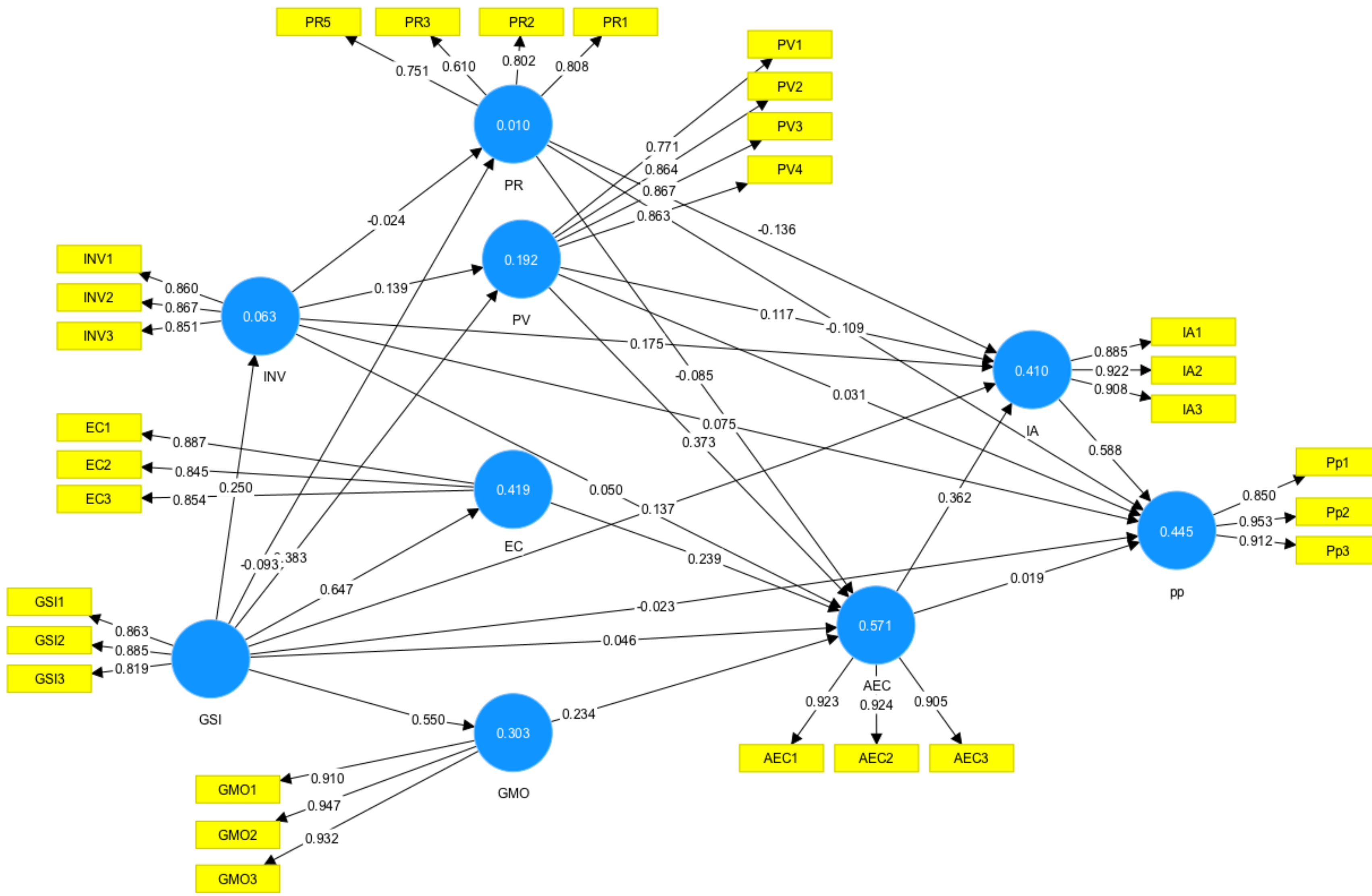

Figure 4.1: Path coefficients of Model 1—results of direct and indirect effects

$H5_a$, $H5_b$, and $H5_c$ assessed whether the PV of electric cars has a positive effect on the probability to purchase (PP) green cars, the intention to purchase (IA) and AEC, respectively. Results indicated that the PV of electric cars had no significant positive effect on PP ($B = 0.012$, $t = 0.291$, $p = 0.771$). However, a significant positive effect on the intention to purchase variable ($B = 0.105$, $t = 2.55$, $p = 0.011$). Hence, **$H5_a$** was not supported and **$H5_b$** was supported. However, results revealed that the PV of electric cars has a significant positive effect on the AEC ($B = 0.339$, $t = 9.16$, $p < 0.001$). Therefore, **$H5_c$** was supported.

$H6_a$, $H6_b$, and $H6_c$ were framed on whether the PR negatively influences green car PP, green car IA and AEC. Results indicated that PR has a significant and negative direct effect on green car PP ($B = -0.099$, $t = 3.82$, $p < 0.001$). Similarly, there was a significant and negative direct effect on the green car AI ($B = -0.128$, $t = 4.85$, $p < 0.001$). Also, a significant negative direct effect on AEC was identified ($B = -0.069$, $t = 3.06$, $p = 0.002$). Hence, **$H6_a$, $H6_b$** and **$H6_c$** were supported.

The direct effect of innovativeness was assessed through multiple hypotheses, including H9a, H9b, H9c, H9d and H9e. Innovativeness has an insignificant direct effect on AEC ($B = 0.045$, $t = 1.75$, $p = 0.080$) but a significant direct effect on PP ($B = 0.066$, $t = 2.03$, $p = 0.043$). Moreover, there was a positive significant direct effect of innovativeness on green car AI ($B = 0.165$, $t = 4.88$, $p < 0.001$). Moreover, innovativeness has a positive direct effect on the PV ($B = 0.091$, $t = 2.30$, $p = 0.022$). There was an insignificant effect of innovativeness on the PR of EV adoption ($B = 0.02$, $t = 0.041$, $p = 0.967$). Thus, **$H9_a$** and **$H9_e$** were insignificant while **$H9_b$**, **$H9_c$** and **$H9_d$** were significant.

Lastly, **H10** was framed on the green car AI having a positive direct effect on green car PP. Results revealed a significant positive direct effect of AI on PP ($B = 0.575$, $t = 16.076$, $p < 0.001$).

Table 4.27: Path coefficients and hypothesis testing of direct effects

Hypothesis	Path	Original sample (O)	T Statistics (|O/STDEV|)	P values	Remarks
$H1_a$	GSI -> EC	0.436	10.361	0.000	Supported

Hypothesis	Path	Original sample (O)	T Statistics (|O/STDEV|)	P values	Remarks
$H1_b$	GSI -> GMO	0.219	5.111	0.000	Supported
$H1_c$	GSI -> AEC	–0.018	0.448	0.655	Not supported
$H1_d$	GSI -> PP	–0.026	0.573	0.567	Not supported
$H1_e$	GSI -> PV	0.093	1.822	0.069	Not supported
$H1_f$	GSI -> PR	–0.006	0.118	0.906	Not supported
$H1_g$	GSI -> INV	0.250	6.821	0.000	Supported
$H1_h$	GSI -> IA	0.151	3.072	0.002	Supported
$H2_a$	EC -> AEC	0.209	5.760	0.000	Supported
$H2_b$	GMO -> AEC	0.171	5.211	0.000	Supported
$H4_a$	AEC -> IA	0.362	8.113	0.000	Supported
$H4_b$	AEC -> PP	0.012	0.265	0.791	Not supported
$H5_a$	PV -> PP	0.012	0.291	0.771	Not supported
$H5_b$	PV -> IA	0.105	2.554	0.011	Supported
$H5_c$	PV -> AEC	0.339	9.167	0.000	Supported
$H6_a$	PR -> PP	–0.099	3.826	0.000	Supported
$H6_b$	PR -> IA	–0.128	4.856	0.000	Supported
$H6_c$	PR -> AEC	–0.069	3.063	0.002	Supported
$H9_a$	INV -> AEC	0.045	1.754	0.080	Not supported
$H9_b$	INV -> PP	0.066	2.031	0.043	Supported
$H9_c$	INV -> IA	0.165	4.881	0.000	Supported
$H9_d$	INV -> PV	0.091	2.301	0.022	Supported
$H9_e$	INV -> PR	0.002	0.041	0.967	Not supported
H10	IA -> PP	0.575	16.076	0.000	Supported

The independent constructs have the highest effect on the AEC factor, with 59% of the variation in the AEC. The other leading R-squared values were 46%, 46%, 43% and 42% for EC, PP, GMO and IA variables, respectively. Table 4.28 indicates the R-squared values for the direct effect on endogenous constructs.

Table 4.28: R-squared values for the direct effect on endogenous constructs

Endogenous constructs	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	P values	2.5%	97.5%
AEC	0.592	0.597	0.025	0.000	0.547	0.644
EC	0.463	0.466	0.032	0.000	0.402	0.527
GMO	0.427	0.428	0.030	0.000	0.367	0.486
IA	0.415	0.423	0.029	0.000	0.364	0.482
INV	0.063	0.064	0.019	0.001	0.030	0.104
PR	0.037	0.046	0.015	0.017	0.020	0.078
PV	0.306	0.318	0.028	0.000	0.265	0.372
PP	0.457	0.465	0.029	0.000	0.408	0.520

4.9.2 Hypothesis Testing of Mediating Effect (Model 1)

Mediation analysis was used to determine the mediation effect of EC, GMO, PV and PR in the relationship with GSI, AEC and PP variables ($H3_a$, $H3_b$, $H8_a$ and $H8_b$). Furthermore, the indirect effect of the independent variables on the dependent variable through the mediating variable was also examined. See Figure 4.1 for the path coefficients of the model with direct and indirect effects.

Four mediation hypotheses were tested. The complete mediation results are presented in Table 4.29, including the total, direct and indirect effects. The results revealed a significant mediating effect of EC in the relationship between GSI and the AEC ($H3_a$: $B = 0.091$, $t = 5.013$, $p < 0.001$). Moreover, there was also a significant mediating effect of GMO in the relationship between GSI and AEC ($H3_b$: $B = 0.037$, $t = 3.81$, $p < 0.001$). However, there was an insignificant mediating effect of PV in the relationship between GSI and green car PP ($H8_a$: $B = 0.01$, $t = 0.242$, $p = 0.809$); also, there was an insignificant mediating effect of PR in the relationship between GSI and green car PP ($H8_b$: $B = 0.001$, $t = 0.115$, $p = 0.909$). Thus, it can be concluded that EC and GMO are mediating factors while PV and PR are not mediating factors. Hence, **$H3_a$** and **$H3_b$** were supported, while **$H8_a$** and **$H8_b$** were not supported.

Table 4.29: Direct and indirect effects estimations for mediation analysis

H#	Path	Total effect	T	Sig.	Direct effect	Sig.	Path	Indirect effect	T	Sig.
$H3_a$	GSI→AEC	0.162	3.482	0.001	–0.018	0.655	GSI→EC→AEC	0.091	5.013	0.000
$H3_b$	GSI→AEC	0.162	3.482	0.001	–0.018	0.655	GSI→GMO→AEC	0.037	3.810	0.000
$H8_a$	GSI→PP	0.146	2.815	0.005	–0.026	0.567	GSI→PV→PP	0.001	0.242	0.809
$H8_b$	GSI→PP	0.146	2.815	0.005	–0.026	0.567	GSI→PR→PP	0.001	0.115	0.909

4.9.3 Hypothesis Testing of Moderation Effect (Model 2)

The role of SC will now be reported. H7 was built on nine sub-hypotheses ($H7_a$–$H7_i$). The results of all moderation analyses are presented in Table 4.30. Six hypotheses (H7b, H7c, H7d, H7f, H7h and H7i) were significant and the results concluded that SC with green products significantly and negatively moderates the relationship between GSI and EC ($B = –0.095$, $t = 3.88$, $p < 0.001$). Moreover, SC with green products significantly moderates the relationship between GSI and PP for electric cars, with higher SC leading to higher PP ($B = 0.078$, $t = 2.67$, p = 0.008). Furthermore, a significant moderation effect with GSI and AEC ($B = 0.083$, $t = 2.58$, $p = 0.010$) and significantly negatively between EC and AEC ($B = –0.107$, $t = 3.141$, $p = 0.002$) was identified.

Similarly, a significant and negative moderation effect with GSI and PR for electric cars ($B = –0.086$, $t = 2.198$, $p = 0.028$) was identified, along with a significant moderation effect with GSI and AI for electric cars, with higher SC leading to higher AI ($B = 0.071$, $t = 2.455$, $p = 0.014$).

However, results revealed that SC with green products did not moderate the relationship between GSI and PV for electric cars; between GSI and GMO, with higher SC leading to higher GMO; between GMO and AEC, with higher SC leading to higher AEC. Thus, it can be concluded that H7b, H7c, H7d, H7f, H7h and H7i were supported and **$H7_a$, $H7_e$,** and **$H7_g$** were not supported by the data. It is important to mention that H7c and H7f have significant moderation effects; however, the effects are in opposite directions to the hypotheses. That will be discussed further in Chapter 5. See Figure 4.2 for the path coefficients of the model with direct and indirect effects.

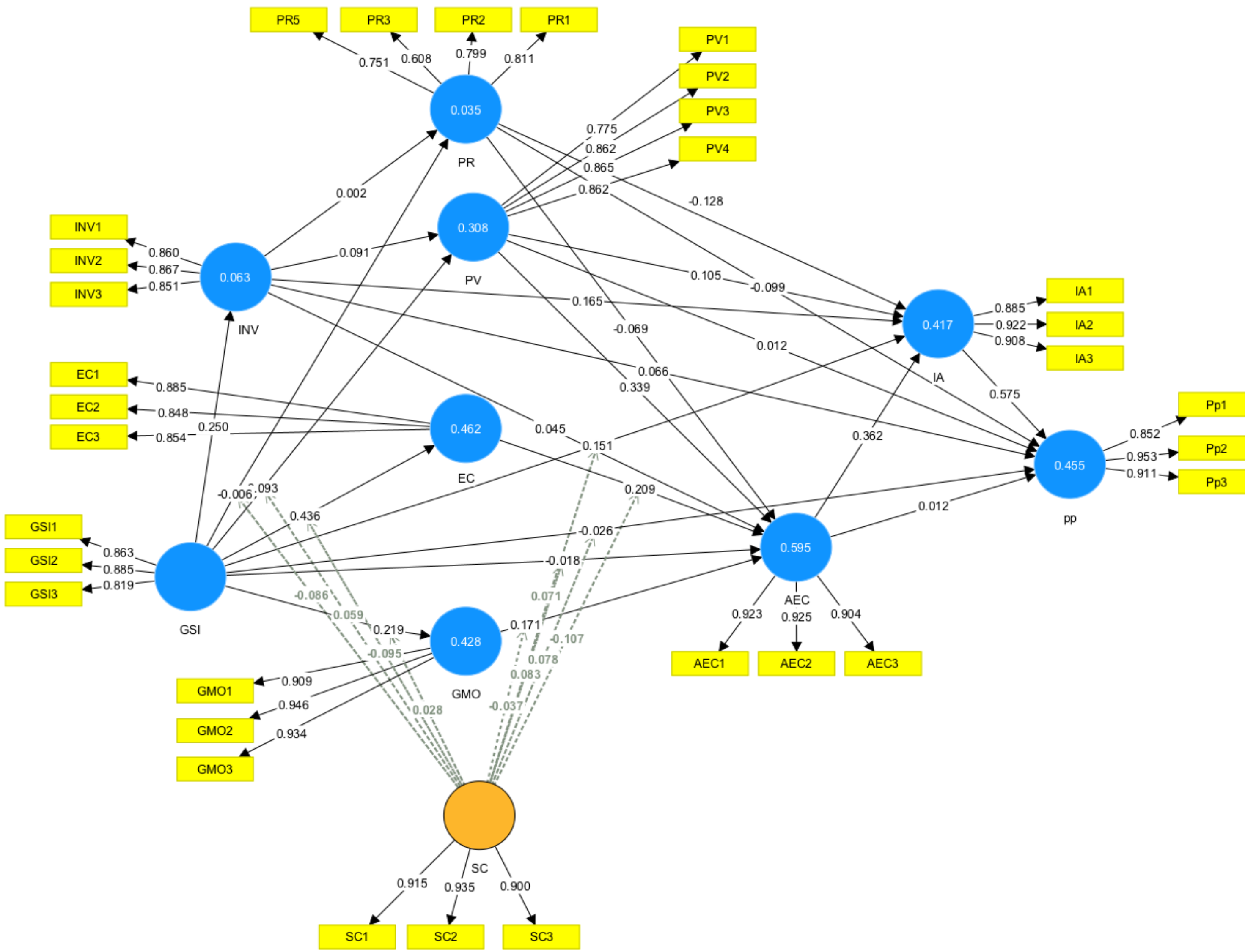

Figure 4.2: Path coefficients of Model 2 with moderation effects

Table 4.30: Direct and indirect effects estimations with moderators

Hypothesis	Path	Original sample (O)	T Statistics (|O/STDEV|)	P values	Remarks
H7a	SC x GSI -> PV	0.059	1.734	0.083	Not supported
H7b	SC x GSI -> PR	–0.086	2.198	0.028	Supported
H7c	SC x GSI -> EC	–0.095	3.888	0.000	Significant, not supported, negative
H7d	SC x GSI -> AEC	0.083	2.585	0.010	Supported
H7e	SC x GSI -> GMO	0.028	1.073	0.284	Not supported
H7f	SC x EC -> AEC	–0.107	3.141	0.002	Significant, not supported, negative
H7g	SC x GMO -> AEC	–0.037	1.190	0.234	Not supported
H7h	SC x GSI -> PP	0.078	2.673	0.008	Supported
H7i	SC x GSI -> IA	0.071	2.455	0.014	Supported

In the case in which a significant moderating effect is present, a technique was suggested by Aiken and West (1991) to visualise the plots of each interaction with one standard deviation above the mean (+1 SD) and one standard deviation below the mean (–1 SD). Thus, plots for each interaction were constructed to illustrate the moderation effect at different moderation values in the relationship between the independent and dependent constructs. The Smart-PLS's graphs of the structural model for the moderation effect of SC between dependent and independent variables with the beta coefficient for –1 SD, mean, and +1 SD are presented in Appendix 6.

4.10 Evaluation of Two SEM Structural Models

With the introduction of each moderator construct (or moderation interaction construct), the structural models were assessed in a stepped manner with both the moderator introduced (i.e., with the moderation/s included) and compared for the PLS-SEM without moderator/s ((i.e., with the moderation/s included). The beta regression coefficients for each regression path are presented in Figure 4.1 of Model 1 (without moderation/s) and Figure 4.2 (with moderation/s).

The main effects model is the relationship between the independent variables and dependent variable. The interaction model is interaction terms and moderators that influence the relationships between predictors and the response construct. Afterwards, the main effects and interaction models are modelled with the differences in effect size (f^2) of the main effects and interactions model being assessed by the J. Cohen (1988) effect size formula. To determine the merit of the interaction term (moderators) being added to the model, the effect size was calculated. The following formula was used to calculate the effect size of the main effect model and interactions model (Henseler & Fassott, 2009).

$$f^2 = \frac{R^2_{model\,with\,moderator} - R^2_{model\,without\,moderator}}{1 - R^2_{model\,with\,moderator}}$$

The effect size is considered small, moderate and large when the f^2 value is 0.02, 0.15 and 0.35, respectively (J. Cohen, 1988). It is important to understand that a small f^2 does not necessarily imply an unimportant effect (Henseler & Fassott, 2009). Table 4.31 shows the effect size along with the interpretation.

Table 4.31: Moderation analysis: direct and indirect effects

Variable	R^2 (with moderator)	R^2 (without moderator)	F-Square	Interpretation
AEC	0.595	0.571	0.059	Small
EC	0.462	0.419	0.080	Small
GMO	0.428	0.303	0.219	Moderate
IA	0.417	0.410	0.012	Small
INV	0.063	0.063	0.000	No effect
PR	0.035	0.010	0.026	Small
PV	0.308	0.192	0.168	Moderate
PP	0.455	0.445	0.018	Small

The R2 values indicate the proportion of variance explained by the model, with and without the inclusion of the moderator construct (SC). When the moderator construct (SC) was included in the AEC construct, the R2 value increased from 0.571 to 0.595, with the J. Cohen (1988) effect size calculation suggesting a small effect size. This indicates that the moderator has a small and meaningful influence on the relationship between AEC and the outcome construct. The R2 value increased from 0.303 to 0.428 when the moderator (SC) was included for the GMO construct, indicating a moderate effect size. This indicates that the moderator has a significant impact on the relationship between GMO and the outcome construct. According to Table 4.31, the moderator has a small influence on the relationship between IA and the outcome construct, whereas the moderator does not have affect the relationship between INV and the outcome construct. The table also shows that the moderator has a small influence on the relationship between PP and the outcome construct. Thus, the moderation analysis reveals that the presence of the moderator variable has varying effects on the different variables in the study. The constructs of GMO and PV demonstrated a moderate effect size when the moderator was included, indicating a significant influence of the moderator on these relationships. Conversely, the remaining constructs show small effect sizes or no significant effect. These findings emphasise the importance of considering the moderator variable in understanding the relationships between the constructs under investigation.

4.11 Model 3 with Control Variables

Model 3 was tested with the aim of investigating the control variables or demographics. The study contains eight controls: education, gender, marital status, age, monthly income, driver's licence status, type of car and number of cars. These eight control variables were entered into the model to measure their potential effect on the overall structural model.

Results indicated that two controls (number of vehicles currently owned and having a driver's licence) are the only significant predictors to influence the level of purchase probability. Conversely, the remaining six controls (type of car usually driven, gender, education, age, marriage and income) do not have a statistically significant influence on PP. The results are presented in Table 4.32. The model's R^2 value with all controls was 0.463 and without the controls was 0.455; this difference in R^2 is negligible (J. Cohen, 1988). According to these results and Table 4.32, there is no noticeable difference in the overall R^2 across the two models. The difference in the R-squared value of the model with controls and the model without controls is 0.015, which is negligible. The path coefficient values for both models were inspected and were similar.

Table 4.32: Path coefficients and R-squared with control variables and without control variables

Path	With control variables			Without control variables		
	Original sample (o)	T statistics (|o/stdev|)	P values	Original sample (o)	T statistics (|o/stdev|)	P values
AEC -> IA	0.384	8.188	0.000	0.362	8.113	0.000
AEC -> pp	0.016	0.182	0.856	0.012	0.265	0.791
EC -> AEC	0.558	4.827	0.000	0.209	5.76	0.000
GMO -> AEC	0.23	2.785	0.005	0.171	5.211	0.000
GSI -> AEC	–0.296	2.406	0.016	-0.018	0.448	0.655
GSI -> EC	0.758	8.504	0.000	0.436	10.361	0.000
GSI -> GMO	0.189	1.631	0.103	0.219	5.111	0.000
GSI -> IA	–0.075	0.69	0.490	0.151	3.072	0.002
GSI -> INV	0.262	6.537	0.000	0.25	6.821	0.000

Path	With control variables			Without control variables		
	Original sample (o)	T statistics (|o/stdev|)	P values	Original sample (o)	T statistics (|o/stdev|)	P values
GSI -> PR	0.233	2.018	0.044	–0.006	0.118	0.906
GSI -> PV	–0.078	0.689	0.491	0.093	1.822	0.069
GSI -> pp	–0.583	3.026	0.003	–0.026	0.573	0.567
SC x GSI -> PV	0.037	1.68	0.093	0.059	1.734	0.083
SC x GSI -> PR	–0.055	2.222	0.026	–0.086	2.198	0.028
SC x GSI -> EC	–0.069	3.704	0.000	–0.095	3.888	0.000
SC x GSI -> AEC	0.063	2.569	0.010	0.083	2.585	0.010
SC x GSI -> GMO	0.027	1.115	0.265	0.028	1.073	0.284
SC x EC -> AEC	–0.076	3.321	0.001	–0.107	3.141	0.002
SC x GMO -> AEC	–0.02	1.192	0.234	–0.037	1.19	0.234
SC x GSI -> PP	0.119	2.711	0.007	0.078	2.673	0.008
SC x GSI -> IA	0.059	2.454	0.014	0.071	2.455	0.014
IA -> pp	1.116	15.479	0.000	0.577	16.076	0.000
INV -> AEC	0.049	1.788	0.074	0.045	1.754	0.080
INV -> IA	0.188	4.846	0.000	0.165	4.881	0.000
INV -> PR	0.002	0.046	0.963	0.002	0.041	0.967
INV -> PV	0.077	2.142	0.032	0.091	2.301	0.022
INV -> PP	0.146	2.01	0.045	0.066	2.031	0.043
PR -> AEC	–0.089	3.349	0.001	–0.069	3.063	0.002
PR -> IA	–0.151	4.375	0.000	–0.128	4.856	0.000
PR -> pp	–0.199	3.045	0.002	–0.099	3.826	0.000
PV -> AEC	0.401	9.585	0.000	0.339	9.167	0.000
PV -> IA	0.132	2.506	0.012	–0.128	4.856	0.000
PV -> PP	0.01	0.103	0.918	0.012	0.291	0.771
Age <- PP	–0.046	0.498	0.619			
Education <- PP	–0.037	0.441	0.659			
Gender <- Pp	0.155	0.761	0.447			
M.Income <- Pp	–0.016	0.355	0.723			
Marriage <- Pp	0.036	0.328	0.743			

Path	With control variables			Without control variables		
	Original sample (o)	T statistics (|o/stdev|)	P values	Original sample (o)	T statistics (|o/stdev|)	P values
T.car <- Pp	0.191	1.475	0.140			
C.owned <- Pp	0.313	3.823	0.000			
license <- Pp	–0.28	2.429	0.015			
	R^2 = 0.463			**R^2 = 0.455**		

4.12 Additional Analysis: Exploring Unobserved Heterogeneity/FIMIX-PLS Model

An additional analysis was undertaken to determine if the data were heterogeneous and possibly the PLS results may offer more predictive utility via multiple segments or explanatory models. For example, respondents in this study are from Saudi Arabia; they share the same culture and language and many other things, yet when it comes to electric car purchasing, some of them could be inclined to be influenced in a different construct route compared with another response segment. In simple terms, arguably, one segment may be more influenced by the environmental concerns and green constructs more than somebody from another segment. It is possible to have more than a two segment solution using FIMIX analysis. These differences in perspectives may result in a different pattern of construct-to-construct relationships, varied by segment. Such heterogeneity can be either be observed or unobserved; again, from the previous example, it can be intimated that Saudi males and females, their ages, income levels and possession of regular or green cars are obvious and readily observed. Such observed heterogeneity can be clustered and researchers can carry out group-specific PLS-SEM analysis (Hair et al., 2016; Sarstedt et al., 2009).

FIMIX is adept at assessing the existence of unobserved heterogeneity:

> Unobserved heterogeneity occurs when there are significant differences in model relationships between groups of data and the sources of these differences cannot be traced back to any observable characteristics such as gender, age or income. (Hair et al., 2016, p. 64)

The previous analyses on controls in Section 4.11 indicated the very minor role observable characteristics played within the model.

Consistent with Hahn et al. (2002), researchers have tried to account for this problem through cluster analysis, but cluster analysis was not sufficient for model relationships and clustering was also poor at identifying the group differences. Hahn et al. (2002) introduced FIMIX-PLS, which is one of the most prominent latent class approaches. This is called finite mixture partial least squares modelling (FIMIX-PLS; Sarstedt et al., 2011). Although unobserved heterogeneity cannot be detected completely owing to the mixture regression concept, FIMIX-PLS concurrently estimates the path coefficients and determines whether there is any heterogeneity in the dataset by evaluating the probability of the segment membership of the data points in an attempt to classify them into a predetermined number of segments (Sarstedt et al., 2011). Robustness checks on the heterogeneity of data are crucial (Hair et al., 2016). Smart-PLS 4 has the built-in technique for FIMIX-PLS (Ringle et al., 2022). As the name implies, this approach relies on the finite mixture models' concept, meaning that the study population is a mixture of the density functions that are group specific (Hair et al., 2016). The purpose of the FIMIX-PLS is to free or separate those mixtures and estimate parameters or the path coefficients of each member of that mixture group in mixture regressions (Sarstedt et al., 2011). The FIMIX-PLS is implemented next.

4.12.1 FIMIX Analysis

FIMIX-PLS checks that there are no variables in the model that can be further divided into additional variables (Shmueli et al., 2019). First, the assessment focused on determining the number of segments to enter the software for estimation. The value initially chosen was selected on the basis of the number of predictors in the study model, which was eight. Following the recommendation of Hair et al. (2016) and considering the rough 10-times rule for the minimum sample size (Hair et al., 2017; Sarstedt et al., 2022), these factors were considered. Thus, it needed 80 samples at minimum, meaning that it could have a maximum of eight segments in the research data on the basis of the total responses (i.e., 822; see Table 4.33).

Considering the above prerequisites, FIMIX was run with 5,000 iterations and other default settings such as stop criterion (10^{-10}) and 10 repetitions (Hair et al., 2016). Using these settings, there could be up to 10 separate segments or PLS-SEM models. The software ran in stepped fashion the FIMIX routine for 1, 2, 3, 4 to possibly 10 segments on the datafile (Sarstedt et al., 2017). Results of the FIMIX are presented in Table 4.33.

Table 4.33: FIMIX-PLS results segment criterion

	Segment criteria									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
AIC	15734.9	15301.5	15172.9	14955.5	14956.1	14878.5	14840.9	14739.5	14711.8	*14663.3*
AIC3	15782.9	15398.5	15318.9	15150.5	15200.1	15171.5	15182.9	*15130.5*	15151.8	15152.3
AIC4	15830.9	15495.5	15464.9	*15345.5*	15444.1	15464.5	15524.9	15521.5	15591.8	15641.3
BIC	15961.1	*15758.6*	15860.8	15874.3	16105.8	16259.0	16452.3	16581.8	16784.9	16967.3
CAIC	16009.1	*15855.6*	16006.8	16069.3	16349.8	16552.0	16794.3	16972.8	17224.9	17456.3
HQ	15821.7	15476.9	15436.8	*15308.1*	15397.2	15408.2	15459.2	15446.3	15507.2	15547.2
MDL5	*17249.7*	18362.7	19780.5	21109.5	22656.5	24125.2	25634.0	27079.0	28597.6	30095.5
LnL	*–7819.4*	–7553.8	–7440.4	–7282.8	–7234.0	–7146.2	–7078.4	–6978.7	–6915.9	–6842.6
EN	0	0.718	0.656	0.640	0.656	0.675	0.770	0.720	*0.821*	0.777
NFI	0	*0.757*	0.647	0.602	0.604	0.610	0.705	0.630	0.753	0.683
NEC	0	231.58	282.43	296.22	282.98	266.93	188.72	230.49	*147.00*	183.55

FIMIX-PLS results assist in determining the optimal segments that might exist to determine the best number of segments. There are statistics and model selection criteria that guide the analyst's decision regarding how many optimal segments can be retained (Hair et al., 2016; Matthews et al., 2016). In determining the number of segments, the analyst needs to inspect statistics such as Akaike's information criterion (AIC), consistent Akaike's information criterion (CAIC), minimum description length with factor 5 (MDL5), AIC with factor 3 (AIC3), AIC with factor 4 (AIC4), Bayesian information criteria (BIC), Hannan–Quinn criterion (HQ), log-likelihood (LnL), normed entropy statistic (EN), non-fuzzy index (NFI) and normalised entropy criterion (NEC).

These statistics, or what is referred previously as the FIMIX criteria, are statistical criteria used in model selection to choose the most appropriate model that best fits the data (Hair et al., 2016). They help to balance model complexity and goodness of fit, thereby improving the interpretability of statistical analyses and guiding choice. Consistent with Hair et al. (2016) the criteria are:

- AIC: A model selection criterion that evaluates the trade-off between the goodness of fit and the complexity of the model on the basis of the maximised log-likelihood function of the model. AIC provides a way to compare different models and select the one that best balances the fit and complexity.
- CAIC: A variant of AIC that corrects for sample size and imposes a larger penalty for overfitting, particularly for smaller sample sizes.
- MDL5: A model selection criterion that evaluates the trade-off between the model fit and the complexity by measuring the length of the code that describes the data and the model.
- AIC3: A variant of AIC that includes a third factor in addition to the model fit and complexity to adjust for potential misspecification of the model.
- AIC4: A variant of AIC that includes a fourth factor, in addition to the model fit, complexity and misspecification, to account for possible nonlinearities in the model.
- BIC: A model selection criterion that penalises model complexity more strongly than AIC by imposing a larger penalty for the number of parameters in the model.
- HQ: A variant of AIC that places a stronger penalty on model complexity and is less sensitive to sample size.
- LnL: A statistical measure that evaluates the probability of observing the data given the model used in many model selection criteria.
- EN: A model selection criterion that evaluates the trade-off between model fit and complexity on the basis of the normalised entropy of the residuals.
- NFI: A model selection criterion that evaluates the fit of a model to the data by comparing the variance accounted for by the model with the total variance in the data.
- NEC: A model selection criterion that balances model fit and complexity by measuring the ratio of the residual entropy to the maximum possible entropy.

Among these criteria, AIC overestimates and MDL5 underestimates the correct number of segments (Hair et al., 2016; Matthews et al., 2016). Sarstedt et al. (2011) outlined that the two best performing indicators are AIC4 and BIC. For this study, the recommendations of

Sarstedt et al. (2011) were adopted to determine the optimal number of possible segments suggested in the following FIMIX-PLS analyses.

Table 4.33 presents the FIMIX results and indicates four possible segment solutions according to the above criteria (some of which need the lowest value, e.g., AIC, and some of them need highest value, e.g., NFI). The solution provided by Segment-9 (see Table 4.33) was suitable on the basis of using EN as the decision rule showing the lowest value and NEC presenting the highest value among the qualification criteria. The Segment-4 solution was stronger on the basis of the HQ and AIC4 criteria. Indeed, it was a strong candidate because of the AIC4 criteria, which is one of the best performing criteria (Sarstedt et al., 2011). A one-segment or unitary model built on Segment-1 was also a possible candidate for selection if the decision was to be framed on the MDL5 and LnL criteria. Overall, these last criteria were not utilised in FIMIX number of segments determination because they suffer from an underestimation problem for overly complex models, leading to potential overfitting and a loss of generalisation performance (Hair et al., 2016). Finally, the Segment-2 solution was strongly endorsed as an ideal solution using the BIC, CAIC and NFI criterion. It is pertinent to mention that these criteria for selecting the segments have been backed by many studies (e.g., Irfan et al., 2022; Yoshikuni et al., 2019). Overall, it is acknowledged that no clear decision on number of segments could be concluded at this stage, but a second procedure was also utilised to assess the FIMIX.

4.12.2 Relative Sample Size for Segment Solution

After the review of the fit indices (see Section 4.12.1), there was an indication of divergent results and at that stage, no optimal number of segments were clearly indicated by the FIMIX solution (i.e., one clear selection). The analysis progressed by inspecting the relative segment sizes to determine if this offered superior guidance or utility on the number of segment choice (Hair et al., 2016). According to Section 4.12.1's discussion on fit criteria, this analysis only considered Segment-1, Segment-2, Segment-4 and Segment-9 solutions. These were the most promising solutions to iterate further. The Segment-9 solution was ruled out because the sample size to have a robust Segment-9 model (9 Segment PLS-SEM model) did not meet the minimum sample cell criteria. That is, it is desirable to have 80 respondents per segment;

this would make for a very large sample size. Additionally, it was implausible to have a sample size of 13 per segment (i.e, 0.015 x 822 = 12.33; see Table 4.34). Similarly, Segment-4 was also ruled out because it could only yield a sample size of 36 observations (0.044 x 822 = 36.17; see Table 4.34), which was less than the minimum required 80 respondents per segments; 80 respondents per segment was calculated using a general rule of 10-times respondents per predictor variable. Since the model had eight predictors, a rough estimate was 80 respondents (Hair et al., 2017).

This process of elimination left a Segment-1 or –2 solution as the only remaining candidate to present for the FIMIX analyses. Referring to the MDL5 criteria, Segment-1 was prone to underestimation problems. Therefore, it could not be declared as the sole solution for the study model even though this had the maximum sample size in the native Segment-1 solution. The Segment-2 solution had an equally acceptable sample size cross-loaded. This solution held the most promise. In this solution, the smaller segment had 246 respondents, which is three times the minimum required segment size recommended by Sarstedt et al. (2017b).

Sarstedt et al. (2017b) proposed that if the results point to a one-segment solution or reveal divergent findings, the researcher can declare that unobserved heterogeneity was not significantly a pervasive issue with the data. The analyses do not provide an entirely clear segmentation solution because the Segment-1 solution and -2 solutions could be considered as both satisfying the sample size requirements. Therefore, it could be possibly intimated that the presence of unobserved heterogeneity in this data was not pervasive (see Table 4.34). Nonetheless, on the basis of the combination of the above selection criteria and the adequacy of the relative sample size, a Segment-2 solution will be presented.

Table 4.34: FIMIX segment sizes to decide on the number of valid segments based on relative sample size

Criteria	**Segment**									
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	*1.000*									
2	*0.701*	*0.299*								
3	0.498	0.400	0.102							

4	0.381	0.334	0.241	0.044						
5	0.381	0.250	0.229	0.087	0.053					
6	0.372	0.254	0.174	0.108	0.047	0.046				
7	0.429	0.315	0.091	0.052	0.042	0.036	0.035			
8	0.323	0.206	0.175	0.148	0.052	0.038	0.032	0.027		
9	0.519	0.144	0.099	0.065	0.054	0.042	0.040	0.023	0.015	
10	0.300	0.265	0.153	0.097	0.042	0.038	0.036	0.032	0.023	0.016

Note: Bold = meeting the minimum sample criteria (i.e., 80 respondents).

4.12.3 Segment Membership

On the basis of the relative segment size and total sample size, the sample size was calculated for the two groups, which was identified from the FIMIX procedure (see Table 4.35 for exact numbers). These partitions in the data were used for comparing the groups.

Table 4.35: Segment sizes—number of cases

Segment 1	576 cases = 822 x 0.701. Total sample x relative sample size from Table 4.34
Segment 2	246 cases = 822 x 0.299. Total sample x relative sample size from Table 4.34

4.12.4 Segments 1 and 2 Profiling Using FIMIX

Viewing Table 4.36, it is apparent that the segment percentages on gender in Segments-1 and -2 were matched to the total sample. However, some divergence was observed in age groups, in which Segment-2 was lower (22% compared with 34% for Segment-1 against 31% for total data) representation from the 25–34-year-old participants and higher representation in the age group of 50 and above (30% for Segment-2, 20% for Segment-1 and 23% for total data, respectively). Other than these described variations, the characteristics were the same as the total sample.

Table 4.36: Demographics of the two segments and total data

Variable/category	Segment 1		Segment 2		Total data	
	N = 576		N = 246		N = 822	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Gender						
Male	287	50%	124	50%	411	50%
Female	289	50%	122	50%	411	50%
Age						
18–24	133	23%	53	22%	186	23%
25–34	198	34%	53	22%	251	31%
35–49	132	23%	65	26%	197	24%
50 and above	113	20%	75	30%	188	23%
Education						
High school or less	84	15%	44	18%	128	16%
Diploma	33	6%	24	10%	57	7%
Bachelor	337	59%	131	53%	468	57%
Postgraduate	122	21%	47	19%	169	21%
Marriage						
Unmarried	187	32%	59	24%	246	30%
Married	161	28%	70	28%	231	28%
Married and have children	228	40%	117	48%	345	42%
Monthly income (riyal)						
6,000 or less	132	23%	47	19%	179	22%
6,001–9,999	67	12%	30	12%	97	12%
10,000–14,999	100	17%	41	17%	141	17%
15,000–19,999	57	10%	35	14%	92	11%
20,000 and over	89	15%	40	16%	129	16%
Prefer not to answer	131	23%	53	22%	184	22%
Driving licence						
Yes	352	61%	154	63%	506	62%

Variable/category	Segment 1		Segment 2		Total data	
	N = 576		N = 246		N = 822	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
No	67	12%	29	12%	96	12%
No, but intended in next 10 years	157	27%	63	26%	220	27%
Type of car usually driven:						
Small car	100	17%	37	15%	137	17%
Medium-size car	169	29%	86	35%	255	31%
Large-size car	77	13%	29	12%	106	13%
None	6	1%	2	1%	8	1%
Does not have a licence	224	39%	92	37%	316	38%
How many vehicles are currently owned in your household?						
1	111	19%	40	16%	151	18%
2	89	15%	56	23%	145	18%
3	60	10%	25	10%	85	10%
4+	89	15%	29	12%	118	14%
None	3	1%	4	2%	7	1%
Does not have a licence	224	39%	92	37%	316	38%

4.12.5 Independent Samples T-Test

To explore the Segment-2 solution, independent T-tests were conducted to compare the PP of the green cars to determine whether there was any difference in the scores across Segment-1 and Segment-2. This study utilised 1,000 samples of bootstrapping with 95% confidence intervals to analyse the segments' differences.

Results showed that PP1 scores for Segment-2 ($M = 5.09$) were higher than the scores of Segment-1 ($M = 3.05$). This difference of scores on PP1 ($M = 2.04$) was statistically significant, $t(7.725) = 7.725$, $p = 0.001$, 95% CI (–2.561, –1.515). This can be interpreted that respondents in Segment-2 had a significantly higher PP green cars within the next year than did respondents in Segment-1 (see Table 4.38).

T-test analyses also revealed that the PP2 scores for Segment-2 ($M = 6.33$) were higher than the scores of Segment-1 ($M = 4.51$). The difference of scores on PP2 ($M = 1.82$) was statistically significant, $t(820) = 7.809$, $p = 0.001$, 95% CI (–2.271, –1.391). This can indicate that respondents in Segment-2 had a significantly higher PP green cars in the next two to five years than did respondents in Segment-1, despite the fact that there were fewer ($N = 247$) respondents in Segment-2 than in Segment-1 ($N = 576$; see Table 4.38).

Results of the t-test on segment difference indicated that PP3 scores for Segment-2 ($M = 7.70$) were higher than the PP3 scores of Segment-1 ($M = 6.27$). This difference ($M = 1.43$) was statistically significant, $t(559.85) = 7.288$, $p = 0.001$, 95% CI (–1.821, –1.043). This meant that respondents in Segment-2 had a significantly higher PP green cars in the next six to ten years than did respondents in Segment-1 (see Table 4.37).

Table 4.37: T-test—segment differences

	Segment	N	Mean	Mean difference	SE	T	df	P	95% CIs of the difference
PP1	1	576	3.05	2.039	0.253	7.725	423.536	0.001	–2.561
	2	246	5.09						–1.515
PP2	1	576	4.51	1.828	0.234	7.809	820	0.001	–2.271
	2	246	6.33						–1.391
PP3	1	576	6.27	1.424	0.195	7.288	559.852	0.001	–1.821
	2	246	7.70						–1.043

4.12.6 FIMIX Segments v. Total Data

Path analysis was conducted to determine the difference between total data, Segment-1 and Segment-2. As can be noted from Table 4.38, Segment-1 was significantly different from Segment-2 and the total data in 2 path coefficients of 33. Segment-2 had 11 significantly different path coefficients of 33 in comparison with Segment-1 and total data.

Correspondingly, total data had six meaningful and significantly different paths while comparing Segment-1 and Segment-2. In 14 path coefficients, both segments and total data had statistically and significantly similar path coefficients, Table 4.40 presents the hypotheses overview for both FIMIX segments and total data. Finally, it can be stated that Segment-2 was the most divergent segment. Appendix 7 presents path coefficients for each segment.

Table 4.38: Path coefficients for FIMIX segments and total data

	Segment-1			Segment-2			Total data		
	Estimate	T	P	Estimate	T	P	Estimate	T	P
AEC -> IA	0.344	7.079	0.000	0.471	5.427	0.000	0.362	8.113	0.000
AEC -> PP	0.006	0.127	0.899	0.041	0.433	0.665	0.012	0.265	0.791
EC -> AEC	0.242	5.716	0.000	0.046	0.859	0.390	0.209	5.76	0.000
GMO -> AEC	0.157	4.246	0.000	0.397	6.728	0.000	0.171	5.211	0.000
GSI -> AEC	-0.048	1.090	0.276	0.226	4.773	0.000	-0.018	0.448	0.655
GSI -> EC	0.404	8.015	0.000	0.417	9.495	0.000	0.436	10.361	0.000
GSI -> GMO	0.204	4.379	0.000	0.025	0.557	0.578	0.219	5.111	0.000
GSI -> IA	0.046	0.836	0.404	0.409	6.602	0.000	0.151	3.072	0.002
GSI -> INV	0.079	1.853	0.064	0.62	12.772	0.000	0.25	6.821	0.000
GSI -> PR	–0.035	0.635	0.526	0.102	0.794	0.427	–0.006	0.118	0.906
GSI -> PV	–0.008	0.137	0.891	0.320	5.483	0.000	0.093	1.822	0.069
GSI -> PP	–0.057	1.109	0.268	–0.145	1.646	0.100	–0.026	0.573	0.567
IA -> PP	0.52	12.941	0.000	0.926	11.264	0.000	0.575	16.076	0.000
INV -> AEC	0.072	2.242	0.025	–0.082	3.321	0.001	0.045	1.754	0.080
INV -> IA	0.150	3.623	0.000	0.086	2.196	0.028	0.165	4.881	0.000
INV -> PR	–0.016	0.338	0.735	0.008	0.076	0.939	0.002	0.041	0.967
INV -> PV	0.048	1.064	0.288	0.01	0.235	0.814	0.091	2.301	0.022
INV -> PP	0.092	2.574	0.010	–0.033	0.571	0.568	0.066	2.031	0.043
PR -> AEC	–0.108	3.093	0.002	–0.003	0.134	0.894	–0.069	3.063	0.002
PR -> IA	–0.167	4.183	0.000	–0.088	2.646	0.008	–0.128	4.856	0.000
PR -> PP	–0.136	3.747	0.000	–0.02	0.467	0.640	–0.099	3.826	0.000

	Segment-1			Segment-2			Total data		
	Estimate	T	P	Estimate	T	P	Estimate	T	P
PV -> AEC	0.309	7.870	0.000	0.465	9.514	0.000	0.339	9.167	0.000
PV -> IA	0.067	1.435	0.152	0.110	1.190	0.234	0.105	2.554	0.011
PV -> PP	0.026	0.558	0.577	–0.100	1.076	0.282	0.012	0.291	0.771
SC x EC -> AEC	–0.107	2.841	0.005	0.117	2.151	0.032	–0.107	3.141	0.002
SC x GSI -> AEC	0.054	1.426	0.154	0.026	0.598	0.550	0.083	2.585	0.010
SC x GSI -> EC	–0.159	4.578	0.000	–0.109	4.588	0.000	–0.095	3.888	0.000
SC x GSI -> GMO	–0.026	0.699	0.485	–0.030	1.990	0.047	0.028	1.073	0.284
SC x GSI -> IA	0.009	0.254	0.799	0.04	1.724	0.085	0.071	2.455	0.014
SC x GSI -> PR	–0.124	2.775	0.006	–0.049	0.651	0.515	–0.086	2.198	0.028
SC x GSI -> PV	0.048	1.193	0.233	–0.143	5.465	0.000	0.059	1.734	0.083
SC x GSI -> PP	0.029	0.732	0.464	0.095	1.681	0.093	0.078	2.673	0.008
SC x GMO -> AEC	–0.024	0.724	0.469	–0.216	5.621	0.000	–0.037	1.190	0.234

4.12.7 Multi-Group SEM Analysis

Lastly, multi-group SEM analysis was performed using FIMIX segments (Hair et al., 2016) to compare the differences in the effects on how the two segments influenced PP constructs. A PLS multiple-group analysis model was implemented for cross-segment comparison. Table 4.39 displays the results of the multi-group analysis and path coefficients difference values between Segment-1 and Segment-2. The respondents from Segment-1 acted as a reference group (or baseline). As shown in Table 4.40, 10 out of 15 instances showed significant difference between the two segments. Segment-2 had higher/stronger path coefficients than Segment-1. Consequently, Segment-1 had better/higher path coefficients than Segment-2 in five instances. In Segment 2, only SC x EC→ AEC and SC x GSI → PV, the moderation effect was significant. For Segment-1, SC x GSI → PV, SC x GMO → AEC, and SC x GMO →AEC were significant, which could have implications for model specifications and their outcomes for FIMIX in several ways.

First, the identification and estimation of subgroups in FIMIX may be affected by the presence of moderation effects (Irfan et al., 2022; Yoshikuni et al., 2019). If the relationship between variables differs across subgroups, this could lead to the identification of different subgroups or the estimation of different regression coefficients for each subgroup. Second, including moderators in FIMIX can improve model fit and increase the accuracy of subgroup identification and estimation (Hagenaars & McCutcheon, 2002). Overall, successful moderation effects can have important implications for FIMIX because they can affect the identification and estimation of subgroups and the accuracy of the model.

Table 4.39: Multi-group analysis using FIMIX segments

	Difference (S1–S2)	**1-tailed (S1 v. S2) p-value**	**2-tailed (S1 v. S2) p-value**
AEC -> IA	–0.126	0.895	0.210
AEC -> PP	–0.035	0.625	0.751
EC -> AEC	0.195	**0.002**	**0.005**
GMO -> AEC	–0.24	1.000	**0.000**
GSI -> AEC	–0.274	1.000	**0.000**
GSI -> EC	–0.013	0.579	0.842
GSI -> GMO	0.179	**0.004**	**0.008**
GSI -> IA	–0.363	1.000	**0.000**
GSI -> INV	–0.54	1.000	**0.000**
GSI -> PR	–0.137	0.838	0.323
GSI -> PV	–0.328	1.000	**0.000**
GSI -> PP	0.088	0.197	0.394
IA -> PP	–0.406	1.000	**0.000**
INV -> AEC	0.154	**0.000**	**0.000**
INV -> IA	0.065	0.126	0.251
INV -> PR	–0.024	0.575	0.850
INV -> PV	0.039	0.261	0.522
INV -> PP	0.125	**0.032**	0.064
PR -> AEC	–0.105	0.995	**0.010**
PR -> IA	–0.079	0.938	0.124

	Difference (S1–S2)	1-tailed (S1 v. S2) p-value	2-tailed (S1 v. S2) p-value
PR -> PP	–0.116	0.984	**0.033**
PV -> AEC	–0.155	0.994	**0.012**
PV -> IA	–0.033	0.626	0.747
PV -> PP	0.126	0.115	0.230
SC x EC -> AEC	–0.225	1.000	**0.001**
SC x GSI -> AEC	0.028	0.325	0.651
SC x GSI -> EC	–0.049	0.879	0.242
SC x GSI -> GMO	0.005	0.457	0.915
SC x GSI -> IA	–0.031	0.764	0.471
SC x GSI -> PR	–0.074	0.794	0.413
SC x GSI -> PV	0.191	**0.000**	**0.000**
SC x GSI -> PP	–0.066	0.824	0.353
SC x GMO -> AEC	0.192	**0.000**	**0.000**

Note: Bold = significant path estimate.

The multi-group SEM analysis comparing Segment-1 and Segment-2 in FIMIX revealed significant differences in path coefficients. Segment-2 generally had more prounounced path coefficients, while Segment-1 performed better in certain instances. The presence of moderation effects highlights the importance of including them in FIMIX because they can affect subgroup identification and improve model accuracy.

Table 4.40: Hypotheses Overview for the FIMIX Segments and Total Data

Hypotheses	Path	Segment 1	Segment 2	Total data
$H1_A$	GSI -> EC	Supported	Supported	Supported
$H1_B$	GSI -> GMO	Supported	Not supported	Supported
$H1_C$	GSI -> AEC	Not supported	Supported	Not supported
$H1_D$	GSI -> pp	Not supported	Not supported	Not supported
$H1_E$	GSI -> PV	Not supported	Supported	Not supported
$H1_F$	GSI -> PR	Not supported	Not supported	Not supported
$H1_G$	GSI -> INV	Not supported	Supported	Supported
$H1_H$	GSI -> IA	Not supported	Supported	Supported

Hypotheses	Path	Segment 1	Segment 2	Total data
$H2_A$	EC -> AEC	Supported	Not supported	Supported
$H2_B$	GMO -> AEC	Supported	Supported	Supported
$H4_A$	AEC -> IA	Supported	Supported	Supported
$H4_B$	AEC -> pp	Not supported	Not supported	Not supported
$H5_A$	PV -> pp	Not supported	Not supported	Not supported
$H5_B$	PV -> IA	Not supported	Not supported	Supported
$H5_C$	PV -> AEC	Supported	Supported	Supported
$H6_A$	PR -> pp	Supported	Not supported	Supported
$H6_B$	PR -> IA	Supported	Supported	Supported
$H6_C$	PR -> AEC	Supported	Not supported	Supported
$H9_A$	INV -> AEC	Supported	Supported	Not supported
$H9_B$	INV -> pp	Supported	Not supported	Supported
$H9_C$	INV -> IA	Supported	Supported	Supported
$H9_D$	INV -> PV	Not supported	Not supported	Supported
$H9_E$	INV -> PR	Not supported	Not supported	Not supported
H10	IA -> pp	Supported	Supported	Supported
$H7_A$	SC x GSI -> PV	Not supported	Supported	Not supported
$H7_B$	SC x GSI -> PR	Supported	Not supported	Supported
$H7_C$	SC x GSI -> EC	Not supported	Not supported	Not supported
$H7_D$	SC x GSI -> AEC	Not supported	Not supported	Supported
$H7_E$	SC x GSI -> GMO	Not supported	Not supported	Not supported
$H7_F$	SC x EC -> AEC	Not supported	Supported	Not supported
$H7_G$	SC x GMO -> AEC	Not supported	Supported	Not supported
$H7_H$	SC x GSI -> pp	Not supported	Not supported	Supported
$H7_I$	SC x GSI -> IA	Not supported	Not supported	Supported

Note: Bold = different hypotheses outcome for FIMIX segments and total data.

Table 4.40 provides an overview of the hypotheses for the FIMIX segments and total data, concluding that the most deviating segment was Segment-2. A path analysis was conducted to compare total data, Segment-1 and Segment-2. The results in Table 4.40 indicate that Segment-1 significantly differed from Segment-2 and total data in two out of thirty-three path coefficients. In contrast, Segment-2 showed 11 significantly different path coefficients compared with Segment-1 and total data. Additionally, total data had six statistically and significantly different paths compared with Segment-1 and Segment-2. Finally, in 14 path coefficients, segments and total data significantly shared the same path coefficients.

4.13 Chapter Summary

This chapter presented data using Smart-PLS. In the first section, preliminary data analysis was conducted including descriptive statistics, correlation analysis and factor analysis to determine the suitability of items and constructs. Validity and reliability were assessed. The construct, convergent and discriminant validity indicated sufficient evidence supporting the validity of the instruments. In addition, the reliability coefficient was also above 0.80, indicating a good and reliable instrument. Research hypotheses were tested in Smart-PLS. Direct, mediation and moderation effects were analysed separately. Two models were assessed, the overall model, including the moderation construct and the model without the moderation factor. Results concluded that both models (with and without moderation) fit adequately. Furthermore, Cohen's f-squared effect size was used to determine the utility of adding each interaction in a stepped fashion. Results concluded that there are direct effects of independent constructs on the dependent construct. EC and GMO are significant moderating constructs in the relationship between GSI and AEC. As far as moderation is concerned, SC with green products significantly moderates the relationship between GSI and EC. SC with green products significantly moderates the relationship between GSI and PP for electric cars. Lastly, two additional analyses were performed: one with control variables and the other without control variables. There was no significant difference in the model for controlling variables except for two controls. In addition, two segments were found through unobserved heterogeneity analysis, which will be discussed in Chapter 5.

Chapter 5 discusses the findings and establishes connections with existing literature. Additionally, it will outline the academic and practical contributions of this research. The chapter will conclude by discussing the limitations of the study, suggesting future research directions and summarising the key inferences drawn from the thesis. This will serve as the conclusion of the chapter and the thesis.

Chapter 5: Discussion and Conclusion

5.1 Introduction

This chapter concludes the thesis. Section 5.2 provides a summary of the work undertaken to produce this thesis, while Section 5.3 discussion of the main conceptual model and contribution. Section 5.4 presents a discussion of the influence of the control variables. Section 5.5 discusses the unobserved heterogeneity result (two segments PLS-SEM results) and Section 5.6 summarises of the discussion. Section 5.7 considers the research contribution for the green behaviour field, Section 5.8 discusses the research implications and Section 5.9 outlines the research limitations. Section 5.10 suggests opportunities for future research that upcoming researchers may wish to consider. Concluding remarks for this thesis are presented in Section 5.11.

5.2 Summary of the Research Work

Given the scant research on self-identity and green behaviour (Barbarossa et al., 2015) in oil-producing countries such as Saudi Arabia (K. Alzahrani et al., 2017), this study aimed to fill this gap. The key objective of this study was:

To assess the extent of GSI and how this influences the attitude towards and the probability of adopting electric cars among Saudi Arabian consumers.

To achieve the main objective of this study, four questions were formulated:

• *RQ1:* To what extent do GSI, EC, GMO, INV, PV, PR and AEC influence the intention and probability of purchasing electric cars?

• *RQ2:* Do EC, GMO, PV and PR mediate the relationship between GSI and AEC as well as the probability of purchasing electric cars?

• *RQ3:* Does SC moderate the relationship between the constructs in the posited model?

• *RQ4:* Are there segments of customers with different attitudes, values and behaviours among potential consumers of electric cars?

Section 5.6 presents the answers to the research questions. A comprehensive literature review on GSI and green behaviour was conducted to meet the goals of this research and answer the questions raised. This study demonstrates that having a GSI is a cognitive framework that moves someone to engage in certain environmentally friendly activities, such as buying an electric car that is good for the environment. For a potential buyer that has an environmentally friendly identity, it acts as a primary driver for correspondingly engaging in certain environmentally friendly acts (Confente et al., 2020). The influence of a consumer's 'green' self-identity is reliant on developed norms (Barbarossa et al., 2015). In this investigation, there was a clear need to ascertain the role of self-identity on green car attitude and stated PP. Important dimensions of green customer behaviour were included in the conceptual model (see Figure 2.4), along with several constructs and hypotheses. The conceptual framework consisted of GSI, INV, EC, GMO, PV, PR, AEC, AI and PP as dependent constructs. The study employed green SC as a moderating construct, allowing for exploration of dynamics in the main structural model. The proposed model, the development of its hypotheses and the literature review were detailed in Chapter 2.

A quantitative methodology was employed for this inquiry. An online questionnaire instrument was developed, subsequently translated and subjected to a pilot study to gather data from participants. The questionnaire gathered data from 822 Saudi Arabian individuals. The individuals were chosen through a convenience selection process. Chapter 3 of the study explicated the methodology utilised to conduct the research comprehensively. The data analysis in this study employed PLS-SEM and the results presented in Chapter 4 offer empirical validation for the proposed model.

This chapter discusses the results in the context of previous and select new literature. It discusses the results of the hypothesis testing on the basis of the posited conceptual model. Also, this chapter discusses how the study's findings contribute to academic knowledge in the domain of green behaviour. The managerial, public policy and theoretical implications are also discussed (see Section 5.7 and 5.8). Finally, the limitations and avenues for future research are discussed (see Sections 5.9 and 5.10).

5.3 Discussion of the Main Conceptual Model

The hypothesis of the relationship between GSI and EC, GMO, INV and AEC was accepted on the basis of significant and meaningful path coefficients. In the main model, the path between GSI and AEC, green car PP, PV and PR was not significant. The hypothesised relationship between the EC of using cars and AEC and the hypothesis relationship between GMO and AEC was significant.

5.3.1 Green Self Identity

To summarise, the relationships between GSI and EC, GMO, INV and AEC were significant. The direct relationships of GSI with AEC, green car PP, PV and PR were not significant. Table 4.27 lists the hypotheses results.

H 1a: GSI and EC

The model illustrates a path between GSI and the perceived EC of using electric cars. Summary results for GSI are outlined in Sections 4.3.1 and 4.9.1. This hypothesis was able to achieve the study's objective by showing positive and significant outcomes (see Table 4.27). Barbarossa, De Pelsmacker et al. (2017) found that GSI affected the intention to adopt electric cars. However, in their model, they did not clearly state the consumer EC of using environmentally friendly cars. A previous study by the same authors (Barbarossa et al., 2015) showed the positive and direct impact of GSI on the EC of using an electric car.

This investigation established that GSI has a significant direct and positive impact on the EC of using cars among people of Saudi Arabia. The results of the current investigation concur with Sharma et al. (2022) and Sinnappan and Rahman (2011), who identified that GSI has a positive impact on consumers to adopt more environmentally friendly products. Similar results were presented recently by M. Y. Bhutto et al. (2022) and Y. Li et al. (2021).

H 1b: GSI and GMO

The study identified issues with GSI and GMO among Saudi Arabian consumers. H1b proposed a positive direct effect of GSI on GMO. Summary results for GSI can be found in Sections 4.3.1 and 4.9.1.

GSI has a positive direct effect on consumers of Saudi Arabia's GMO (see Table 4.27). A similar study by Shang and Wu (2022) identified that the cultivation of a GSI is a crucial factor that influences individuals' sense of moral obligation towards the consumption of green products. However, in a previous study, the relationship was found to have an indirect impact. For this investigation, the supported relationship was direct. A similar result was observed in direct effect by Barbarossa et al. (2015, 2017) and M. Chen (2020); the study described that GSI has a significant and beneficial impact on customer morality to embrace EVs. Recent research on GSI and GMO in adopting electric cars has identified positive and direct relationships for existing and even for new potential users (Han et al., 2021; Higueras-Castillo et al., 2020; Hojnik et al., 2021) that support this study finding.

H 1c: GSI and AEC

GSI is reported in Sections 4.3.1 and 4.9.1. According to the research findings, GSI did not significantly influence Saudi Arabian consumer attitudes towards the adoption of eco-friendly electric cars (see Table 4.27). This does not concur with the findings of Barbarossa et al. (2017), who demonstrated that GSI has a significant impact on changing the behaviour or attitude of consumers towards adopting electric cars to protect the external environment. However, the study found that the consumer's intention to buy electric cars is influenced by the acceptance of new changes because EVs are considered an innovation (Barbarossa et al., 2017). According to Armenio et al. (2022), consumers' eco-friendly behaviour is one of the reasons to adopt electric cars. R. Liu et al. (2021), H. Singh et al. (2023) and He et al. (2018) found that individuals' attitudes to adopting green cars are positively affected by GSI. These findings are similar to those of the current research and previous research by Asadi et al. (2021), Gulzari et al. (2022) and Tarigan (2019).

H 1d: GSI and green car PP

In terms of the positive direct effect between GSI and green car PP, summary results for GSI can be found in Sections 4.3.1 and 4.9.1. The current study findings show that GSI has no positive direct impact on Saudi Arabian consumers' PP of buying green cars (see Table 4.27). This contrasts with the findings of L. Li et al. (2022), who established that Chinese consumers' purchasing decisions of EVs are positively affected by GSI. This thesis finding is atypical and supports the rationale for checking dataset heterogeneity using FIMIX (see Sections 4.12 and 5.4) to determine if segmentation gains explanatory power. Additionally, the findings of Neves and Oliveira (2021) and Chng et al. (2019) do not concur with the thesis results. They supported the role of GSI influencing consumers to adopt green products (Y. Joshi et al., 2021; Mou et al., 2020; Zhao et al., 2018).

H1e: GSI and PV of electric cars

Summary results for GSI and for H1e are found in Sections 4.3.1 and 4.9.1. The findings indicate that GSI has no significant direct positive impact on the PV of electric cars (see Table 4.27). Findings show that the consumers of Saudi Arabia's GSI were unable to influence their perception positively. Consumers may have noticed that the net benefit of electric cars is relatively lower in terms of meeting their environmental desires, sustainable expectations and green requirements. This is in comparison with the value offered by gasoline vehicles (Ottman et al., 2006). For this investigation, GSI or a consumer's tendency to be eco-friendly failed to impart a positive PV of an electric car. According to Barbarossa et al. (2017), consumers who prioritise less-conservative ideals are less likely to use EVs and less likely to consider the ecological and moral implications of their purchasing decisions. They emphasised that consumers who have self-improvement ideals express their GSI by directly incorporating environmental and moral considerations into their goals, while still approaching green behaviour with a sense of seriousness. It can be inferred that the underlying reason of engaging in self-improvement and prioritisation of less-conservative ideals for Saudi Arabia's consumer's group is that they believe the level of PV offered by electric car ownership is low. Confente et al. (2020) outlined the significant positive impact of GSI on the PV of green products adoption. Similarly, Loaiza-Ramírez et al. (2022) established that consumers who prefer environmentally friendly cars tend to be keener to buy electric cars with renewable energy sources. Finally, previous studies (Berraies et al., 2017;

M.-K. Kim et al., 2018; Nosi et al., 2017) have shown that consumers who do not prioritise environmental concerns are more likely to ignore EVs.

H1f: GSI negatively influences the PR of adoption.

Consumer understanding of new technology and infrastructure can be slow (Khazaei & Tareq, 2021). In terms of EVs, it is very normal for consumers to think about outcomes of their purchase decisions, including factors like range and durability. Summary results for GSI feature in Section 4.3.1 and H1f results can be found in Section 4.9.1. The finding confirms that the role of GSI negatively influencing the PR of adoption of EVs cannot be confirmed. (see Table 4.27). Thus, it can be said that individuals in Saudi Arabia with a strong GSI may experience a reduction in their PR when considering the adoption of EVs. To explain this dynamic, He et al. (2018) stated that consumers might be concerned about the range and durability of EVs. The study findings reinforce that consumers' GSI negatively influences consumers' PR of adopting EVs. In addition, L. Li et al. (2022) established that consumers' self-identity motive is driving them to adopt EVs. N. K. Jain et al. (2022) claimed that the adoption of electric cars is higher when usage-related risk is lower—they added that PR negatively affects consumers' buying behaviour towards environmentally friendly electric cars. Consumer understanding of EVs was positively and substantially associated with perceived utility, attitude and desire to adopt EVs but adversely and strongly connected to PR. According to Featherman et al. (2021), the risk of EV adoption is negatively affected by privacy risk. Risk perception has a detrimental impact on perceived utility, attitude and desire to embrace EVs, as identified by researchers (Rotaris et al., 2021; Thøgersen & Ebsen, 2019; Wang et al., 2018). Han et al. (2021) described that consumers' GSI to adopt green products is unable to be affected by the PR of consumers, which is similar to the current study outcome. Thus, it is important to overcome the risk of adopting electric cars. To overcome the financial barriers to buying electric cars, the government should reinforce incentives at the national and local levels (Giansoldati et al., 2020); to minimise the charging time, there should be investments in fast-charging stations along the main toll highways (Rotaris et al., 2021). Finally, reliable and complete information is needed to enhance knowledge of the technological and environmental pros and cons of electric cars so that consumers can adopt electric cars.

H 1g: GSI has a positive direct effect on innovativeness.

GSI is profiled in Section 4.3.1 and H1g can be found in Section 4.9.1. This investigation found that GSI significantly and positively affects consumers' innovativeness towards green activities (see Table 4.27). The current study produced similar findings that described that GSI for Saudi Arabia's consumers significantly leads to more innovations. L. Huang et al. (2022) discussed that the centrality of GSI influences individuals to be more innovative towards developing and using green products. R. Liu et al. (2021) conducted a study to explore components that influence the intention to adopt EVs from the perspective of consumer GSI and innovativeness. The authors found a positive influence of innovativeness on the adoption of EVs, which is supported by the works of Flores and Jansson (2022) and Mutum et al. (2020).

H1h: GSI positively affects green car IA.

For summary results for GSI, see Sections 4.3.1 and 4.9.1. This investigation established that GSI has a significant direct positive impact on IA. Findings show that the consumers of Saudi Arabia's GSI significantly influence their green car IS. The findings complement those of Barbarossa et al. (2015) and Barbarossa, De Pelsmacker et al. (2017), who established that the consumer's GSI has a significant direct impact on the consumer's intention to buy or adopt green or electric cars. Sharma et al. (2022) observed how individuals' self-identity towards greening affects their green-buying intentions. Similarly, L. Li et al. (2022) and M. H. Bhutto et al. (2020), along with He et al. (2018), Nam et al. (2017) and Wijekoon and Sabri (2021), discussed that consumers are adopting green cars or electric cars because of their self-motives to save the environment and purchase intention of green cars increasing. Section 5.6 provides a summary of the discussion.

5.3.2 Care for the Environmental Consequences of Using Electric Cars

To summarise, the hypothesis of the relationship between care for the EC of using electric cars and the attitude towards adopting eco-friendly electric cars is accepted on the basis of the findings because it is significant. Thus, the hypothesis is accepted for these relationships.

H2a: EC has a positive direct effect on AEC.

Summary results for EC are presented in Section 4.3.2 with H2a featured in Section 4.9.1. Findings established that EC significantly affects Saudi Arabian consumer attitudes towards adopting eco-friendly cars. The concept of EC is to make people aware of environmental safety and damage. These findings were similar to those obtained by Barbarossa et al. (2015) and Barbarossa et al. (2017), who identified that EC has a significant positive direct impact on AEC. Recent studies have yielded similar results. For instance, Cruz-Jesus et al. (2023) emphasised that consumers' environmental awareness plays a crucial role. Additionally, L. Li et al. (2022) highlighted the significance of consumers' eco-friendly behaviour and pro-environmental tendencies in influencing their preference for electric or green cars over gasoline cars. These findings align with research conducted by Dash (2020), Lashari et al. (2021), Shim et al. (2018) and Patyal et al. (2021).

H3a: EC is expected to mediate the relationship between GSI and AEC.

The finding reveals that EC affects Saudi Arabian consumers' attitudes and subsequently the adoption of eco-friendly cars (see Table 4.29). Sections 4.3.2 and 4.9.2 present the findings. Overall, EC mediates the relationship between GSI and AEC. This result aligns with the findings of Barbarossa et al. (2015). Additionally, Barbarossa et al. (2015) discussed that the ecological care of consumers has a significant mediating effect between GSI and electric car adaptation. According to Barbarossa et al. (2015), GSI and EC have a positive and significant relationship. This study's findings showed a negative relationship between GSI and AEC and a positive relationship between EC and AEC. Han et al.'s (2021) findings did not concur with the thesis results. Therefore, the generalisability of the current findings is crucial in different sectors and different regional contexts. Section 5.6 provides a summary of the discussion.

5.3.3 Green Moral Obligation

To summarise, the path relationship between GMO and AEC is significant. Thus, the hypothesis was accepted.

H2b: GMO has a positive direct effect on AEC.

The results for GMO are situated in Section 4.3.3 and summary results for H2b in Section 4.9.1. Interpreting the finding, for Saudi Arabian consumers, GMO had a significant positive direct impact on AEC. This research thesis results are similar to those of Barbarossa et al. (2017) and the result illustrates that GMOs can influence consumer attitudes towards adopting electric cars. Furthermore, Chng et al. (2019) identified that consumers in the UK had significantly higher environmental consideration while buying cars.

The findings mirrored those of Armenio et al. (2022), who found that consumers' morality towards saving the environment positively affected AEC. Additionally, buyers appear to be concerned with the level of environmental friendliness (A. M. Khalid & Khuman, 2022). Not surprisingly, environmental concern has been studied as a construct influencing consumers' attitudes and behaviour towards adopting electric cars (V. Singh et al., 2020). The current study has contributed to the existing literature and theory by identifying the significant impact of GMO) on attitudes towards adopting green cars.

H3b: GMOs are expected to mediate the relationship between GSI and AEC.

Summary results for GMO feature in Section 4.3.3. H3b is reported in Section 4.9.2. The results show a significant mediating effect of GMO in the relationship between GSI and EC (see Table 4.29). This current study obtained similar findings to those of Barbarossa et al. (2015), who established that GMOs have a significant mediating impact between GSI and AEC in the Italian and Belgium contexts.

Han et al. (2021) showed that GMO is positively and significantly associated with GSI and attitude toward adopting eco-friendly aeroplanes. According to Higueras-Castillo et al. (2020), GMO is a crucial element in driving consumers towards adopting electric cars. Additionally, higher GMO means that consumers are concerned about the environment and interested in adopting EVs. Barbarossa et al. (2017) observed that consumers' moral obligation to behave pro-environmentally has a positive and significant impact on their adaptation to green cars. The current study identified that consumer GMO positively mediates the relationship between GSI and AEC. Within this finding, this study has contributed to the existing literature by adding new findings and broadening the research scope practically and theoretically. Section 5.6 provides a summary of the discussion.

5.3.4 The Attitude Toward the Adoption of Electric Cars

The hypothesis of the relationship between AEC and IA was significant. However, the study was unable to find a significant impact of AEC on the PP of electric cars.

H4a: AEC has a positive influence on green car IA.

Summary results for AEC can be found in Section 4.3.8 and summary results for H4a are featured in in Section 4.9.1. The study identified that AEC has a significant positive direct impact on the IA of eco-friendly electric cars. This was aligned with a previous study by Barbarossa et al. (2015), as they previously confirmed a significant direct relationship between AEC and IA.

J. Kim et al. (2014) established that consumers' intention to buy electric cars was influenced by their attitude towards environmental friendliness behaviour. Similarly, researchers have identified that consumers' attitudinal characteristics positively increase their intention and willingness to buy EVs or green cars (Westin et al., 2018). Liu et al. (2020) suggested that consumer attitude has the most powerful and distinct contribution to explaining electric cars or green car AI, which matches the current study finding. Because electric cars or green cars are considered new items, favourable experiences with other creative products may reinforce positive sentiments towards willingness to buy electric cars (Jaiswal et al., 2021; Shakeel, 2022).

H4b: AEC has a positive influence on green car PP.

Summary results for AEC are reported in Section 4.3.8 and H4b is reconciled in Section 4.9.1. Thesis findings showed that AEC had no significant positive influence on Saudi Arabia's consumers PP toward eco-friendly or green cars (see Table 4.27). The study's empirical findings complement those of Coffman et al. (2016), in which the authors discussed that consumers' AEC does not match actual buying behaviour. The authors highlighted that the actual sales of electric cars were significantly lower than consumers' preferences, which aligns with the findings of the current study. However, AEC indirectly affects consumers' buying probability with EC attitude (Egbue & Long, 2012; W. Li et al., 2017; T. Lu et al., 2020). Furthermore, the researchers found that consumers' positive attitude towards adopting electric cars is valuable for designers in creating suitable models that align with consumers' preferences, leading to a higher probability of purchase (Bansal et al., 2021; Ghasri et al., 2019; Ling et al., 2021). Section 5.6 provides a summary of the discussion.

5.3.5 Perceived Value

To summarise, the relationship between PV and AI and AEC was significant, whereas PV had no significant impact on PP.

H5a: The PV of electric cars has a positive effect on PP.

For summary results for PV, see Section 4.3.5. H5a is outlined in Section 4.9.1. The current investigation conflicts with previous study conclusions that identified a positive and direct relationship between PV and buying electric cars (Asadi et al., 2021; Salsabila & Hartono, 2023; Da Costa et al., 2020). The adverse results of this study can be attributed to two main factors. First, the relatively new concept of electric cars in Saudi Arabia may have led to lower adoption rates. Second, the country's abundant availability of oil has kept the prices of conventional vehicles comparatively lower than electric ones, making the latter appear more expensive to consumers.

It has been identified that developers are facing a difficult task securing purchasers of electric cars (Dixit & Singh, 2022). The study further suggests that consumers' PV in buying electric cars depends on age, gender, income, level of environmental concerns, vehicle cost, running cost, vehicle performance, driving range and mass behaviour. Consumers show a higher level of receptivity to initial pricing incentives compared with ongoing operational cost incentives (Dixit & Singh, 2022; Junquera et al., 2016). Ghasri et al. (2019) outlined that the purchase of green cars will be higher with incentives or rebates for buyers and manufacturers. The current study intends to identify the direct relationship between PV and the probability of purchasing a green car. However, it has been identified that there is no significant relationship in this study context.

H5b: The PV of electric cars has a positive effect on IA.

Summary results for PV are situated in Section 4.3.5 and those for H5b can be found in Section 4.9.1. According to the findings, PV has a significant direct positive effect on IA (see Table 4.27). The investigation finding contrasts with those of Coffman et al. (2016), which concluded that the consumer's attitude to buying electric cars did not align with their purchase intention outcome. This observation aligns with the current hypothesis, indicating that PV has a positive effect on intention but a negative effect on PP. W. Zhang et al. (2022) reported that the PV of consumers has a direct positive impact on the intention to purchase EVs, in consensus with the thesis findings. Additionally, He and Hu (2021) found that PV has a positive impact on the purchase intention of electric or green cars. According to Ng et al. (2018) and Xie et al. (2022), consumers' intention to buy electric cars increases if they find subsidies or incentives from government bodies because government involvement makes it valuable to the consumers. The Saudi Government launched many initiatives to support adopting green choices in general and electric cars in particular (see Section 2.3.2).

H5c: The PV of electric cars has a positive effect on AEC.

Summary results for PV feature in Section 4.3.5 and summary results for H5c can be found in Section 4.9.1. The findings show that PV had a significant positive effect on IA. This concurs with Afroz et al. (2015) and Higueras-Castillo et al. (2020), who showed that the PV of consumers positively influences consumer attitudes towards adopting electric cars. In addition, consumers' PV are associated with factors such as lower purchase prices owing to government-controlled regulations and the presence of adequate infrastructure for EVs, including charging stations, fast lanes and free parking spaces (Broadbent et al., 2021; Ottesen et al., 2022). The current study contributes significantly to the existing literature by revealing a positive relationship between PV and AEC.

H8a: PV is expected to mediate the relationship between GSI and green car PP.

Summary results for PV are presented in Section 4.3.5 and results for H8a can be found in Section 4.9.2. According to the study findings, there was an insignificant mediating effect of PV in the relationship between GSI and green car PP (see Table 4.29). The current study findings did not replicate previous findings by Confente et al. (2020). Also, it is important to note that Khan and Mohsin (2017) established that consumers' behaviour towards environmentally friendly products was significantly mediated by their values towards the environment. Similarly, M.-K. Kim et al. (2018) reported that the PV of consumers influenced them to buy electric cars in Korea. De Medeiros et al. (2016) found that consumers' PV increased their willingness to buy electric cars in Brazil. The insignificant mediating effect observed in this study can be attributed to the country's abundant availability of oil, which has kept the costs of conventional vehicles comparatively lower than electric ones, potentially diminishing the impact of PV in influencing consumers' preference for green cars. As a result, the mediating effect of PV on green car adoption may have been overshadowed by these factors. Section 5.6 provides a summary of the discussion.

5.3.6 Perceived Risk

The hypotheses of the relationship between PR and PP, AI and AEC was significant.

H6a: PR negatively influences green car PP.

Summary results for PR are outlined in Section 4.3.6 and summary results for H6a can be located in Section 4.9.1. The findings show that the PR had a significant negative effect on PP. This finding is in the intended direction because Saudi Arabians exhibit a significant negative downward effect on their purchase of electric cars. Previous studies also discussed that PR reduces the PP of consumers' future consumption (Jiang et al., 2021; Letmathe & Suares, 2020; Xie et al., 2022). Similar to the current study, Garretson and Clow (1999) and He et al. (2018) found that PR had a negative effect on consumers' intentions to purchase electric cars. According to Shu et al. (2022), performance risk, electric charging, maintenance value and charging time were crucial risk terms that negatively influence consumers' purchase behaviour of electric cars. These risks create barriers for consumers in Saudi Arabia, leading to a lower adoption rate of electric cars. However, the current study suggests that the purchasing of electric cars in Saudi Arabia is likely to increase if these risk factors are effectively reduced or addressed.

H6b: PR negatively influences green car IA.

Summary results for PR can be found in Section 4.3.6 and summary results for H6b in Section 4.9.1. The findings show that PR had a significant negative effect on PP (see Table 4.27).

Parallel to this study, Lou et al. (2017) and Jiang et al. (2021) identified that consumers' PR has negative influences on consumers' green car intentions. The thesis results support their contention. As per McLeay et al. (2018), the negative association emerged because PR had a detrimental effect on product purchasing behaviour. Any consumer that has genuine concern about environmentally friendly items would have a higher propensity to investigate harm and risks for the environment. As a result, to improve interest in purchasing electric cars, the green PR should be minimised (Dhewi et al., 2018; Jiang et al., 2021).

H6c: PR negatively influences AEC.

Summary results for PR are documented in Section 4.3.6 with summary results for H6c outlined in Section 4.9.1. The findings of the study show that PR has a significant negative effect on AEC (see Table 4.27). This finding aligns with those of Jayani et al. (2022) that customers' attitudes towards adopting electric cars were negatively influenced by PR. The current study was partially related to the Zang et al. (2022), in which the authors found that PR negatively affected Chinese consumers' attitudes towards adopting electric cars. Al-Majali (2020) and Lan et al. (2019) observed that financial risk, functional risk, social risk and time risk had a negative and significant impact on consumers' purchasing attitudes towards electric cars. Therefore, the consumer of Saudi Arabia finds electric cars a risky investment. Thus, their attitude to adopting electric cars was negatively affected by PR.

H8b: PR is expected to mediate the relationship between GSI and green car PP.

The current study has hypothesised that PR has a mediating effect between GSI and PP. Summary results for PR are profiled in Section 4.3.6 and discussion of H8b can be found in Section 4.9.2. The findings of the study show an insignificant mediating effect of PR in the relationship between GSI and green car PP (see Table 4.29). Therefore, PR was not a mediating construct in this case. The current study has similar findings to the those of Han et al. (2021), in which the author studied the effect of PR on the relationship between GSI and consumers' purchase of green products. Dhewi et al. (2018) found PR of consumers towards electric cars was negatively associated with purchase behaviour. All hypotheses on PR have shown a similar results pattern for this model. The current study was significant because it provided a generalisable outcome by aligning with previous studies in a Saudi Arabia context. Section 5.6 provides a summary of the discussion.

5.3.7 Innovativeness

In summary, innovativeness had a significant positive relationship with PP, IA and PV, while its relationship with AEC and PR was insignificant.

H9a: INV has a positive direct effect on AEC.

The results for innovativeness are presented in Section 4.3.4 and summary results for H9a are tabled in Section 4.9.1. The study identified that innovativeness had no significant positive direct impact on consumers' AEC (see Table 4.27). The current study is in consensus with Chao et al. (2021), who concluded that consumers were not influenced by innovativeness to adopt electric cars. Unlike this thesis investigation, previous studies on innovativeness and consumer attitude towards the adoption of electric cars have illustrated a positive correlation. Flores and Jansson (2022) described that consumer innovativeness affects attitudes towards adopting green cars. Similarly, Shanmugavel and Micheal (2022) demonstrated the importance of customers' own innovativeness in the pursuit of items that include new technology. In the case of the current thesis, innovativeness was insignificant in the Saudi context. Because this hypothesis was not supported, it is difficult to compare this result with the literature but possibly the EV category is still too underdeveloped or complex for consumers to make this connection with level of innovativeness (Khazaei & Tareq, 2021). Another possible reason could be because gasoline is widely available and extremely cheap compared with the high-priced electric cars with their supplementary charging infrastructure costs (He et al., 2018). Electric cars are a relatively recent innovation and consumers may still perceive certain advantages and conveniences offered by gasoline cars over electric cars.

H9b: INV has a positive direct effect on green car PP.

The investigation revealed a significant positive impact of consumers' innovativeness on the probability of purchasing green cars in Saudi Arabia (see Table 4.27). Summary results for innovativeness can be found in Section 4.3.4 and summary results for H9b are featured in Section 4.9.1. Yang and Chen (2021) showed that innovativeness is more likely to increase the probability of consumers buying electric cars owing to their heightened concern for the environment. Yang and Chen's findings align with multiple studies in which innovativeness has been found to be a core element positively influencing the purchase of green cars (Cecere et al., 2018; Chao et al., 2021; Morton et al., 2016; Paparoidamis & Tran, 2019; Plötz et al., 2014). This investigation finding has significantly contributed to the existing literature by showing a direct impact.

H9c: INV has a positive direct effect on green car IA.

The results for innovativeness can be found in Section 4.3.4 and summary results for H9c are located in Section 4.9.1. The study identified a significant positive direct effect of consumers innovativeness on green car purchase intention in Saudi Arabia (see Table 4.27). Similarly, Carley et al. (2013) explained that the innovativeness of green cars has significantly and positively affected IA. The current study implication aligned with those of previous studies, in which innovativeness was shown to have a positive direct relationship with IA (Alzubaidi et al., 2021; Chao et al., 2021; Deng & Nam, 2022; Tu & Yang, 2019; Xiao & Zhang, 2022). Thus, it can be said that innovativeness is crucial for consumers' purchase intention development towards green cars.

H9d: INV has a positive direct effect on PV.

The findings demonstrated that innovativeness has a significant positive direct effect on the PV of green cars (see Table 4.27). Summary results for innovativeness are featured in Section 4.3.4 and H9d is discussed in Section 4.9.1. The current study finding is in consensus to Pham et al. (2020), whereas innovativeness has been identified as positively affecting the PV of consumers. Environmental factors are a major selling point for electric cars (Benzidia et al., 2021; Morton et al., 2016; Rezvani et al., 2015; Sovacool et al., 2019). The current study found that consumers' innovativeness significantly shapes their PV of electric cars. By embracing innovative and eco-friendly technologies, consumers positively perceive electric cars for their environmental benefits.

H9e: INV negatively influences the PR of EV adoption.

The study identified that innovativeness has an insignificant negative impact on the PR of EV adoption (see Table 4.27). Summary results for innovativeness are presented in Section 4.3.4 and for H9e, see Section 4.9.1. The current study's findings differ from those of He et al. (2018) because they revealed that innovativeness has a negative influence on the PR of EV adoption. Al-Majali (2020) mirrored the investigation finding, outlining that innovativeness has no impact on reducing the level of PR of consumers towards buying electric cars. For this thesis, despite innovativeness, various risk factors associated with electric cars, such as financial risk, durability, mileage and battery concerns, remained unaffected and could not be reduced. As time progresses, electric cars are expected to be adopted by a growing number of consumers. However, for widespread adoption, it is crucial to lower the price so that individuals with lower economic means can also afford them (Fett et al., 2018; He & Hu, 2021; Müller, 2019). Lowering the cost of EVs will make them more accessible and appealing to a broader range of consumers, contributing to the transition towards sustainable transportation. Section 5.6 summarises the discussion.

5.3.8 Intention to Adopt Eco-friendly Electric Cars

The investigation revealed a significant positive relationship between AI and the PP of electric cars.

H10: Green car IA has a positive influence on green car PP.

Summary results for the intention to adopt eco-friendly electric cars are highlighted in Section 4.3.9, while Section 4.9.1 discusses H10. It can be concluded that consumers in Saudi Arabia have a higher probability of purchasing green cars, as indicated by their stronger intention to buy. To date, current literature does not cover this key finding. A vast array of researchers has studied the purchase intention of electric cars (Degirmenci & Breitner, 2017; J. Kim et al., 2016; Lashari et al., 2021), but few researchers have discussed the relationship between IA and PP (Juster, 1966; Morrison, 1979; Wright & MacRae, 2007). This finding represents a significant contribution to the dearth in the current literature. Current study findings have created scope for future studies to adopt the current hypothesis to further test this key finding. Section 5.6 provides a summary of the discussion.

5.3.9 Green Self-congruity

To summarise, the hypotheses of the moderation effect of green SC between GSI and PV, EC and GMO; between EC and AEC; GMO and AEC were not supported, whereas the moderation effect between GSI and PR, AEC, PP and IA was supported. A further description of the hypothesis is featured below.

H7a: SC with green products positively moderates the relationship between GSI and PV for electric cars.

Section 4.3.7 contains summary results. The study findings show that SC has no moderating impact on the relationship between GSI and PV for Saudi consumers (see Table 4.30). The current finding did not align with that of Confente et al. (2020), who found a positive and significant moderating impact of SC between GSI and PV. The thesis finding aligns with those of Gravelines et al. (2022), who reported an outcome in which SC has an insignificant moderating effect on the relationship between GSI and sustainable behaviour. R. R. Kumar and Alok (2020) posited that consumers open to considering an electric car had a high level of SC and viewed it as a sign of personal identity. Several studies have made significant contributions to the use of green aeroplanes (Han et al., 2019, 2021). They have explored areas such as utilising bioplastics to promote sustainability (Confente et al., 2020; Salsabila & Hartono, 2023), adopting eco-friendly food consumption practices (Gravelines et al., 2022) and investigating electric car adoption (Barbarossa et al., 2015; Barbarossa et al., 2017; Gulzari et al., 2022). These studies collectively form a research landscape with a positive focus on the impact of green SC on the use of environmentally friendly products. The divergence in findings can likely be attributed to the distinct behaviours and preferences of Saudi Arabian consumers regarding cars. Economic factors, including the country's oil-based economy (Alam et al., 2012) and market dynamics characterised by high consumption levels (Assad, 2007) could play a significant role in shaping how customers perceive and engage with green personality traits and the associated value. The disparity in findings should be explored further in future research endeavours.

H7b: SC with green products negatively moderates the relationship between GSI and PR for electric cars.

It was established that SC negatively moderates the relationship between GSI and PR. Summary results for SC are located in Section 4.3.7 and summary results for H7b in Section 4.9.3. The results indicated that the data supported the hypothesis. Additionally, the negative beta coefficient value indicated that SC negatively moderates the relationship between GSI and PR for electric cars (see Table 4.30). Many studies have identified that SC moderates the relationship between GSI and PV, in which the relationship was significantly positive (Confente et al., 2020; Salsabila & Hartono, 2023). Also, Gravelines et al. (2022) observed a positive moderating relationship of SC between GSI and green product consumption. However, the moderating effect of SC between GSI and PR is scarce. Through this study, it was found that when Saudi consumers' SC increases, it minimises the PR regarding electric cars. Likewise, when Saudi consumers have a lower level of SC, it increases the PR regarding electric cars. The moderation effect was determined by the interaction effect of the independent constructs and moderating constructs (see Appendix 6 for moderation effects' interaction).

These results can be explained within the literature; for instance, Khare and Pandey (2017) found that GSI leads to lower PR, and lower PR leads to higher purchase intention. Consumers' beliefs concerning environmental problems can influence their green environment behaviour. SC could reduce consumers' level of PR. A stronger self-concept tied to green products has the potential to reduce PR in consumer behaviour. This SC factor plays a role in mitigating PR for individuals considering an electric car purchase. This decreased risk perception significantly influences their actual purchasing behaviour, as highlighted by X. Zhang and Yu (2020) and confirmed by this current study. The current study has contributed to the existing literature by being the first to explore these relations. In the Saudi context, it has been discovered that SC exerts a negative moderating influence between GSI and PR. To extend this hypothesis, additional research is warranted to assess and confirm the present findings across broader contexts.

H7c: SC with green products positively moderates the relationship between GSI and EC.

The current study hypothesised that SC positively moderates the relationship between GSI and EC. Summary results for SC are featured in Section 4.3.7 and summary results for H7c are presented in Section 4.9.3. Findings show that the hypothesis was significant. However, owing to a negative beta result, the moderation effect became adverse or negatively affected the relationship (see Table 4.30). The negative beta coefficient value indicated that SC negatively moderates the relationship between GSI and EC. This result contradicts the original posited research hypothesis. There may be a reason for this negative moderation effect. A previous study showed that GSI has a positive and significant relationship with EC (Barbarossa et al., 2015), whereas the current investigation found a similar significant outcome. However, the moderation effect was negative owing to a negative beta value. For instance, the negative result may be explained by Saudi consumers having concerns about the environment, but they were sceptical about electric cars and whether the electric cars can affect the environment in a friendly way, as discussed by Hojnik et al. (2021). The study's current findings enrich the existing literature by unveiling novel insights; Saudi consumers exhibiting high self-congruity exhibit a weakened link between GSI and EC.

H7d: SC with green products positively moderates the relationship between GSI and AEC.

The current study hypothesised that SC positively moderates the relationship between GSI and AEC. Summary results for SC can be found in Section 4.3.7 and summary results for H7d are located in Section 4.9.3. The study finding shows that SC positively moderated the relationship between consumers' GSI and AEC (see Table 4.30). This is an interesting finding that suggests that consumers' self-identity and attitudes towards the adaptation of eco-friendly electric cars are significantly moderated by SC. Consumers with higher SC regarding electric cars have a higher level of attitude towards the adoption of eco-friendly electric cars (Moons & De Pelsmacker, 2015). Likewise, Han et al. (2021) identified a notable positive effect of both GSI and AEC. The subsequent research explored the emotion of pride associated with electric car purchases. Another recent study identified SC as a moderator between GSI and consumers' buying behaviour towards green product consumption (Gravelines et al., 2022). This result can be understood by consideration that Saudi consumers' AEC could easily be influenced by the reviews, feedback and recommendations of other people who are important to them, such as friends, family members or consumers. Their opinions, endorsements and positive or negative reviews provide information that influences consumers' green SC and attitudes to opt for green products. People's care for the environment and consideration of the moral duties also enables them to have higher green SC, which influences their AEC. Barbarossa et al. (2017) established that GSI leads to the intention to adopt electric cars with mediating role of ecological care and moral obligation.

H7e: SC with green products positively moderates the relationship between GSI and GMO.

Summary results for the notion that SC positively moderates the relationship between GSI and GMO are presented in Section 4.3.7 and findings for H7e are located in Section 4.9.3. The finding shows that a negative moderation effect of SC between GSI and GMO (see Table 4.30). A previous study identified a positive moderating effect of SC between GSI and green consumption behaviour (Gravelines et al., 2022). However, GMO was missing in that study. Previously, Barbarossa et al. (2015) identified a positive relationship between GSI and GMO. The author further added that GSI is a direct and positive predictor of customer willingness to purchase green items. However, the current study shows adverse results, which can be understood as green consumers who may or may not consider purchasing eco-friendly products. Given the scarcity of literature, this study's distinct focus on the moderating influence of SC represents a significant and original contribution, enhancing our understanding of the subject.

H7f: SC with green products positively moderates the relationship between EC and AEC.

The results of the moderation analysis for H7f unveiled a significant negative moderating role played by SC in the link between consumers' EC and AEC. Summary results for SC can be found in Section 4.3.7 and summary results for H7f are listed in Section 4.9.3. The current study found a negative but significant moderation effect of SC (see Table 4.30). Simultaneously, an earlier examination of the moderating influence of SC had significant and positive outcomes, as evidenced by prior research (Confente et al., 2020; Gravelines et al., 2022; Salsabila & Hartono, 2023). However, this previous investigation lacked the specific focus addressed in the present study. The current research ventures into uncharted territory, testing a novel hypothesis that involves the moderating role of green SC in the relationship between EC and AEC. The unexpected finding of this current study this may be attributed to the cultural orientation of the Saudi population (Alwakid et al., 2020). KSA is an oil country and oil is available to all Saudi car owners easily and at a very nominal price. Therefore, Saudi drivers prefer petrol cars to electric cars. Even if Saudi people have a green identity and efficacy towards a green environment, it is difficult to adopt an attitude different from their traditionally viewpoint (i.e., common consumption with oil). Moreover, this negative moderation may be because Saudi consumers may care about the EC of using fossil fuel cars but owing to the easy availability of oil in the country, they may have a lower attitude towards the adaptation of eco-friendly electric cars (Alotaibi et al., 2022). The Energy Efficiency Centre calculates that transportation currently consumes around 21% of total energy in Saudi Arabia, at around one million barrels of oil equivalent per day. This transportation energy consumption is forecast to double by 2030 (Saudi Energy Efficiency Center, 2018). In conclusion, the findings suggest that Saudi consumers exhibit a stronger inclination towards gasoline-powered cars than towards electric ones, primarily because of the accessibility and cost-effectiveness of oil in KSA. Notably, this study's unique contribution lies in uncovering a negative moderation effect of SC within the Saudi context, shedding light on the factors influencing consumer preferences. This thesis makes significant contributions to the existing literature and theories by introducing new hypotheses including the moderating role of SC.

H7g: SC with green products positively moderates the relationship between GMOs and AEC.

The investigation hypothesised that SC positively moderates the relationship between GMO and AEC (see Sections 4.3.7 and 4.9.3). The study findings show that the moderation effect of SC between GMO and attitude to buying cars was not supported (see Table 4.30). That is, Saudi consumers' GMO and attitudes to buying electric cars were not positively moderated by their degree of SC. The thesis results did not concur with the moderation effect of SC reported by Confente et al. (2020), Gravelines et al. (2022) and Salsabila and Hartono (2023). However, the previous studies lacked the test the moderate the relationship between the GMO and AEC relationship, as the current research hypothesised. Barbarossa et al. (2015) established that GMO of consumers in Europe is positively associated with the attitude to buy electric cars. According to Barbarossa et al. (2017), those who view themselves as green consumers were more inclined to participate in pro-environmental action to express their self-identity, according to SC considerations. Despite contradicting previous research that showcased a positive moderating influence of SC, the present study's identification of a detrimental connection between GMO and AEC contributes significantly to the academic discourse. This novel finding not only enriches the existing literature but also advances theoretical understanding. Furthermore, by introducing a fresh hypothesis for potential future investigations, this study opens avenues for broader applications of its insights, ultimately fostering a more comprehensive comprehension of consumer behaviour in relation to eco-friendly vehicle adoption.

H7h: SC with green products positively moderates the relationship between GSI and PP for electric cars.

In this study, a hypothesis was posited that suggested a positive moderating role for SC in the connection between GSI and PP. Detailed findings regarding SC can be located in Section 4.3.7, while a concise summary of the results for H7h is available in Section 4.9.3. The study findings show that SC significantly and positively moderates the relationship between GSI and PP for electric cars (see Table 4.30). This also implies that with a higher level of SC, there was a tendency to have a higher positive moderation effect between the impact of GSI and PP for electric cars. Barbarossa et al. (2017) revealed a similar implication to the current study. The author described that the consumers' GSI has a positive relationship with the adoption of electric cars. Drawing upon SC, as proposed by Sirgy (1985), individuals who view themselves as environmentally conscious are more inclined to partake in pro-environmental actions as a manifestation of their self-identity. According to Han et al. (2019), individuals''green product usage attitude is driven by self-realisation of environmental safety. Nosi et al. (2017) found that young consumers' knowledge enhancement towards pro-environmental behaviour can drive them to purchase electric cars. This finding further provides room for researchers to explore various factors to influence consumers' probability of purchasing electric cars. Given the scarcity of existing literature, it can be concluded that the current study significantly contributes to the extant research by providing a positive and significant impact of SC between GSI and PP of electric cars in the Saudi context.

H7i: SC with green products positively moderates the relationship between GSI and IA for electric cars.

The thesis hypothesised that SC positively moderates the relationship between GSI and IS. This study finding establishes similar results to $H7_h$ and the results of $H7_i$. This indicates that SC significantly and positively moderates the relationship between consumers' GSI and Saudi's IA for electric cars (see Table 4.30). For summary results, see Sections 4.3.7 and 4.9.3. Likewise, Confente et al. (2020) and Kristiyono and Anjani (2021) conducted a study to assess the moderating effect of SC on the relationship among PV, GSI and AI. They found that higher SC has a moderating effect on the relationship between GSI and PV. It is important to mention that there was insufficient literature with which to compare this finding. Thus, this study brings a significant contribution to the literature by the findings representing an original contribution utilising the moderation effect of SC. Section 5.6 summarises the discussion and suggestions.

5.4 Discussion of the Influence of the Control Variables

Demographic variables such as age, gender, education, income and other socio-economic factors could have a significant impact on research findings (Schäfer et al., 2012). For example, studies have shown that age and gender can affect how individuals respond to certain measures, leading to different research outcomes (J. W. Lee et al., 2002; Noble et al., 2014). Additionally, demographic variables can affect the prevalence of certain conditions or behaviour, leading to varying results across different populations (X. Huang et al., 2017).

The study incorporated eight control variables: education, gender, marital status, age, monthly income, driver's licence status, type of car driven and number of cars owned. To evaluate their potential impact on the overall structural model, these eight control variables were included in the model. This investigation was particularly interested in gender as a control variable to shed light on the distinctive circumstances in Saudi Arabia, where women were only granted the right to drive from 2018. This investigation aims to discern potential dissimilarities in the preferences of new and old car buyers.

The findings of the study indicated that of all the control variables considered, only two had a significant influence on PP. The results for model with control variables can be found in Section 4.11. Table 4.32 depicts the control variables result. These two variables were the number of currently owned vehicles and whether the respondent was in possession of a driver's licence. The study found that participants who owned more vehicles or had a driver's licence were more likely to purchase EVs than those who did not have these characteristics because respondents with no licence and previously owned cars might not understand the difference between green and gasoline cars. Furthermore, they may not feel the need to use green cars as their daily transport.

This research found that the number of currently owned vehicles and possession of a driver's licence were important demographic variables to consider when predicting PP for the particular product or service studied. However, the other demographic variables examined in the study did not have a significant influence on PP, indicating that they may not be as important to consider in this context.

For instance, Jia et al. (2020) investigated the influence of demographic variables, such as age, gender, income and education, on the intention to purchase EVs. The study found that age, income and education had a significant impact on the intention to purchase EVs, which does not align with the findings of this study. Similarly, Habich-Sobiegalla et al. (2019) reported that income and education were significant predictors of the adoption of EVs in China. The study found that individuals with higher income and education were more likely to adopt EVs than those with lower income and education. In contrast, Kim et al. (2019) determined that gender, age, education and income did not significantly influence the adoption of EVs in Korea, which aligns with the findings of this study.

Gender is a crucial aspect to consider in the context of Saudi Arabia (Assad, 2007) owing to ongoing social transformations. Surprisingly, the study's outcomes revealed no significant differences between genders concerning the purchase of electric cars. This finding may be attributed to the notion that decisions regarding long-term investments, such as the purchase of electric cars, often involve collective decision-making among family members (Alharbi & Boling, 2022), both male and female, in a society that prioritises collectivism over individualism.

These findings underscore the importance of considering sociocultural factors and the influence of family dynamics when examining consumer behaviour, particularly in contexts in which decisions are typically made collectively. The results challenge traditional assumptions about gender differences in car purchasing decisions and highlight the need for a nuanced understanding of how sociocultural factors shape consumer choices.

Overall, the lack of significant effects for the six controlling variables in the specific study cited could be attributed to several factors, including the specific context of the study, the sample size and the sample population characteristics (V. Singh et al., 2020). The findings suggest that the impact of demographic variables on the adoption of environmentally friendly products may vary depending on the specific product or service studied and the cultural or societal context.

5.5 Unobserved Heterogeneity FIMIX-PLS Model Discussion

The nature of research data was complex and understanding its underlying mechanisms has always been challenging for researchers. Data collected from any population can be heterogeneous. It is commonly accepted in social sciences that even people of the same age, gender and social class can have diverging perceptions (Nassiri & Mohammadpour, 2023). Heterogeneity (or differences) can be observed or unobserved. This investigation implemented FIMIX-PLS to reveal whether the explanatory power of the model is best explained by a 1, 2, 3, 4 or n segment solution. The findings were slightly mixed but Segment-2 solution was deemed the model outcome.

This investigation used FIMIX-PLS (Hahn et al., 2002), which concurrently estimates all the model path coefficients and determines whether heterogeneity is present in the data by evaluating the probability of segment membership for data observations to fit them into a predetermined number of segments. Two usable segments (Segment-1 and Segment-2) were identified.

The results revealed that Segement-1 had more significant outcomes on the INV and PR relationship; in other words, it can be implied that Segment-1 members favoured innovativeness, but were also perhaps afraid of new things, likely owing to functionality and sustainability. Considering these points, these members are best described as price (affordability)-conscious customers. Segment-2 had more impact and significant path results for AEC, IA for electric cars, SC and GSI. This implies that these individuals were more environmentally conscious and showed a preference for brands or products with which they were associated. The concept of SC suggests that people tend to identify with their preferred brands or products, classifying them as eco-friendly or environmentally conscious.

Assessment of demographic heterogeneity was also carried out to evaluate if there were any specific influencers of Segment-1 and Segment-2 and to make marketing suggestions by utilising these segments. Table 4.36 reveals slight differences in demographic characteristics between Segment-1 and Segment-2 only. The latter had a lower percentage of 25–34-year-old participants (25% compared with 34% for Segment-1) but a higher percentage of participants aged 50 and above (28% v. 19% for Segment-1). Segment-2 had a higher proportion of diploma holders (10%) but a lower proportion of postgraduates (18%) than Segment-1 (5% and 22%, respectively). Moreover, Segment-2 had a smaller proportion of unmarried individuals (25%) than Segment-1 (33%). In terms of car ownership, Segment-2 had a higher proportion of medium-size cars (34%) than Segment-1 (29%) and a slightly higher proportion of households owning two cars (20% compared with 16% for Segment-1). Conversely, Segment-1 had a higher proportion of households owning 4 or more cars (16%) than Segment-2 (12%). Largely, there were no further significant differences observed in the sample.

On the basis of the results of the FIMIX-PLS analysis presented in the Table 4.38, it was clear that there are two distinct segments of potential customers for electric cars: Segment-1 and Segment-2. While both segments had some level of interest in electric cars, their motivations and concerns were quite different; marketers would do well to tailor their messaging and strategies accordingly. This is further outlined next.

Segment-1: The analysis suggests that Segment-1 could be more closely linked with affordability consciousness than Segment-2. Therefore, marketers should highlight the affordability of electric cars and promote financing options, such as lease agreements or low-interest loans. It may also be useful to offer discounts or promotions such as having at home charging infrastructure to make the cars more appealing to this segment.

Segment-1 showed an interest in innovation; electric cars are still relatively new and innovative in the market. Marketers can emphasise the advanced technology and features of electric cars to appeal to this segment. They can also highlight the benefits of owning an electric car, and correspondingly, the low maintenance costs and the convenience of charging at home.

Segment-1 members may be conservative (PR), probably regarding functionality and sustainability. Therefore, marketers should address these PRs by providing clear and concise information about the functionality and sustainability of electric cars. This can include information about the driving range, charging infrastructure and environmental benefits of owning an electric car.

Given that Segment-1 can be considered affordability-conscious, marketers can focus on promoting electric cars to local communities. This can include partnering with local businesses, offering test drives at community events or sponsoring local events. By promoting electric cars as a community-driven initiative, marketers can make them more appealing to this segment.

Segment-1 may be more receptive to marketing messages delivered through social media. Therefore, marketers can create targeted social media campaigns that highlight the affordability, innovation and sustainability of electric cars. These campaigns could also feature user-generated content from existing electric car owners to showcase their positive experiences.

Segment-2: Despite, the a priori recommendations for Segment-1, it is strongly recommended that marketers of electric cars focus their efforts and investment more on Segment-2, which consists of individuals who are environmentally conscious and have a stronger inclination towards eco-friendly cars. This group showed the model relations were relatively greater through GSI and SC. Marketers can leverage this insight by creating targeted campaigns that emphasise the eco-friendliness and sustainability of their electric cars, highlighting how their EV brand aligns with the values of environmentally conscious consumers. Additionally, the T-test results in Table 4.37 demonstrate that the respondents in Segment-2 had a significantly higher probability of purchasing green cars in the next year, next five years and next ten years as compared with respondents in Segment-1. On the basis of this result alone, they represent the most viable target.

It is important to note that Segment-2 had a lower percentage of 25–34-year-old participants but a higher percentage of participants aged 50 and above. Therefore, marketers should tailor their messaging to appeal to this older demographic, highlighting the practical (functional, cost saving, ease of use) benefits of electric cars. Other appeals like lower maintenance costs and, to a lesser degree, reduced environmental impact may be important. This group may also respond well to messages that emphasise the social responsibility of purchasing an electric car for future generations and to be a good corporate citizen.

In terms of education level, Segment-2 had a higher proportion of diploma holders and a lower proportion of postgraduates than Segment-1. Marketers can use this information to create content that is easily digestible and not overly technical or complicated because this group may not have as much formal education on the topic of electric cars. Conversely, they may respond well to messages that emphasise the financial benefits of purchasing an electric car, such as tax incentives or lower fuel costs.

Segment-2 had a smaller proportion of unmarried individuals than Segment-1. Marketers can use this information to tailor their messaging to appeal to families, emphasising the safety and reliability of electric cars for transporting children and other family members. They may also respond well to messages that highlight the practical benefits of electric cars, such as the ability to charge at home overnight.

Finally, marketers should consider the differences in car ownership between the two segments. Segment-2 had a higher proportion of medium-size cars than Segment-1. Marketers can use this information to create targeted campaigns that emphasise the practicality and convenience of electric cars, highlighting how they can fit into the daily lives and routines of consumers who already own medium-sized cars. Additionally, marketers should consider messaging that addresses any potential concerns or misconceptions that consumers in this segment may have about electric cars, such as range anxiety or battery life.

Overall, the additional FIMIX-PLS analyses provided superior insights into the model and enabled managerial tactics to be recommended. The results confirmed two distinct segments of customers with different characteristics and preferences. Quite simply, the model was dynamically different from each segment. Segment-1 could be expressed as affordability-conscious customers who are interested in the innovativeness of electric cars but have concerns about their functionality and sustainability. Conversely, Segment-2 consisted of eco-friendly or environment-conscious customers who may prioritise the environment and may prefer the brands (owing to SC) with which they were already associated.

5.6 Summary of the Discussion

This section is significant because it summarises the findings of the study. On the basis of the above-discussed hypotheses, this section identifies the answer to the research questions and objective of this study.

RQ1: **To what extent do GSI, EC, GMO, INV, PV, PR and AEC influence the intention and probability of purchasing electric cars?**

The key constructs influencing the green car purchase intention of Saudi Arabia's consumers were GSI, AEC, PV and INV. These factors had a significant direct impact on consumers' AI of green cars. Conversely, the influencing factors for PP were INV, PR and AI.

The study's results indicate that GSI exerts a substantial influence on the purchasing intentions of Saudi Arabian consumers in relation to environmentally friendly cars. Nevertheless, GSI hurts the probability of purchasing environmentally friendly vehicles. The research indicates that the adoption of a GSI among consumers in Saudi Arabia does not appear to have a significant impact on their probability of purchasing green vehicles as their primary mode of transportation. The results validate the notion that a distinction exists between the intention to purchase a green vehicle and the likelihood of consumers acquiring a green vehicle as their primary mode of transportation. In conjunction with the GSI and AEC, the PV of eco-friendly or green cars does not exert a statistically significant positive impact on the PP of Saudi Arabian consumers. This is because the customers' intentions to buy an environmentally friendly vehicle are different from the action of buying green cars. Along with the GSI, the AEC and PV do not have a significant positive influence on the PP of Saudi Arabian buyers.

The innovativeness of green cars has a positive impact on consumers' probability of buying. Consumers find the technological advancement of green cars attractive. Conversely, the consumers PR have a significant negative effect on their PP of electric cars. On the basis of this finding, the risk of buying a green car was deemed very high by consumers of Saudi. Because green cars run on battery, there is no alternative to using fuel or oil. This was a concern of range, time consumption on charging, durability, availability of charge pump as oil pump is widely available, concern on the availability of parts on any shop and pricing of new technology restrict the consumers to buy the green cars.

On the basis of above discussion, several recommendations can be made regarding the factors influencing green car purchase intention and probability among Saudi Arabian consumers. Policymakers and marketers should address the PRs of green car purchases, such as range limitations, charging infrastructure and parts availability. Targeted marketing campaigns should emphasise green cars' personal and environmental benefits, bridging the gap between intention and action. Manufacturers should highlight green cars' technological advancements and innovative features to enhance their attractiveness. Future research should explore the incongruity between GSI and purchasing behaviour, providing a deeper understanding of developing effective strategies to promote sustainable transportation.

- ***RQ2:* Do EC, GMO, PV and PR mediate the relationship between GSI and the AEC and PP of electric cars?**

EC, GMO, PV and PR were applied as mediators between GSI, AEC and probability of buying green cars. Findings show a significant mediating impact because EC successfully mediated the relationship between GSI and AEC of Saudi Arabia's consumers. Furthermore, there was a significant mediating effect of GMO on the relationship between GSI and EC. Additionally, the mediating effect of PV on the relationship between GSI and green car PP was found to be insignificant. Finally, PR as a mediator between GSI and green car PP was deemed insignificant. The construct of EC was found to act as a mediator in the relationship between GSI and AEC. The statement suggests that the attitudes of individuals towards the adoption of green cars were notably influenced by their perception of the environmental impact associated with the use of conventional cars.

On the basis of the discussion above, several recommendations can be made regarding the mediating factors between GSI, AEC and PP. First, emphasise EC by highlighting the ecological impact of conventional cars and promote the benefits of green cars in reducing EC. Conduct awareness campaigns and educational programs to increase understanding and encourage the adoption of green alternatives. Second, strengthen GMO by fostering individuals' environmental conscientiousness by promoting green ethics and a sense of responsibility for the environment. Implement educational initiatives, social norms and policy interventions to enhance individuals' concern for the environmental consequences of car usage. Third, highlight the value proposition of green cars by emphasising the long-term cost savings, environmental benefits and unique features. Showcase the value green cars offer potential buyers through marketing efforts and informational campaigns. Finally, address perceived risks by mitigating PRs associated with green vehicles, such as concerns about range, charging infrastructure and parts availability. Provide accurate information, ensure reliable charging infrastructure and offer warranties or guarantees to build consumer confidence in purchasing green cars. These recommendations aim to promote the adoption and purchase of EVs by individuals with a GSI by addressing relevant mediating factors.

• RQ3: Does SC moderate the relationship between the constructs in the posited model?

The investigation analysed the notion of GSI as a moderator within the interrelationships among distinct constructs. The present study centred on examining the moderating function of green SC in the relationship between GSI and several factors, including PV, EC, GMO, PR, AEC, PP and IA.

The research discovered that the moderating effect of green SC was insignificant in the associations between GSI and PV, EC and GMO. The findings indicate that the degree of consistency between a person's self-concept and their assessment of the ethical implications, ecological outcomes and ethical duty linked to eco-friendly actions did not exert a substantial influence on their attitudes or apprehensions concerning the adoption of environmentally friendly automobiles.

Additionally, the research revealed that the impact of SC on the moderation between EC and AEC, as well as between GMO and AEC, was statistically insignificant. The findings suggest that the moderation impact between a GSI and perception of the environmental consequences and moral obligation did not significantly impact their inclination towards EVs.

Conversely, the research recognised a favourable moderating impact of SC concerning the GSI and AEC, PR, IA and PP. The aforementioned proposition posits that an individual's propensity to acquire and express an intention to procure eco-friendly vehicles is positively correlated with the degree of consistency between their self-concept and their inclination towards embracing electric cars.

The unexpected finding of the negative moderation effect of SC on the relationship between EC and AEC suggests that Saudi Arabian customers may have a genuine concern for the environment and possess knowledge about environmental preservation. However, their scepticism regarding the environmental impact of electric cars indicates a need for further investigation. Future research should delve into the specific factors contributing to this scepticism and explore ways to address and alleviate these concerns. Understanding the unique dynamics of consumer perceptions and knowledge surrounding electric cars in Saudi Arabia will be crucial for developing effective strategies to promote their adoption and highlight their positive environmental impact, distinguishing them from other products.

The findings of this study recommend several suggestions for marketing practitioners targeting consumer adoption of eco-friendly products or services, such as EVs. Specifically, SC emerged as a potentially influential factor in shaping consumers' attitudes and behaviours in this context. Therefore, marketing strategies should consider the alignment between consumers' self-concept and their inclination towards eco-friendly actions.

To effectively leverage SC, marketers should emphasise the congruence between consumers' self-identity and their adoption of environmentally friendly options. By highlighting how eco-friendly products align with consumers' self-concept, such as being environmentally conscious or socially responsible, marketers can enhance consumers' positive attitudes and intentions towards adopting such products. Furthermore, understanding the specific factors influenced by SC, such as PR, PP and AI, can guide marketing tactics. Tailoring marketing messages to address these factors and incorporating SC can effectively influence consumers' decision-making processes.

***RQ4:* Are there segments of customers with different, attitudes, values and behaviours among potential consumers of electric cars?**

The analysis found heterogeneity in the data. On the basis of the finding, the study divided participants into two segments: Segment-1 and Segment-2. Segment-1 can be described as cost-conscious clients who are interested in the innovativeness of EVs but are concerned about their utility and sustainability.

Conversely, Segment-2 comprises eco-friendly or environment-conscious customers who may value the environment and may favour companies with which they already identify (owing to SC). Therefore, it can be concluded that the research question on hidden heterogeneity was successfully answered and the study provided useful insights into understanding different segments of customers regarding electric cars, which can be valuable for car manufacturers and marketers in developing effective marketing strategies and communication campaigns.

The findings of this study recommend several suggestions. These insights into the heterogeneity among consumers of electric cars have important implications for car manufacturers and marketers. It is recommended that they consider the diverse needs and preferences of different segments when developing marketing strategies and communication campaigns. By tailoring their approaches to each segment, car manufacturers and marketers can effectively address the unique concerns and motivations of cost-conscious clients in Segment-1 and appeal to the environmental values and SC of customers in Segment-2.

Developing targeted marketing strategies that align with the distinct characteristics of each segment can lead to increased customer satisfaction and higher adoption rates of EVs. For example, emphasising the cost-effectiveness and practicality of electric cars may be more compelling to cost-conscious clients, while highlighting the eco-friendly features and sustainability aspects may resonate with environment-conscious customers.

5.7 Research Contribution

This study contributes knowledge to the field of green product adoption by proposing and validating a conceptual framework for green car adoption. The study also has methodological contributions by introducing a new methodological approach, especially in the context of Saudi Arabia. This study's contributions are discussed in Sections 5.7.1–5.7.2.

5.7.1 Contribution to Knowledge

The findings of this study have several theoretical outcomes. The development and empirical validation of the influence of the electric car self-identity model represents the study's most significant theoretical contribution. The structural model provided a clearer indication on what affects green customer discussion and behaviour. The electric car self-identity mediation and moderation model can be applied for a comprehensive understanding of what drives an individual to engage in specific green behaviours, not only in the adoption of eco-friendly electric cars but also in any context.

The conceptual framework for the electric car self-identity model, developed for this research, draws from identity theory (Stryker & Burke, 2000), self-perception theory (Bem, 1972), theory of planned behaviour (Ajzen, 1991), consumption values theory (Sheth et al., 1991) and SC theory (Sirgy, 1985). By aligning with these theories, this study sought a holistic comprehension of the underlying motivations propelling individuals towards environmentally conscious actions, extending beyond just the adoption of eco-friendly electric cars to various other contexts.

This study's structural model tried to fill a gap in the literature by combining two existing self-identity models and adding three more constructs and more relationships between model constructs to propose a new conceptual mediation and moderation model. Confente et al. (2020), Barbarossa et al. (2015) and He et al. (2018) pointed out that future researchers have an opportunity to integrate the theoretical model with other related constructs and conduct research in other countries. The added constructs to the self-identity of the electric car adoption model show a positive and significant relationship in the model, which allows greater understanding of what affects and guides customers' green behaviour to adopt green products. GSI has influenced consumers' EC, GMO, INV and AEC. Current study findings were aligned with the previous findings in which EC (Barbarossa et al., 2015; M. Y. Bhutto et al., 2022), INV (R. Liu et al., 2021), GMO (Barbarossa et al., 2015, 2017), green car IA (Barbarossa et al., 2015; Barbarossa, De Pelsmacker et al., 2017; Sharma et al., 2022) and GSI can reduce the PR of adopting EVs (He et al., 2018) among the Saudi consumers. This study holds significance by addressing the limited research on green car adoption in Saudi Arabia. Its contribution to the existing literature and empirical findings through the electric car self-identity developed model enhances our understanding within this specific context.

He et al.'s (2018) call for exploring actual behaviour in addition to purchase intention. To align with this perspective, the study employed PP as the dependent construct owing to its closeness to real behaviour compared to intention, as affirmed by Juster's (1966) theory. By emphasising PP, this study captured the dynamics of consumer decision-making for eco-friendly car adoption. This approach acknowledges that purchase intention might not fully encapsulate the complexities of consumer choices, particularly for novel or environmentally conscious products. The study's unique conceptual model integrated a probability scale across different future time frames, allowing for a closer evaluation of purchase behaviour. Prioritising PP offers insights into shifts among non-intending consumers, enriching our understanding of the factors influencing actual purchase actions. By adopting this approach, the study addressed a research gap and established a direct and positive link between purchase intention and PP, contributing significantly to the existing literature. This pioneering framework advances the comprehension of consumer behaviour in the context of adopting eco-friendly vehicles, widening the empirical insights in this domain.

This study's findings emphasise the significant moderating role of SC, showcasing the substantial impact of the moderator construct in shaping the relationship under investigation. SC with green products significantly moderates the relationship between GSI and PP, AEC, PR and IA. The current study has contributed to the existing study with the positive findings of SC with green products significantly moderates the relationship between GSI and PP, AEC, PR and IA. Another contribution is through developing new hypothesises; SC between GSI and PR, SC between EC and AEC, and SC between GSI and PP in the context of Saudi Arabia.

On the basis of the previously mentioned theories and theoretical models, the current study developed and studied a new structural model for green car adoption research area empirically. The current structural model significantly contributes to existing studies by identifying similar and new knowledge. Additionally, the current model contributes to the research gap in the green car purchase research area by developing new relationships with empirical findings.

5.7.2 Methodological Contributions

The present investigation has made a valuable contribution to the extant literature by utilising a new methodological approach to access diverse segments of Saudi Arabian society. The present investigation disseminated its online questionnaire link through Twitter, specifically by posting on the trending hashtags (#) or top hashtags in the Saudi Arabian region. Over 100 hashtags that were trending in various categories, such as location, activity, news, sport, event, weather and others, were employed to disseminate the questionnaire. The implementation of an online questionnaire proved to be a highly effective approach in engaging diverse segments of Saudi Arabian society.

A methodological contribution involved the assessment of the unobserved heterogeneity of the respondents. In the PLS-SEM literature, this type of analysis, FIMIX, has not yet been carried out concerning related research areas like green cars and PP. Also, this study is the first to apply in the Saudi Arabia context.

Therefore, the methodological contribution of this study is employing the online trending hashtags (#) on Twitter to post the questionnaire along with PLS-FIMIX and the assessment of the unobserved heterogeneity. The current research could be a path provider for future research to follow the method to secure more in-depth knowledge.

5.8 Practical Implications

The outcomes of this study carry various practical implications. Policymakers, marketers, consumers, communities, investors and organisations can leverage these findings to effectively shape consumer attitudes and intentions towards electric car adoption.

Saudi car dealers and suppliers are encouraged to improve their incentive policies to encourage the purchase of electric cars. T. Lu et al. (2020) demonstrated that incentive policies, such as special lane driving permits, parking incentives, charging infrastructure development, road toll fee waivers and licensing incentives, can be effective in promoting the adoption of electric cars. Additionally, dealers, marketers and organisations can link with different government bodies to promote electric cars to the users, so the government offers all these mentioned facilities to the electric car users.

To cultivate favourable attitudes towards electric car purchases in Saudi Arabia, communication strategies may highlight the potential for consumers to bolster their FSI through the adoption of electric cars. Additionally, such communication can address the specific environmental benefits of electric car usage (Barbarossa et al., 2015). Given the insights from this current research that identified distinct customer segments, it is imperative to tailor messaging accordingly. The two unique customer segments with differing needs and perspectives suggest the need to underscore the significance of sustainable consumption in messaging, aiming to encourage individuals to align themselves with the eco-conscious group. This research suggests that emphasising GSI among Saudi consumers can increase their desire for eco-friendly cars.

Communities in Saudi Arabia may stress the importance of eco-conscious consumption by encouraging individuals to consider the detrimental environmental effects associated with car usage. Such initiatives could promote eco-friendly consumption choices, which have a reduced negative impact on the environment. This research suggests that the effect of GSI on PP, AEC, PR and IA was significantly moderated by the degree of green SC among consumers in Saudi Arabia. Additionally, EC mediated the GSI and AEC of Saudi consumers. Saudi consumers' higher GMO increases their GSI to develop a care for the environment. Because consumers in Saudi Arabia prioritise reducing their environmental footprint, fostering positive attitudes towards eco-friendly electric cars is crucial.

The reduction of risk perception associated with purchasing electric cars should be a priority for government policymakers and industry leaders (Zhang et al., 2018) in Saudi Arabia. The results of this study indicate that Saudi consumers perceive the purchase of electric cars to be a risky endeavour, which may dissuade them from considering such a purchase. Electric car manufacturers and the Saudi Government can take proactive measures by issuing statements and reports that highlight the attributes, performance, usefulness and benefits of electric cars. Moreover, various channels of information dissemination, such as newspapers, magazines, radio programs, television shows and new social media, can be utilised to provide consumers with concrete and tangible information about electric cars and educate the public about their importance and benefits.

Furthermore, manufacturers may consider hosting auto shows and implementing vehicle-sharing activities, such as visiting electric car experience centres, test drives and electric car rentals, to encourage consumers to learn more about and consider purchasing electric cars. Wang et al. (2018) described that the risk of buying electric cars can be minimised by communicating and developing the knowledge of consumers.

The study's findings have demonstrated practical contributions by identifying two significant consumer segments within Saudi Arabia. The results indicate that Segment-1 may be associated with a concern for affordability, a curiosity for innovation and a hesitancy towards unique concepts owing to PR, particularly in regard to functionality and sustainability. Additionally, this segment appears to be more responsive to marketing communications disseminated through social media channels. Therefore, it is imperative for marketers and dealers to prioritise accentuating the affordability of EVs and endorsing financing alternatives, including lease agreements or low-interest loans, as well as discount and promotional offers. Additionally, it is crucial to underscore the advanced technology and features of electric cars by highlighting the advantages of owning one, such as the reduced maintenance costs and the convenience of charging both at home and in public areas. The proposed strategy involves promoting electric cars as a community-driven initiative through targeted social media campaigns that emphasise the affordability, innovation and sustainability of electric cars. The aim is to attract Segment-1 consumers.

On the contrary, the Segment-2 demographic comprises individuals who exhibit a heightened awareness towards environmental issues and possess a greater affinity towards eco-friendly automobiles. This group is characterised by a stronger association with GSI and SC.

Additionally, a majority of the participants in this segment were aged 50 years and above, possessed a diploma and were married. Furthermore, a larger proportion of this group tended to prefer medium-sized cars. Marketers and dealers can prioritise emphasising the alignment of brand values with those of environmentally conscious consumers, highlighting the lower maintenance costs and reduced environmental impact of electric cars. It is important to ensure that the content regarding electric cars is easily comprehensible and not excessively technical or complex because some consumers may have lower levels of education or be older. Furthermore, providing information on the practicality, convenience, safety and reliability of medium-sized electric cars for transporting families and children can be effective in attracting consumers from Segment-2.

The alignment between Vision 2030 and the Green Car Initiative is evident in the Saudi Government's prioritisation of the former (Al Otaibi et al., 2020). Nonetheless, the predominant apprehension among the general populace pertains to the exorbitant expenses associated with procuring EVs. Therefore, incentives that motivate the acquisition of EVs and advance ecological sustainability are of utmost significance. The implementation of public incentives could facilitate a more widespread acceptance and utilisation of EVs. It is recommended that policymakers persist in their intervention efforts by enacting communication and marketing tactics as well as incentive-based policies across all industries that exhibit detrimental effects on the natural environment. The implementation of this measure would facilitate environmentally conscious consumer behaviour and informed decision-making while concurrently mitigating pollution.

In light of these contributions, it can be said that this study contributes to the understanding of self-identity and how that affects Saudi consumer green behaviour. Therefore, the current study is theoretically significant by aligning with previous findings, theories and Saudi Arabia's Vision 2030 objectives and by studying in the Saudi Arabia context.

5.9 Limitations of this Research

The investigation applied a structural model. Although this present study did not intend to offer definitive conclusions, it emphasised the importance of promoting the purchase of eco-friendly vehicles in Saudi Arabia.

Despite the contributions, the present study has some limitations. The current study is set in Saudi Arabia only. Thus, the results come from a single country perspective. Simultanously, a previous study identified a cross-country perspective of green car adaptation (Barbarossa et al., 2015). The previous study showed that different countries have diverse approaches to buying electric cars. The findings of this study may have limited generalisability to other contexts. Other cultural, social and economic factors may influence the electric car self-identity model in different regions.

Another limitation is that sampling biases may have occurred because the current study used a Twitter survey to reach out to participants. Furthermore, participants were asked to re-tweet and share the online questionnaire with their friends and contacts over Twitter, WhatsApp and SMS. This method of data collection may have led to sampling bias because not all individuals have access to or were widely available online or may not be active users of social media platforms. However, Twitter and WhatsApp are widely used in Saudi Arabia (Kemp, 2021). Still, this may have resulted in a biased sample that may not be representative of the entire population of Saudi Arabia. Moreover, the current study has limitations in terms of sample size. Thus, future studies could use another method to develop more effective studies in Saudi Arabia and other regions (He et al.,2018).

The study has another limitation; the use of self-reported data may have led to social desirability bias, in which participants may have provided responses that they believed were socially acceptable or desirable. This may have influenced the validity of the study findings because participants may have underreported or over-reported certain attitudes or behaviours. This study used self-reported measures, although the common method variance test found no acknowledged issues against conventional cut-offs. Multiple approaches to tap each construct in this research did not occur (Barbarossa et al., 2015). There were practical limitations and alternative forms measurement could not be adopted.

Additionally, the study did not assess other potential constructs that may influence green car purchase intention and probability. Additionaly, the study used a cross-sectional design, which limits the ability to establish causality between variables. While the study identified significant relationships between variables, it could not establish the direction of causality or rule out the possibility of reverse causality.

Finally, the study was conducted within a limited time frame, which may have limited the ability to conduct a more comprehensive and in-depth investigation of the research questions. Future research may benefit from a longer data collection period to allow for a more thorough exploration of the research questions.

5.10 Opportunities for Future Research

Drawing from the aforementioned discourse and the research constraints, the present investigation has discerned prospects for prospective research. Initially, the study utilised a research approach that focused solely on Saudi Arabia. Subsequent research endeavours may consider the inclusion of two additional oil economy nations to further enhance the comprehensiveness of insights pertaining to the adoption of EVs, given that distinct cultural, societal and economic factors may exert varying influences. Hence, researchers possess the capability to determine the probability of purchase across various regions and can extend the implications of the current research findings. To mitigate potential sampling biases, future researchers and practitioners may employ a variety of data sources, including both online and offline data or even multiple sources in combination to collect data such as interview data (He et al.,2018).

The current study chose to focus on a select range of variables for analysis. It is important to acknowledge that numerous factors, whether similar or diverse in their impact, could affect the probability of purchase across Saudi Arabia or other diverse regions. Future research, Ph.D. students/scholars may choose to employ the same model, incorporate different variables alongside the same model or even explore alternative variables to comprehend their impact on PP and the mediating role of IA. It is imperative to consider various factors such as government initiatives, the influence of opinion leaders and seekers, religious aspects, levels of green trust and multiple identities beyond self-identity when conducting further investigations.

On the basis of the findings of the current study, it is recommended that future research explore the underlying reasons for the negative moderation effect of SC on the relationship between the environmental consequences of using electric cars and their eco-friendly attitudes. This could involve further investigation into the specific concerns and scepticism of Saudi consumers regarding the environmental impact of electric cars. Understanding these factors would be valuable for developing targeted marketing strategies and communication campaigns that address consumer concerns and promote the adoption of electric cars in a way that aligns with their eco-friendly values.

The current study utilised a cross-sectional methodology, which limits the ability to establish causal relationships among variables. To overcome this limitation, future research, Ph.D. students/scholars would benefit from incorporating longitudinal and mixed-methods approaches. Morover, the study's findings were partially elucidated, constrained by limitations in the provided explanation. Future investigations stand to gain by offering a more comprehensive understanding of the observed associations and delving into the underlying mechanisms that contribute to the identified effects.

5.11 Conclusion

This structural model investigated a complex model highlighting the impact variables may have on intention and PP EVs in Saudi Arabia. The research revealed that the purchase intention of green cars was influenced by several constructs, including GSI, AEC, PV and INV. INV and IA were identified as significant determinants of PP. The research discovered that the PR factor had a noteworthy adverse impact on the probability of purchasing EVs. However, it was observed that GSI did not exert any significant influence on the probability of purchasing eco-friendly cars as the primary mode of transportation.

The research also investigated the potential mediating roles of EC, GMO, PV and PR in the association between GSI and AEC, as well as the probability of adopting EVs. The research revealed a noteworthy mediating effect of environmental outcomes and ethical responsibility towards the environment on the association between green self-concept and the inclination to embrace eco-friendly automobiles. Additionally, the study exposed that the mediating effect of PV and PR on the correlation between GSI and the probability of purchasing a green car was deemed insignificant.

The research examined the potential moderating effect of SC on the relationship between the variables in the proposed theoretical framework. The research revealed that SC played a constructive moderating role in the relationship between GSI and PR, AEC, PI and PP. Nonetheless, the impact of the aforementioned construct did not yield any noteworthy outcome concerning the correlation between GSI and the PV, EC and GMO.

The present investigation identified a noteworthy result by examining the influence of IA on PP. This study made a valuable contribution to the existing literature by formulating and validating novel hypotheses and by elucidating the influence of IA on PP. The study made a theoretical contribution by introducing an innovative theoretical framework for the procurement of environmentally friendly vehicles, which was subsequently subjected to empirical testing.

The present study has made a practical contribution by identifying two distinct segments of environmentally conscious automobile consumers in Saudi Arabia. The study revealed significant insights into the segmented consumer market and presented potential implications for various stakeholders such as the government, marketers, manufacturers, other stakeholders and future consumers.

In summary, the present study holds significance because it has contributed to the existing literature by addressing theoretical and practical research gaps. This study aimed to elucidate the significance of effective communication in mitigating the risks associated with purchasing EVs. It is expected that the findings of this research will provide valuable insights to stakeholders, enabling them to develop and implement targeted marketing strategies that cater to the specific needs and preferences of consumers across various demographic segments and unobserved segments. The present study identified potential areas for future research on the basis of its limitations. As a result, future investigations may benefit from the research framework presented herein, potentially yielding unique insights.

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Appendix 1: Questionnaire

(English Version)

VICTORIA UNIVERSITY

English

(للغة العربية اختر من الأعلى)

You are invited to participate in a research project entitled “An Examination Of Environmentally Friendly Car Purchase Probability In Saudi Arabia”

Purpose of the study:
The key aim of the study is to assess the probability of adopting electric cars among Saudi Arabia’s consumers. Electric Cars totally run on electric energy, not conventional fuel. This study will help policymakers, marketers, and other relevant stakeholders. The findings of this study may assist with developing policies concerning electric cars in Saudi Arabia and elsewhere.

Participation in the study:
Your participation in this study is voluntary and is highly appreciated. All the answers will be confidential. The study does not have any risk, and you will not be asked to write your name or any information that may identify you. To help us to achieve this study, please carefully answer all questions before submitting the survey.

Contact:
This research is conducted by Mohammed Alsuwaidan, a Saudi citizen who is a PhD student at Victoria University in Australia. If you have any questions regarding the study or to learn more, you can contact the researcher or one of the supervisors:
Mohammed Alsuwaidan / mohammed.alsuwaidan@live.vu.edu.au
@vu.edu.au
nall@vu.edu.au

Consent:
I have read the above information. I am 18 years or older, living in Saudi Arabia, and voluntarily choose to participate in this study.

- ○ **Yes, I consent**, please tick this box to continue.
- ○ **No, I do not**

For the following statements, please estimate how likely it is that you or someone in your household will buy an electric car.

1. How probable is it that you or someone in the household will purchase environmentally friendly electric car in **the next year?**

- 10 Certain, practically certain (99 in 100)
- 9 Almost sure (9 in 10)
- 8 Very probable (8 in 10)
- 7 Probable (7 in 10)
- 6 Good possibility (6 in 10)
- 5 Fairly good possibility (5 in 10)
- 4 Fair possibility (4 in 10)
- 3 Some possibility (3 in 10)
- 2 Slight possibility (2 in 10)
- 1 Very slight possibility (1 in 10)
- 0 No chance, almost no chance (1 in 100)

2. How probable is it that you or someone in the household will purchase environmentally friendly electric car **in the next two to five years?**

- 10 Certain, practically certain (99 in 100)
- 9 Almost sure (9 in 10)
- 8 Very probable (8 in 10)
- 7 Probable (7 in 10)
- 6 Good possibility (6 in 10)
- 5 Fairly good possibility (5 in 10)
- 4 Fair possibility (4 in 10)
- 3 Some possibility (3 in 10)
- 2 Slight possibility (2 in 10)
- 1 Very slight possibility (1 in 10)
- 0 No chance, almost no chance (1 in 100)

3. How probable is it that you will or someone in the household purchase environmentally friendly electric car **in the next six to ten years?**

- 10 Certain, practically certain (99 in 100)
- 9 Almost sure (9 in 10)
- 8 Very probable (8 in 10)
- 7 Probable (7 in 10)
- 6 Good possibility (6 in 10)
- 5 Fairly good possibility (5 in 10)
- 4 Fair possibility (4 in 10)
- 3 Some possibility (3 in 10)
- 2 Slight possibility (2 in 10)
- 1 Very slight possibility (1 in 10)
- 0 No chance, almost no chance (1 in 100)

B

For the following statements, please say how much you agree or disagree with each one.

4. Next time I buy a car, I will consider buying an environmentally friendly electric car.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

5. I have the intention to drive an environmentally friendly electric car in the near future.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

6. I expect to drive an environmentally friendly electric car in the near future.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

7. I think of myself as someone who is concerned about environmental issues.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

8. I would describe myself as an ecologically conscious consumer.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

9. I think of myself as a "green" consumer.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

10. Buying environmentally friendly electric car would make me feel like a green consumer.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

11. It is important to me how the usage of cars affects the environment.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

12. It is important to me whether cars cause the depletion of our natural sources such as oil.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

13. It is important to me whether car usage causes air pollution.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

14. I would feel guilty if I drove a car damaging the environment.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

15. To buy a car that damages the environment would be morally wrong for me.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

16. Buying a car that affects the environment would go against my principles.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

17. I would feel satisfied with myself if I bought an environmentally friendly electric car.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

18. I would take pride if I owned an environmentally friendly electric car.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

19. I like the idea of owning an environmentally friendly electric car.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

Green products are ones which do not damage the environment. For the following statements, please say how much you agree or disagree with each one.

20. I feel like I am part of the green products family.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

21. People who buy green products are very similar to me.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

22. Buying green products reflects who I am.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

For the following statements, please say how much you agree or disagree with each one.

23. Electric cars' environmental functions provide very good value for you.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

24. Electric cars show more concern for the environment than other cars.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

25. Electric cars are environmentally friendly.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

26. Electric cars have more environmental benefits than other cars.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly Agree
◯	◯	◯	◯	◯	◯	◯

27. To buy an electric cars means a financial risk for me.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

28. Electric cars are risky since they often breakdown.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
◯	◯	◯	◯	◯	◯	◯

29. Electric cars have a lower resale value than other cars.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

30. To own an electric car means that others look down on me.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

31. I am worried that the battery in an electric car will go flat before I reach my destination

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

For the following statements, please say how much you agree or disagree with them.

32. If I heard about new technology, I would look for ways to experience it.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

33. Among my peers, I am usually the first to try out new technologies.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

34. In general, I do not hesitate to try out new technologies.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

35. I like to experience driving electric cars.

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree
○	○	○	○	○	○	○

E

Please, select the answer that best describes you for the following questions.

1. Gender:

Male	Female
○	○

2. Age:

18 - 24	25 - 34	35 - 49	50 - and above
○	○	○	○

3. Education: Highest level reached

High School or less	Diploma	Bachelor	Potsgraduate
○	○	○	○

4. Marriage Status:

Unmarried	Married	Married and have Children
○	○	○

5. Monthly Income: Riyal

6000 or less	6001- 9999	10,000 – 14,999	15000 – 19,999	20,000 and over	Prefer not to answer
○	○	○	○	○	○

6. Do you have a driver's license?

Yes	No, but I I plan to have a drivers licence within the next 10 years	No
○	○	○

7. Type of car usually driven:

Small car	Medium size car	Large size car	None
○	○	○	○

8. How many vehicles are currently owned in your household :

1	2	3	4+	None
○	○	○	○	○

(Arabic Version)

VICTORIA UNIVERSITY

العربية

أنت مدعو للمشاركة في مشروع بحثي بعنوان " دراسة احتمالية شراء سيارة صديقة للبيئة في المملكة العربية السعودية"

الهدف من إجراء البحث:
يهدف هذا البحث إلى معرفة احتمالية تبني السيارات الكهربائية بين المستهلكين في المملكة العربية السعودية؛ حيث تعتمد السيارات الكهربائية بالكامل في تشغيلها على الطاقة الكهربائية بدلاً من البترول.
ستساعد هذه الدراسة صانعي السياسات، والمسوّقين، والجهات المعنية الأخرى؛ وقد تساهم نتائجها في تطوير السياسات المتعلقة بالسيارات الكهربائية في المملكة العربية السعودية وغيرها.

المشاركة في البحث:
المشاركة في هذا البحث اختيارية ومثمّنة جداً. جميع الإجابات التي ستقدّمها ستكون سرية. ولا تحتوي هذه الدراسة على أي مخاطرة، كما لن يُطلب منك كتابة اسمك أو أي معلومة قد تكشف عن هويتك.
ولمساعدتنا في تحقيق أقصى استفادة، يُرجى الإجابة بحرص على جميع الأسئلة قبل تقديم الاستبيان.

التواصل:
يقوم بإجراء هذا البحث محمد السويدان، طالب دكتوراه في جامعة فيكتوريا في أستراليا. في حال كان لديكم أي أسئلة بخصوص الدراسة أو لمعرفة المزيد حولها يمكنكم التواصل مع الباحث أو مع أحد مشرفيه:

محمد السويدان/

Mohammed.Alsuwaidan@live.vu.edu.au

ı@vu.edu.au /

all@vu.edu.au

موافقة على المشاركة في المشروع البحثي:
لقد قرأت المعلومات الواردة أعلاه. وأقرّ بأنني أبلغ من العمر ١٨ عاماً أو أكثر، أعيش في المملكة العربية السعودية وأختار المشاركة في هذا البحث بمحض إرادتي.

○ **نعم، أوافق.** يُرجى وضع إشارة في المكان المناسب للمتابعة.

○ **كلا، لا أوافق.**

يُرجى قراءة العبارات التالية، وتقدير مدى احتمالية قيامك أنت أو أحد أفراد أسرتك بشراء سيارة كهربائية في المستقبل.

١. ما مدى احتمالية أن تشتري أنت أو أي شخص في المنزل سيارة كهربائية صديقة للبيئة **خلال العام المقبل؟**

- ١٠ متيقن، شبه متيقن (٩٩ من كل ١٠٠) ○
- ٩ متأكد، شبه متأكد (٩ من كل ١٠) ○
- ٨ محتمل جداً (٨ من كل ١٠) ○
- ٧ محتمل (٧ من كل ١٠) ○
- ٦ احتمال جيد (٦ من كل ١٠) ○
- ٥ إمكانية جيدة إلى حد ما (٥ من كل ١٠) ○
- ٤ من المرجح (٤ من كل ١٠) ○
- ٣ بعض الاحتمالية (٣ من كل ١٠) ○
- ٢ احتمال طفيف (٢ من كل ١٠) ○
- ١ احتمال طفيف جدا (١ من كل ١٠) ○
- ٠ لا يوجد احتمال، لا يوجد احتمال تقريباً (١ من كل ١٠٠) ○

٢. ما مدى احتمالية قيامك أنت أو أحد أفراد الأسرة بشراء سيارة كهربائية صديقة للبيئة **في غضون عامين إلى خمسة أعوام مقبلة؟**

- ١٠ متيقن، شبه متيقن (٩٩ من كل ١٠٠) ○
- ٩ متأكد، شبه متأكد (٩ من كل ١٠) ○
- ٨ محتمل جداً (٨ من كل ١٠) ○
- ٧ محتمل (٧ من كل ١٠) ○
- ٦ احتمال جيد (٦ من كل ١٠) ○
- ٥ إمكانية جيدة إلى حد ما (٥ من كل ١٠) ○
- ٤ من المرجح (٤ من كل ١٠) ○
- ٣ بعض الاحتمالية (٣ من كل ١٠) ○
- ٢ احتمال طفيف (٢ من كل ١٠) ○
- ١ احتمال طفيف جدا (١ من كل ١٠) ○
- ٠ لا يوجد احتمال، لا يوجد احتمال تقريباً (١ من كل ١٠٠) ○

٣. ما مدى احتمالية قيامك أنت أو أي شخص في المنزل بشراء سيارة كهربائية صديقة للبيئة **في السنوات الست إلى العشر القادمة؟**

- ١٠ متيقن، شبه متيقن (٩٩ من كل ١٠٠) ○
- ٩ متأكد، شبه متأكد (٩ من كل ١٠) ○
- ٨ محتمل جداً (٨ من كل ١٠) ○
- ٧ محتمل (٧ من كل ١٠) ○
- ٦ احتمال جيد (٦ من كل ١٠) ○
- ٥ إمكانية جيدة إلى حد ما (٥ من كل ١٠) ○
- ٤ من المرجح (٤ من كل ١٠) ○
- ٣ بعض الاحتمالية (٣ من كل ١٠) ○
- ٢ احتمال طفيف (٢ من كل ١٠) ○
- ١ احتمال طفيف جدا (١ من كل ١٠) ○
- ٠ لا يوجد احتمال، لا يوجد احتمال تقريباً (١ من كل ١٠٠) ○

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يُرجى قراءة العبارات التالية وتحديد درجة موافقتك أو رفضك لكلٍ منها.

٤. في المرة القادمة التي أشتري فيها سيارة، سأفكر في شراء سيارة كهربائية صديقة للبيئة.

غير موافق بشدة	غير موافق	غير موافق إلى حدٍ ما	محايد	موافق إلى حدٍ ما	موافق	موافق بشدة
○	○	○	○	○	○	○

٥. أنوي قيادة سيارة كهربائية صديقة للبيئة في المستقبل القريب

غير موافق بشدة	غير موافق	غير موافق إلى حدٍ ما	محايد	موافق إلى حدٍ ما	موافق	موافق بشدة
○	○	○	○	○	○	○

٦. أتوقّع أن أقود سيارة كهربائية صديقة للبيئة في المستقبل القريب

غير موافق بشدة	غير موافق	غير موافق إلى حدٍ ما	محايد	موافق إلى حدٍ ما	موافق	موافق بشدة
○	○	○	○	○	○	○

٧. أعتقد أنني شخصٌ مهتمٌ بالقضايا البيئية

موافق بشدة	موافق	موافق إلى حد ما	محايد	غير موافق إلى حدٍ ما	غير موافق	غير موافق بشدة
○	○	○	○	○	○	○

٨. أصف نفسي كمستهلك واعٍ بيئيًا

موافق بشدة	موافق	موافق إلى حدٍ ما	محايد	غير موافق إلى حدٍ ما	غير موافق	غير موافق بشدة
○	○	○	○	○	○	○

٩. أعتقد أنني مستهلك "أخضر"

موافق بشدة	موافق	موافق إلى حدٍ ما	محايد	غير موافق إلى حدٍ ما	غير موافق	غير موافق بشدة
○	○	○	○	○	○	○

١٠. شراء سيارة كهربائية صديقة للبيئة سيجعلني أشعر بأنني مستهلك أخضر

موافق بشدة	موافق	موافق إلى حدٍ ما	محايد	غير موافق إلى حدٍ ما	غير موافق	غير موافق بشدة
○	○	○	○	○	○	○

١١. من المهم بالنسبة لي كيف يؤثر استخدام السيارات على البيئة

موافق بشدة	موافق	موافق إلى حدٍ ما	محايد	غير موافق إلى حدٍ ما	غير موافق	غير موافق بشدة
○	○	○	○	○	○	○

١٢. من المهم بالنسبة لي ما إذا كانت السيارات تتسبب في استنفاد مصادرنا الطبيعية مثل النفط.

موافق بشدة	موافق	موافق إلى حدٍ ما	محايد	غير موافق إلى حدٍ ما	غير موافق	غير موافق بشدة
○	○	○	○	○	○	○

١٣. من المهم بالنسبة لي ما إذا كان استخدام السيارة يُسبب تلوث هواء

موافق بشدة	موافق	موافق إلى حدٍ ما	محايد	غير موافق إلى حدٍ ما	غير موافق	غير موافق بشدة
○	○	○	○	○	○	○

١٤. سأشعر بالذنب إذا قمت بقيادة سيارة تُلحق الضرر بالبيئة

غير موافق بشدة	غير موافق	غير موافق إلى حدٍ ما	محايد	موافق إلى حدٍ ما	موافق	موافق بشدة
○	○	○	○	○	○	○

١٥. إنَّ شراء سيارة تضر بالبيئة سيكون خطأً أخلاقياً بالنسبة لي

غير موافق بشدة	غير موافق	غير موافق إلى حدٍ ما	محايد	موافق إلى حدٍ ما	موافق	موافق بشدة
○	○	○	○	○	○	○

١٦. إنَّ شراء سيارة تؤثر على البيئة يتعارض مع مبادئي

غير موافق بشدة	غير موافق	غير موافق إلى حدٍ ما	محايد	موافق إلى حدٍ ما	موافق	موافق بشدة
○	○	○	○	○	○	○

١٧. سأشعر بالرضا عن نفسي إذا اشتريت سيارة كهربائية صديقة للبيئة

غير موافق بشدة	غير موافق	غير موافق إلى حدٍ ما	محايد	موافق إلى حدٍ ما	موافق	موافق بشدة
○	○	○	○	○	○	○

١٨. سأشعر بالفخر إذا امتلكت سيارة كهربائية صديقة للبيئة

غير موافق بشدة	غير موافق	غير موافق إلى حدٍ ما	محايد	موافق إلى حدٍ ما	موافق	موافق بشدة
○	○	○	○	○	○	○

١٩. تعجبني فكرة امتلاك سيارة كهربائية صديقة للبيئة

غير موافق بشدة	غير موافق	غير موافق إلى حدٍ ما	محايد	موافق إلى حدٍ ما	موافق	موافق بشدة
○	○	○	○	○	○	○

"المنتجات الخضراء" هي تلك التي لا تضر بالبيئة. يُرجى قراءة العبارات التالية وتحديد درجة موافقتك أو رفضك لكلٍ منها.

٢٠. أشعر وكأنني جزء من عائلة المهتمين بالمنتجات الخضراء

غير موافق بشدة	غير موافق	غير موافق إلى حدٍ ما	محايد	موافق إلى حدٍ ما	موافق	موافق بشدة
○	○	○	○	○	○	○

٢١. الأشخاص الذين يشترون المنتجات الخضراء يتشابهون معي كثيرًا

غير موافق بشدة	غير موافق	غير موافق إلى حدٍ ما	محايد	موافق إلى حدٍ ما	موافق	موافق بشدة
○	○	○	○	○	○	○

٢٢. شراء المنتجات الخضراء يعكس من أكون

غير موافق بشدة	غير موافق	غير موافق إلى حدٍ ما	محايد	موافق إلى حدٍ ما	موافق	موافق بشدة
○	○	○	○	○	○	○

يُرجى قراءة العبارات التالية وتحديد درجة موافقتك أو رفضك لكلٍ منها.

٢٣. توفر الوظائف البيئية للسيارات الكهربائية قيمة جيدة جدًا لك

غير موافق بشدة	غير موافق	غير موافق إلى حدٍ ما	محايد	موافق إلى حدٍ ما	موافق	موافق بشدة
○	○	○	○	○	○	○

٢٤. تُظهر السيارات الكهربائية اهتمامًا بالبيئة أكثر من السيارات الأخرى

غير موافق بشدة	غير موافق	غير موافق إلى حدٍ ما	محايد	موافق إلى حدٍ ما	موافق	موافق بشدة
○	○	○	○	○	○	○

٢٥. السيارات الكهربائية صديقة للبيئة

غير موافق بشدة	غير موافق	غير موافق إلى حدٍ ما	محايد	موافق إلى حدٍ ما	موافق	موافق بشدة
○	○	○	○	○	○	○

٢٦. تتمتع السيارات الكهربائية بفوائد بيئية أكثر من السيارات الأخرى

غير موافق بشدة	غير موافق	غير موافق إلى حدٍ ما	محايد	موافق إلى حدٍ ما	موافق	موافق بشدة
○	○	○	○	○	○	○

٢٧. شراء سيارة كهربائية يعني مخاطرة مالية بالنسبة لي

غير موافق بشدة	غير موافق	غير موافق إلى حدٍ ما	محايد	موافق إلى حدٍ ما	موافق	موافق بشدة
○	○	○	○	○	○	○

٢٨. السيارات الكهربائية خطرة لأنها غالبًا ما تتعطل

غير موافق بشدة	غير موافق	غير موافق إلى حدٍ ما	محايد	موافق إلى حدٍ ما	موافق	موافق بشدة
○	○	○	○	○	○	○

٢٩. السيارات الكهربائية لها قيمة إعادة بيع أقل من السيارات الأخرى

غير موافق بشدة	غير موافق	غير موافق إلى حدٍ ما	محايد	موافق إلى حدٍ ما	موافق	موافق بشدة
○	○	○	○	○	○	○

٣٠. إنّ امتلاك سيارة كهربائية يعني أن الآخرين ينظرون إلي بدونيّة

غير موافق بشدة	غير موافق	غير موافق إلى حدٍ ما	محايد	موافق إلى حدٍ ما	موافق	موافق بشدة
○	○	○	○	○	○	○

٣١. أشعر بالقلق من أن البطارية في السيارة الكهربائية سوف تنفد قبل أن أصل إلى وجهتي.

غير موافق بشدة	غير موافق	غير موافق إلى حدٍ ما	محايد	موافق إلى حدٍ ما	موافق	موافق بشدة
○	○	○	○	○	○	○

يُرجى قراءة العبارات التالية وتحديد درجة موافقتك أو رفضك لكلٍ منها.

٣٢. إذا سمعت عن التكنولوجيا الجديدة ، فسأبحث عن طرق لتجربتها

غير موافق بشدة	غير موافق	غير موافق إلى حدٍ ما	محايد	موافق إلى حدٍ ما	موافق	موافق بشدة
○	○	○	○	○	○	○

٣٣. من بين زملائي ، عادة ما أكون أول من يجرب التقنيات الجديدة

غير موافق بشدة	غير موافق	غير موافق إلى حدٍ ما	محايد	موافق إلى حدٍ ما	موافق	موافق بشدة
○	○	○	○	○	○	○

٣٤. بشكل عام ، لا أتردد في تجربة التقنيات الجديدة

غير موافق بشدة	غير موافق	غير موافق إلى حدٍ ما	محايد	موافق إلى حدٍ ما	موافق	موافق بشدة
○	○	○	○	○	○	○

٣٥. أحب تجربة قيادة السيارات الكهربائية

غير موافق بشدة	غير موافق	غير موافق إلى حدٍ ما	محايد	موافق إلى حدٍ ما	موافق	موافق بشدة
○	○	○	○	○	○	○

من فضلك، حدد أفضل إجابة تصفك للأسئلة التالية.

١. الجنس:

ذكر	أنثى
○	○

٢. العمر:

١٨ - ٢٤	٢٥ – ٣٤	٣٥ – ٤٩	٥٠ – وما فوق
○	○	○	○

٣. الدرجة العلمية: اذكر أعلى درجة حصلت عليها

الثانوية العامة أو أقل	دبلوم	بكالوريوس	دراسات عليا
○	○	○	○

٤. الحالة الاجتماعية:

غير متزوج	متزوج	متزوج ولدي أطفال
○	○	○

٥. الدخل الشهري: بعملة الريال السعودي

٦،٠٠٠ أو أقل	٦،٠٠١ - ٩،٩٩٩	١٠،٠٠٠ - ١٤،٩٩٩	١٥،٠٠٠ – ١٩،٩٩٩	٢٠،٠٠٠ وأكثر	أفضل عدم الإجابة
○	○	○	○	○	○

٦. هل لديك رخصة قيادة ؟

نعم	لا، لكني أخطط للحصول على رخصة قيادة في غضون السنوات العشر القادمة	لا
○	○	○

٧. نوع السيارة التي يتم قيادتها عادة:

سيارة صغيرة	سيارة متوسطة الحجم	سيارة كبيرة الحجم	لا شيء
○	○	○	○

كم عدد المركبات المملوكة حاليًا في منزلك:

١	٢	٣	٤ وأكثر	لا يوجد
○	○	○	○	○

Appendix 2: Examples of Tweets

M S A @malsuwaidan · Mar 30, 2022

✅مشاركتك تهمنا كثيرًا 🌹

أود من سعادتكم المشاركة في الاستبانة لاستكمال رسالة الدكتوراة موضوع البحث حول الوعي البيئي وأثره على سلوك المستهلك السعودي تجاه الشراء الصديق للبيئة.

رابط الاستبانة:
vuau.qualtrics.com/jfe/form/SV_aW...
أتمنى المشاركة و إرسالها مشكورين للأصدقاء 🌹 #القصيم #الدمام

M S A @malsuwaidan ·

✅Your participation is vital!

Please take part in our survey on environmental awareness and its influence on Saudi consumers' attitudes toward environmentally friendly purchases.

Questionnaire link:
vuau.qualtrics.com/jfe/form/SV_aW...

#KSA #Riyadh #TASI

Thank you, 🌹

M S A @malsuwaidan ·

✅مشاركتك تهمنا كثيرًا

أود من سعادتكم المشاركة في الاستبانة لاستكمال رسالة الدكتوراة موضوع البحث حول الوعي البيئي وأثره على سلوك المستهلك السعودي تجاه الشراء الصديق للبيئة.

أتمنى مشاركتها مع للأصدقاء في #WhatsApp و #SMS #رسالة_اليوم

رابط الاستبانة:
vuau.qualtrics.com/jfe/form/SV_aW...
🌹

M S A @malsuwaidan ·

✅Your participation is crucial!

Please take part in our survey on environmental awareness and its influence on Saudi consumers' attitudes toward environmentally friendly purchases.

Kindly share with friends #WhatsApp& #SMS #Today

Questionnaire:
vuau.qualtrics.com/jfe/form/SV_aW...
🌹

Appendix 3: Ethics Committee Approval

Dear

Your ethics application has been formally reviewed and finalised.

» Application ID: HRE21-186
» Chief Investigator: ASPR BRADLEY WILSON
» Other Investigators: MR MOHAMMED SAMIR M ALSUWAIDAN, ASPR DAVID BEDNALL
» Application Title: GREEN MARKETING AND CUSTOMER BEHAVIOUR IN SAUDI ARABIA: AN EXAMINATION OF ENVIRONMENTALLY FRIENDLY CAR PURCHASE PROBABILITY.
» Form Version: 13-07

The application has been accepted and deemed to meet the requirements of the National Health and Medical Research Council (NHMRC) 'National Statement on Ethical Conduct in Human Research (2007)' by the Victoria University Human Research Ethics Committee. Approval has been granted for two (2) years from the approval date; 11/02/2022.

Continued approval of this research project by the Victoria University Human Research Ethics Committee (VUHREC) is conditional upon the provision of a report within 12 months of the above approval date or upon the completion of the project (if earlier). A report proforma may be downloaded from the Office for Research website at: http://research.vu.edu.au/hrec.php.

Please note that the Human Research Ethics Committee must be informed of the following: any changes to the approved research protocol, project timelines, any serious events or adverse and/or unforeseen events that may affect continued ethical acceptability of the project. In these unlikely events, researchers must immediately cease all data collection until the Committee has approved the changes. Researchers are also reminded of the need to notify the approving HREC of changes to personnel in research projects via a request for a minor amendment. It should also be noted that it is the Chief Investigators' responsibility to ensure the research project is conducted in line with the recommendations outlined in the National Health and Medical Research Council (NHMRC) 'National Statement on Ethical Conduct in Human Research (2007).'

On behalf of the Committee, I wish you all the best for the conduct of the project.

Secretary, Human Research Ethics Committee
Phone: 9919 4781 or 9919 4461
Email: researchethics@vu.edu.au

Appendix 4: Translator's Certification

CERTIFIED TRANSLATION
Translated by a NAATI certified translator
ABN 35646817442

18/03/2021

Watad Translation

1701/36-46 Cowper St,

Parramatta, NSW, 2150.

info@watadtranslation.com

To whom it may concern

We, Watad Translation can confirm that the research instruments provided by Mohammed Alsuwaidan have been translated into Arabic by Yousef Sahari, a Professional NAATI-accredited translator, NAATI No. CPN5OQ23X.

Should you require further information, please do not hesitate to contact us

Sincerely

Yousef Sahari

YOUSEF SAHARI
CPN5OQ23X
ENGLISH -> ARABIC
VALID TO 13/12/2023
SIGNATURE :
TRANSLATION DATE : 13/01/2022
CERTIFIED TRANSLATOR

info@watadtranslation.com | +61451158406 | +966540766627 | www.watadtranslation.com

Appendix 5: Common Method Variance

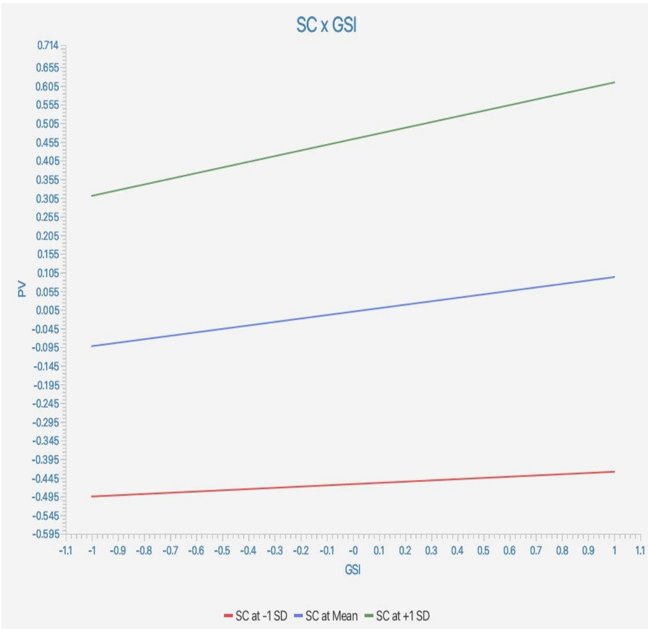
Total Variance Explained

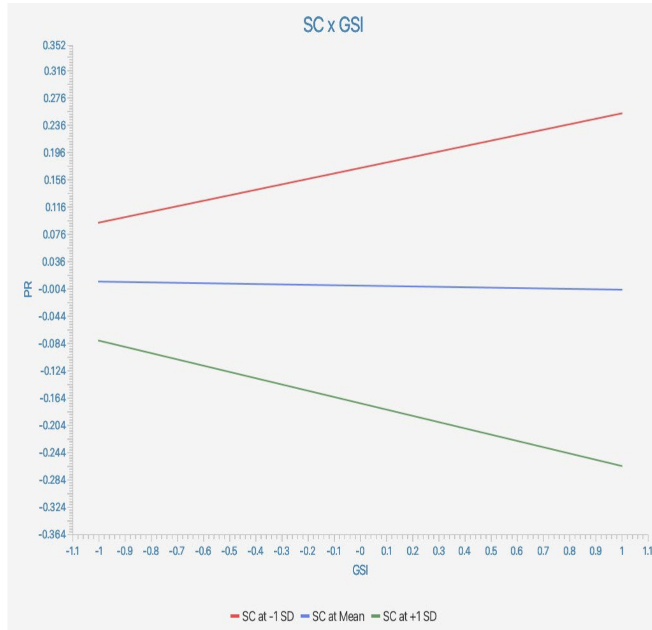
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	12.222	34.920	34.920	12.222	34.920	34.920
2	3.030	8.656	43.576			
3	2.328	6.652	50.228			
4	2.208	6.307	56.535			
5	1.797	5.134	61.669			
6	1.369	3.910	65.579			
7	1.106	3.159	68.738			
8	.948	2.708	71.447			
9	.860	2.456	73.903			
10	.746	2.131	76.033			
11	.699	1.996	78.029			
12	.663	1.893	79.923			
13	.594	1.696	81.619			
14	.501	1.433	83.052			
15	.471	1.345	84.397			
16	.432	1.233	85.630			
17	.423	1.208	86.838			
18	.391	1.118	87.956			
19	.378	1.079	89.035			
20	.360	1.030	90.064			
21	.352	1.006	91.070			
22	.323	.923	91.993			
23	.317	.905	92.898			
24	.289	.826	93.724			
25	.261	.747	94.471			

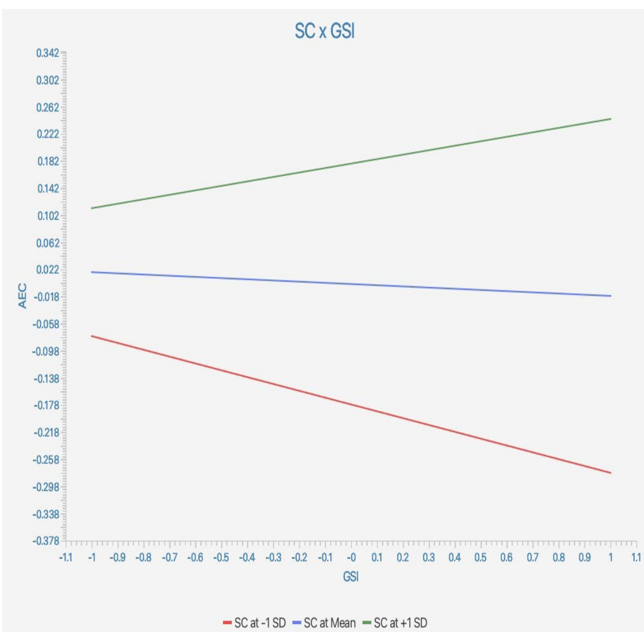
26	.252	.720	95.191
27	.242	.691	95.882
28	.238	.679	96.560
29	.215	.614	97.174
30	.212	.605	97.779
31	.192	.548	98.327
32	.176	.502	98.829
33	.157	.449	99.278
34	.135	.387	99.665
35	.117	.335	100.000

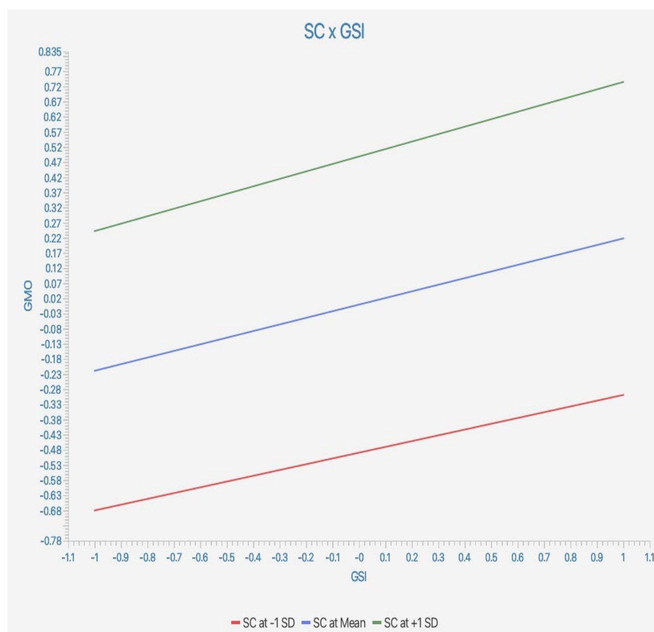
Extraction Method: Principal Component Analysis.

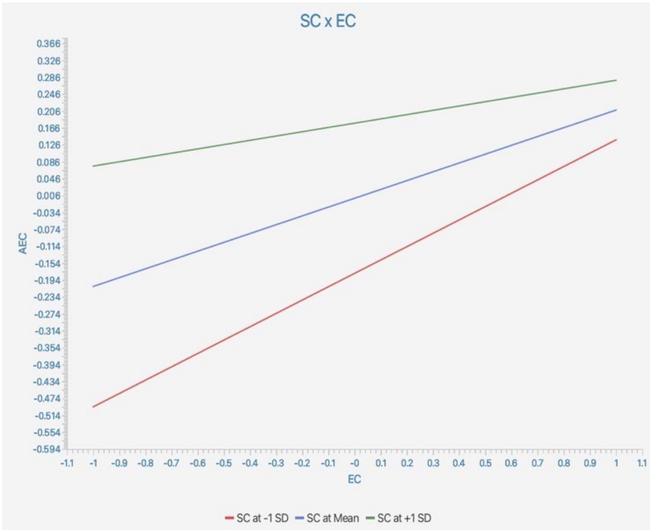
Appendix 6: Moderation Effect's Interaction

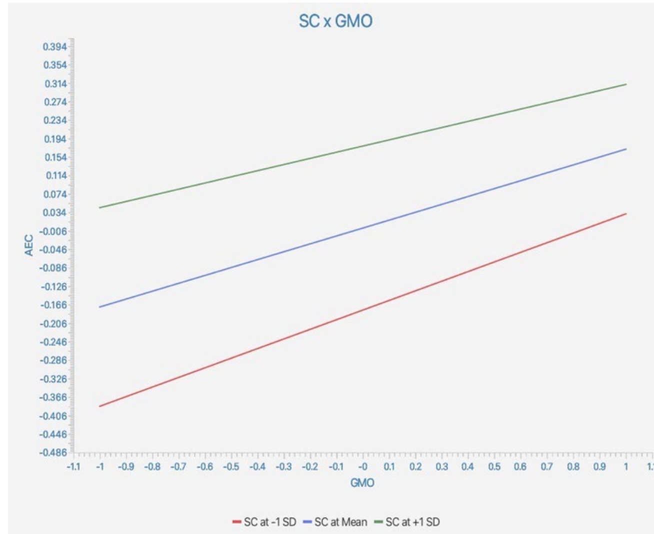


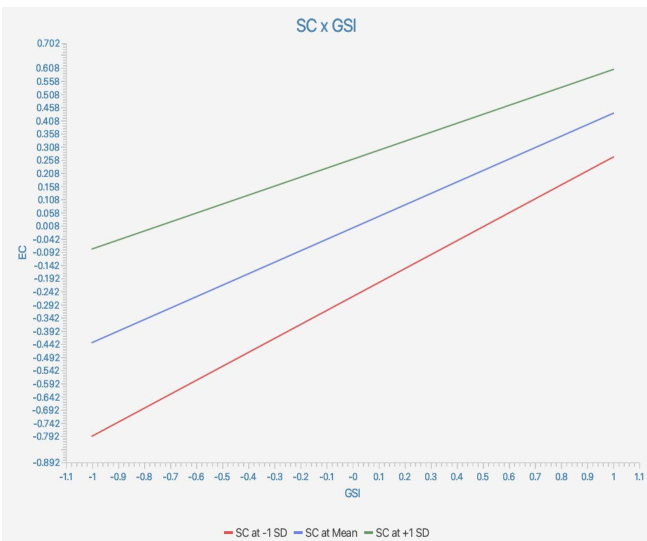




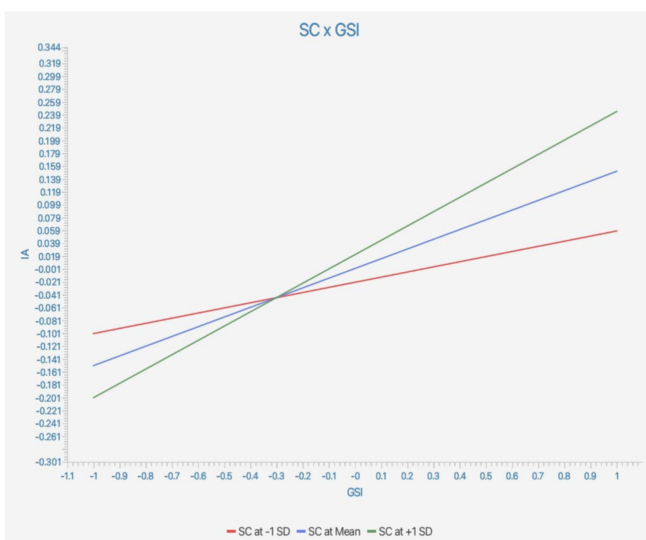



SC x EC
AEC
EC
SC at -1 SD
SC at Mean
SC at +1 SD


SC x GMO
AEC
GMO
SC at -1 SD
SC at Mean
SC at +1 SD

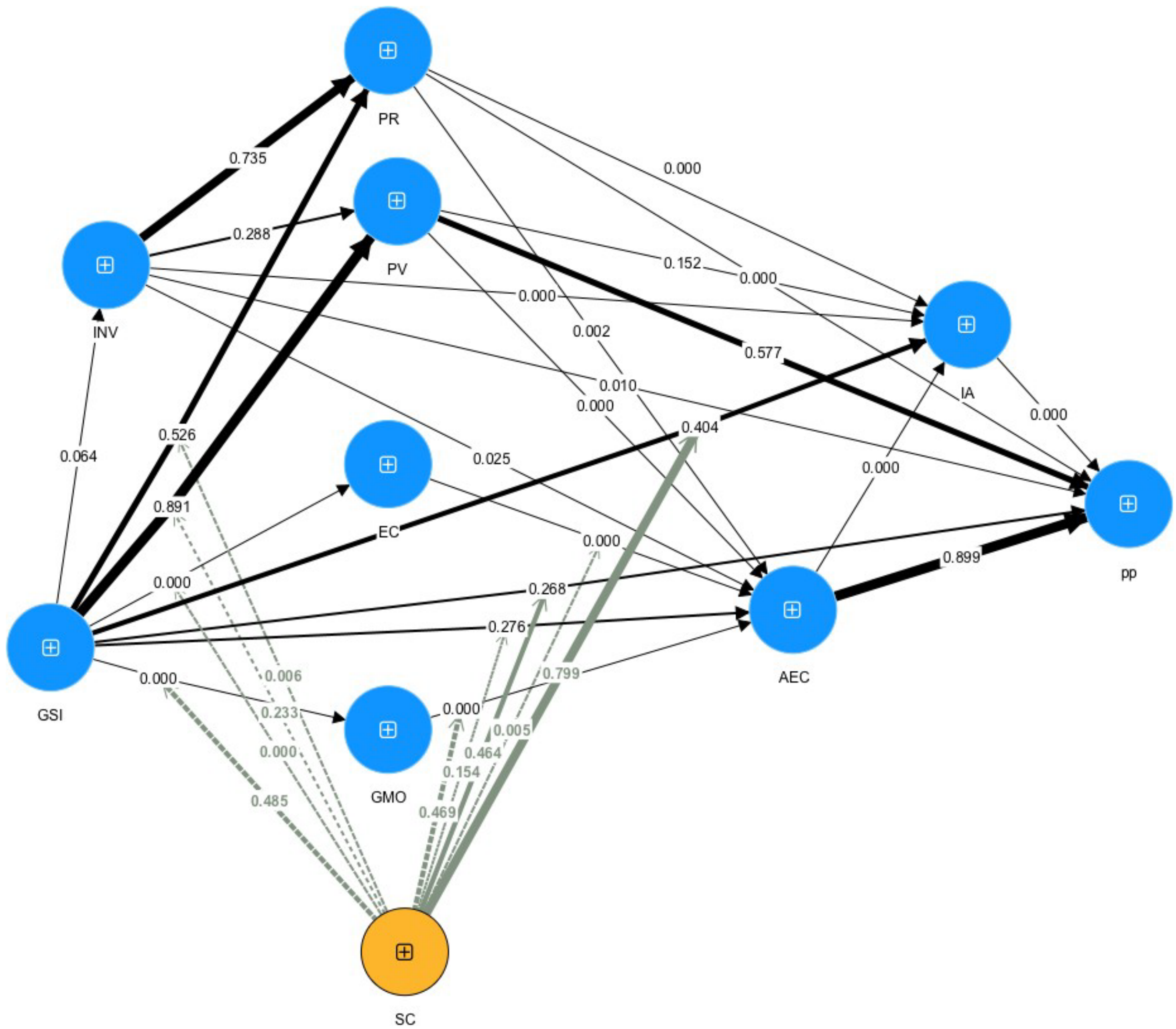

SC x GSI
EC
GSI
SC at -1 SD
SC at Mean
SC at +1 SD


SC x GSI
PP
GSI
SC at -1 SD
SC at Mean
SC at +1 SD

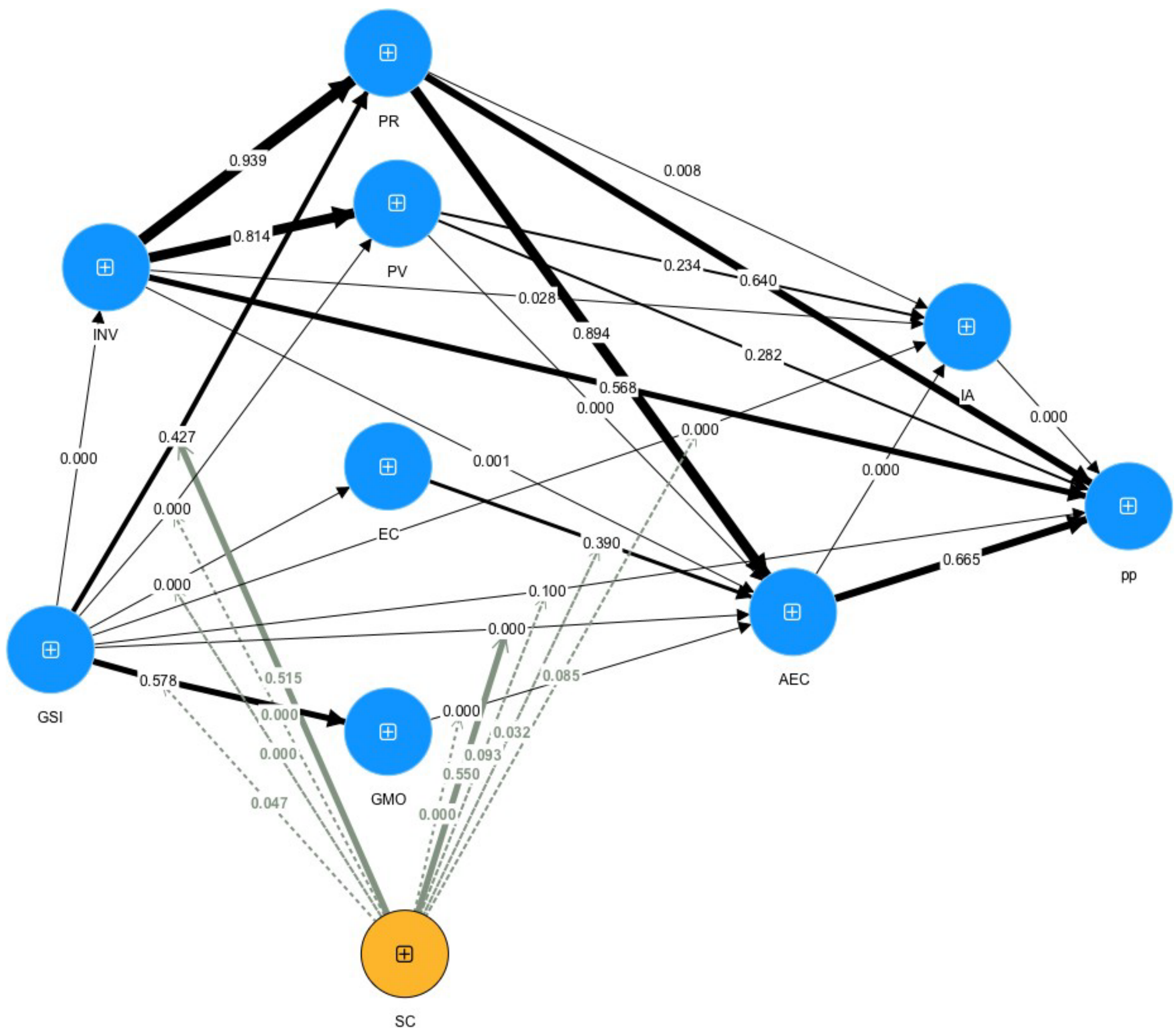

SC x GSI
IA
GSI
SC at -1 SD
SC at Mean
SC at +1 SD

Appendix 7: Path Coefficients for FIMIX Segments and Total Data

FIMIX Segment_1



FIMIX Segment_2



FIMIX Total Data