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Exploring electric vehicles attributes and users' satisfaction based on driving experience

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by

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Resumo

A aquisição de veículos elétricos tem sido promovida pelo governo nos últimos anos, consequência da crescente preocupação relativamente ao aquecimento global devido à libertação de gases com efeito de estufa associada à utilização de combustíveis fósseis. Não obstante, a quota de mercado dos veículos elétricos ainda é bastante reduzida, pelo que se torna significativo entender o panorama atual. Para determinar a condição atual da experiência dos utilizadores destes veículos é importante analisar a sua satisfação. Com base na experiência de condução e na teoria do comportamento planeado, foi elaborado um esquema no qual se integra a avaliação do consumidor relativamente às características dos veículos elétricos, bem como a sua relação com a experiência de condução e satisfação. Por forma a efetivar esta análise, foi possível averiguar o impacto da experiência de condução na perceção dos consumidores relativamente às características destes veículos e, por outro lado, compreender os efeitos na sua satisfação e, consequentemente, na sua intenção de recompra e possível recomendação. Neste estudo, foram recolhidas e analisadas as opiniões de atuais proprietários de veículos elétricos (N=279) com diferentes níveis de experiência. Os resultados demonstram que tanto a experiência de condução, como a avaliação das características de veículos elétricos (à exceção da avaliação relativamente a postos de carregamento) afetam positivamente a satisfação dos utilizadores. Além disso, aqueles que evidenciam estar satisfeitos, tendencialmente recomprarão, bem como recomendarão estes veículos a outros. No entanto, os resultados revelam que a avaliação das características dos veículos elétricos não se altera com o aumento da experiência. Considerando que a presente investigação se baseou na experiência real dos proprietários de veículos elétricos, os resultados contribuem para a perceção do estado atual da mobilidade elétrica confirmando-se, por conseguinte, relevante para a definição de um melhor serviço prestado aos utilizadores de veículos elétricos.

Palavras-chave: Veículos Elétricos, Experiência de Condução, Satisfação do utilizador, atitudes, Atributos de veículos elétricos

Abstract

The acquisition of battery electric vehicles (BEVs) has been strongly promoted by the government for the last years due to the growing environment concerns towards the global warming due to the release of greenhouse gas emissions prevenient from the use of fossil fuels. However, BEV market share is still low, so it is important to understand the big picture. To determine the current conditions of BEV owners experience it is important to evaluate BEV users' satisfaction. Based on driving experience and the theory of planned behaviour, it was established a framework containing the consumer´s evaluation about BEV attributes as well as their driving experience and satisfaction. Thus, empirically, this thesis examines into what extent the driving experience influences the consumer's perception in what concerns the characteristics of these vehicles. On the other hand, it also tries to understand in what way it influences the previous BEV owners to repurchase these type of vehicles and recommend them to others, also based in their driving experience and satisfaction.

This study collected and analysed the self-reported opinions of actual BEV owners (N=279) with different levels of driving experience. The results show that both driving experience and attitudes towards BEV attributes (except from attitudes towards charging infrastructures) positively affects the overall satisfaction of BEV users. Furthermore, those who are satisfied with BEVs have the intention to repurchase and recommend them to others. Nevertheless, the results also reveal that the evaluation of BEV attributes does not change with increasing driving experience. Considering that this study was based on actual experience of BEV owners, such findings could enhance the understanding of BEV driving status and, hence, allow better services for BEV users.

Keywords: Battery Electric Vehicle (BEV), Driving Experience, User satisfaction, Attitudes, BEV attributes

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List of Acronyms

TS	Transport Sector
GHG	Greenhouse gases
VAT	Value-added tax
TPB	Theory of Planned Behaviour
PBC	Perceived Behavioural Control
SN	Subjective Norm

Description of vehicle types

ICEV – Internal Combustion Engine Vehicle:

A vehicle that uses an internal combustion engine, mostly fed by fossil fuels as petrol or diesel (Egnér & Trosvik, 2018).

EV – Electric Vehicle:

A general term used to describe vehicles that use an electric motor. This term includes BEVs, HEVs and PHEVs (Egnér & Trosvik, 2018).

BEV – Battery Electric Vehicle:

A vehicle that runs exclusively on electricity using an electric motor, powered by an on-board battery which is charged by plugging it into a charging point (Egnér & Trosvik, 2018).

HEV – Hybrid Electric Vehicle:

A vehicle that combines an internal combustion engine with an electric motor. These vehicles cannot be plugged in and recharged even though they have an

electric motor and battery. Instead, their batteries are charged from capturing energy that is normally wasted in ordinary vehicles (Egnér & Trosvik, 2018).

PHEV – Plug-in Hybrid Electric Vehicle:

A vehicle identical to a HEV, equally equipped with an internal combustion engine and an electric motor, however a PHEV has a higher battery capacity and can be charged by plugging it into a charging point. Further, a PHEV has the capability to use electricity as its primary engine source, while the internal combustion engine generally serves as a back-up when the battery is depleted (Egnér & Trosvik, 2018).

Introduction

According to Morton (2013), cars are one of the main sources of greenhouse gas emissions, hitting the natural environment massively with their contribution to climate change (IPCC, 2007). As the highest traffic is mostly concentrated in urban areas it contributes to high levels of local pollution which can have significant implications in public health (Yim & Barret, 2012). Moreover, as gasoline powered vehicles' engines rely mainly on oil-based fuels to operate and these are increasingly scarce (MacKenzie, 1998), this also created a significant source of various pressing social problems all embracing the deteriorating air quality, the aggravated climate change, congestion, and negative alterations to urban form and function (Sovacool et al., 2018). Considering this evidence, the European Commission proposed in September 2020 to raise the 2030 greenhouse gas emission reduction target to at least 55% compared to 1990. Accordingly, the former introduced the "2030 Climate and Energy Framework", announcing three key targets for 2030: at least 40% cuts in greenhouse gas emissions (from 1990 levels); at least 32% share for renewable energy and at least 32,5% improvement in energy efficiency (European Commission, 2019).

Concerning renewable energy, Portugal had in 2017 a 54,2% share of renewables in the electricity sector, being the fifth highest in the European Union. (Agência Portuguesa do Ambiente [APA], 2019).

Even though the penetration of renewable sources within the electricity mix is one of the measures proposed to support the transition to low-carbon economies, sectors based predominantly on fossil fuels, for instance Transport Sector (TS), continue to delay this transition.

As reported by the Agência Portuguesa do Ambiente (APA) in their last report (2019), the "transport" sector (TS) was one of the highest energy consumption field, accounting for 37,2% of total primary energy consumption in

2017. This sector is also one major source of GHG emissions, accounting for 24,3% of the total national emissions in this same year.

In agreement with Almeida Neves et al. (2019), to decarbonise economies, there must be a refinement in the TS energy paradigm.

In order to fulfil this goal, electric vehicles (EV) are being developed and implemented within the automotive market. Car manufacturers are currently promoting a variety of electric based Low Emission Vehicles (LEVs), including hybrid electric vehicles (HEVs), plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs).

In this thesis only BEVs were considered since they are highlighted as one of the most significant technology alternatives to Internal Combustion Engine Vehicles (ICEVs) in pursuant of fossil independence and a more energy efficient transport sector. Technically, BEVs only use batteries, charged from the electricity grid, to power an electric motor, unlike the other LEVs considered before which use both an internal combustion engine (ICE) and an alternative electric motor (Almeida Neves et al., 2019).

However, the potential of BEVs can only be thoroughly understood if a high percentage of the energy used to charge this type of mobility is generated from renewable energy sources (Hawkins et al., 2012). As such, BEV should not only rely on electricity but also in other clean energy forms such as wind, solar, and water (Rauh et al., 2017). Since in Portugal 55.3% of electricity production derives from renewable sources (Agência Portuguesa do Ambiente [APA], 2019), the GHG emissions from BEVs are relatively low, bringing benefits such as air quality improvements and reduced noise.

Even with the growth of the BEV market in the past few years in some European countries, the market share of BEVs is still relatively low in some countries such as Germany, Denmark and the United Kingdom (Sierzchula et al., 2014). In fact, the popularity of BEV is bound to consumers' perceived uncertainties (Cecere et al., 2018; Liu et al., 2017) and when it comes to deciding

which type of car to purchase, EVs still represent not only a consumer choice problem but also a behavioural adjustment problem – considering other functional characteristics such as limited range and availability of charging (Sovacool et al., 2018). This way, it is crucial to find effective ways to promote BEV circulation (Liu et al., 2020).

In the present moment, the research on aspects influencing the adoption of EVs and the functionality of its technology, are focusing mainly on contextual and psychological factors (Li et al., 2017). The most important contextual factors are taxes and subsidies, with a considerable influence on the relative price of an EV after tax (e.g., Lévay et al., 2017; Sierzchula et al., 2014) and the charging infrastructure (Lieven, 2015; Sierzchula et al., 2014). On the other hand, psychological factors were found to have a significant impact, including the person's attitude towards buying an EV (Moons & De Pelsmacker, 2012), the feeling of being obligated to buying an eco-friendly car (Nayum & Klöckner, 2014) and other environmental concerns (Beck et al., 2017). Equally scalable psychological factors include consumer uncertainty (Liao et al., 2017; Naor et al., 2015) and expected difficulties when experimenting this new car technology (Peters & Dütschke, 2014). Extensive studies conducted in this area revealed meaningful results (Adepetu & Keshav, 2017; Bakker & Jacob Trip, 2013). However, expectations about difficulties in the everyday use of an EV, for instance, perceived difficulty in use and uncertainty about this new technology continue to be consumers' main concerns, proving it to be one of the greatest psychological barriers to buying intentions (Thøgersen & Ebsen, 2019). Indeed, the former appears to be the psychological antecedent with the strongest effect on intention to buy an EV, fostered by the belief that an EV's driving range is insufficient, often referred to as ''range anxiety" (Adepetu & Keshav, 2017).

Hence, to achieve higher adoption rates "policies should not only build on financial incentives and increase the quantity and quality of charging infrastructures" (Sierzchula et al., 2014) but also count on reducing expected

uncertainty and the perceived difficulties. Therefore, experience with BEVs should be considered given that it has been argued as relevant to policy interventions (Larson et al., 2014). Some authors found that direct experience influences consumers' evaluation of BEV attributes concerning their level of experience (Jensen et al., 2013; Schmalfuß et al., 2017). As stated in Liu et. al (2020), experiencing BEVs may change people's evaluation of specific attributes, for instance, low emissions and low noise levels, thereby contributing to overcoming prejudices and convincing people that BEVs are user-friendly vehicles. Despite the effort to understand BEVs consumers perceptions, only few studies have been employing data collected from actual BEV users (Figenbaum & Kolbenstvedt, 2016; Ouyang et al., 2018; Helveston et al., 2015). Additionally, most previous studies converged into BEVs adoption strategies rather than evaluating and improving its practical usage (Kwon et al., 2020).

The current research contributes relevant insights regarding BEVs driving experience and its influence on BEV users' satisfaction. To further enrich the study an exploratory investigation was conducted in order to ascertain which attributes BEVs users' value most. Moreover, this thesis will use questionnaire data from BEV consumers from Portugal. Based on the theory of planned behaviour (TPB) this research formulates a framework of influencing factors for the BEV users' satisfaction, linking the consumer experience with BEVs as one background factor. According to Schmalfub et al. (2017), existing models of BEV adoption did not encompass experience with BEVs as a factor and previous studies have not considered potential indirect experience effects on attitudes, behavioural intentions relating to BEVs nor on user satisfaction. To overcome this gap and following the suggestion given by Liu et. al (2020) in their article, this research explores the differences between consumers with more or less experience when evaluating different BEVs attributes, different levels of satisfaction as well as repurchase and recommended intention. Specifically, this study intends to analyse the following: (1) the differences between distinctive

levels of driving experience in attitudes toward BEV's attributes, BEV user satisfaction and repurchase and recommend intention; (2) whether the consumer driving experience has an impact on BEVs user satisfaction; (3) whether BEVs user satisfaction has an impact on repurchase and recommendation intention; and (4) whether recommendation intention can turn into repurchase intention.

The thesis is structured as follows: in the "Literature review" section, relevant literature is reviewed, followed by chapter 2 in which the theoretical framework is introduced and the research hypotheses are proposed. Then it is introduced the "Method" section. In this chapter, the research objectives are detailed followed by the description of the methodology adopted and the data collection and analysis procedures utilized. Following that, the "Results and Data analysis" section is presented. Here, the sample is characterized followed by the introduction of the research results. Afterwards, "Discussion and conclusions" section is presented, in which a discussion of the research findings is conducted, followed by the "Managerial implications" and "Conclusions". Finally, the "Research limitations" are presented as well as further research suggestions.

Chapter 1
Literature Review

1.1 Factors affecting the adoption of BEVs

Literature on consumer EV adoption has considered distinct factors affecting the adoption of EVs. For instance, Coffman et al. (2016) suggests the division of factors into internal to EVs and external to EVs. With respect to internal factors, the literary works identify vehicle ownership cost, driving range and charging time as those that most affect EV adoption.

When it comes to consumers' purchase decisions, some authors found that the purchase price of an EV compared to ICEVs or HEVs is extremely important. For instance, in a quantitative study by Carley et. al (2013), the main finding is that EV purchase price is the most preeminent disadvantage. However, Coffman et al. (2016) states that the differential price between EVs and other vehicles narrows since the purchase costs of EVs are rapidly declining.

Among the non-financial aspects, electric driving range is being considered to be the major limitation to adoption. People's fear that the driving range will not fit well into their everyday life, reduces the likelihood to accept (Thogersen & Ebsen, 2019), fostered by the belief that an EV's driving range is insufficient, often referred to as ''range anxiety" (Adepetu & Keshav, 2017). Notwithstanding, Tran et. al (2013) concluded that "range anxiety is better addressed through enabling access to charging stations than extended range vehicles", highlighting the importance of reducing the charging time.

Moreover, studies referring to external factors mentioned relative fuel prices, consumer characteristics, availability of charging stations and public visibility/social norm as having the greatest effect on EV adoption.

Simulation studies exhibit higher fuel cost savings for EVs when diesel and petrol prices are higher (Al-Alawi & Bradley, 2013; Prud'homme & Koning, 2012), giving great importance to fuel prices as a key drive of EV adoption (Beresteanu & Li, 2011). Yet, Sierzchula et al. (2014), found that fuel price is not a weighty predictor of EV market share.

Among consumer characteristics that are likely to affect EV adoption, several studies include: education, income, number and type of cars owned, level of environmentalism and technology attachment. However, there is no consent on which of these characteristics matter most (Coffman et al., 2016). Some authors argue that having a higher level of education leads to an increase in EV adoption probability (Carley et. al, 2013), others, for instance, Sierzchula et. al (2014) found that neither education nor income levels are indicative of EV purchase.

Graham-Rowe et. al (2012) found that car users give little importance to environmental impacts, prioritising vehicle utility. On the other hand, Burgess et. al (2013) found that "green image" impacts attitudes towards EVs. In fact, Noppers et. al (2014) confers great importance to the environmental attribute and states that people are motivated to adopt sustainable innovations because of their environmental benefits.

However, current literature presents some limitations regarding the study of consumer characteristics since most of the investigations are around the concept of early adopters. Giving the increase of the EV market share as well as the growing use and experience of this type of mobility, it becomes mandatory to assess mass adopters.

Concerning charging infrastructures, its ability to fulfil everyday consumer necessities is found to be critically important due to limited driving range. Nevertheless, Egbue & Long (2012) found in their study that the lack of charging infrastructure is the biggest concern with EVs whereas Kester et al. (2018) states that the number of charging stations are playing an important role in the increase in BEVs adoption and has influenced positively EVs market share. Yet, there is

an increase in the demand for more reliable, accessible, affordable and fast charging networks to recharge vehicle batteries more efficiently (Almeida Neves et al., 2019). Nonetheless, adequate charging infrastructure demands for a local understanding of certain behaviour and contextual patterns. According to Coffman et al. (2016), the optimal distribution and type of public charging support depends on regular driving distance, vehicle driving range, types of trips, home charging availability, charging time and impacts to the power system.

Currently, in Portugal there are more than 500 charging stations which correspond to about 1250 charging points (Mobi.E, n.d.).

Similarly, public visibility of EVs and social/subjective norms play a significant role in the uptake of EVs (Eppstein et. al, 2011). Thus, adoption of EVs technology is a result of one getting recognition from others for doing so (Sovacool, 2017; Liao et. al., 2017). Cars were found to be to be a "status symbol" by several authors. Moreover, attitudes towards cars are influenced by other psychological motives besides the need for mobility (Lois & López-Sáez, 2009). For instance, Allen (2002) attributes two meanings linked with owning a certain product: utilitarian and symbolic. The first is, in turn, described as the practical benefits obtained from the functionalities inherent to the product. The latter, represents self-expressive motivation, helping the buyer to achieve the desired self-image and personal fulfilment. In this sequence, Rezvani et al. (2015) suggested that the greater the level of personal moral norms (self-transcendence, self-interest, principles, environmental concern, technical knowledge among others) the higher the probability to adopt EVs will be.

Apart from the internal and external factors above mentioned, the literature identifies financial and non-financial incentives as equally important to EV acceptance. Tax incentives on the purchase of an EV and benefits such as free parking or high occupancy vehicles lanes are stated as the main incentives by governments (Coffman et al., 2016). In Portugal, according to the dispatch nº

3169/2020 published by the department of environment and climate action in *Diário da República n.º 49/2020, Série II of 2020-03-10, part C*, the following incentives for 2020 were granted: allocation of 3000€ incentive in the case of private consumption (individual persons), and 2000€ in the case of corporate entities for the purchase of 100% electric passenger vehicles whose final purchase cost is less than 62 500€. These incentives are limited up to a maximum of 700 units for individuals and 300 units for corporations, ordered according to the date and time of submission of the incentive request.

Additionally, there is an incentive for the consumption of 100% electric goods vehicles translated in the form of a 3000€ incentive limited up to 300 units, ordered according to the date and time of submission of the incentive request.

Besides purchase incentives, there are other advantages, such as exemption from Vehicle Tax and Car Circulation Tax for electric cars purchased by individuals and companies. From a fiscal point of view, companies also can deduct the full VAT on the purchase of electric cars, below the limit of 62 500€. For 2021, the incentives will be the same as in the previous year.

In some cities, electric cars do not pay parking either.

1.2 BEV experience

BEV adoption is being delayed by consumer uncertainty (Liao et al., 2017; Naor et al., 2015) and expected difficulties with using this new car technology in practice (Peters & Dütschke, 2014). Findings by Thøgersen and Ebsen (2019) demonstrate that one of the greatest psychological barriers to buying intentions is the expected difficulties in the everyday use of an EV, for instance, perceived difficulty in use and uncertainty about this new technology. The effect of experiencing BEVs in overcoming prejudices and persuading consumers that BEVs are interesting and convenient vehicles have been repeatedly examined by several empirical studies. Burgess et. al (2013) described experience as a

significant factor relevant to changing people's perception of specific BEV attributes. In fact, various studies have settled that the evaluation of BEV attributes diverge with the level of experience (e.g., Skippon et al., 2016). According to Schmalfuß et al. (2017), the concept and influence of experience on purchase decision has been extensively investigated. For instance, in a study of drivers was found that experienced consumers have a higher purchasing intention and therefore are more willing to pay higher prices for BEVs than inexperienced drivers (Gyimesi & Viswanathan, 2011). Additionally, some studies conducted with early adopters proved that after drivers had tested a BEV for at least three months, their opinion regarding BEVs changed, namely, the evaluation of car attributes such as low noise (Cocron & Krems, 2013), perceived advantages and disadvantages (Buhler et. al., 2014), attitudes toward BEVs, willingness to adopt (Schmalfuß et al., 2017; Liu et. al., 2020) and purchase intention (Turrentine et. al., 2011).

However, most studies conducted so far only mention BEVs experience as a background factor leading to the purchase or willingness to adopt BEVs. In fact, studies using data gathered from actual BEV users are lacking (Know et al., 2020). Previous studies have mainly focused on evaluating actual purchasing behaviour or on identifying factors that influence the adoption of BEVs contributing to the understanding of consumers purchasing intention. Nevertheless, the studies of post-purchase behaviour, for instance, influence of the driving experience in consumers attitudes toward BEVs attributes and levels of satisfaction with BEVs, are still insufficient, so its investigation is essential. In agreement with Know et al. (2020), most previous studies focused on strategies to promote the adoption of BEVs instead of evaluating and improving the current picture of consumer experience with BEVs.

Thus, the present research aims to bridge this gap and investigates the role of post - purchase experience for explaining either the evaluation of different BEV attributes and, consequently, BEV users' satisfaction and their intention to

repurchase and recommend. Experience with BEV range can be defined by distinct indicators. Therefore, the term experience in this thesis refers to the total driven kilometres with a BEV, because it is expected that this indicator can be more precisely estimated by the participants (Rauh et al., 2015).

Moreover, satisfaction is a direct and broadly used measure to determine the conditions of use of a certain product (Know et al., 2020). Thereby, once BEVs are purchased, users engage in driving them. As above mentioned, it was found that experience is a decisive factor to changing people's perception of specific BEV attributes (Burgess et. al., 2013). There are some BEV attributes, for instance, low noise emission, performance, regenerative braking, fun or hedonic aspects when driving a BEV, environmental attributes and reliability, that seems to profit from higher levels of experience and, consequently, increasing the level of satisfaction of BEV drivers (Schmalfuß et al., 2017). Therefore, it is proposed the following hypothesis:

***Hypothesis1**: Driving experience positively affects BEV user satisfaction.*

Chapter 2
Model and Proposition Development

According to Rezvani et al. (2015), scholars define consumer adoption of an innovation as a behavioural response embracing the purchase and the use of the innovation. Given that, different types of intentional measures, for instance, consumer readiness and willingness to adopt, are considered as the main predictors of adoption behaviour in several studies. Thus, given the low market share of EVs, consumer EV adoption has been reviewed by focusing on intentions for adoption rather than actual adoption (Know et al., 2020).

Nonetheless, in the past few years this outlook is shifting. As reported in Transport & Environment (2020). *Misson (almost) accomplished,* Europe will reach 10% in electric car sales by the end of 2020. This would be triple the 3% EU28 sales share in 2019. In 2021 this is expected to rise to 15% share. Although the volume of sales is currently difficult to predict with a high level of certainty, despite the COVID-19 crisis, it is expected that the total number of electric cars sold in Europe double from half a million in 2019 up to one million in 2020 and reach 1.8 million in 2021.

2.1 Theoretical Framework

In the present study it will be assessed the actual adoption instead of intentions or willingness to adopt. Due to the increasing use of BEVs, it is of extreme importance to analyse the actual experience of using these vehicles in order to understand to at what extent users are satisfied and, thus, improve BEV promotion policies, service and, first and foremost, teaching consumers how to adapt to this technology by developing the skills and knowledge needed to operate the vehicles. Therefore, the framework used in this study will be adapted

from three previous studies carried out by Liu et. al (2020), Schmalfuß et al. (2017) and Know et al. (2020).

Ajzen and Fishbein (2005) testified that experience plays a role in Theory of Planned Behaviour (TPB), and it performs as a crucial contextual factor. Therefore, learning from previous experiences affects disparate beliefs and thus affects consumer behaviour.

In fact, the experience with BEVs may have an impact on consumers satisfaction and, consequently, in their willingness to recommend and repurchase BEVs. Furthermore, experience may generate changes in attitudes, subjective norms and perceived behavioural control, and thus affect willingness and behaviour (Schmalfuß et al., 2017; Liu et al., 2020). Accordingly, it will be analysed the impact of experience on BEVs users' satisfaction based on the theory of planned behaviour, first developed by Ajzen (1991). The theory of planned behaviour has been continually applied in green consumer behaviour studies throughout the years. According to Klöckner (2014), the decision-process of purchasing EVs in pre-actional stage is aligned with TPB. In fact, the literature has been revealing that the willingness to adopt BEVs varies amongst individuals according to their differences in attitudes, subjective norm and perceived behavioural control (Liu et al., 2020).

Thus, TPB determines that intention is the determining factor of behaviour (Ajzen, 1991). In this manner, intentions to perform different behaviours can be predicted from subjective norms (SN), perceived behavioural control (PBC) and attitudes toward the behaviour (ATT). Therefore, attitudes, subjective norms, and perceived behavioural control are considered to be influenced by experience (Schmalfuß et al., 2017).

Accordingly, in the following figure is proposed a new theoretical framework for attitudinal and behavioural acceptance of BEVs. The model is an extended version of the TPB (Ajzen, 1991), including driving experience and BEV users' satisfaction and their intention to repurchase and recommend BEVs. Thus, it is

intended to estimate the impacts of driving experience on BEVs users' satisfaction and the mediating effects of subjective norm, attitudes toward BEVs attributes and perceived behavioural control.

However, in this thesis, the mediating effects of subjective norm and perceived behavioural control will not be measured, so we suggest its study in future research. Nevertheless, a brief analysis on the influence of experience in the previous factors will be thereafter conducted.

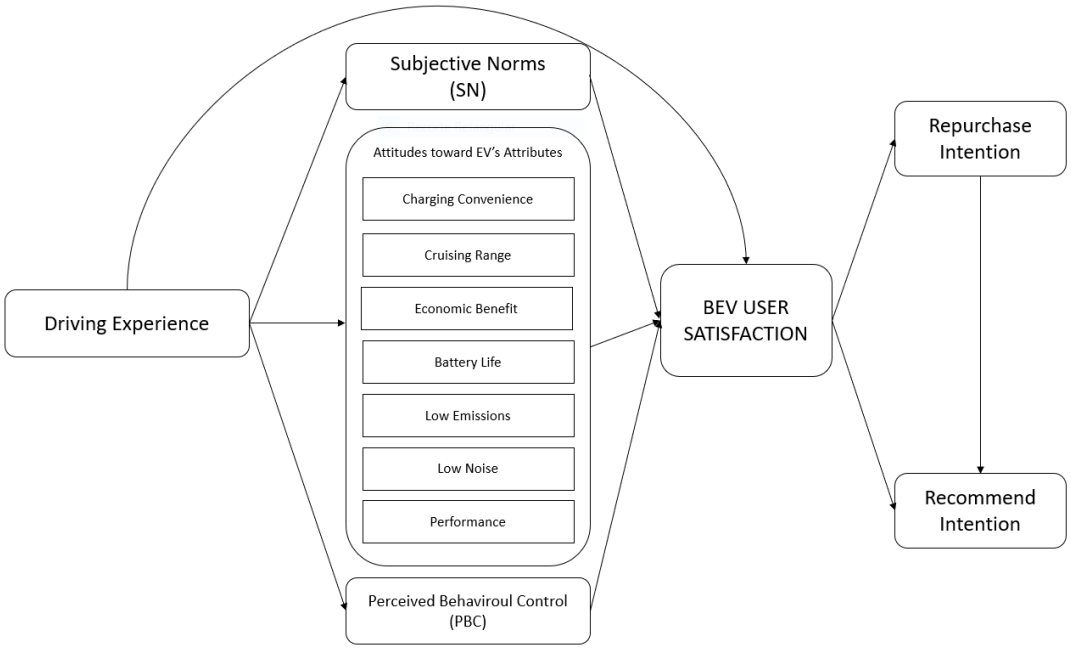


Figure 1 - Theoretical Framework for attitudinal and behavioural acceptance of BEVs. *Note.* The model is an extended version of the TPB (Ajzen, 1991) and adapted from Schmalfuß et al. (2017) and Know et al. (2020).

Subjective norm and experience. SN in TPB model refers to the perceived social pressure to perform or not perform a certain behaviour (Ajzen, 1991). According to Schmalfuß et al. (2017), BEV-experienced drivers have a more positive subjective norm than inexperienced drivers. For instance, people with more subjective norms and more positive attitudes will be remorseful and less satisfied if they deny using BEVs, as these behaviours are not adjusted with their obligations and moral norms (Liu et al., 2020). Thus, this feeling of "pressure"

will lead to inner anxiety and discomfort, avoiding such behaviours. Consequently, as BEVs are considered by the majority as environmentally friendly, users will feel more satisfied using BEVs because they believe that it has a positive impact on society (Chen, 2013). Briefly, subjective norms are investigated with consumer perceptions of peers' ideas about BEVs and whether they perceive adoption BEVs to be a social norm or not (Rezvani et al., 2015). By way of example, in a study performed in Germany, BEV users showed higher values for social norms than those who drive ICEVs (Peters & Dutschke, 2014). Conversely, results from an investigation conducted by Nayum et al. (2016) in Norway, did not show any relevant difference in subjective norms between BEV and ICEV owners. The varying results could be the reflection of a two distinctive BEV approval scenarios, as in Germany the BEV market share in 2015 was 0,7%, compared to a 23,3% BEV market share in Norway (International Energy Agency, 2016).This reveals different support and attitudes regarding BEVs in those two countries, therefore revealing that social norms might be more positive in general and the variance between the acceptability of BEVs within the group of BEV users and the group of non-users might be smaller in Norway than in Germany.

Perceived Behavioural Control and experience. PBC refers to the perceived easiness or difficulty of performing a certain behaviour. That is, the individual judgement on the difficulty to carry out a behaviour is based on their past experiences as well as anticipated impediments and obstacles including time limitation, convenience, and economic conditions (Ajzen, 1991). In agreement with Ajzen and Fishbein (2005), one's PBC ability will be stronger, when there are more resources or opportunities and fewer expected difficulties. In other words, the more perceived control a human being has over a behaviour, the more confident he will be, and thus he will be more willing to perform it (Echegaray & Hansstein, 2017). Therefore, given that specific BEV attributes predict PBC, BEV experience could also have an indirect effect by means of the evaluation of BEV attributes

(Schmalfuß et al., 2017). For instance, if experiencing a BEV changes the evaluation of cruising range in a positive way, so that the driver is sure that the BEV has enough battery to meet his traffic needs, the driver might deduce that he can use a BEV in his daily routine if he wants to. Consequently, PBC will have an indirect effect on one's satisfaction.

2.1.1 Attitudes toward BEVs attributes and experience

Attitudes in TPB model refers to at what extent a person has a favourable or unfavourable evaluation of the behaviour in question. In line with Liu et al. (2020), attitudes towards BEVs attributes will be defined as the views and evaluations of Battery Electric Vehicles attributes, such as cruising range, battery life, charging convenience, economic benefit, low emission, low noise and performance. Therefore, several studies revealed that attitudes toward BEVs attributes can change with a higher level of experience (Rezvani et al., 2015) and, this way, impact user's satisfaction (Know et al., 2020)

Hence, the following hypothesis will be examined:

Hypothesis 2*: Attitudes mediate the relationship between driving experience and BEV user satisfaction.*

Battery life and cruising range are considered as two of the key factors with most weight in BEVs acceptance (Wang et al., 2018). Short battery life could increase expense in the total lifetime of BEVs, which may lead to an unfavourable attitude toward this attribute, as driving experience increases and, therefore, impact negatively BEV users' satisfaction.

Furthermore, the short cruising range has been one of the biggest concerns of BEV owners (Franke et al., 2012). Despite previous investigations which have shown that BEV users adapt their driving to the short range (Rauh et al., 2015), the last could restrict their desired travel. As a consequence, this range limit could possibly have a negative effect on range satisfaction and, at last, on overall

satisfaction with the BEV (Know et al., 2020). So, the following assumptions are described:

Hypothesis 2a: *Attitudes towards the cruising range mediates the relationship between driving experience and BEV user satisfaction.*

Hypothesis 2b: *Attitudes towards battery life mediates the relationship between driving experience and BEV user satisfaction.*

The literature has identified availability of charging infrastructures as crucial and determinant to consumers' acceptance of BEVs (Sierzchula et al., 2014) as well as with users' satisfaction (Know et al., 2020). For instance, if consumers consider the charging infrastructure is inadequate, it may cause some concerns and, therefore, dissatisfaction. In fact, the accessible charging infrastructure is a key factor in BEV user satisfaction (Salah & Kama, 2016). Therefore, availability of a considerable number of charging stations and the possibility of charging at home or workplace are important conditions that influence the perception of usefulness and increase a favourable evaluation of BEVs (Liu et al., 2020). In large cities, where most people live in apartments rather than houses, charging networks may be even more important since the accessibility to charging at home could be limited (Egnér & Trosvik, 2018). Thus, for a person that lives in an apartment, the lack of charging points may lead to an unfavourable assessment of this BEV attribute, leading to dissatisfaction.

Therefore, it is assumed that the attitudes towards the availability of charging infrastructures will mediate the relationship between driving experience and BEVs users' satisfaction, leading to:

Hypothesis 2c: *Attitudes towards charging convenience mediates the relationship between driving experience and BEV user satisfaction.*

Fact-finding on consumer behaviour mentions that consumers will buy a certain product if they found it economically beneficial or convenient to use (Mat

Said et al., 2003). When it comes to BEVs, previous studies have indicated that consumers that have economic benefit into account are more willing to buy and use environmentally friendly cars in pursuance of usage cost reduction (for instance, operation costs) and fuel efficiency improvement. In this way, BEVs purchase price, fuel prices and policies privileges from the government have a direct effect on evaluation of BEVs and, therefore, user satisfaction.

In recent years, with the purpose of environmental pollution reduction, the Portuguese Government has introduced numerous policies to alter people's vehicle purchase patterns (see section 2.1 "Factors affecting the adoption of BEVs" for further information). In this manner, people are being encouraged to relinquish fuel vehicles and to consider "green cars" (Wang et al., 2017). Thus, if one perceives these government policies as economically beneficial and that they have an impact on economic savings in a long term, his satisfaction is likely to increase.

Accordingly, the following research hypothesis is formed:

Hypothesis 2d: *Attitudes towards economic benefits mediates the relationship between driving experience and BEV user satisfaction.*

In a study performed by Graham-Rowe et al. (2012) in which 40 British households were asked about their driving experience with EVs, it was found that some drivers have a positive attitude towards the environmental benefits delivered by this mobility. Therefore, this effect indicates that the environmentally friendly BEV will affect consumer satisfaction. In fact, "user satisfaction increases when the use of environmentally friendly products has a positive impact on society" (Chen, 2013). In addition, as more BEVs are used, BEV-related environment benefits will become more obvious, having a positive impact on society by reducing emissions and noise problems (Liu et al., 2020). Therefore, this thesis will use "low emissions" as an indicator to measure the

environmental friendliness of BEV. Consequently, the relationship between attitudes towards low emissions, driving experience and satisfaction is hypothesized as follows:

Hypothesis 2e: *Attitudes towards low emissions mediates the relationship between driving experience and BEV user satisfaction.*

As reported by Gärling (2001) in a study exploring Sweden users' EV acceptance, participants expressed that low noise contributes to a more enjoyable driving experience. Similar findings were also found in an EV fleet usage study conducted by Carrol (2010). Despite the appreciation of low noise by most drivers, some have shown some concern for the safety of other road users. Notwithstanding, the results reported in a field study, managed by Cocron and Krems (2013), assessing drivers' subjective evaluation of low noise emissions, have shown that low noise is perceived as significantly less dangerous and more pleasant with increasing driving experience. Thus, in order to explore at what extent a person has a favourable evaluation of low noise with the increase of driving experience and, therefore, an increase on his satisfaction, the following hypothesis will be examined:

Hypothesis 2f: *Attitudes towards low noise mediates the relationship between driving experience and BEV user satisfaction.*

Previous literature suggested some kind of performance attribute, such as acceleration (Mabit & Fosgerau, 2011) or top speed (Batley et al., 2004). In this study, it will be assessed "BEVs' instant acceleration" as a performance attribute. According to Jensen et al. (2014), drivers (especially women) tend to show a more positive attitude towards the performance of EVs.

Accordingly, the following research hypothesis is formed:

Hypothesis 2g: *Attitudes towards performance mediates the relationship between driving experience and BEV user satisfaction.*

2.1.2 Satisfaction and repurchase and recommend intention

Preceding investigations have shown that higher satisfaction leads to the adoption of two different intentions: repurchasing of the product and recommendation of the product to others (Know et al., 2020).

2.1.2.1 Satisfaction and repurchase intention

One's repurchase intention is based on his past experiences and future expectations regarding the product or service concerned (Czepiel et al., 1987). In other words, if a certain individual is satisfied with a given product or service, the likelihood of repurchase will be higher. Thus, user satisfaction is fundamental and determinant for repurchase intention (Yi & La, 2004) yet not sufficient (Homburg & Rudolph, 2001). In consonance with Vigripat and Chan (2007), in the ICEV automobile industry, the relationship between user satisfaction and repurchase intention is not statistically expressive. Given that BEVs have many attributes of conventional vehicles, it is of extreme importance to understand if this post-purchase behaviour remains the same. To explore this, the following hypothesis is exhibited:

Hypothesis 3*: BEV user satisfaction will have a positive impact on repurchase intention.*

2.1.2.2 Satisfaction and recommend intention

Positive or negative, word-of-mouth occurs when an individual purchases and uses a certain product, leading them to express positive or negative information to their families and friends (Anderson, 1998). Previous studies have indicated that this feedback will help consumers to make a wiser purchase decision about a given product (Know et al., 2020). In fact, Mazzarol et al. (2007) concluded that recommendation is an extremely effective tool, being nine times more effective than traditional commercials. For instance, a satisfied customer is willing to become a powerful oral advertisement channel, playing an important role in

attracting potential product purchasers (Blodgett et al., 1993). Given that most of the customers manifest their uncertainties regarding some BEV attributes prior to their use, BEV users' positive feedback plays a critical role in green vehicles adoption (Know et al., 2020). The hypothetical relationship between users' satisfaction and intention to recommend settled as follows:

Hypothesis 4: *BEV user satisfaction will have a positive effect on the intention to recommend to others.*

2.1.2.3 Repurchase and recommendation intention

Past investigations confirmed an existence of a relationship between intention to repurchase and recommend. In this way, recommendation intention can turn into repurchase intention (Olaru et al., 2008). Besides the direct path from users' satisfaction to repurchase intention, it can indirectly affect repurchase intention through recommendation intention (Know et al., 2020). In other words, the possibility to repurchase will be higher when BEV users share their positive assessment to others regarding their experience. Thus, the following hypothesis is presented:

Hypothesis 5: *BEV user recommendation intention will have a positive impact on repurchase intention.*

2.2 Proposed structure model

Based on the literature, twelve hypotheses were formulated and organized into (i) the relationship between driving experience and BEVs user satisfaction, (ii) the relationship between driving experience and attitudes toward BEV attributes, (iii) the relationship between attitudes toward BEVs attributes and BEV user satisfaction and (iv) the relationship between user satisfaction and his intention to repurchase and recommend. Therefore, these links together form a hypothetical structure (displayed in figure 2) which presents an overview of the analysis regarding the mediating effects of attitudes toward BEV attributes between Driving experience and BEV user satisfaction. Accordingly, this framework was statistically tested using questionnaire data collected from actual BEV drivers.

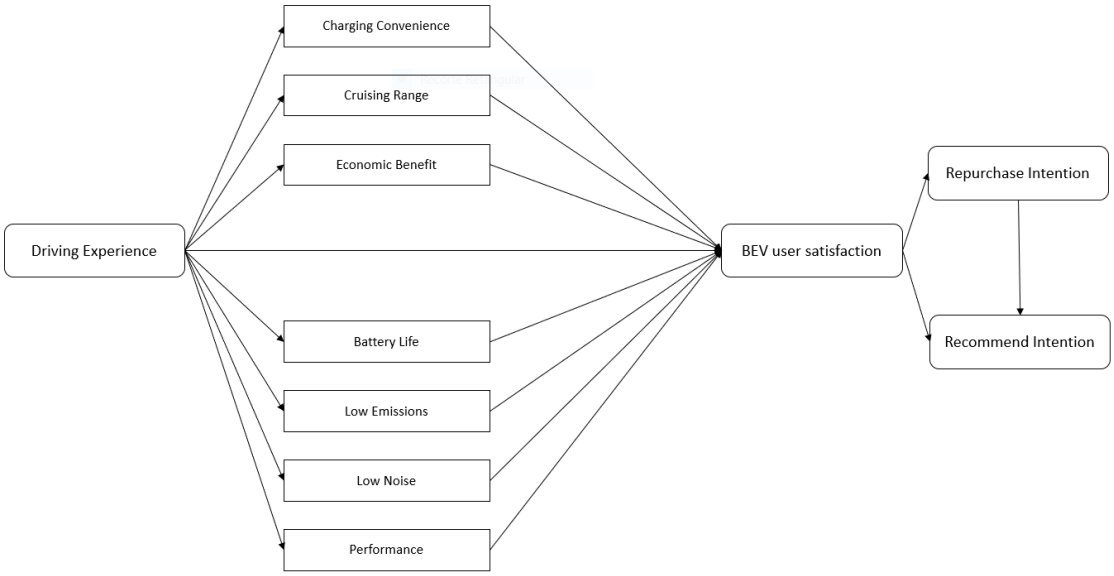


Figure 2 – Research Framework

Chapter 3
Method

This chapter is divided into four subchapters, the first being a referential to the research objectives and research questions. Thereafter, it will be addressed the research methodology followed by data collection procedures and, finally, data analysis approach.

3.1 Research objectives and questions

Once the research framework has been formulated, it is important to define its objectives. Their formulation contributes to the preparation of the research process and subsequently to determine the research questions that will support the investigation. This way, the objectives were developed based on significant insights established on the literature review together with gaps found on previous investigations.

Thus, most studies conducted so far have been mentioning BEV experience as a background factor that contributes to the purchase or willingness to adopt this type of mobility. By way of explanation, previous investigations have mainly focused on evaluating actual purchasing behaviour that influence the adoption of BEVs, contributing to the understanding of consumers purchasing intention. Although these findings are extremely important as they reveal what contributes the most to the adoption of these cars, it is worthwhile to assess the influence of the experience in consumers attitudes toward BEVs attributes in a post-purchase perspective. More specifically, the current study intends to analyse whether driving experience has an impact in attitudes toward BEV's attributes, BEV user satisfaction and repurchase and recommend intention. Hence, it was formulated the following research question:

Does driving experience affect the overall experience of using battery electric vehicles?

Accordingly, four objectives were defined conducive to give an explicit answer to the question above mentioned:

- Explore the influence of driving experience in BEV users' satisfaction;
- Understand the impact of driving experience on the attitudes toward BEV attributes;
- Understand the impact of attitudes toward BEV attributes on consumers' satisfaction;
- Identify the impact of BEV users' satisfaction on their intention to recommend and to repurchase.

By meeting the proposed objectives, we will be able to assess what is the current picture of the electric vehicles market. In other words, we will perceive the position of current users concerning their day-to-day experience as well as difficulties and facilities they might have.

Thus, to answer the question suggested were elaborated sub research questions, based on the research objectives and literature review, that will support the investigation. They can be found in the following table 1.

Research Objectives	Sub Research Questions	Literature Review Authors
Explore the influence of driving experience in BEV users' satisfaction	Does driving experience have an impact on BEV users' satisfaction?	(Rauh et al., 2017); (Kwon et al., 2020); (Liu et al., 2020); (Schmalfub et al., 2017); (Jensen et al., 2013)
Understand the impact of driving experience on the attitudes toward BEV attributes	Do attitudes toward BEV attributes change with the increase of driving experience?	(Liu et al., 2020); (Schmalfub et al., 2017); (Burgess et al., 2013); (Skippon et al., 2016); (Cocron & Krems, 2013); (Buhler et. al., 2014)

Understand the impact of attitudes toward BEV attributes on consumers' satisfaction	Which BEV attributes do consumers value the most?	(Kwon et al., 2020); (Liu et al., 2020); (Schmalfub et al., 2017);
Identify the impact of BEV users' satisfaction on their intention to recommend and to repurchase.	Will the increase in satisfaction lead to an increase in the probability of repurchase and recommend BEVs to others?	(Kwon et al., 2020)

Table 1 - Relating Research Objectives, Sub Research Questions, and Literature Review authors

3.2 Research methodology

According to Clifford Woody, research, otherwise defined as "search for knowledge, comprehend defining and redefining problems, formulating hypotheses, collecting, organising and analysing data, making deductions and reaching conclusion and at length testing the conclusions to whether they fit the formulating hypothesis" (Kothari, 1990). Research has its special interest in the business and industry world since it contributes for problem solving together with profit maximization once it helps to make business decisions more wisely. (Kothari, 1990). Thus, referring to EV experience, a vigorous understanding of which factors consumers value the most would allow car manufacturers to invest in the appropriate features and increase customer loyalty.

In order to examine the formulated hypotheses, this thesis follows a sequential mixed method research. This type of multi-method research provides a scope for a more complete approach to data collection, analysis, and comprehension. In this design, a double phase research is made, using one method with another to "expand or elaborate on the initial set of finding" (Saunders et al., 2016). Thus, the mixed method used was the sequential exploratory research design (qualitative followed by quantitative). Since the qualitative approach is only used

in the first stage of data collection, the approach to be used in this thesis is the partially integrated mixed method research (Tashakkori & Teddlie, 2010).

3.3 Data collection procedures

3.3.1 Interviews

In a first phase, an exploratory study was carried out. The aim was to assess the BEV attributes considered by the literature as the most impactful on the consumer experience. Thus, the combination of both culminated in the proposed research framework (introduced in chapter 2, subchapter 2.2). Therefore, structure in depth interviews were conducted to six BEV users and five BEV sellers, both from Portugal. The interview model had predefined questions to avoid divergence from the main subject, contributing for a more efficient data collection. In order to have a more comprehensive, diversified, and heterogeneous view of factors, the people interviewed were selected taking into account the brand of car they owned as well as different vendors were chosen considering the brand of car they sell. All users were gathered in the social network (Facebook) with the condition of having at least one BEV. The interviewed vendors were mentioned by a third party that works with them in the company Salvador Caetano.

Concerning the interview methods, the contact with BEV users was made by video conference and phone call and the contact with BEV vendors was carried in their workplace Caetano Baviera, Vila Nova de Gaia. The interview's average duration was 10 minutes and took place during October and November 2020.

In appendix 1 can be found the interview model used for the two types of interviewed groups (BEV users and BEV vendors) since there were distinct questions for each group.

3.3.1.1 Sample characterization

The interviewed BEV users are characterized by the brand of vehicle they own. For this exploratory study have cooperated 6 BEV users with different vehicles, described in table 2. Due to privacy reasons, their names will remain anonymous in this thesis, rather, a numerical designation will be assigned to each of the interviewees.

Nº	User	Battery Electric Vehicle Brand	Battery Electric Vehicle Model
1	User 1	Tesla	Model S
2	User 2	Tesla	Model 3 LR
3	User 3	BMW	I3
4	User 4	Nissan	Leaf
5	User 5	Renault	Zoe
6	User 6	Volkswagen	E-Golf

Table 2 - Characterization of the sample of BEV users interviewed.

As mentioned in table 2, all users have different BEV models. Thus, with this careful selection, it was intended to have the widest and the most diversified possible sample, so that the overall evaluation of the attributes was not conditioned by the vehicle brand or model.

Regarding BEV vendors, they are characterized by the brand of vehicles they sell. As well as with BEV users, their names will not be shared in this thesis, but only a numerical designation will be assigned to each of the interviewees. Therefore, BEV vendors were selected considering the brand of BEV they are currently selling in order to have a more diversified sample.

Nº	Vendor	Battery Electric Vehicle Brand
1	Vendor 1	Smart
2	Vendor 2	MINI
3	Vendor 3	BMW
4	Vendor 4	Renault
5	Vendor 5	Porsche

Table 3 - Characterization of the sample of BEV vendors interviewed.

3.3.2 Questionnaire

A cross-sectional descriptive study was carried out. The target population of the study were the BEV users in Portugal. A convenience sample was used, consisting of 322 individuals. After removing the invalid answers, for instance, individuals who claimed not to have a BEV and those who did not answer all the questions, 279 valid questionnaires were taken into consideration, with an effective rate of 86,6%.

The questionnaire, developed using *Google Forms*, was disseminated through social networks such as LinkedIn and Facebook, in electric mobility forums as well as groups of BEV users. It was intended only for individuals with BEVs and, consequently, driving license holders.

All questions were adapted from previous studies about Battery Electric Vehicles and User satisfaction (Schmalfuß et al., 2017; Liu et al., 2020; Kwon et al., 2020). The questions can be found in the table 4.

The questionnaire was divided into 6 sections. In the first section were socio-demographic questions (gender, age, education, household size, household

monthly income, number of battery electric vehicles). Then, in the second section, the total number of kilometres performed by an individual with his battery electric vehicle is evaluated. Therefore, a value scale is used, composed by 5 levels: “<15 000Km”, “15 000Km - 30 000Km”, “30 000Km - 45 000Km'', “45 000Km - 60 000Km”, “>60 000Km''. In the third section, to assess the individuals’ opinion regarding the attributes that influence the experience of using BEVs, is used a Likert Scale, with five options, from “totally disagree '' to “totally agree” (scores of 1 to 5). Concerning the fourth section, in which is assessed the overall satisfaction of BEV users, a Likert Scale is used once more, with five options, from “totally unsatisfied” to “totally satisfied” (scores of 1 to 5). The fifth section estimates one’s recommendation intention with a Likert Scale, with five options, from “totally disagree” to “totally agree” (scores of 1 to 5). Finally, in the sixth section, to appraise one’s repurchasing intention, is used the same scale as the previous section.

The data collection procedure took place from 18th November 2020 to 19th January 2021.

For this research, three variables per transformation have been added in order to give more robustness to the data analysis as well as to increase the accuracy of the conclusions.

For instance, a new variable was developed based on the 7 factors assessed in the section 3 of the questionnaire (charging convenience, cruising range, economic benefit, battery life, low emission, low noise, and performance), with a score between 1 and 5. Thus, the higher the score, the greater will be the respondents’ satisfaction. This way, it is possible to measure their satisfaction based on the score that all individuals assigned to each parameter. Therefore, in addition to the variable “BEV user satisfaction”, appraised in the fourth section, in which is reflected the direct opinion of each respondent regarding their satisfaction with their BEVs, is now also indirectly assessed through the mean

score attributed to all attributes. Consequently, this variable will be represented as "BEV user satisfaction (based on the 7 attributes)".

Additionally, two other variables were developed. First, a dichotomic variable which represents two levels of satisfaction: "completely satisfied" and "not completely satisfied". Given the lack of "totally unsatisfied" and "unsatisfied" responses on the fourth section, it became necessary to build a new variable that distinguishes the individuals in order to make the data analysis more complete. Thus, a new variable was established: "BEV user satisfaction (dichotomic)".

Thereafter, a categoric variable was formulated that divides driving experience in three groups: "<15 000Km", "15 000Km – 30 000K", and "> 30 000Km", representing BEV owners without or little experience (inexperienced drivers), significant experience (experienced drivers), and great driving experience (highly experienced drivers), respectively. This procedure was made based on the study conducted by Wikman et al. (1998). Accordingly, the new variable will be represented as: "Driving experience (categories)".

Constructs	Sigla	Items	Source
Driving Experience	DE	Total Kilometres performed with my battery electric car	Rauh et al., 2014
Charging Convenience	CC	I think the number and distribution of charging stations for battery electric vehicles can meet my charging needs.	Liu et al., 2020; Schmalfuß et al., 2017
Cruising Range	CR	I think the cruising range of my battery electric vehicle can meet my traffic needs.	Liu et al., 2020; Schmalfuß et al. 2017
Economic Benefit	EB	I think it is more economical to use my battery electric vehicle because of the purchase incentives.	Liu et al., 2020
Battery Life	BL	I think the battery life of my battery electric vehicle can meet my needs.	Liu et al., 2020
Low Emission	LE	I think my battery life vehicle can reduce carbon dioxide emissions and environmental pollution.	Liu et al., 2020; Schmalfuß et al., 2017
Low Noise	LN	I think the lack of engine noise and no soundscape make the driving experience pleasant.	Schmalfuß et al., 2017
Performance	P	I think the immediate acceleration of my battery electric vehicle increases the driving comfort.	Schmalfuß et al., 2017
BEV User Satisfaction	BUS	I am satisfied with the purchase and use of my battery electric vehicle.	Know et al., 2020
Recommend Intention	RI	I tell people around me about the merits of battery electric vehicles and recommend purchasing them.	Know et al., 2020
Repurchase Intention	PI	I would buy a battery electric vehicle as my next vehicle.	Know et al., 2020

Table 4 - Item's scale, selection and adaption

3.4 Data analysis approach

3.4.1 Qualitative data analysis approach

Qualitative data analysis frequently moves through five phases, for instance, compiling data into a formal database, disassembling the data in the database, reassembling the data, interpreting the data and finally, drawing conclusions (Yin, 2016). Often, computer software such as Nvivo, MAXQDA, among others are used to assist in analysing qualitative data. These software have a set of helpful tools for organising and analysing data. However, given the non-complexity of the gathered data, we do not find a meaningful necessity in using such tools. Nevertheless, we have followed the five phases approach, proposed by Yin (2016).

The interviews testimonials were transcribed to the Microsoft Office Word software in separate documents and later gathered in two schemes, one divided in seven columns (first column with the interview questions and the following six with each BEV user and the respective answer for each question) and the second divided in six columns (first column with the interview questions and the following five with each BEV vendor and the respective answer for each question) to facilitate the data analysis.

Once concluded the first phase of data analysis, for instance, compiling the collected data into a structured document, disassembling phase was conducted followed by reassembling phase. Hence, the early process involves identifying text from the original databased already organized, and creating a new set of substantive notes, ordering the original data in some different order or under distinct concepts and ideas (Yin, 2016). Therefore, through the analysis of BEV owners' responses, were identified different answers corresponding to separate attributes. Hence, they were divided into different categories: contextual attributes, financial attributes, and technological attributes. During this process,

it was found some patterns in the data, leading to the beginning of the next phase in the analysis cycle, that is reassembling the data. The reassembling phase consists of considering data under different arrangements and themes and then altering repeatedly the previous until something relevant emerges (Yin, 2016). Accordingly, quite similar responses were identified, which led to grouping them into different attributes, separated by the previous categories. Therefore, in the fourth and fifth phase, in which data is interpreted and conclusions are drawn, were selected the most mentioned attributes: charging convenience, cruising range, economic benefit, battery life, low emissions, low noise and performance.

3.4.2 Quantitative data analysis approach

In this thesis, SPSS software version 26 was used for data processing and analysis.

In the overall characterization of the sample, the numerical variables are outlined through the mean and standard deviation (SD) and for qualitative variables are used absolute (n) and relative (%) frequencies.

To verify the existence of relations between the ordinal variables it was used the non-parametric Spearman's correlation test. For instance, the existence of relations between the various attributes (charging convenience, cruising range, economic benefit, battery life, low emission, low noise, and performance) was evaluated as well as the relationship of each attribute with the driving experience and satisfaction. Later, it was also analysed the relationship between satisfaction and the intention to repurchase and recommend.

Additionally, it was used Pearson's chi-square test to analyse if driving experience positively affects BEV user satisfaction.

All values less than 0.05 were considered statistically significant for p-value tests.

In the present work, we did not perform the internal consistency analysis (Cronbach alpha). This analysis is relevant to assess the internal consistency with which all the items in a test measure the same construct and hence it is connected to the inter-relatedness of the items within the construct (Tavakol & Dennick, 2011). Thus, the higher the value of the estimated Cronbach's alpha, the greater the homogeneity of the items and the greater the consistency with which they measure the same dimension or theoretical construct (Maroco & Garcia-Marques, 2006). In other words, on a scale of 0 to 1, values greater than 0.70 (Peterson, 1994) reveal reliability in a certain sample of test items. Since there is only one measurement item for each construct, the Cronbach alpha analysis was not performed.

Chapter 4
Results and Data Analysis

This section starts to describe BEV users' socio demographic profile as well as contextual variables (4.1). Thereafter, their driving experience is characterized (4.2), followed by their satisfaction (4.3), culminating in the assessment of the relationship between these two variables (4.4). Next, a descriptive analysis of attitudes toward BEV attributes was carried out (4.5). Finally, a correlation analysis between all items was performed (4.6). The subchapter ends up with a consideration note regarding BEV users' satisfaction and their intention to recommend and repurchase battery electric vehicles (4.6.4).

4.1 Sample characteristics

In order to clearly analyse the distribution characteristics of the sample, it was executed a sample characteristics analysis on the data, which is exhibited in table 5. As the results demonstrate, the sample of 279 respondents was pictured with respect to gender, age, education, household size, household monthly income (EUR) and number of BEVs owned. Moreover, the questionnaire respondents are represented by 230 men (82,4%) and 49 women (17,6%). The age varies from under 20 and over 60 in which the predominant range is 40 to 49, with a total of 107 people, representing 38,4% of the respondents. Next are the individuals whose ages range from 30 to 39, with 68 people (24,4%). Concerning education, most of the population has the highest level of education, representing almost three quarters of the respondents (74,2%), with a total of 207 people. When asked about their household size, 99 people answered that it is composed by 4 people, representing 35,5% of the total 279 respondents. Regarding their household monthly income, 42,7% of the people declared to receive between 1500€ and 3000€. Soon after, 68 people received between 3000€ and 4500€, the equivalent of

24,4% of the sample. Finally, it should be noted that most respondents claim to have only 1 BEV, corresponding to 82,4% of the sample.

Sociodemographic Factors	Classification items	Quantity (N)	Percentage (%)
Gender	Male	230	82,4
	Female	49	17,6
Age	<20	2	0,7
	20-29	29	10,4
	30-39	68	24,4
	40-49	107	38,4
	50-59	51	18,3
	≥60	22	7,9
Education	Primary	7	2,5
	Secondary	65	23,3
	Higher Education	207	74,2
Household Size	1 person	19	6,8
	2 people	66	23,7
	3 people	69	24,7
	4 people	99	35,5
	5 or more people	26	9,3
Household Monthly Income (EUR)	<1500€	30	10,8
	1500€ - 3000€	119	42,7
	3000€ - 4500€	68	24,4
	4500€ - 6500€	29	10,4
	>6500€	33	11,8
Nº of BEV owned	1	230	82,4
	2	45	16,1
	3 or more	4	1,4

Table 5 - Sample characteristic analysis.

4.2 Driving Experience

For the current investigation, the assessment of the driving experience is fundamental to meet the goals outlined. Moreover, one's experience is measured through the kilometres made with one's battery electric vehicle. Thus, 31,9% of the population under study already drove between 15 000Km and 30 000Km with his BEV, corresponding to 89 people. Soon after, we found 75 people who drove up to 15 000km, representing 26,9% of the respondents. These results could be the reflection of the relatively recent introduction of this mobility in the Portuguese market. In 2020, Portugal had a BEV market share of 5,8%, where BEV sales have reached 6% of the total car sales during that same year. (Mathieu & Poliscanova, 2020).

Driving Experience	Quantity (N)	Percentage (%)	Cumulative Percentage (%)
<15 000Km	75	26,9	26,9
15 000Km - 30 000Km	89	31,9	58,8
30 000Km - 45 000Km	38	13,6	72,4
45 000Km - 60 000Km	20	7,2	79,6
> 60 000Km	57	20,4	100

Table 6 - Driving experience' absolute and relative frequencies.

As reported by Automóvel Club de Portugal (ACP) in their report "Estudo Condutor Português"(2018), the Portuguese drivers make, on average, between 50 km and 200Km per week, corresponding up to approximately 10 400Km per year. Hence, 15 000Km correspond to almost 1 year and a half of car ownership, which can be considered a short time of use. However, since BEVs are recent in the market, driving more than 15 000Km (equivalent to more than 1 year and a half of car ownership) can be considered a long time of use.

Thus, drivers were divided into three categories of experience: inexperienced drivers (driving experience up to 15 000Km), experienced drivers (driving experience between 15 000Km and 30 000Km) and highly experienced drivers (driving experience over 30 000Km).

Driving Experience (categories)	Quantity (N)	Percentage (%)	Cumulative Percentage (%)
Inexperienced drivers (<15 000Km)	75	26,9	26,9
Experienced drivers (15 000Km - 30 000Km)	89	31,9	58,8
Highly experienced drivers (>30 000Km)	115	41,2	100

Table 7 - Driving experience (categories)' absolute and relative frequencies.

Accordingly, 75 people are considered inexperienced drivers, which represents 26,9% of the sample, whereas the others 73,1% of the sample are experienced and highly experienced drivers.

4.3 BEV users' satisfaction

Analysing the respondents' overall satisfaction with the purchase and use of their BEV, we find interesting results. None of the 279 respondents considered themselves unsatisfied with their BEV. On the contrary, 80.8% of the respondents considered themselves completely satisfied.

BEV user satisfaction	Quantity (N)	Percentage (%)	Cumulative Percentage (%)
Completely unsatisfied	0	0	0
Unsatisfied	0	0	0
Neutral	6	2,2	2,2
Satisfied	45	16,1	18,3
Completely Satisfied	228	81,7	100,0

Table 8 - BEV user' satisfaction' absolute and relative frequencies.

Since there were no dissatisfied respondents, we can recognize two groups of individuals: 'not completely satisfied' and 'completely satisfied'. As shown in the table 9, 228 individuals are completely satisfied and only 51 respondents declared not to be completely satisfied.

BEV user satisfaction (dichotomic)	Quantity (N)	Percentage (%)	Cumulative Percentage (%)
Not completely satisfied	51	18,3	18,3
Completely Satisfied	228	80,8	100,0

Table 9 - BEV user' satisfaction (dichotomic)' absolute and relative frequencies.

4.4 Driving experience and user satisfaction

Given the absence of dissatisfied individuals, satisfaction was analysed according to the level of experience of consumers. Thus, it was used the crosstabs procedure to test the independence of the two categorical variables: BEV user satisfaction (dichotomic) and driving experience (categories). Therefore, the Pearson chi-square test was conducted, having a value of 8,406, with a significance value of 0,015 (p-value<0,05), leading to reject the null hypothesis "driving experience does not influence BEV user satisfaction".

According to Sharpe (2015), there are some approaches to investigate the statistical significance of a chi-square test result, among which, the calculation of adjusted residuals. A residual analysis identifies those cells that contribute the most to the chi-square test result. Thus, a residual is the difference between the observed and expected values. This way, "the larger the residual, the greater the contribution of the cell to the magnitude of the resulting chi-square obtained value." (Sharpe, 2015).

Hence, an adjusted residual that is +/- 2 indicates that the number of cases in that cell is significantly larger/smaller than would be expected if the null hypothesis were true, with a significance level of .05 (Agresti, 2007). Taking into

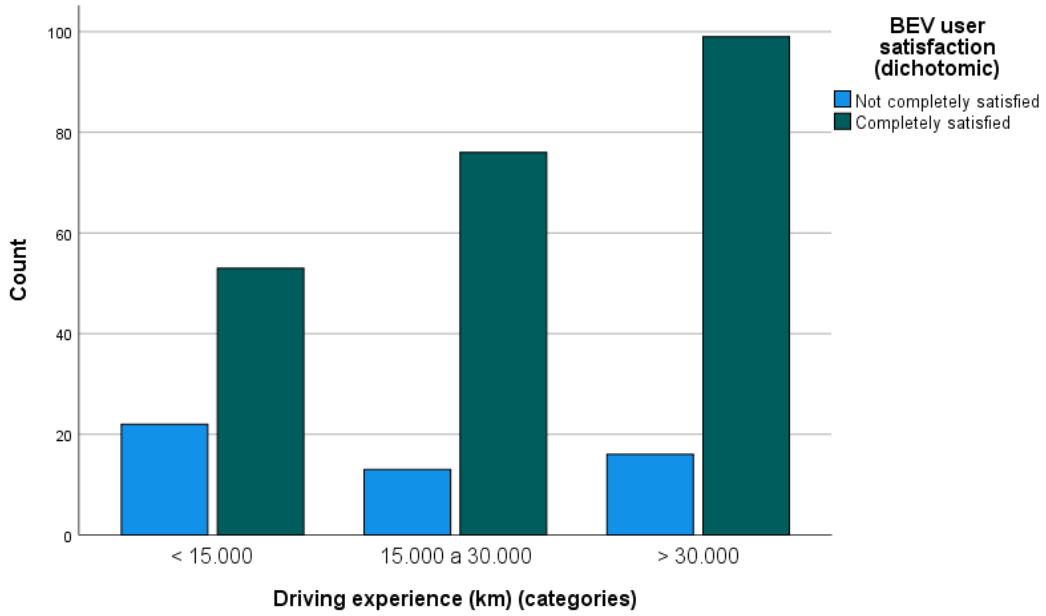
consideration the following table, in the first category of driving experience (<15 000Km), it can be concluded that there are less drivers completely satisfied than would be expected and there are more drivers not completely satisfied than would be expected, given the values of adjusted residuals (-2,9 and 2,9, respectively). Thus, 70,7% of drivers who drove up to 15 00Km are completely satisfied, way less than those who drove more than 15 000Km. For experienced drivers, there are 85,4% completely satisfied and for highly experienced drivers, there are 86,1% completely satisfied. Although this difference is not statistically significant (adjusted residual less than 2), in practical terms it allows us to state that satisfaction increases with experience, once the percentage of completely satisfied individuals increases with driving experience. On the other hand, the percentage of people who are not completely satisfied decreases with driving experience. For instance, there are 29,3% of inexperienced drivers not completely satisfied whereas there are only 14,6% experienced drivers not completely satisfied and 13,9% highly experienced drivers not completely satisfied.

Driving Experience (Km)		BEV user satisfaction	
		Not completely satisfied	Completely satisfied
<15 000Km	Quantity (n)	22	53
Inexperienced drivers	Expected Count	13,7	61,3
	% within driving experience (km)	29,3%	70,7%
	Adjusted residual	2,9	-2,9
15 000Km - 30 000Km	Quantity (n)	13	76
Experienced drivers	Expected Count	16,3	72,7
	% within driving experience (km)	14,6%	85,4%
	Adjusted residual	-1,1	1,1
> 30 000Km	Quantity (n)	16	99
Highly experienced drivers	Expected Count	21,0	94,0
	% within driving experience (km)	13,9%	86,1%

	Adjusted residual	-1,6	1,6

Table 10 - BEV user satisfaction (dichotomic) and driving experience (categories) Crosstabulation.

This scenario can be confirmed in the following graphic in which is presented the number of drivers divided by categories of driving experience and their respective satisfaction. As we can see, there is a growing tendency of people who are completely satisfied as they drive more.



Graphic 1 - BEV owners' driving experience by categories and their satisfaction.

4.5 Attitudes toward BEV attributes

On the third section of the questionnaire were assessed seven attributes that have influence in the experience of using battery electric vehicles, in which respondents were able to give their opinion using a Likert scale with five options, from "totally disagree " to "totally agree" (scores of 1 to 5). Accordingly, all items in which the average of 279 responses exceeds the value '3' can be considered 'positive' (respondents agree more than disagree with this item on the scale).

Thus, it was conducted a descriptive analysis to measure the overall consumers' evaluation regarding BEV attributes and their satisfaction with BEVs, which can be found in table 11.

Attributes	Mean	Standard deviation
Charging convenience	3,06	1,147
Cruising range	4,23	0,995
Economic benefit	3,78	1,201
Battery life	4,22	0,863
Low emissions	4,71	0,665
Low noise	4,66	0,755
Performance	4,55	0,742

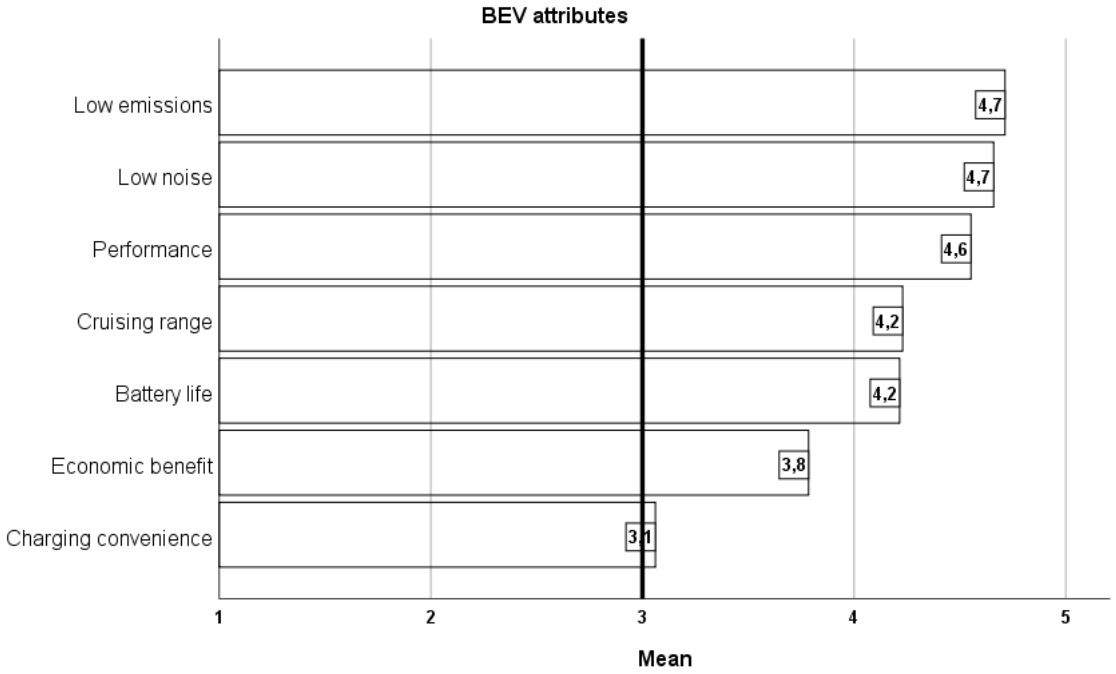
Table 11 - Descriptive analysis results (n=279)

The results shown in table 11 have some curious findings. The scores on low emissions, low noise, performance, cruising range and battery life are relatively high (with scores higher than 4) which may be because more than half of the sample have already driven significantly ("experienced and highly experienced drivers") leading to more positive attitudes toward BEV attributes and, consequently, higher satisfaction. In fact, this satisfaction can be observed through the calculation of satisfaction based on the 7 attributes, available in table 12. In this case, the mean value obtained was 4,1736 out of 5, which could be considered relatively high, meaning that BEV users are satisfied.

	Sigla	Mean	Median	Std. Deviation	Minimum	Maximum	Range	Skewness
BEV user satisfaction (based on the 7 attributes)	**BUS7**	4,1736	4,1429	0,47327	2,14	5,00	2,86	-0,687

Table 12 - BEV user' satisfaction' descriptive analysis results.

On the other hand, the graphic 1 shows that these individuals agree more than disagree with all items in the scale, except the last one ("I think the number and distribution of charging stations for battery electric vehicles can meet my charging needs"), in which opinions differ considerably. This could be explained by some negative attitudes toward charging infrastructures. Moreover, despite the continuous increase of charging stations, some BEV drivers still consider that they are not enough to meet their needs.



Graphic 2 - Average response of 279 individuals to the 7 items on the BEV attributes scale

4.6 Correlation Analysis

In this section, non-parametric Spearman's correlation test was performed. Correlation analysis could be interpreted as the strength of statistical relationship between two random variables (Xu et al., 2013). Thus, correlation is expected to be "large and positive if there is high probability that large (small) values of one variable occur in conjunction with large (small) values of another". If the

direction is reversed, the correlation will be large and negative. (Xu et al., 2013). Thereby, a significance level of 0,05 was used for all the correlations performed.

4.6.1 Driving experience and attitudes toward BEV attributes correlations

Through the examination of table 13 presented below, it was found that only the item: "I think the lack of engine noise and no soundscape make the driving experience pleasant." (LN) is positively correlated with driving experience (DE), with a correlation coefficient of 0,164. This result indicates that the attitude toward LN attribute increases with DE. In other words, low noise is perceived as significantly less dangerous and more pleasant with increasing driving experience.

In contrast, the effect of driving experience on the attitudes toward the remaining six attributes assessed were not significant (p>0,05), indicating that consumers with different experiences have no significant difference in their attitude towards those attributes.

			CC	**CR**	**EB**	**BL**	**LE**	**LN**	**P**
Spearman's rho	**DE**	Correlation coefficient	-0,039	-0,015	-0,029	0,042	0,076	0,164**	0,052
		Sig. (2-tailed)	0,511	0,803	0,630	0,485	0,207	0,006	0,388
		N	279	279	279	279	279	279	279

**. correlation is significant at the 0,01 level (p<0,01)
*. correlation is significant at the 0,05 level (p<0,05)

Table 13 - Driving experience and attitudes toward BEV attributes Spearman's correlation test.

4.6.2 Attitudes toward BEV attributes correlations

From the correlations performed, it was found some correlations statistically significant between the attitudes towards the seven attributes assessed. For instance, the item "I think the battery life of my battery electric vehicle can meet my needs." (BL) is strongly correlated with items "I think the number and distribution of charging stations for battery electric vehicles can meet my charging needs" (CC), with a correlation coefficient equal to 0,326, and "I think the cruising range of my battery electric vehicle can meet my traffic needs" (CR), with a correlation coefficient of 0,429. These results demonstrate that those who positively consider the battery life of their car adequate, also perceive the amount of charging infrastructures available as reasonable as well as the cruising range of their car sufficient to meet their traffic needs.

It was also found that the item "I think the lack of engine noise and no soundscape make the driving experience pleasant." (LN) is correlated with "I think my battery life vehicle can reduce carbon dioxide emissions and environmental pollution." (LE), with a correlation coefficient of 0,318. This could mean that users consider their cars both pleasant and environmentally friendly when asked about low noise and low emissions produced by their electric vehicles.

In addition to these relationships above mentioned, the p-values of other attitude variables are less than 0,01, indicating a significant correlation between them, however not as statistically significant as the ones above mentioned.

			CR	**EB**	**BL**	**LE**	**LN**	**P**
Spearman's rho	**CC**	Correlation coefficient	0,146*	0,143*	0,326**	0,113	0,032	0,059
		Sig. (2-tailed)	0,015	0,017	0,000	0,060	0,589	0,325
		N	279	279	279	279	279	279
	CR	Correlation coefficient		0,085	0,429**	0,088	0,237**	0,129*

	Sig. (2-tailed)	0,159	0,000	0,142	0,000	0,031
	N	279	279	279	279	279
EB	Correlation coefficient		0,198**	0,185**	0,044	0,236**
	Sig. (2-tailed)		0,001	0,002	0,466	0,000
	N		279	279	279	279
BL	Correlation coefficient			0,175**	0,117	0,105
	Sig. (2-tailed)			0,003	0,052	0,079
	N			279	279	279
LE	Correlation coefficient				0,318**	0,202**
	Sig. (2-tailed)				0,000	0,001
	N				279	279
LN	Correlation coefficient					0,239**
	Sig. (2-tailed)					0,000
	N					279

**. correlation is significant at the 0,01 level (p<0,01)
*. correlation is significant at the 0,05 level (p<0,05)

Table 14 - Attitudes toward BEV attributes Spearman's correlation test.

4.6.3 Attitudes toward BEV attributes and User satisfaction correlations

Taking into consideration the following table, the majority of the Spearman correlation tests were statistically significant at p<0,05, two-tailed. Through statistical analysis, users who tend to have a more positive attitude toward cruising range (CR), economic benefit (EB), low emissions (LE), low noise (LN) and performance (P) also tend to be more satisfied and have a greater intention to recommend and repurchase battery electric vehicles. For example, an owner who has a positive attitude toward cruising range, is more likely to be satisfied and to consider the repurchase of a BEV as his next vehicle as well as to recommend the purchase of BEVs to people around him.

However, there are two particular attributes that do not follow the same principle. The effect of attitudes toward charging convenience (CC) on RI ("I tell people around me about the merits of battery electric vehicles and recommend purchasing them.") is not significant (p=0,099), indicating that attitudes toward charging convenience have no significant impact on one's intention to recommend BEVs to others. The same happened with attitudes toward battery life (BL) and item "I would buy a battery electric vehicle as my next vehicle." (PI), with p=0,871, indicating that there is no relationship between these two variables.

			BUS7	**RI**	**PI**
Spearman's rho	**CC**	Correlation coefficient	0,532**	0,099	0,133*
		Sig. (2-tailed)	0,000	0,099	0,026
		N	279	279	279
	CR	Correlation coefficient	0,558**	0,237**	0,156**
		Sig. (2-tailed)	0,000	0,000	0,009
		N	279	279	279
	EB	Correlation coefficient	0,561**	0,159**	0,266**
		Sig. (2-tailed)	0,000	0,008	0,000
		N	279	279	279
	BL	Correlation coefficient	0,638**	0,180**	-0,010
		Sig. (2-tailed)	0,000	0,003	0,871
		N	279	279	279
	LE	Correlation coefficient	0,411**	0,293**	0,264**
		Sig. (2-tailed)	0,000	0,000	0,000
		N	279	279	279
	LN	Correlation coefficient	0,392**	0,219**	0,296**
		Sig. (2-tailed)	0,000	0,000	0,000
		N	279	279	279
	P	Correlation coefficient	0,443**	0,258**	0,316**

		Sig. (2-tailed)	0,000	0,000	0,000
		N	279	279	279

**. correlation is significant at the 0,01 level (p<0,01)
*. correlation is significant at the 0,05 level (p<0,05)

Table 15 - Attitudes toward BEV attributes and User satisfaction Spearman's correlation test.

4.6.4 User satisfaction correlations

From the Spearman's correlation test performed, it can be verified that BEV satisfaction and BEV owner intention to recommend (RI) (Correlation coefficient = 0,492, p<0,01) and repurchase (PI) (Correlation coefficient = 0,533, p<0,01) are statistically significant, having positive effects. For instance, a user who is satisfied with the purchase and usage of his BEV is more likely to consider the repurchase of a BEV as his next vehicle and to recommend the purchase of BEVs to others.

Also, it can be concluded that an owner that recommends BEVs to others is more likely to repurchase a BEV as his next vehicle, and vice-versa, through the analysis of Spearman's correlation test (Correlation coefficient = 0,405, p<0,01). All correlation tests are presented in table 16.

			RI	**PI**
Spearman's rho	**BUS**	Correlation coefficient	0,492**	0,533**
		Sig. (2-tailed)	0,000	0,000
		N	279	279
	RI	Correlation coefficient		0,405**
		Sig. (2-tailed)		0,000
		N		279

**. correlation is significant at the 0,01 level (p<0,01)
*. correlation is significant at the 0,05 level (p<0,05)

Table 16 - User satisfaction Spearman's correlation test.

Chapter 5
Discussion and Conclusions

5.1 Discussion

European countries are currently allocating financial resources to finance the development of renewable energy and multimodal transport systems that are energy-efficient and use cleaner fuels (Labeye et al., 2016). This way, battery electric vehicles are being increasingly promoted in the recent automotive market. However, actual BEV user studies, in which is assessed the current situation of BEV use, for instance, level of satisfaction, which could help formulate strategies for managing and operating BEVs, are lacking (Know et al., 2020). To our knowledge, published studies do not exist in which the effects of driving experience on users' satisfaction are statistically analysed. According to Schmalfuß et al. (2017), previous studies that reported differences between different levels of driving experience compared BEV owners that had driven a BEV for a few months with BEV inexperienced drivers, but none of the studies included experience in a theoretical framework. Therefore, the present study set out to close this research gap and explore the role of driving experience within a framework for explaining attitudinal divergences towards BEV attributes and different levels of BEV users' satisfaction and the consequential effects of satisfaction on the intention to recommend and repurchase BEVs. To this end, it was formulated a framework composed of hypothetical relationships among driving experience, seven attitudes toward BEV attributes: charging convenience, cruising range, economic benefit, battery life, low emission, low noise and performance and BEV user satisfaction. Additionally, three hypotheticals pairwise effects between BEV user satisfaction, intention to recommend to others and intention to repurchase were conducted. To test these

hypothetical relationships, eleven interviews to BEV users and BEV vendors were managed in order to assess the most valued attributes. Later on, we obtained questionnaire data from 279 actual BEV users and used SPSS software version 26 to estimate potential relationships between variables. Accordingly, and with the aim of answering the proposed research question and sub questions, a discussion in the light of theory is afterwards performed.

The results of this study indicate that driving experience positively affects BEV user satisfaction, supporting hypothesis H1. Although all respondents were considered satisfied, through the Pearson chi-square test, it was proven that as BEV users increase their experience, their satisfaction also tends to increase.

Conversely, some interesting findings were obtained from the correlation analysis with respect to the influence of driving experience on people's evaluation of BEV attributes. Regarding attitude towards BEVs, no or only small effects of driving experience were found, reinforcing what was already posited by Schmalfuß et al. (2017). The previous suggests that BEVs and their attributes are better known within the society than in times when previous studies were managed (e.g., Carroll, 2010; Peters & Dutschke, 2014; Skippon et al., 2016), so the evaluation of BEV attributes does not diverge to such a great extent between users with different levels of BEV experience. By way of example, the driving experience has no impact on attitudes toward charging convenience, confirming that more time behind the wheel does not strongly improve concerns about charging, which has been recognized as the biggest obstacle of BEV adoption (Liu et al., 2020). Thus, we found that mediating effects of attitudes toward cruising range, battery life, charging convenience, economic benefit, low emissions, and performance are not significant. Hence, the hypotheses H2a, H2b, H2c, H2d, H2e and H2g were rejected, respectively. However, driving experience proved to have an effect on attitudes toward low noise (correlation coefficient of 0,164, $p<0,05$), suggesting low noise is perceived as significantly less dangerous and

more pleasant with increasing driving experience, corroborating the results reported in a field study, managed by Cocron and Krems (2013), assessing drivers' subjective evaluation of low noise emissions. Hence, the hypothesis H2f was confirmed.

In sum, driving experience proved to have few effects on attitudes toward BEV attributes, but still the total effects on BEV owners' satisfaction cannot be ignored.

Examining people's evaluation of BEV attributes, relatively high scores on low emissions (4,71), low noise (4,66), performance (4,55), cruising range (4,23) and battery life (4,22) suggest more positive attitudes toward BEV attributes and, consequently, higher satisfaction, contrary to some low scores found in these variables in an investigation performed by Liu et al. (2020). Nonetheless, attitudes toward charging convenience resulted in a relatively low score (3,06), which indicates that charging infrastructures still cannot meet the requirements of users. As already mentioned, the accessible charging infrastructure is a key factor in BEV user satisfaction (Salah & Kama, 2016). Notwithstanding the number of charging stations available in Portugal, some BEV drivers still consider that they are not enough to meet their needs.

It is worth mentioning that attitudes toward BEV attributes were found to affect overall BEV user satisfaction. As already explained, this implies that users who have a favourable evaluation regarding a certain BEV attribute, also tend to be more satisfied. For instance, two factors (cruising range and charging convenience) that are closely related with appropriateness of BEV use were found to affect users' satisfaction, which was ascertained to be consistent with previous studies conducted in other countries such as South Korea (Know et al., 2020), Germany (Trommer et al., 2015), Sweden (Vassileva & Campillo, 2017) and the UK (Neaimeh et al., 2017). As suggested by Know et al. (2020), although BEV users are less satisfied with the current status of charging convenience,

satisfaction will gradually improve with technological advances, such as fast charges becoming more available at a reasonable cost and the charging infrastructure continues to develop. Attitudes toward battery life are also found to have a significant effect on BEV user satisfaction, signifying that BEV users are concerned about the duration of their BEV battery. Their satisfaction with the life of their BEV batteries could be explained by the fact that the cars are relatively new and that most brands provide an 8-year warranty on the batteries.

Other noteworthy findings of this study are the correlations between BEV user satisfaction and its intention to repurchase and recommend. Thus, the relationships between these variables points to be positive, supporting hypothesis H3 and H4. These findings are coherent with those found in a study conducted by Know et al. (2020). Therefore, positive judgments from BEV users will contribute to an increase in the BEV's market share by increasing the likelihood of users choosing BEVs as their next car. Furthermore, it was also found that the possibility to repurchase will be higher when BEV users share their positive assessment to others regarding their experience, thereby confirming hypothesis H5. Hence, word-of-mouth plays an important role in influencing people's opinion and attitudes, being able to be up to three times more effective than commercials (Hogan et al., 2004). In this manner, recent evidence has shown that people rely more on information from personal sources such as family and friends instead of commercials (Know et al., 2020).

5.2 Managerial Implications

These findings present relevant implications for the promotion of BEVs in distinct strategic and operational aspects for electric cars companies. Despite the favourable evaluation of the seven BEV attributes assessed and the overall satisfaction revealed by the respondents, there are still large groups of the population who do not invest in BEVs for several reasons, contributing to the

current low BEV market share. As already mentioned, in a private vehicle purchase progress, BEVs still represent not only a consumer choice problem, but a behavioural adjustment problem given operational characteristics such as limited range and availability of charging (Sovacool et al., 2018). Contextual factors as taxes and subsidies (e.g., Lévay et al., 2017; Sierzchula et al., 2014) and charging infrastructures (Lieven, 2015; Sierzchula et al., 2014) along with psychological factors as environmental concern (Beck et al., 2017) and expected difficulties with using this new car technology in practice (Peters & Dütschke, 2014) were found to be in consumer's minds, proving to be the main barriers to adoption intentions.

Thus, to enable BEVs to be the main mode of transport, a new paradigm of electric mobility must be created. For this purpose, we identified some BEV promoting policies to be addressed: (1) improving charging infrastructures, (2) increase BEVs policies incentives, (3) enhance BEVs trialability, (4) reinforce the popularity and promotion of BEV knowledge and (5) educate BEV consumers.

5.2.1 Improving charging infrastructures

In the observed results, we found that BEV's consumers' evaluation of the charging convenience was lower than the other BEV attributes. Additionally, the former is highly correlated with BEV user satisfaction. Some consumers reported that they are not comfortable with the current panorama of BEV charging in Portugal. Therefore, it is extremely important to reinforce the charging infrastructure network conducive to a better BEV experience. Some consumers have the opportunity to charge their vehicles at home, so providing them with achievable solutions as well as high quality monitoring service to set home charging devices may enhance their overall experience. Nevertheless, not all BEV owners have access to charging at home. This way, increasing the number of

charging stations in public places and lowering the price level of the previous may be an effective way to solve this issue.

Furthermore, another controversy pinpointed by some BEV owners was the lack or absence of charging infrastructures in highways, forcing them to get off the highway to load their vehicles, wasting their time. Thus, installing charging devices on highways is another way to improve user satisfaction. In fact, Brisa, private transport infrastructure company in Portugal, will make an investment of 10 million euros, in 2021, to implement a new network of fast and ultra-fast loading points in its highway network, from north to south of Portugal. Hence, 82 new loading points will be installed throughout the year that will make life easier for those who travel the country from one side to the other in a sustainable way. (Sicnoticias, 2021)

According to Liu et al. (2020), battery life is constrained by technical bottlenecks that the manufacturers need to overcome. Therefore, BEVs market price will be more acceptable once manufacturers reduce costs of production.

5.2.2 Increase BEVs policies incentives

Countries with supportive taxation and adequate charging infrastructures distribution have experienced higher EV sales in the past few years. Norway is the best example of successful EV market share leadership, where EV sales have hit two thirds of the total car sales during the first half of 2020 (48% BEVs and 20% PHEVs), (Mathieu & Poliscanova, 2020). Thus, once one of the most important contextual factors are taxes and subsidies influencing the relative price of an EC after tax (e.g., Thøgersen & Ebsen, 2019; Coffman et al., 2016), it would be positive if the portuguese government would consider the measures adopted in these countries like Norway, reinforcing BEV purchase subsidies and, on the other hand, doing steep taxes on gas and diesel vehicles apart from the fuels themselves. These strategies will make BEVs more appealing, once will make

them more affordable than their gas counterparts, and over time, that will make electric vehicles ``normal''. In other words, taxation on gas and diesel vehicles will turn into incentives for electric vehicles.

This approach is in line with the empirical results in which we found that people's current evaluation of economic benefit is lower than the other attributes ($M_{\text{economic benefit}} = 3{,}78$).

5.2.3 Enhance BEVs trialability

Several empirical studies have revealed the importance of experiencing BEVs in overcoming prejudices and persuading consumers that BEVs are interesting and convenient. According to Burgess et. al (2013), experience is a decisive factor relevant to changing people's perception of specific BEV attributes. Although the results of our study exhibit no or only small effects of driving experience in changing people's evaluation of BEV attributes, in a pre-purchase phase it is proven that has a tremendous impact in promoting BEV (Liu et al., 2020). Therefore, providing the experience of BEV can be another interesting strategy for marketing the BEVs. For instance, distributors could provide consumers more opportunities to test drive BEVs and reduce the waiting time to trial them, along with the reduction of waiting period of 3 to 4 months when a consumer orders a BEV (Matthews et al., 2017).

5.2.4 Reinforce the popularity and promotion of BEV knowledge

Although the present study did not study the influence of indirect experience (e.g., advertising) on BEVs user satisfaction, it is important to emphasize its prominence in the promotion of BEVs. Previous studies identified strong impact of subjective norms and perceived behavioural control on adoption willingness of BEV (e.g., Liu et al., 2020). One effective way to enhance the consumers'

subjective norms and perceived behavioural control is through publicity and education (Liu et al., 2020). In addition to the traditional advertising channels currently used such as television commercials, social networks and so on, it would be interesting to use other means of communication. Thus, we suggest that members of the Portuguese government travel in battery electric vehicles since they have plenty of visibility. Additionally, public transports could also be replaced by BEVs, which is already being done in some cities. These initiatives will increase BEVs visibility and increase positive subjective norms in consumers, since it will enhance individuals' perception that BEVs are adopted by the society and by those around him (family, neighbours, friends, and so on).

5.2.5 Educate BEV consumers

BEVs have specific properties such as limited range and relative silence compared to normal vehicles, requiring behaviour adjustments from drivers, involving the development of new driving abilities (Labeye et al., 2016). Thus, it is extremely significant to educate BEV drivers in their early stage of adoption in order to increase their ability to drive their vehicles and, consequently, increase their satisfaction and experience. In a study performed by Labeye et al. (2016), the results showed that driving a BEV "requires a learning phase to acquire the skills and knowledge necessary to operate the vehicle". Thus, drivers are faced with specific BEV properties that are new for them such as the lack of vehicle noise at low speed, regenerative braking function that uses deceleration to charge the vehicle, the limited range of the car and the need to plan the charging of their vehicles. Therefore, drivers may be taught how to interact with their BEVs efficiently from an economical, operational, and safe point of view.

In brief, managing these features in a proper way, will lead to a stronger perception of control, increasing one's confidence to use BEVs more frequently, increasing the overall experience and satisfaction.

5.3 Conclusion

The study aimed to understand the impact of driving experience in attitudes toward BEV attributes and to explore its influence on BEV users' satisfaction and their intention to recommend and repurchase. In detail, to identify if the increasing level of driving experience would have a positive impact on BEV users' evaluation of cruising range, battery life, charging convenience, economic benefit, low emission, low noise and performance, likewise, to understand if the satisfaction of users would increase with driving experience.

Using data from a web questionnaire and statistical analysis in SPSS, few significant differences were found regarding the influence of driving experience on attitudes toward BEV attributes. Thus, only the evaluation of low noise was dependent on the level of experience. Regarding the remaining six attributes, the results revealed that driving experience does not impact the consumers' perception of those attributes. In essence, it was found that the mediating effects of cruising range, battery life, charging convenience, economic benefit, low emission and performance between driving experience and user satisfaction are not significant.

However, despite the previous outcome, the study is of value for showing the relevance of the evaluation of BEV attributes in BEV users' satisfaction. Thus, it was found that a positive judgment of BEV attributes contributes to a higher level of satisfaction, even though they do not change with the increasing level of experience.

Other notable findings of the present research are the linkages between BEV users' satisfaction and intention to repurchase and recommend.

Hence, this study reveals the current panorama of the Portuguese BEV owner, in which is reported a high level of satisfaction and a positive evaluation of the

attributes assessed. Notwithstanding, it is not possible to affirm that driving experience has a remarkable influence on the evaluation of BEV attributes.

Thus, although the transaction to electric mobility is currently on a good path, there are still several factors that are still hindering its progress. Therefore, improvements in charging infrastructures, increase BEV policies incentives, enhance BEVs triability, reinforce the popularity and promotion of BEV knowledge and educate BEV consumers are fundamental to achieve a larger EV market share, thereby contributing to overcoming prejudices and convincing people that BEVs are user-friendly vehicles.

In brief, this research advances theoretical and contextual knowledge, also contributing to the practice of a topic not yet exhaustively investigated in the light of literature.

5.4 Limitations and Further Research

In this manuscript, the influence of consumers' experience with BEVs on attitudes toward BEV attributes and BEV users' satisfaction was studied, so as to reveal the influential role of experience. Therefore, this is one of the first investigations appraising the actual contextual and operating environment and the effect of experience in BEV owners' satisfaction. However, due essentially to the low sampling rate that resulted from the current low market penetration of BEVs, this research is limited in the following ways.

First, the study is focused on the experience of some BEV owners (n=279), so for a better and more concrete analysis it would be beneficial to increase the sample. Hence, the findings could not truly represent the opinion of all BEV drivers in the country. Furthermore, the study uses a self-reported assessment of driving experience by participants, and, consequently, it is possible that there

may be some divergences between self-reported and actual behaviours. Yet, the findings provide additional understanding of driver experience with BEVs.

Secondly, the outcomes may include some geographical issues whereas the sample used included BEV users only in Portugal. Thus, the observed relationships between variables of our model might differ when considering a different population/country, once results could differ depending on specific factors, such as BEV policies, charging infrastructures, and so on. Therefore, it is suggested the collection of samples from other countries and the comparison between the outcomes.

Another limitation of the present study is that its findings rely on the opinion of owners of different BEV models, including all segments, so eventual differences in attitudes toward BEV attributes and in BEV users' satisfaction based on different BEV models were not considered. Changes especially on attitudes toward cruising range or performance may be due to the kind of vehicle. Thereby, it would be beneficial for future studies to assess the appropriateness of this study's results to different BEV segments.

On the basis of these results, it needs to be discussed if online surveys with current BEV owners as used in the present research are the best instrument for investigating the influence of driving experience on attitudes toward BEV attributes and BEV users' satisfaction, even their economic and time efficiency and their potential for reaching large samples are tempting. The diversity of BEV experience is hard to assess and compare. Thus, it is believed that designing a longitudinal approach would be more precise to assess driving experience and its influence on BEV owners' evaluation of BEV attributes and their satisfaction.

The present study only assessed one part of the proposed global model, presented in chapter two. Thus, there were only investigated the mediating effects of attitudes toward BEV attributes between driving experience and BEV

user satisfaction. Given the influence of experience in possible changes in subjective norms and perceived behavioural control found in previous studies (e.g., Liu et al., 2020; Schmalfuß et al., 2017), it is proposed the investigation of mediating effects of these variables in the relationship between driving experience and BEV users' satisfaction.

Finally, the fact that all individuals in the sample considered themselves satisfied may have limited possible comparisons between groups and thus the drawing of conclusions.

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Appendices

Appendix 1 - Interview Guide

Interview Guide for BEV users

1. How many kilometres have you done with your BEV?

2. What car did you have before?

3. Which factors did you consider to be most decisive in the purchase of your BEV?

4. Point out which factors contribute positively and negatively to your BEV experience.

Interview Guide for BEV vendors

1. Regarding your clients' feedback, which factors contribute positively and negatively to their BEV experience?

2. From 1 to 5, in which 1 represents completely unsatisfied and 5 represents completely satisfied, what do you consider to be the degree of your customers satisfaction?

Appendix 2 – questionnaire

Questionário - Caracterização da experiência de utilização de veículos elétricos.

O presente questionário surge no âmbito da realização da dissertação do Mestrado em Gestão pela Católica Porto Business School.

O questionário encontra-se dividido em 6 secções, composto por um total de 17 perguntas.

Assim, o objetivo desta investigação prende-se com a perceção da experiência dos atuais utilizadores de veículos elétricos para o desenvolvimento e aprimoramento do produto baseando-se na opinião real e prática do consumidor. Desta forma, o questionário destina-se apenas e exclusivamente a consumidores que detenham pelo menos um carro 100% elétrico (designado como battery electric vehicle [BEV]).
As respostas obtidas são totalmente anónimas e serão apenas submetidas a análise estatística para efeitos académicos.

Agradeço desde já a contribuição!

1. Género

Marcar apenas uma oval.

- ◯ Feminino
- ◯ Masculino

2. Idade

Marcar apenas uma oval.

- ◯ <20
- ◯ 20 - 29
- ◯ 30 - 39
- ◯ 40 - 49
- ◯ 50 - 59
- ◯ ≥60

3. Nível de Escolaridade

Marcar apenas uma oval.

- ◯ Ensino Básico
- ◯ Ensino Secundário
- ◯ Ensino Superior

4. Agregado Familiar

Marcar apenas uma oval.

- ◯ 1 pessoa
- ◯ 2 pessoas
- ◯ 3 pessoas
- ◯ 4 pessoas
- ◯ 5 ou mais pessoas

5. Rendimento Mensal Agregado (EUR)

Marcar apenas uma oval.

- ◯ <1500€
- ◯ 1500€ - 3000€
- ◯ 3000€ - 4500€
- ◯ 4500€ - 6500€
- ◯ >6500€

6. Número de veículos 100% elétricos

Marcar apenas uma oval.

- 0
- 1
- 2
- 3 ou mais

Recorte Retangular

Experiência de condução

7. Total de quilómetros realizados com o veículo elétrico (se possuir mais que um veículo elétrico, indicar o total de quilómetros realizados nos veículos)

Marcar apenas uma oval.

- <15 000Km
- 15 000Km - 30 000Km
- 30 000Km - 45 000Km
- 45 000Km - 60 000Km
- >60 000Km

Fatores que influenciam a experiência de utilização de veículos elétricos

Nesta secção, serão abordados vários fatores que, segundo vários autores e um estudo exploratório realizado, influenciam a experiência de utilização de veículos elétricos. Assim, utilize a escala de 1 a 5 , em que 1 significa "Discordo Totalmente", 2 "Discordo", 3 "Nem Discordo Nem Concordo", 4 "Concordo" e 5 "Concordo Totalmente", para responder às perguntas seguintes.

8. Na minha opinião, o número e distribuição de postos de carregamento para veículos elétricos satisfaz as minhas necessidades de carregamento.

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	◯	◯	◯	◯	◯	Concordo Totalmente

9. Na minha opinião, a autonomia do meu veículo elétrico satisfaz as minhas necessidades de deslocação na minha vida quotidiana.

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	◯	◯	◯	◯	◯	Concordo Totalmente

10. Na minha opinião, é mais económico utilizar o meu veículo elétrico devido aos incentivos disponibilizados à compra de carros elétricos (subsídio de compra no valor de 3000€ de um veículo com valor inferior a 62 500€; isenção do imposto sobre veículos (ISV) e do Imposto Único de Circulação (IUC)).

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	◯	◯	◯	◯	◯	Concordo Totalmente

11. Na minha opinião, a duração da bateria do meu veículo elétrico satisfaz as minhas necessidades.

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	◯	◯	◯	◯	◯	Concordo Totalmente

12. Na minha opinião, o meu veículo elétrico pode reduzir o dióxido de carbono e a poluição ambiental.

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	◯	◯	◯	◯	◯	Concordo Totalmente

13. Na minha opinião, a ausência de sons produzidos pelo escape e motor tornam a experiência de condução agradável.

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	◯	◯	◯	◯	◯	Concordo Totalmente

14. Na minha opinião, a aceleração rápida e imediata do meu veículo elétrico aumenta o conforto de condução.

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	◯	◯	◯	◯	◯	Concordo Totalmente

Avaliação da satisfação relativamente ao seu veículo elétrico

Nesta secção, será avaliada a satisfação geral perante a compra e utilização do seu veículo elétrico. Assim, utilize a escala de 1 a 5 , em que 1 significa "Completamente Insatisfeito", 2 "Insatisfeito", 3 "Nem Insatisfeito Nem Satisfeito", 4 "Satisfeito" e 5 "Completamente Satisfeito", para responder à pergunta seguinte.

15. Estou satisfeito com a compra e utilização do meu veículo elétrico.

Marcar apenas uma oval.

	1	2	3	4	5	
Completamente Insatisfeito	◯	◯	◯	◯	◯	Completamente Satisfeito

Intenção de recomendação

Nesta secção, será abordada a sua intenção de recomendação de veículos elétricos. Assim, utilize a escala de 1 a 5 , em que 1 significa "Discordo Totalmente", 2 "Discordo", 3 "Nem Discordo Nem Concordo", 4 "Concordo" e 5 "Concordo Totalmente", para responder às perguntas seguintes.

16. Comunico às pessoas que me rodeiam as qualidades dos veículos elétricos e recomendo-lhes a sua compra.

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalmente	◯	◯	◯	◯	◯	Concordo Totalmente

Intenção de Compra

Nesta secção, será abordada a sua intenção de compra de veículos elétricos. Assim, utilize a escala de 1 a 5 , em que 1 significa "Discordo Totalmente", 2 "Discordo", 3 "Nem Discordo Nem Concordo", 4 "Concordo" e 5 "Concordo Totalmente", para responder às perguntas seguintes.

17. Compraria um veículo elétrico como o meu próximo veículo

Marcar apenas uma oval.

	1	2	3	4	5	
Discordo Totalemente	◯	◯	◯	◯	◯	Concordo Totalmente