INSTITUTO
UNIVERSITÁRIO
DE LISBOA

The expansion of electric vehicles in Portugal: Investigating the Impact of Business Models on Consumer's Preferences

Vasco Figueira de Landerset Simões

Master in Management

Supervisor:

Prof.º Leandro Pereira, ISCTE Business School, Department of Marketing, Operation and Management

BUSINESS
SCHOOL

The expansion of electric vehicles in Portugal: Investigating the Impact of Business Models on Consumer's Preferences

Vasco Figueira de Landerset Simões

Master in Management

Supervisor:

Prof.º Leandro Pereira, ISCTE Business School, Department of Marketing, Operation and Management

Acknowlegments

Someone once told me: “We are neither better nor worse than anyone, we are different”. And it is with that thought that I have been living with, trying to make the difference in the people around me and in everything I do.

To my parents, who are my support at all times and who have the patience to put up with me in good and bad times. Words are few to thank you! Love you!

To my family, who always encouraged me to do better and never give up.

To my friends, for everything we have overcome and conquered together. For all the crazy things and adventures we’ve been through. Without you, it wouldn’t be so fun.

To my supervisor, for the excellent accompaniment during all the stages. For the knowledge, feedback and availability which were fundamental to improve the quality of the investigation.

Last, but not least, to the people who are no longer amongst us but who made the difference in my life and left me a little bit of them.

Life is made of choices and mine brought me this far. Couldn’t be more pleased.

This is not the end, it’s just the beginning!

Abstract

Business Models are crucial for a successful market penetration and diffusion of sustainable innovations. Nonetheless, the consumer preferences knowledge for adopting EV's under Innovative Business Models is low. Drawing on BMs existing conceptualizations, this investigation studies consumer's preferences for 3 IBMs (EV-Leasing; Battery-Leasing; B2C EV-Sharing) plus the traditional Total Purchase BM. This research aims to analyse the EV's market growth as well as to understand the consumer's preferences regarding the business models and understand how it can eliminate the barriers of the EV's purchase. By conducting a questionnaire in Portugal based on a quantitative analysis, it concludes that most of the people has interest in EVs but consider as main barrier the high costs. Environmental benefits are the main motivation to buy one since these people are very concerned with environment. Regarding the IBMs, most people were not aware of its existence but believes that are fundamental for EV's acquisition.

Keywords: Electric Vehicles, Business Models, Innovative Business Models, Consumption Behaviour.

JEL Classification:

L-92 Electric Vehicles;

L-21 Business Models;

M-31 Consumer Behaviour;

Y-40 Dissertation.

Resumo

Os Modelos de Negócio são cruciais para uma penetração de mercado bem-sucedida e uma difusão das inovações sustentáveis. No entanto, o conhecimento relativamente às preferências do consumidor na adoção de veículos elétricos é baixo. Ao basear-se em conceitos já existentes de Modelos de Negócio, esta investigação estuda as preferências do consumidor para 3 Modelos de Negócio Inovadores ("EV-Leasing"; "Battery-Leasing"; "B2C EV-Sharing") mais o tradicional Modelos de Negócio de Compra Total. Esta pesquisa tem como objetivo analisar o crescimento do mercado de veículos elétricos, bem como perceber as preferências do consumidor em relação aos Modelos de Negócio e perceber como é que os Modelos de Negócio podem eliminar as barreiras da compra de veículos elétricos. Ao conduzir um questionário em Portugal, baseado numa análise quantitativa, conclui-se que a maior parte das pessoas tem interesse nos veículos elétricos, mas consideram como principal barreira os altos custos. Os benefícios ambientais são a principal motivação devido ao facto das pessoas interessadas serem bastante preocupadas com o ambiente. Em relação aos Modelos de Negócio Inovadores, a maior parte das pessoas não estava ciente da sua existência, no entanto, acreditam que são fundamentais para a aquisição veículos elétricos.

Palavras-Chave: Veículos Elétricos, Modelos de Negócio, Modelos de Negócio Inovadores, Comportamento do Consumo.

JEL Classification:

L-92 Electric Vehicles;

L-21 Business Models;

M-31 Consumer Behaviour;

Y-40 Dissertation.

Table of Contents

List of Graphics

List of Tables

List of Abbreviations

EV- Electric Vehicles

BEV- Battery Electric Vehicle

PHEV- Plug-In Electric Vehicle

HEV- Hybrid Electric Vehicles

BM- Business Models

EU- Europe Union

ITA- International Trading Administration

ACEA- European Automobile Manufacturers' Association

IEA- International Energy Agency

BMI- Business model innovation

AFV- Alternative Fuel Vehicle

WLTP - Worldwide harmonized Light-duty vehicles Test Procedure

Chapter I- Introduction

1.1 Introduction

In this part, it will be presented the theme of the dissertation, alongside with the context analysis of the EV's and development of the objectives. This chapter will be divided in several sub-themes, which starts in the context analysis, followed by the general and specific objectives. Lastly, I'm going to introduce the Investigation questions and the structure and scope of this dissertation.

1.2 Context Analysis

For many years, there are a lot of discussions concerning the environment. Significant research has been done through technological progress, policy support and market pull (Rennings, K., 2000), so sustainable innovations could be developed to face the environmental problems such as global warming and air pollution (Van den Bergh et al., 2011).

The transportations sector was responsible for 75% of greenhouse gases emissions, being one of the top contributors in the European Union. These emissions have been increasing since 2014 (European Environment Agency, 2019a). In Portugal, 76% of the total primary energy used is related with the fossil fuel dependency, which almost half is associated to the transportation sector (Ribau, J., & Ferreira, A., 2014).

Because of the environmental issues, the golden age of cars running on combustion engines it's reaching to an end (Ileana Gavrilescu, 2017), and EV's are being positioned as viable alternatives to petrol and diesel vehicles. Naturally, these vehicles are causing a change in the customer's perception despites the classic and hybrid vehicles lower price compared to the EV's price. This happens because of their disruptive technology.

The impact of different Business Models in the EV's commercialization is often ignored by the literature. As Bohnsack et al., (2014) said: "Commercialization takes place through business models, which describes how a company creates, delivers and captures value".

As said before, the EV's price is higher than the usual vehicles, but the conventional BM (in this case, total ownership) might have some limitations achieving wider options and diffusion of sustainable innovations (Stoiber et al., 2019). To address the societal transitions towards sustainability, the IBM is recognized to be an important factor. Over the years, multiple business models innovations have emerged in the EV market.

The research problem is the few knowledge that examines the impact of the different Business Models in the EV's commercialization in Portugal, having a more focused view on the consumer's preferences. The consumers attitudes towards EVs needs to change (Zarazua de Rubens et al., 2020), so it could be possible to overcome all the problems associated with its purchase (Scarinci et al., 2017). Since the innovative BMs address the concerns regarding the traditional BM and also, seems to be more worried about achieving sustainability to address environmental concerns, it's important to understand how these IBM can change the perception of people regarding EVs.

There were many academics that already did some similar research about the impact of some of these Business Models. Zarazua de Rubens et al. (2020) investigated the EV's mass adoption challenges under the current business models by conducting semi-structured interviews.

To predict the consumers preferences about EV's increasing depending on the EV's leasing, Liam et al. (2015) applied an economic model. Liao et al. (2019) examined and differentiate consumer's preferences for EV's in two innovative business models (vehicle-leasing and battery-leasing).

The most similar research to this dissertation is the one made by Youlin Huang, Lixian Qian, Didier Soopramanien and David Tyfield (2021), where their aim focus on empirically investigation, under four different business models of the consumer's preferences in the biggest EV market of the world, China.

Hereupon, and as I said before, there is no other investigation close to this made in Europe and, much less, in Portugal. Being Portugal one of the most advanced Europe countries regarding the electric vehicles and the road's electrification, there is nonrecent investigation about the consumer's needs/preferences and the impact of the BMs.

So, my research gap will be the same as them: focusing on empirically investigate consumer's preferences under four different business models (traditional business model: total car purchase and three innovative business models: car-leasing, battery-leasing and B2C EV-sharing) but regarding the Portuguese context.

1.3 Dissertation Structure

This dissertation was developed under the following structure:

Chapter I- Introduction: This chapter presents a context analysis regarding the investigation matter, the General Objective alongside with the Specific objectives and the Investigation Question. At last, the structure on which the dissertation is established.

Chapter II- Literature Review: This chapter presents the bibliographic base on which the investigation is developed, exposing some concepts that will support the dissertation.

Chapter III- Methodology: In this chapter is where are described all the processes and tools used to gather the data. Also, a sample definition and a pre-test validation were also performed.

Chapter IV- Data Analysis: This chapter presents the data gathered and then, analysed from the questionnaire with the help of some statistical techniques, for a better comprehension of the results.

Chapter V- Conclusions: In this final chapter is where all the study conclusions and findings are discussed and compared with bibliography support. The fulfilment and validity of the proposed objectives will be checked, alongside with exposure of research results limitations. To finalize, for future investigations, some recommendations and leads will be proposed.

Chapter II- Literature Review

2.1 Introduction

The theme of the electric vehicles is always connected with the protection of the environment and a necessary change that needs to be made in the automotive industry since it is one of the responsible for the pollution around the world so, this chapter will begin with the sustainable transition. After, an analysis of the EVs market will be made. The barriers and motivations of adopting an EV will also be mentioned, alongside with Government incentives. To finalize, it discusses the impact of the business models on the adoption of this disruptive technology.

2.2 Sustainable Transition in the vehicles industry

Road transport, which is mainly powered by fossil fuels, contributes to a wide range of sustainability problems, such as global warming, environmental pollution, and oil dependency, etc. Substituting cars powered by internal combustion engines with electric vehicles (EV) at a large scale is expected to be a potential solution to the above problems (Siegel, 2009).

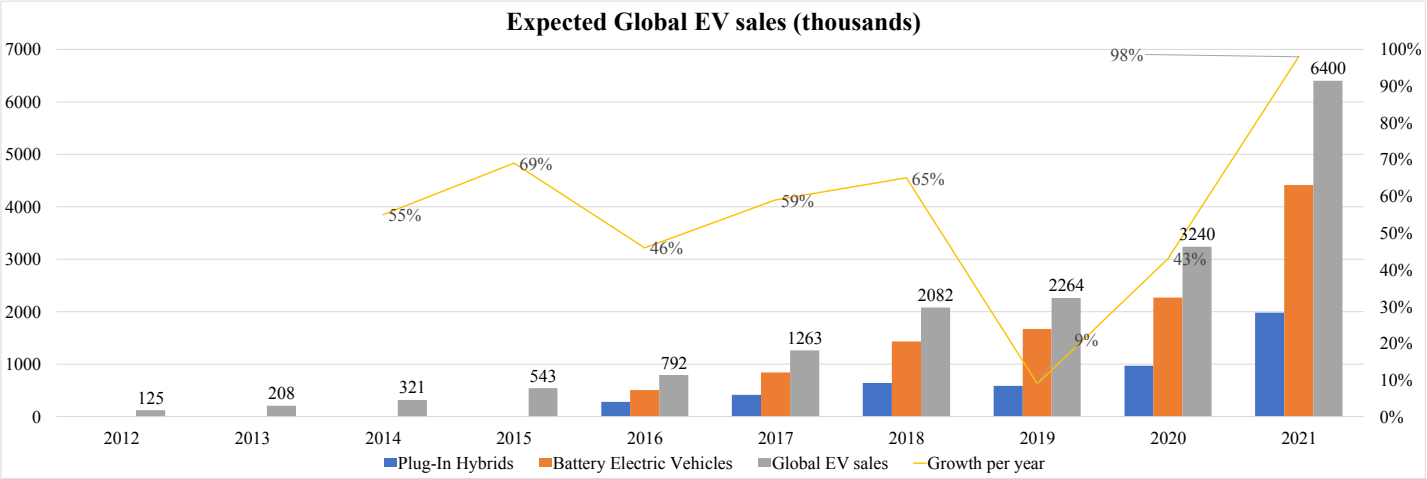
The automobile industry has undergone and is undergoing significant transformations driven by technological changes and external issues such as government policies and consumers' concern to protect the environment (Kodama, 2019). Also, Guffarth and Knappe (2019) and Yigitcanlar et al., (2019) state that the use of petrol cars has created substantial environmental problems such as air pollution and energy shortages. Such vehicles are causing a shift in what consumers expect despite their prices compared with classic vehicles (Weiss et al., 2019), where consumer satisfaction is intrinsically linked to technological performance (Anderson et al., 1994; Muller, 2020).

Furthermore, innovative business models may be a prerequisite for sustainable technologies to become commercially viable and fulfil its potential in alleviating environmental problems (Budde Christensen et al., 2012).

2.3 EV's Market

2.3.1 EV's Market (Worldwide/ European Union context)

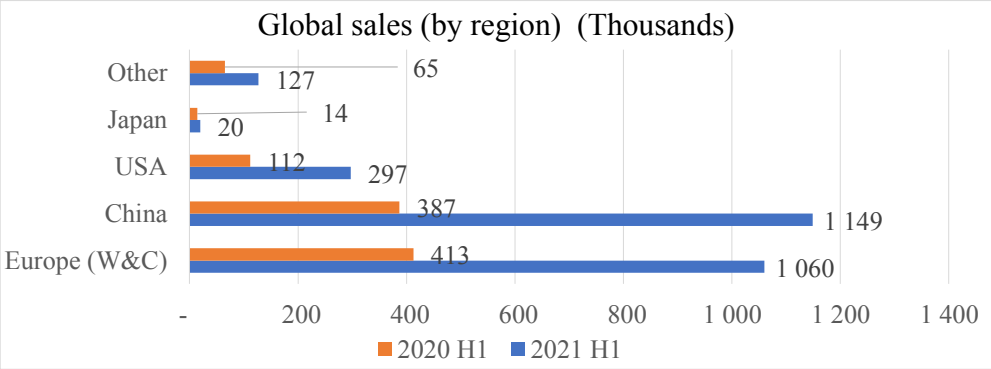
In the first years, the electric cars were unattractive for most of the consumers due to the high purchase prices and lots of uncertainties such as the battery life, short driving range, limited numbers of charging stations and the long charging time (Liao et al., 2019).



Graphic 1 - Expected Global EV sales (from 2012 to 2021) (EV Volumes, 2021)

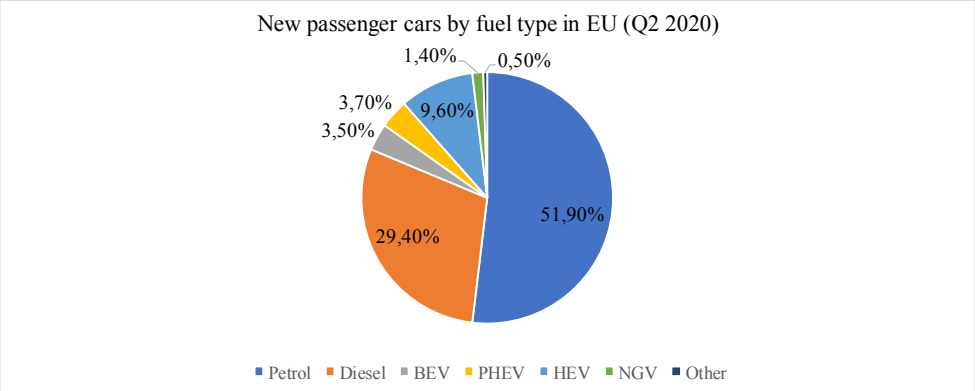
2019 and 2020 global sales stayed below trend. Back in 2019, the demand and supply of popular offers in China and Europe were reduced because of the WLTP. In 2020, the support was increased by the policy makers, but the first wave of Covid-19 caused a slump in car sales (Roland Irle, 2021). According to graphic 1, it has been an exponential EV sales growth since the first years of its commercialization. We can see that in almost every year, the sales had a

growth of, at least, 45%. In 2021, it was estimated that 6,4 million of Electric vehicles would be sold, being 4,42 million BEV and 2,18 million PHEV.

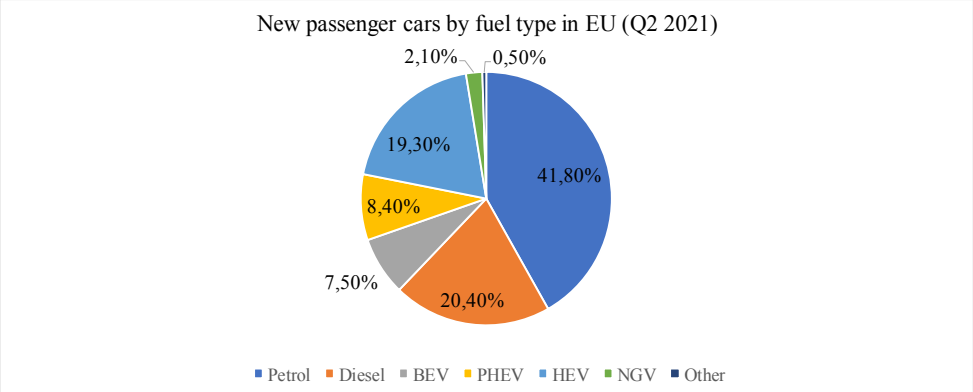


Graphic 2 - Global sales (by region) (EV Volumes, 2021)

When analysing graphic 2, we can reach to the conclusion that EV sales had a high increase on the growth rates during 2021 H1, achieving +157% in Europe, +197% in China, +166% in USA, with 1,06 million, 1,149 million and 0,297 million sales, respectively.

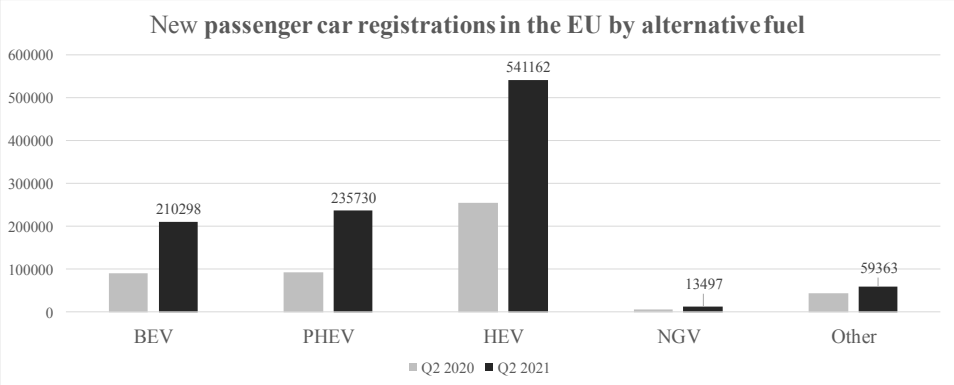


Graphic 3 - New passenger cars by fuel type in EU (Q2 2020) (ACEA, 2021)



Graphic 4 - New passenger cars by fuel type in EU (Q2 2021) (ACEA, 2021)

The focus will now change to the EU. Regarding the graphic 4, in the second quarter of 2021, the electric cars expansion continued in the EU. The BEV's market share more than doubled, to 7,5% in 2021. The PHEV had an increase up to 8,4%. Regarding the HEV, its demand also had a strong increasing, accounting for 19,3% of EU registrations.



Graphic 5 - Nº of passenger car registrations in the EU by alternative fuel (Q2 2020 and Q2 2021) (ACEA, 2021)

The market share of traditional fuel types (petrol and diesel) decreased, having a combined market share of 62,2% (ACEA, 2021). During the second quarter of 2021, BEV's registrations were 210 298 cars, an expansion of +231,6% comparatively to 2020. The PHEV's registrations reached 235 730 units sold, having a growth of +255,8%. The HEV, with 541 162 units sold, were the EU largest alternative-powered cars category. (ACEA, 2021).

2.3.2 EV's Market (Portugal context)

According to J.F.G. Mendes and P. Ribeiro (2012), Portugal intends to position itself as a pioneer in the adoption of new environmentally sustainable mobility models, capable of optimizing the rational use of electricity by taking advantage of its generation from renewable sources, while integrated with the rate of operation and development of cities.

Electric Car Charging Points per 100 Km of road, by country	
Top 5: Most chargers per 100 km	**Top 5: Least chargers per 100 km**
1- Netherlands (47,5)	**1**- Lithuania (0,2)
2- Luxembourg (34,5)	**2**- Greece (0,2)
3- Germany (19,4)	**3**- Poland (0,4)
4- Portugal (14,9)	**4**- Latvia (0,5)
5- Austria (6,1)	**5**- Romania (0,5)
10 EU countries do not have even 1 charger per 100 Km of road. All these countries have an electric car share of <3% (except Hungary)	

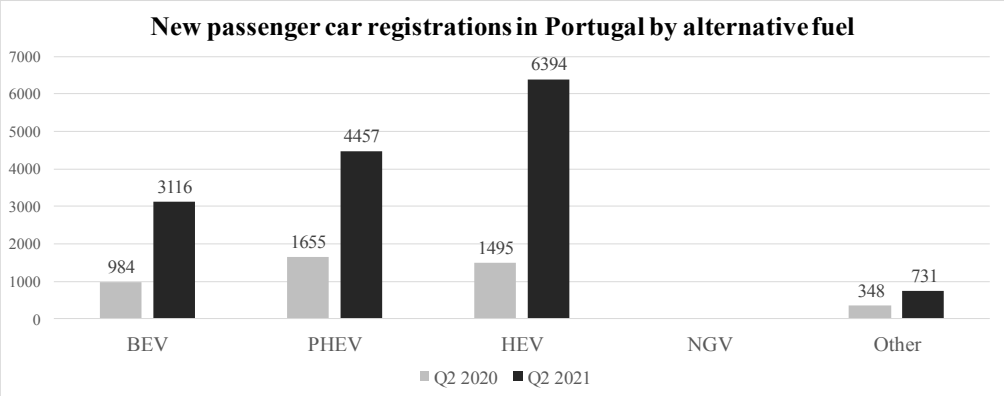
Table 1 - Electric car charging points per 100km of road (ACEA, 2021)

After analysing Table 1, Portugal is the 4th country in the European Union with most charging points for the electric vehicles, having a total of 14,9 electric spots by 100 km of road.

	Normal and Fast Charging Points	
	Normal (≤22 kW)	Fast (>22 kW)
Portugal	1976	494

Table 2 - Portugal's normal and fast charging points (ACEA, 2021)

The Table 2 shows that, in Portugal, there are 1976 normal and 494 fast charging points. Portugal benefits from being the first nationwide, fully interoperable electric mobility system. A cluster around new mobility concepts and services in Portugal is emerging. (ITA, 2021)



Graphic 6 - New passenger car registrations in Portugal by alternative fuel (ACEA,2021)

According to Graphic 6, during the Q2 of 2021, in Portugal, BEV's registrations were 3116 cars, an expansion of +317%. The PHEV's registrations reached 4457 units sold, having a growth of +269%. The HEV, with 6394 units sold, were the Portugal largest alternative-powered cars category, reaching a +428% growth. According to the European Federation for Transport and Environment (2020), Portugal is among the European countries that sell the most electric cars, ranking fifth. 11% of the cars sold during the Q2 2020 were electric cars.

2.4 Electric Vehicles

2.4.1 Barriers to EV's adoption

Several authors have been studying the barriers regarding the EV's adoption and how it influences the consumer's preferences. An analysis was made about their sentiment towards technology present in EVs and it is predominantly negative (Jean, 2020).

2.4.1.1 Lack of Knowledge

According to Diamond (2009), the lack of knowledge, by the potential customers, is a common barrier in the adoption of any innovative technology. In general, the clients' choices are influenced by the media and social networks, being the largest information strainers nowadays

(Lane and Potter, 2007). Besides some early adopters have paved the way, most consumers are yet learning or unaware about the advantages and it is still common the electric vehicles misconceptions (Geotab Energy, 2021).

As Keith (2018) stated, probably, when people are buying a car, they just don't think about electric vehicles. The cars have been driven the same way for 100 years, so the long-held norms and practices that the society has about the vehicles has been challenged because of the EVs. Thus, most of times, the purchase of this disruptive technology is not on the radar because they never ride in an electric vehicle. In several studies, there is few information about people's opinion regarding the costs, benefits and driving experiences and the ones that have the information it was found that general knowledge is quite low (Hjorthol, 2013).

2.4.1.2 High Costs

According to the theory, price is a factor that doesn't play in "the same team" as the purchase of "green products". After all, this type of products is usually associated with high costs, creating a social dilemma during the act of buying (Cronin, Smith, Gleim, Ramirez & Martinez, 2010). Appointed by several investigations, the second factor identified as a concern for the customers is their perception of the costs (Egbue & Long, 2012) and many people still consider this disruptive technology as a luxury item. (Axsen et al., 2013; Krause et al., 2013).

In a study conducted in Portugal by Oliveira, Dias & Santos (2015), the monetary criteria are the ones which influences the most people's buying decision. The development and production of EVs by the car manufacturers uses different processes and techniques. In the past, another major cost associated with these products were the battery packs. The high cost of lithium-ion batteries which increases battery capacity for driving range is the origin of the EV's high price (Brown et al., 2012; Bubeck et al., 2016).

There are some advantages in maintenance and fuel cost. The complexity of EVs propulsion is significantly less comparing to the combustion engines, making it less costly to maintain but the costumers when looking for an EV don't incorporate in their decision the fuel economy, leading to irrational behaviour (Krause et al., 2013; Turrentine and Kurani, 2007).

2.4.1.3 Battery Autonomy (Range anxiety)

The conservatism about technology that still exists in the consumers lead to the dimension of anxiety and concern emerging in relation to the autonomy. This matter is emphasized when the topic is, exclusively, the BEV, not existing the possibility of using any other type of fuel, like

the hybrid vehicles. So, the clients have some apprehension that autonomy will not be enough, turning it in a barrier for the adoption (Egbue & Long, 2012). Range anxiety is defined as the fear of run out an EV fuel in the middle of a ride (Neubauer & Wood, 2014). Because of the inexperience and the insecurity of some drivers about the trip's duration, it's hard for them to guess how long the battery will lasts. Most of these vehicles has a reduced autonomy which means that it will be necessary more than one charging per long trip.

Although, this apprehension is considered a barrier, an investigation affirms that people evaluate, in a subjective way, the autonomy as a resource they can successfully adapt to (Frank et al., 2012). According to Bühler et al. (2013), the distance problems decrease when there is an experience increasement. Nowadays, people use to drive vehicles with an autonomy of 800 km. Instead, EVs need to recharge almost every day. According to Van Barlingen et al., (2021), the average range of EVs is 313 km (194 miles).

2.4.1.4 Charging Time

Having in consideration the variety of EVs and the existent charging stations, probably it's no surprise that the charging time of these types of vehicles also varies (KIA, 2020). Charging an electric vehicle can take from a few minutes to over 24 hours and depends on 2 important factors, the type of charger and the battery's size (Wallbox, 2021; Hyundai, 2021). According to several authors like Hidrue et al., (2011), Ebgue & Long (2012), the charging time is still very long. An investigation conducted by Yilmaz et al., (2013) affirms that the charging time and battery's life are connected to the characteristics of the charger. The authors defined three levels of charging. The less effective level can be used in any place with a normal power plug. It can take up 6 to 8 hours to charge the battery to 100%. The 2º level can be found in public places located in the cities or by buying appropriate equipment to be used in private. It takes 1 hour to charge 80% of the battery. The last level is usually found in the gas stations being the fastest of them all. Despites it can take 15 to 30 minutes to recharge the battery by 100%, the number of existent spots with this equipment is still limited and may not be enough to meet all users' needs.

2.4.1.5 Infrastructures

Similar to the gas stations for the combustion vehicles, the charging infrastructures are a key factor to the transition and implementation of a well-structured electric mobility, which is an obstacle for the EV adoption (Nocera & Cavallaro, 2016; Lane and Potter, 2007). In order to make the EVs a viable option, it's important the harmonization of the performance standards,

installation of fast charging stations and sustained R&D support (Eggers & Eggers, 2011). Also, it's possible to promote the purchase of EVs by developing dedicated infrastructures (Liao, Molin & van Wee, 2019), it will allow to drive more miles and end with the range anxiety already demonstrated in some people (Plötz et al., 2018; Zhang et al., 2016). The possibility to charge the vehicles at home is seen as an advantage in the investigations of some authors, not just for convenience but also the security and safety that allows to the vehicle and the charging cord (Bühler et al., 2013) The density of charging spots is a valuable factor concerning the utility of EVs. As Sierzchula et al., (2014) mentioned, the charging infrastructures in a nation will foresee the EV market share the best.

2.4.2 Government Incentives

It is true that there is a positive growth in the European EV market, however, the uptake is still low. To turn this innovative technology more attractive for the customers, governments are offering incentives such as support policies, mainly financial incentives, to make it more interesting (Sierzchula et al., 2014). A study made by Lanbgroek, Franklin and Susilo (2016) concluded that the incentives offered by the governments have a positive effect on the EV's adoption. These incentives reduce the purchase cost and the total cost of ownership gap existent between the EVs and the combustion vehicles, which is crucial for the consumers (IEA & CEA, 2017). The environmental fund, created by the Portuguese Environment and Climatic Action Ministry, supports the acquisition of electric vehicles with 10 million €. Portugal has developed its own support policies to reduce the CO2 emissions and potentiate the EV adoption. There are several programs which promotes the energetic efficiency and electric mobility, like MOBI.E program. This program is responsible for the installation of charging spots (Oliveira et al., 2015) and the Environment Ministry has made a deal for the conception of a pilot grid. Also, the Portuguese Government gave an incentive for the purchase of home chargers and has full exempted the ISV (Vehicle Tax) and IUS (Road Tax) (Law Proposal nº257/XII).

2.4.3 Motivations

2.4.3.1 Performance

One of the motivations passes by the driving pleasure through a good performance. A study conducted by Skippon & Garwood (2011) affirms that the experience of driving an EV improves some measures for the drivers, including the initial acceleration, noise, smoothness, capacity of response and driving pleasure. Also, Skippon (2014), concluded that drivers divide

themselves the car performance in two different/independent categories, the dynamic performance and travel. The first category covers factors such as the acceleration, the potency and start answer. The other consists in the smoothness and low noise that the vehicle does in a high-velocity travel. The EVs have the potential of having better performances than the combustion vehicles in the 2 dimensions, thereby this advantage may compensate the utility in long distances, charging times and high costs. On other side, the participants of an investigation made by Graham-Rowe et al., (2012) felt that the EVs have a poor-quality regarding power and performance than the combustion vehicles. If these cars achieve a technical performance identical to the conventional cars, the customer will tend to change (Eggers & Eggers, 2011).

2.4.3.2 Fuel Price

The buying decisions of BEV and HEV have been influenced not only for the fact of being friendly-environmental solutions but also for being financial advantages. Studies based on the construction of scenarios and sales analysis on a determined temporal space affirms that the gasoline price increase has a positive influence on the EVs' adoption (Van Bree et al., 2010).

The significant influence of fuel consumption may be connected to progressive increase of fuel prices, thus being able to contribute for a bigger relevance on the future buying decisions (Oliveira et al., 2015). Nonetheless, these same authors concluded that fuel price will need to increase, at least, 70 cents to influence the customers to adopt an EV.

2.4.3.3 Environmental Incentives

The increase of CO2 emissions on the atmosphere is a problem for all the population. The fact that electric vehicles produce zero emissions is one of the reasons that people prefer them over a conventional vehicle. Chen et al., (2021) affirms that the environmental factors have influence over the customers intention to buy on the acquisition of alternative fuel vehicles. Later, Anderson (2019) reinforced this idea affirming that the principal purchase reason of an EV is the environmental concern. The investigation of Graham-Rowe et al., (2012) affirms that the EV drivers experience a "well-being factor", due to environmental factor conscientization.

There is a wide range of negative externalities resulted from fossil fuel burning. A few studies indicates that EVs are less prejudicial than combustion vehicles, including health and environmental impacts (Ke et al., 2017), while others point to some environmental concerns in the battery production phase (Hawkins et al., 2012). Jochem, Doll and Fitcher (2016) found that EVs have more advantages than conventional vehicles since they reduce petrol dependency and

provides benefits to the climatic changes, atmospheric poluents and local noises, especially in populous cities.

2.4.4 Consumer Behaviour

It is important to understand the underlying primitives regarding the process of the consumers' search (Jindal et al., 2021). Assuming rational expectations implies that customers' beliefs are homogeneous, which can extenuate the retailers' opportunity to discriminate the price based on heterogeneity belief (Jindal et al., 2021). The customers are stimulated by environmental factor (Economic, Technological, Political and Cultural) and by marketing stimulus such as advertising, discounts, etc… (Wang et al., 2018).

Regarding the Electric Vehicles context, a variety of promotional activities are used by the dealers to promote the EV's such as cash back, prize-giving sales and old car replacement to attract client's attention. EV buyers are environmentally conscious individuals, highly educated and younger. (Hidrue et al., 2015). These vehicles are low-carbon innovative products, so to motivate the customers adopting EV's, it's necessary for them to experience the performance and characteristics (Xu et al., 2020). Also, Erdem et al., (2010) studying consumer willingness, discovered that people with an academic degree, higher income and more concerned about global warming are more likely to pay a premium price for these vehicles. Additionally, a study found that the number of cars and driver's license holders within the family, and the household size had critical direct impact on choosing a more fuel-efficient car (Nayum & Klöckner, 2014). Due to its high involvement characteristics, EV's are an innovative eco-friendly breakthrough. To encourage the adoption by the customers, some "rules" as green special license plates, access to bus lanes, exemption from purchase taxes and test drives were provided. It is important and necessary to give an opportunity to the customers of reach out and increase their feelings about EV's (Li et al., 2017; Wang et al., 2018; Xu et al., 2020).

2.4.5 Impact of Business Models

2.4.5.1 Definition of Business Models

Every successful organization needs a sound business model whether it is a new venture from an established organization or a start-up (Lambert, 2006). Business models define how firms create and capture value from their product or service offerings, with particular attention to how they configure their activities with partners and suppliers and deliver value to a customer segment (Chesbrough & Rosenbloom 2002).

It has been argued, therefore, that firms need different business models to transform the specific characteristics of sustainable technologies into new ways to create economic value (Chesbrough & Rosenbloom, 2002) and overcome the barriers that hinder market penetration (Kley et al., 2011). The mass adoption of sustainable innovations is usually constrained by the uncertainty associated with the technology (Liao et al., 2019; Wang et al., 2018). Particularly, conventional business models are typically based on ownership-based consumption but have limitations in achieving the wider adoption and diffusion of sustainable innovations (Wells, 2013; Stoiber et al., 2019).

Disruptive technologies have the potential to reinvent a product by introducing new attributes that could become a key source of competitive advantage (Bohnsack, R., & Pinkse, J., 2017). BMI is increasingly recognised as a vital component of societal transitions towards sustainability (Bocken et al., 2016; Boons and Lüdeke-Freund, 2013; Schaltegger et al., 2016). Through business model innovation, sustainable technologies would create new sources of value for customers in addition to their positive impact for the environment (Bohnsack et al., 2014). BMI has attracted attention in recent years as a source of competitive advantage in early-stage technological industries. Indeed, research has shown that business model innovation can often make the difference between innovations that are successfully commercialised, vs. those that stay on the shelf (Chesbrough & Rosenbloom 2002; Teece 2010).

2.4.5.2 Innovative Business Models

The emergence of innovative business models in the automotive industry are expected to lead growth of electric vehicles (Kley et al., 2011; Wells, 2013; Wesselling et al., 2020). There are being implemented new strategies for value creation and value capture such as, an integration of EVs in mobility service business models or valuing them as resources for electricity markets. To correspond to the major barriers presented in the EV's market penetration, this sector is emerging with a diversity of innovative business models designed by the companies, with a view to change consumer attitudes toward EVs (Scarinci et al., 2017). Also, the manufacturers tried to overcome those difficulties by adopting a direct sales model, improving services, and educating consumers on the benefit of using electric cars (Bohnsack et al., 2014). But the sustainable development of the industry will highly depend on whether the key stakeholders fulfil their commitment, involvements, and efforts. (Kley et al., 2011; Sioshansi &Denholm, 2010; S. Bakker et al., 2014).

As Liao et al., (2019) said: “If Business models are found to be useful in increasing the market share of EVs, car manufacturers should pay more attention to providing innovative business models apart from focusing on improving EV technology. Knowledge regarding consumer preferences in BM is significant for the decision making of both car manufacturer marketing strategies and government EV promotion policies.”

There are a lot of literature reviews that are mostly based on the conventional business model, the EV total purchase (Helveston et al., 2015; Lin and Wu, 2018; Qian et al., 2019), despite the positive effects the innovative Business Models role has in EV’s adoption (Zarazua de Rubens et al., 2020). The social, economic, and environmental benefits can be transformed or enhanced with additional values for customer and firms (Richter, 2013; Chesbrough & Rosenbloom, 2002). These BMI lead to a fall in the cost for the adoption/usage and offer great customer value, from a customer’s perspective. Regarding an organizational view, will have impact on a firm’s performance because it will attract new customers by creating and dominating new markets (Visnjic et al., 2016; Yun et al., 2019).

People with a positive view of EV’s are more likely to adopt EV’s innovation models and considers them, not only a status symbol but also a highly value of the symbolism of modern living that derives from EV usage (Zhu et al., 2012). It’s important to know that the consumers do not always share the same preferences and choices about a product, so the communication is valuable to minimize the perceived barriers (Padgett and Mulvey, 2007). To achieve success in selling electric cars, the firms need to clearly prove that customer’s needs and values are well understood and clearly highlight the benefits and attributes it offers to them (Van Dijk, Antonides and Schillewaert, 2014).

There is little research that empirically examined consumer preferences for EVs when offered under different business models. A few similar researches such as Zarazua de Rubens et al. (2020), Liao et al. (2019) and Huang, Y., Qian, L., Soopramanien, D., & Tyfield, D. (2021). My investigation will be based on the last one and it will be focused on the Portuguese context to study the customer’s preferences regarding four different Business Models.

2.4.5.3 Differences between Business Models

According to the investigation of Liao et al., (2018), these are the different BMs:

EV-buying (traditional method): In this model, the EV’s full ownership is purchased from the dealers by the customers. Limited warranty is provided for clients, while there is no warranty

included for the battery. Due to high battery costs, the EV-buying model has considerable higher initial capital costs for the customers than the other 3 Business models.

Battery-Leasing: This model allows consumer to purchase only the car body which means an initial capital lower than the full purchase, leasing the battery with annual payments. Without the necessity of recharging the battery, consumers that adopt this business model can opt by replacing the used battery with a fully charged one in a swapping service station. Notably, the swapping time will be shorter than charging a depleted battery in a fast-charging station. The battery leasing business model reduces negative environmental impact that is resulted from the battery disposal and provides, for the battery, a more professional lifetime management.

EV-Leasing: Under a contract, the customers need to pay a leasing fee (annual or monthly) to have exclusive access to the car for a period (at least three months). After, they can opt to renew the contract or lease a different EV. Additionally, consumers are exempt from the licensing process and registration of the vehicle. People who adopt this model have less financial pressure and the risk of market value depreciation will be transferred for the service providers.

B2C EV sharing economy: By providing the clients instant mobility need fulfilment with a more flexible and on-demand access to EVs, it has gained worldwide momentum. To gain access, the customers only need to make the request in a mobile app and can pick up the vehicle in EV- rental service place. If the remaining driving range is low, people can switch to another EV. This service is charged by hours/ minutes or driving distance.

Models	Value Propositions	Value Network	Revenue Model
EV-Buying	Product-oriented (Limited warranty + Full ownership)	Car makers and dealers (Tesla is the only exception since its sales are online)	Sell the whole vehicle
Battery-leasing	Product-oriented (Limited warranty + Battery swapping service + Car-body ownership)	Car makers, dealers and battery swapping stations	Sell the car body and lease battery with annual charge
EV-leasing	Use-oriented (Free warranty + Exclusive access)	Car makers, dealers or internet stores and service providers	Lease the vehicle, charging by months
B2C EV-sharing	Result-oriented (Free warranty + Exclusive access + On-demand car rental and return)	Car makers, mobile internet apps and rental sites	On-demand rental of the vehicle, charging by usage (time and driving distance

Table 3 - Component analysis of four business models for EV adoption; Source: own elaboration based on Liao (2018), Tukker (2004) and Williams (2007).

2.5 Critical Analysis

During the Literature Review, a market analysis was made to verify how has been the growth of this disruptive technology, in the world, Europe and Portugal (where is the focus of this investigation). After, it was introduced some concepts such as barriers, government incentives

and motivations regarding the EV's adoption. Then, research about the consumer behaviour was made with the objective of understanding their preferences regarding the EVs. The introduction of the EVs leads the automobile industry to create new/innovative business models to face the changes that happened regarding the perception of the customers.

Taking into consideration the research gap mentioned in the above chapter, the present dissertation will seek to answer the following investigation questions:

> **Question 1:** Which are the factors that condition the EV's commercialization in Portugal?

Despite what Liao et al., (2017) said about the unattractiveness of the EVs due to the high purchase prices and other uncertainties (battery life, short driving range, etc…), in Portugal the process is moving fast. The Portuguese consumers, in the first 9 months of 2021, already bought more 100% electric cars than the last 7 years combined. It was 7839 registered cars, which represents a market quote of 7% (Nunes, F., D., 2021).

Although it's a good mark, it is possible to improve those numbers even more. The consumers need to be motivated to change to an electric perspective, either for a personal experience to feel the performance and characteristics of the cars like Xu et al., stated or from more incentives from the government like Wang et al., and Xu et al., explained in the literature. During the State Budget proposal, the Portuguese Environment Minister stated that the Government will find a way to increase the supports to the Electric Vehicles acquisitions (Agência Lusa, 2021).

> **Question 2:** How will be the customer's vision about the adoption of the new Business Models?

In the literature, Wang et al., has stated that the customers are led by various factors that stimulate when it is time of buying something. Also, Liao explained that the knowledge regarding the BM's consumers preferences is important for the decision making for marketing strategies implemented by car manufacturers.

However, a global study made by Kantar to identify the consumption trends that drive the electric vehicles commercialization has shown that people need more information about the technology associated with this matter since 42% of the people are not conscious of the benefits included in the acquisition of this type of vehicles (Away, 2022).

> **Question 3:** Will the companies benefit the introduction of the innovative Business Models in the EV's commercialization?

Padgett and Mulvey defend that it's important for the companies understand that the consumers are all different from each other's since they don't share the same preferences, so the firms need to highlight the benefits and attributes the electric cars have for them. The companies need to interiorize that business models are very important because two BMs selling the same product/technology can yield different outcomes (Chesbrough, 2010). Since the electric vehicles are a disruptive technology, the introduction on the new/innovative BM will be fundamental for its commercialization.

For the development of the next chapter, these 3 questions will be fundamental since it shows what can influence people making their choices. To achieve more accurate results, an online survey will be further addressed in the Methodology chapter.

Author	Title	Journal (Year)	Main Issues
Liao et al.	Consumer preferences for electric vehicles: a literature review	Transport Reviews (2017)	EV's unnatractiveness
Xu et al.	Moving towards sustainable purchase behavior: examining the determinants of consumers' intentions to adopt electric vehicles	Environmental Science and Pollution Research (2020)	Motivation and personal experience
Xu et al; Wang et al;	Moving towards sustainable purchase behavior: examining the determinants of consumers' intentions to adopt electric vehicles	Environmental Science and Pollution Research (2020)	Government Incentives
Wang et al.	Extending the theory of planned behavior to understand consumers' intentions to visit green hotels in the Chinese context	International Journal of Contemporary Hospitality Management (2018)	Stimulation factors regarding the purchasing time
Liao et al.	Consumer preferences for business models in electric vehicle adoption	Transport Policy (2019)	Consumers' preference knowledge regarding Business Models
Padgett and Mulvey	Differentiation Via Technology: Strategic Positioning of Services Following the Introduction of Disruptive Technology	Journal of Retailing (2007)	Differences among the customers
Van Dijk et al	Effects of co-creation claim on consumer brand perceptions and behavioural intentions	International Journal of Consumers Studies (2014)	Highlight Ev's benefits and attributes
Chesbrough	Open Innovation: The New Imperative for Creating and Profiting from Technology	Harvard Business Press (2006)	Outcomes of different Business Models selling the same technology

Table 4 - Main Issues

Chapter III- Methodology

3.1 Introduction

This chapter will be the connection between the literature review and the expected results which are the answer to the investigation questions. First, it will be presented a description of the design method, followed by the sample's definition. After, to ensure the quality of the questionnaire, a pre-test validation was made. Last, to show the steps made through the methodology process, the workflow of the methodology is presented.

3.2 Methodology Research Design

According to Homburg and Kromher (2016), data presentation is the base for a solid market research. During this study, it will be applied an empirical study based on the quantitative method. This method has the objective of quantify a problem and understand its dimension. Also, this type of method is used to infer evidence about a theory through an evaluation of variables which produce numerical results (Field, 2009). This type of research provides numerical information about the consumer's behaviour. The quantitative research generates precise metrics based on a determined sample.

Having in mind that the main objective of this dissertation is to understand the expansion of the EV's in Portugal, investigating the impact of the innovative business models on EV's commercialization, an online survey will be conducted in the context of the Portuguese EV market.

To support the main objective by trying to give more detailed information about this topic, this dissertation has some specific objectives that will give some insight about the thesis' aim and will contribute for the concretization of the General Objective, such as:

I- Analyse the growth of the EV's market;

II- Understand the consumer's preferences regarding the business models;

III- Understand how the business models can eliminate the barriers of the EV's purchase

Main Issues	Research Questions	Research Objectives
EV's unattractiveness (Liao et al., 2017)	Which are the factors that condition the EV's commercialization in Portugal?	Analyse the growth of the EV's market
Motivation and personal experience (Xu et al., 2020)	Which are the factors that condition the EV's commercialization in Portugal?	Analyse the growth of the EV's market
Government Incentives (Xu et al.; Wang et al., 2020)	Which are the factors that condition the EV's commercialization in Portugal?	Analyse the growth of the EV's market
Stimulation factors regarding the purchasing time (Wang et al., 2018)	How will be the customer's vision about the adoption of the new Business Models?	Understand the consumer's preferences regarding the business models
Consumers' preference knowledge regarding Business Models (Liao et al., 2019)	How will be the customer's vision about the adoption of the new Business Models?	Understand the consumer's preferences regarding the business models
Differences among the customers (Padgett and Mulvey, 2007)	How will be the customer's vision about the adoption of the new Business Models?	Understand the consumer's preferences regarding the business models
Highlight EV's benefits and attributes (Van Dijk et al., 2014)	Will the companies benefit the introduction of the innovative Business Models in the EV's commercialization?	Understand how the business models can eliminate the barriers of the EV's purchase
Outcomes of different Business Models selling the same technology (Chesbrough, 2006)	Will the companies benefit the introduction of the innovative Business Models in the EV's commercialization?	Understand how the business models can eliminate the barriers of the EV's purchase

Table 5 - Integrate Main Issues with Literature

Deutskens et at., (2015) and Bryman (2008) state that the online data gathering has countless advantages. It allows to save time and money, insert directly all the data, incorporate ramifications, and utilize several kinds of questions (Bryman, 2008). Besides, since this study is anonymous, the interviewed people are more open and honest in it. (Deutskens et al., 2005). In addition, this method offers the possibility to analyse the collected data with statistical proceedings and deduce evidence of a population sample and generalize results (Bryman, 2008).

3.3 Quantitative Analysis

3.3.1 Investigation Variables

Independent Variable	Dependent Variable	Controlled Variable
Consumer Behaviour	Interest on Electric Vehicles' adoption	Differences between an EV and a combustion vehicle
Barriers to EV adoption		
Government incentives		
Motivations		
Innovative Business Models		
Difference between BMs		

Table 6 - Investigation Variables

3.3.2 Measures and Scales

The scales from this investigation were adapted from several studies presented in the Literature regarding the electric vehicles. Firstly, in the question about age, a scale presented in the Huang and Qian (2021) study was used with 5 levels, “18-29”, “30-39”, “40-49”, “50-59”, “more than 60”. Regarding the Literary Abilities, a complete scale was adapted from the Huang and Qian (2021) study with 6 levels, “Basic Education”, “High School”, “Bachelor’s Degree”, “Master’s Degree”, “Post-Graduation” and “Phd”. Evaluating the driving time per day, it was adapted a scale made by Okada et al., (2019), presented in the dissertation of Sara Almeida, “Perceção do consumidor sobre mobilidade elétrica: Caso dos veículos elétricos”, divided in 6 levels, “less than 30 minutes”, “30 minutes < 1 hour”, “1 hour < 2 hours”, “2 hours < 3 hours”, “3 hours < 4 hours” and “more than 4 hours”. About the Gross Income per year question, a scale of values presented in the Costa e Farinha (2012), “Inquérito à situação financeira das famílias: metodologia e principais resultados”, elaborated by “Banco de Portugal” was adapted, divided in 6 levels, “less than 20 000 €”, “20 000 to 40 000€”, “40 000 to 60 000€”, “60 000 to 80 000€”, “More than 80 000€”, “Prefer not to say”. In the ownership of EVs, a scale was adapted from Liao et al., (2018). It is divided in two questions. First, to know if the respondent has any EV, with “Yes” and “No” answers and the second question is only answered if the “Yes” question

was chosen, dividing it in 3 levels, “1”, “2” and “more than 2”. To evaluate the level of interest regarding the EVs, a Likert scale of 5 degrees was adopted, which 1 means "No interest at all" and 5 means "Very interested". On the familiarity of the innovative Business models, a Likert scale of 5 degrees was also used, which 1 means "Unfamiliar" and 5 means "very familiar".

Research Objectives	Question	Scale	Variables
Analyse the growth of the EV’s market	How do you classify your interest regarding the electric vehicles? 1 means "No interest at all" and 5 means "Very interested".	Likert	Consumer behaviour, Interest on Electric Vehicles' adoption, Differences between an EV and a combustion vehicle
Analyse the growth of the EV’s market	Rank the following factors that you consider to be the biggest barrier to adopting an electric vehicle, up to what you consider to be the smallest barrier. 1 means "biggest barrier" and 5 means "smallest barrier".	–	Barriers, Interest on Electric Vehicles' adoption, Differences between an EV and a combustion vehicle
Analyse the growth of the EV’s market	In your opinion, the Government incentives for the EV's adoption are:	–	Government incentives, Interest on Electric Vehicles' adoption, Differences between an EV and a combustion vehicle
Understand the consumer’s preferences regarding the business models	Rank the following that you consider to be the biggest motivation for adopting an EV, to what you consider to be the smallest motivation. 1 means "biggest motivation" and 4 means "smallest motivation".	–	Motivations, Interest on Electric Vehicles' adoption, Differences between an EV and a combustion vehicle
Understand the consumer’s preferences regarding the business models	How familiar are you with the innovative Business Models (EV-leasing; Battery-leasing; EV-sharing economy)? 1 means "Unfamiliar" and 5 means "very familiar".	Likert	Innovative Business Models, Interest on Electric Vehicles' adoption, Differences between an EV and a combustion vehicle
Understand the consumer’s preferences regarding the business models	If, in this moment, you were to adopt an EV, which Business Model would you opt?	–	Difference betweeen BMs, Interest on Electric Vehicles' adoption, Differences between an EV and a combustion vehicle
Understand how the business models can eliminate the barriers of the EV’s purchase	After this brief explanation regarding the innovative Business Models, do you believe that its introduction can make the difference for the customers in the moment of the EVs adoption?	–	Innovative Business Models, Interest on Electric Vehicles' adoption, Differences between an EV and a combustion vehicle
Understand how the business models can eliminate the barriers of the EV’s purchase	Do you believe the BMs adopted are more important than the barriers and motivations related with EV's?	–	Difference betweeen BMs, Interest on Electric Vehicles' adoption, Differences between an EV and a combustion vehicle

Table 7 - Prototype Instrument

3.3.4 Pre-Test Validation

In order to acknowledge the flaws of the survey, it was sent to a small and restrict number of people to test and verify if everything was correct. After the feedback, changes were made for the survey to be the most accurate as possible. Some alterations were made such as, correction

of semantic errors and addiction of a question directly linked with the literature. After this process, it was time to release the survey.

3.3.5 Population and Sample Definition

Who? – This questionnaire was spread via social media to reach as many people as possible. It has a specific target being only allowed to answer people with, at least, 18 years old.

When? – The data collection period was between May 2nd and June 29th of 2022.

Where? – The questionnaire was meant for people who live in Portugal.

Chapter IV- Data Analysis

4.1 Introduction

This chapter focus on the data analysis' results presentation.

In a first moment, the sample's demography will be presented through a descriptive analysis. After that, with help of a statistical program called SPSS, it will be possible to observe the descriptive statistic of the related variables with the interest of electric vehicles' adoption.

4.2 Sample Error

Our sample (N) is 163. In this case and based on the analysed sample average, it's pertinent to affirm that the standard error values are low, meaning that are well distributed over the populational average. Concluding, it's populational representative.

4.3 Sample characterization

This part of the results refers to demographic data of the participants. Includes gender, age, area of residence in Portugal, literary abilities, driving license time, driving time per day, gross income per year and if the participants own an EV.

A total of 167 participants answered the questionary, however, it was necessary to exclude 4 people since they didn't pass on the control question. This control question had the objective of identify people who do not have the necessary knowledge of the subject, so the survey could be the most accurate as possible. Regarding to the people that succeed on the control question, 163 people, 72 (44,2%) are females and 91 (55,8%) are males.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	72	44,2	44,2	44,2
	Male	91	55,8	55,8	100
	Total	163	100	100	-

Table 8 - Gender

Regarding the age, the question was categorized in 5 different age groups. Most of the participants are between the "18-29", being 71,8% (117) of the total sample, followed by "40-49" group with 12,3% (20). With 11,7% (19) are the "50-60" people, finished by the "30-39" and "more than 60" groups with 2,5% (4) and 1,8% (3), respectively.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-29	117	71,8	71,8	71,8
	30-39	4	2,5	2,5	74,2
	40-49	20	12,3	12,3	86,5
	50-60	19	11,7	11,7	98,2
	More than 60	3	1,8	1,8	100
	Total	163	100	100	-

Table 9 - Age

What concerns the area of living in Portugal, "Alentejo" is the area with most participants, a total of 40,5%. Next, is "Lisboa" with 39,3%, followed by 9,2% of "Centro". The two last areas are "Algarve", 7,4%, and "Norte", 3,7%.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Alentejo	66	40,5	40,5	40,5
	Algarve	12	7,4	7,4	47,9
	Centro	15	9,2	9,2	57,1
	Lisboa	64	39,3	39,3	96,3
	Norte	6	3,7	3,7	100
	Total	163	100	100	-

Table 10 - Living Area

Focusing on the Literary Abilities, 45,4% of participants have a bachelor's degree and 0,6% have a PhD. The other referred literary abilities are master's degree, High School, and Post-Graduation with 23,9%, 21,5% and 8,6%, respectively.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	PhD	66	40,5	40,5	40,5
	High School	12	7,4	7,4	47,9
	Bachelor's Degree	15	9,2	9,2	57,1
	Master's Degree	64	39,3	39,3	96,3
	Post-Graduation	6	3,7	3,7	100
	Total	163	100	100	-

Table 11 - Literary Abilities

Most of the participants have “4-6” years of driving license time, 36,2%, followed by 31,3% of the “10 or more years” group. After those, with 17,8%, there are people that have driving license for “up to 3 years”. Finally, people with “7-9” years, 8%, and “I don’t have driving license”, 6,7%.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	10 or more years	51	31,3	31,3	31,3
	4-6 years	59	36,2	36,2	67,5
	7-9 years	13	8	8	75,5
	Up to 3 years	29	17,8	17,8	93,3
	I don't have it	11	6,7	6,7	100
	Total	163	100	100	-

Table 12 - Driving License Time

Regarding the driving time per day, there are 6 possible options. “30 minutes <1 hour” is the most voted option, 43,6%. The second most voted option is “less than 30 minutes” with 28,8% of total sample, followed by “1 hour <2 hours” with 21,5%. The least voted option, with significant distance are “2 hours < 3 hours” (3,7%), “3 hours < 4 hours” (1,8%) and “more than 4 hours” (0,6%).

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 hour < 2 hours	35	21,5	21,5	21,5
	2 hours < 3 hours	6	3,7	3,7	25,2
	3 hours < 4 hours	3	1,8	1,8	27
	30 minutes < 1 hour	71	43,6	43,6	70,6
	More than 4 hours	1	0,6	0,6	71,2
	Total	163	100	100	-

Table 13 - Driving Time per day

About the gross income per year, it’s possible to observe that 56,4% of the participants have an income of “less than 20000€”, followed by “20000 a 40000€” income, 23,9%. Next option is “Rather not to say”, with 12,3%, finished by “40000 a 60000€” and “more than 80000€”, with 3,7% and 1,2%, respectively.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20000 a 40000€	39	23,9	23,9	23,9
	40000 a 60000€	6	3,7	3,7	27,6
	60000 a 80000€	4	2,5	2,5	30,1
	More than 80000€	2	1,2	1,2	31,3
	Less than 20000€	92	56,4	56,4	87,7
	Rather not to say	20	12,3	12,3	100
	Total	163	100	100	-

Table 14 - Gross Income per year

The final demographic question was made to see if people own an EV. 152 participants don´t have an EV and 11 participants do have. From those 11 participants, 8 people have 1 EV, 1 person has 2 EVs and, finally, 2 participants have 2 or more EVs.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	152	93,3	93,3	93,3
	1	8	4,9	4,9	98,2
	2	1	0,6	0,6	98,8
	More than 2	2	1,2	1,2	100
	Total	163	100	100	-

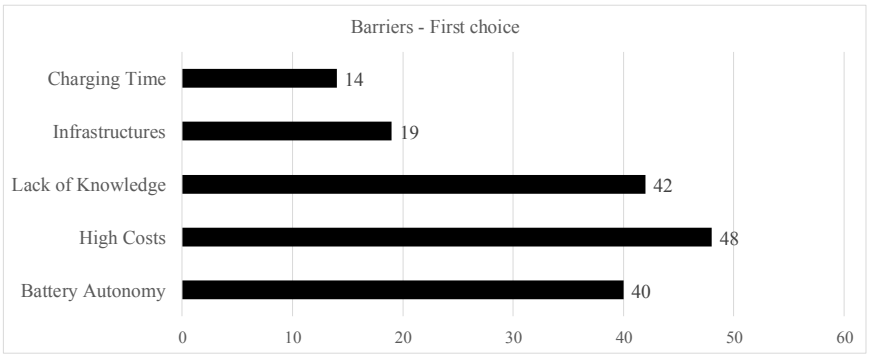
Table 15 - Ownership of EVs

In the question "How do you classify your interest in EVs?", in a scale of 1 to 5, where 1 means "No interest at all" and 5 means "Very Interested", 61 respondents are on level 4, 53 people have a lot of interest, correspondent to level 5, 27 people are on level 3, 15 on level 2 and the final 7 claims to have no interest at all, correspondent to level 1.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	7	4,3	4,3	4,3
	2	15	9,2	9,2	13,5
	3	27	16,6	16,6	30,1
	4	61	37,4	37,4	67,5
	5	53	32,5	32,5	100
	Total	163	100	100	-

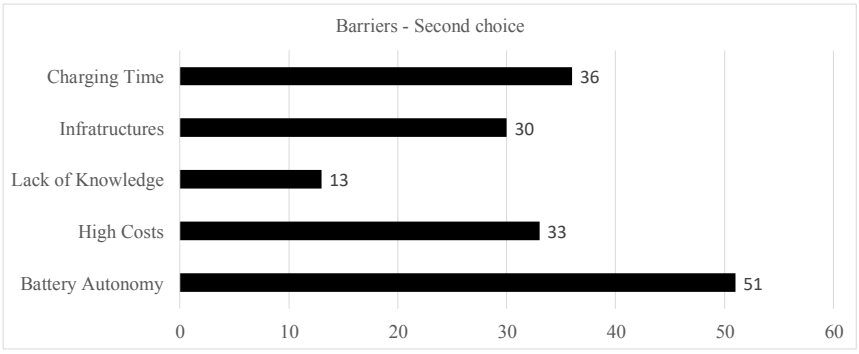
Table 16 - Question 1

When asked to classify which are the factors that consider to be biggest barriers on EV adoption, for first choice, the respondents considered "High costs" has the biggest barriers with 48 votes, while "Charging Time" was the least voted with 14 answers.



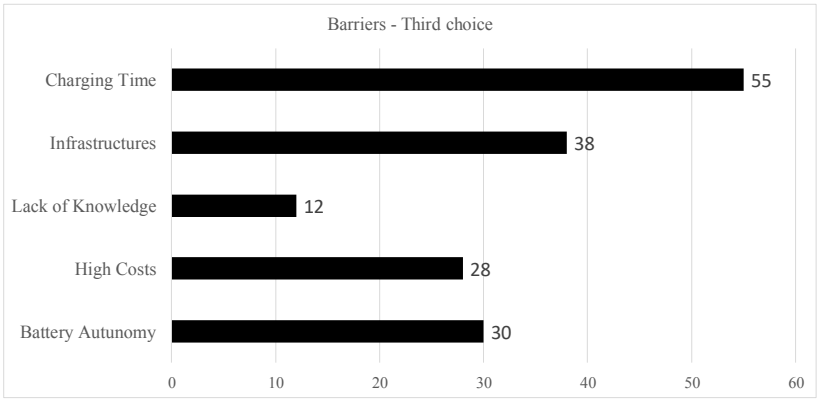
Graphic 7 - Barriers – First choice

For the second option of the biggest barriers on EV adoption, "Battery Autonomy" had the most responses, 51, while only 13 people voted on "Lack of Knowledge".



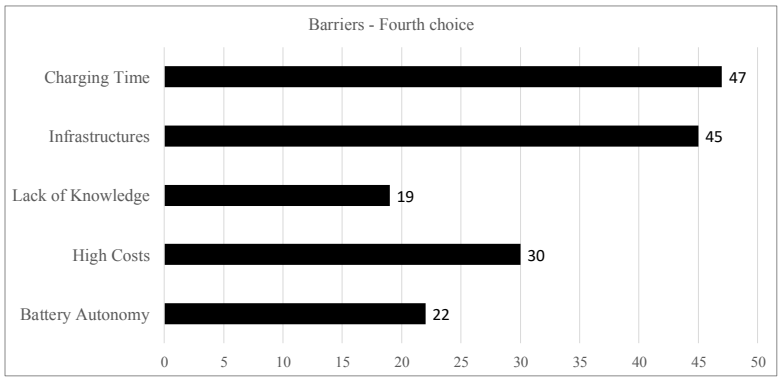
Graphic 8 - Barriers – Second choice

Regarding the third choice of the respondents, 55 people choose "Charging Time" being the most voted, while "Lack of Knowledge" was, once again, the least voted option, with 12 answers.



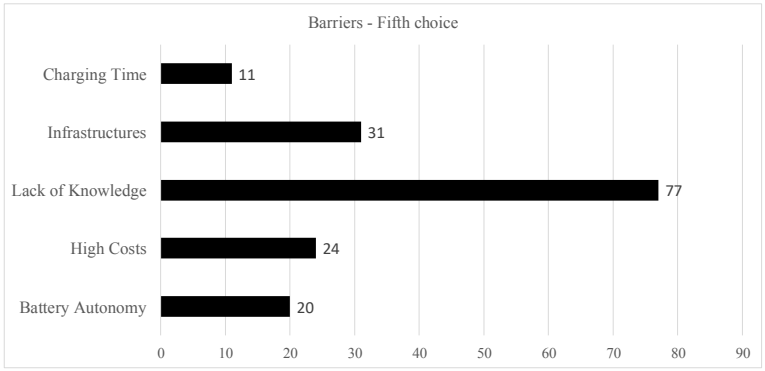
Graphic 9 - Barriers – Third choice

The respondents, for fourth choice, voted in "Charging Time" the most, with 47 answers, followed by "Infrastructures" with 45. The less voted was "Lack of Knowledge" with 19 answers.



Graphic 10 - Barriers – Fourth choice

For the fifth choice of the barriers, the most answered option was “Lack of Knowledge” with 77 people choosing it. Meanwhile, “Charging Time” was the least answering option with 11 answers.



Graphic 11 - Barriers – Fifth choice

For most of the respondents, 96 (58,9%), the government incentives to EV’s adoption are: “Important: It can accelerate the introduction of EVs in the market;”, 35 (21,5%) considers “Useful: It can be a good help for its purchase;” and 24, (14,7%), claims that are “Fundamentals: Only through Government Incentives it is possible to buy na EV;”. For the final answers, 5 (3,1%) people believe that are “Bad for the market: In the sense that market will be dependent on the Government;” and only 3 (1,8%) defends that are “Unnecessary: The technical characteristics of an EV are more important;”.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Unnecessary: The technical characteristics of an EV are more important;	3	1,8	1,8	1,8
	Fundamentals: Only through Government Incentives it is possible to buy an EV;	24	14,7	14,7	16,6
	Important: It can accelerate the introduction of EVs in the market;	96	58,9	58,9	75,5
	Bad for the market: In the sense that market will be dependent on the Government;	5	3,1	3,1	78,5
	Usefull: It can be a good help for its purchase;	35	21,5	21,5	100
	Total	163	100	100	-

Table 17 - Question 3

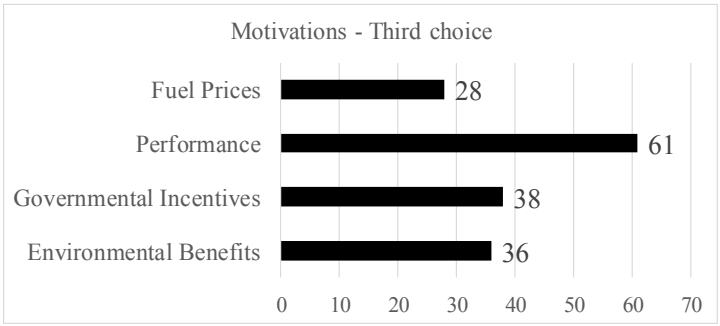
When People were asked about how their motivations would be to buy an EV, for first choice, they chose “Environmental Benefits”, with 59 answers, while 15 people chose “Performance” as their first motivation.

Graphic 12 - Motivations - First choice

For second choice of motivation to adopt an EV, "Fuel Prices" was the most voted answer with 61 nominations, while only 28 people chose "Governmental Incentives".

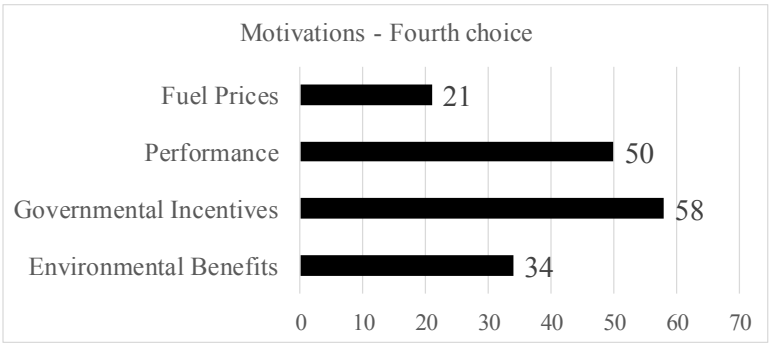
Graphic 13 - Motivations - Second choice

Regarding the third choice, 61 people chose "Performance", while 28 chose "Fuel Prices".



Graphic 14 - Motivations – Third Choice

To finalize the motivations' analysis, the respondents, for fourth choice, voted the most in "Governmental Incentives", with 58 answers, while "Fuel Prices only had 21.



Graphic 15 - Motivations -Fourth choice

In the question "How familiar are you with the Innovative Business Models (EV-Leasing; Battery-Leasing; EV-Sharing Economy)?", on a scale which 1 means "Unfamiliar" and 5 means "Very Familiar", 55 respondents are nothing familiarized, level 1, 47 people are on level 3, 37 on level 2, 16 people on level 4 and only 8 respondents are very familiarized, level 5.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	55	33,7	33,7	33,7
	2	37	22,7	22,7	56,4
	3	47	28,8	28,8	85,3
	4	16	9,8	9,8	95,1
	5	8	4,9	4,9	100
	Total	163	100	100	-

Table 18 - Question 5

Regarding the question nº6, "After this brief explanation regarding the Innovative Business Models, do you believe that its introduction can make the difference for the customers in the moment of EVs adoption? 116 (71,2%) answered "Yes", 29 (17,8%) answered "I don't know" and 18 (11%) People said "No".

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	18	11	11	11
	I don't know	29	17,8	17,8	28,8
	Yes	116	71,2	71,2	100
	Total	163	100	100	-

Table 19 - Question 6

What concerns the question "If, at this moment, you were to adopt an EV, which Business Model would you opt for? 64 people (39,3%) preferred "EV-Leasing", 57 answered "Full Purchase (traditional method)", 29 (17,8%) opt for "Battery-Leasing) and, finally, 13 (8%) choose "EV-Sharing Economy".

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Battery-Leasing	29	17,8	17,8	17,8
	Full Purchase (Traditional Method)	57	35	35	52,8
	EV-Leasing	64	39,3	39,3	92
	EV-Sharing Economy	13	8	8	100
	Total	163	100	100	-

Table 20 - Question 7

For the final question, "Do you believe the BMs adopted are more important than the barriers, government incentives and motivations related with EVs?", 86 (52,8%) respondents believe that the adopted business models are more important than barriers, governmental incentives and motivations related with EVs, while 77 (47,2%) do not believe in it.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	77	47,2	47,2	47,2
	Yes	86	52,8	52,8	100
	Total	163	100	100	-

Table 21 - Question 8

4.4 Mean and Standard Deviation

Analysing the table and looking to the average, it's possible to conclude that the variable "How do you classify (…)" is the most important variable and the one whom has more weight on the respondents' decision, having a 3,85 average.

Descriptive Statistics			
	Mean	Std. Deviation	N
How do you classify (…)	3,85	1,109	163
In your opinion, the Government Incentives (…)	3,28	1,02	163
How familiar are (…)	2,29	1,176	163
After this brief explanation (…)	2,6	0,681	163
Do you believe the Business Models (…)	1,53	0,501	163

Table 22 - Mean and Standard Deviation

4.5 Correlation Analysis

This test measures the strength and direction of the relation between two variables, being that the correlation coefficient can vary from -1 (indicates a negative correlation) to +1 (indicates a positive correlation), and 0 (non-correlation).

In this case, based on the analysed variables, the hypothesis pretends to know if exists a correlation between the variable "How do you classify (…)" and the variable "How familiar are (…)".

Based on the table analysis, it's possible to affirm that the correlation coefficient/ Pearson value is 0,253, which declares the existence a positive correlation. Analysing the significance value, where the standard alpha value is 0,05, which means a positive correlation since the value is 0,001.

Correlations			
		How do you classify (…)	How familiar are (…)
How do you classify (…)	Pearson Correlation	1	0,253
	Sig. (2-tailed)		0,001
	N	163	163
How familiar are (…)	Pearson Correlation	0,253	1
	Sig. (2-tailed)	0,001	
	N	163	163

Table 23 - Correlations

4.6 Factorial Analysis

The KMO test is a measure test to evaluate how suitable is the data to the factorial analysis. The final analysis, with a result of 0,518, allows a factorial analysis since the minimum value is 0,5.

The Bartlett's test is another indication of the strength between the variables' relation. It tests the null hypothesis that the correlation matrix is an identity matrix. An identity matrix is a matrix in which all the diagonal elements are 1 and all the elements outside of the diagonal are 0.

So, the null hypothesis is rejected. By analysing the table it's possible to observe that the sphericity of the Bartlett's test is significant, meaning, probability of association is less than 0,5. By the way, it has a significance of 0,002. This means that the level of significance is small enough to reject the null hypothesis, meaning that the correlation matrix is not an identity matrix.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0,518
Bartlett's Test of Sphericity	Approx. Chi-Square	28,205
	df	10
	Sig.	0,002

Table 24 - KMO and Bartlett's Test

The communalities table demonstrates how much of variance was accounted on the variables by the extracted factors. For example, 83,6% of the variation on the question "Do you believe the Business Models (…)" is accounted, while only 60,8% of the variation on the question "How do you classify (…)" is accounted.

Communalities		
	Initial	Extraction
How do you classify (…)	1,000	0,608
In your opinion, the Government Incentives (…)	1,000	0,807
How familiar are (…)	1,000	0,667
After this brief explanation (…)	1,000	0,648
Do you believe the Business Models (…)	1,000	0,836

Table 25 - Communalities

The next table shows all the extractable factors from the analysis together with its eigenvalues, the percentage of the assigned variance to each factor and cumulative variance of the factor and previous factors. To notice that the first factor answers by 28,441% of the variance, the second by 22,427% and the third by 20,453%. All the other factors are not significant.

Total Variance Explained									
		Initial Eigenvalues		Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1,422	28,441	28,441	1,422	28,441	28,441	1,278	25,552	25,552
2	1,121	22,427	50,868	1,121	22,427	50,868	1,183	23,666	49,219
3	1,023	20,453	71,321	1,023	20,453	71,321	1,105	22,102	71,321
4	0,732	14,639	85,96						
5	0,702	14,040	100						
Extraction Method: Principal Components Analysis									

Table 26 - Total Variance Explained

The component matrix table shows the charge of the 5 variables on the 3 extracted factor. The higher the charge absolute value, more the factor contributes to the variable. The visible gaps on the table are chargers inferior to 0,25 which were supressed.

Component Matrix			
	Component		
	1	2	3
How do you classify (…)	0,682	-0,264	0,27
In your opinion, the Government Incentives (…)	-0,467		0,748
How familiar are (…)	0,548	-0,534	0,285
After this brief explanation (…)	0,65	0,466	
Do you believe the Business Models (…)		0,721	0,549

Table 27 - Component Matrix

The objective of the rotated component matrix is to reduce the number of factors about which the variables in analysis possess high charges. For example, and according with the analysed table, it's possible to verify that the questions "How do you classify (…)" and "How familiar are (…) have a substantial charge on the Factor 1, while the variables "After this brief explanation (…)" and "Do you believe the Business Models (…)" have a substantial load on the Factor 3. The remaining variable has a substantial charge on the Factor 2.

Rotated Component Matrix			
	Component		
	1	2	3
How do you classify (…)	0,76		
In your opinion, the Government Incentives (…)		0,878	
How familiar are (…)	0,806		
After this brief explanation (…)		-0,622	0,465
Do you believe the Business Models (…)			0,909

Table 28 - Rotated Component Matrix

4.7 Regression Analysis

The "R" value is the simple correlation coefficient. It's used to measure the quality of the dependent variable prevision. It has a value of 0,298.

The R^2 value is the determination coefficient. It's the proportion of the variance on the dependent variable, explained by the independent variables. The $R^2 = 0,089$ demonstrates that the independent variables explain, approximately, 8,9% of the dependent variable variance.

Model Summary									
					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of Estimative	R Square Change	F Change	df1	df2	Sig. F Change
1	0,298	0,089	0,066	1,072	0,089	3,846	4	158	0,005

Table 29 - Model R test

Based on the ANOVA table, it's pertinent to affirm that, in this case, there are differences between the groups, since the presented level is 0,005. So, the null hypothesis is rejected.

ANOVA's Null and Alternative hypothesis

H0: the group averages are the same ($p>0,05$)

H1: exists differences between the group averages ($p<0,05$)

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	17,67	4	4,417	3,846	0,005
	Residual	181,496	158	1,149		
	Total	199,166	162			

Table 30 - ANOVA Test

Chapter V- Discussion and Conclusions

5.1 Introduction

This chapter summarizes the main conclusion obtained from this investigation, responding to the formulated research questions and fulfilment and validity of the specific objectives. From the questionnaire analysis, it will be described possible scenarios alongside with recommendations concerning the impact of the Innovative Business Models on the consumer´s preferences, when adopting an EV. Additionally, it will be made known the limitations as well as some leads for future investigations.

5.2 Discussion and Findings

5.2.1 Question 1

The first research question is "Which are the factors that condition the EV's commercialization in Portugal?". It goes towards the first specific objective described during the dissertation.

According to Liao et al. (2019) and Jean (2020), during the introduction of EVs, there was a negative feeling/unattractiveness towards them but as stated in graphic 1, sales are growing fast each year that passes by. It was estimated that 6,4 million EVs were sold in 2021.

Portugal is one of the countries in Europe with most conditions for the electric vehicles' disruption, being the fourth with most charging points (ACEA, 2021). Only during the 2nd Quarter of 2021, 13.967 EVs were sold here, an increase of +337% regarding the same period of 2020 (Graphic 6).

If there was a negative feeling, it is gone for sure. Also, according to my investigation, 114 people out 163 are interested (level 4) or very interested (level 5) regarding this matter, which is observable that people's vision has changed during these past few years.

But, as known, there are more "variables" than the interest that influences the consumers. The barriers, the motivations and the external incentives are some of those variables.

Several investigations conducted by Krause et al. (2013), Egbue & Long (2012), Buhler et al. (2014), amongst others… refer to these 5 barriers mentioned above as the ones which influences the most consumers.

The impact that it has can vary from country to country, depending on the conditions that they have and give for EVs' commercialization. A study conducted in Portugal by Oliveira Dias &

Santos (2015) refers the monetary criteria as the which influences the most. Regarding the data analysis, it's possible to agree with their affirmation since "High Costs" was the most voted option, followed by close for "Lack of Knowledge" and "Battery Autonomy".

Because of the High Costs, the association between a high income and the purchase of these types of cars was positively confirmed by Erdem et al. (2010), when he refers that people with higher income are more likely to pay premium prices for these vehicles and it's enhanced by this study. From the 163 respondents, 11 possesses EVs and 6 have an income of, at least, 60.000€.

In order to make EV's cost more affordable and attractive for the consumers, the governments give incentives, mainly financial, to increase its adoption (Newberry & Strback, 2016) and it's having a positive effect (Franklin & Susito, 2016). Portugal, thanks to tax breaks and subsidies, has one of the highest EV market shares in Europe. An Environmental fund was also created to support the acquisition of these vehicles (Environment and Climate Action Ministry Office, 2022). Full exemption of vehicle Tax and Road Tax were implemented in the Law Proposal nº257/XII.

As it was mentioned before, Portugal has a good market share and the adoption of EVs is growing fast, so the governmental incentives are working well, and it meets my analysis in the sense that 158 people believe the incentives are useful, important and fundamental for EV's adoption. Then, it's plausible to conclude that governmental incentives and EV's commercialization are positively related.

Finally, the motivations inherent to this disruptive innovation. All the technologies have good and bad aspects. Regarding this one, the bad aspects were already mentioned (barriers) as some of the good ones were too (Governmental Incentives).

The EVs are directly linked to the substitution of fossil fuel vehicles towards to solve sustainability problems (Siegel, 2009). During the Literature Review, it was possible to state different views regarding these motivations. Graham-Rowe et al. (2012) believes that EVs performance is worse than combustion vehicles and Eggers & Eggers (2011) adds that with time, this opinion will change.

Other motivation is the fuel prices. In recent times, the fuel prices have reached prices never seen before. As Oliveira et al., (2015) stated, this will contribute for future decisions when

buying an EV. Whatever what was said before, Andersen (2019) affirms that the principal purchase reason of an EV is the environmental concern.

Due to the data analysis of this investigation, it's possible to agree with the last author by corroborate that "Environmental Benefits" are the ones which motivates the most to buy an EV, with 58 answers. So, there is a positive relation between the Environmental Benefits and EV's commercialization.

5.2.2 Question 2

The second research question is "How will be the customer's vision about the adoption of the new Business Models?". It goes towards the second specific objective described.

Communication is valuable. Believing that all customers are equal and share the same preferences is a mistake. To succeed, it's important to understand people (Padgett & Mulvey, 2007) and realize they are stimulated due to the environmental factors around them (Wang et al., 2018). Regarding the EVs and the context of this investigation, the Business Models innovation leads to the creation of new sources of value for the customers, The significance of knowing the preferences of the consumer regarding the BMs is huge. During the literature, Chesbrough & Rosebloom (2002) stated that innovative business models can make the difference for a product sale. But do people know that automobile industry has created Innovative Business Models for this disruptive technology? According to my investigation, only 24 out of 163 people said that are familiar (level 4) or very familiar (level 5) with them. Thus, this question is the one with the highest correlation value regarding the dependent variable, which means that, as more familiarized people will become with the Innovative Business Models, more interest will have on EVs.

During the data analysis, a brief explanation regarding the IBMs was made to introduce to most people what were these new IBMs and how they could be "applied". Afterwards, people needed to choose one of them plus the conventional if adopting an EV and "EV-Leasing" was the most answered option.

5.2.3 Question 3

The third research question is "Will the company benefit the introduction of the Innovative Business Models in the EV's purchase?". It goes towards the third specific objective described during the dissertation.

Regarding the context of this investigation, Hidrue et al., (2015) said dealers use promotional activities to promote EVs. To achieve success, firms need to highlight the characteristics of electric vehicles (Van Dijk, Antonides and Schillewaert, 2014) and also to advertise the introduction of Innovative Business Models. These IBMs are directly connected to the increasement of environmental concerns and change the customer's view towards it. In a matter of fact, the data analysis comproves that it helps changing their vision since 116 people believe that Innovative Business Models can make the difference during EV's adoption. The Business Models are how firms create and capture value from their products. Besides it, Johnson and Suskewics (2009) believes that can overcome the barriers that difficult market penetration by adopting a direct sales model, improving services, and educating consumers on EV's benefit (Bohnsack et al., 2014). Due to data analysis, 86 people believe that Innovative Business Models are the most important "variable" during EV's commercialisation. Additionally, this question was the one with the highest value of variation in the analysis.

5.3 Conclusions

The present investigation has as main goal investigate the impact of the Business Models on consumer's preferences and how it can facilitate electric vehicle's commercialisation in Portugal.

EVs sales have grown exponentially in Portugal. The market share more than doubled from Q2 2021 compared to Q2 2020. However, it still has a lot of potential to grow since the barriers mentioned are still very present in the minds of the customers. Each year that passes, people are having more knowledge about EVs. However, the cost of these types of cars is still very high, being the principal barrier for the commercialisation and showing accordance with the literature. That's why Portugal's Government incentivized people by helping them buy an EV with monetary subsidies and tax breaks, having importance when adopting an EV. Since its introduction, the EVs are directly linked with the environment and sustainable practices and it's still the main motivation to buy one. Besides the good infrastructure system present in Portugal, there's a lack of performance and battery autonomy and the consumers are not confident about it, yet.

In the Literature, the importance of the Business Models is referred a lot of times because it highlights the benefits of the products. Since the EVs are a disruptive technology, Innovative Business Models were created to help on the EV's adoption, to demonstrate their best attributes. Something that was possible to conclude is that, in Portugal, most of the people were not

familiar with these IBMs but, after a quick explanation, they realised its importance for the commercialisation.

In general, people believe that Innovative Business Models are important for EV's proliferation. However, it was not possible to conclude if the IBMs have a bigger "weight" than the barriers, government incentives and motivations. The number of "Yes" and "No" answers was very similar and didn't get any confident finding.

5.4 Limitations

The first limitation that, probably, affected the most the present study was the small number of respondents. The sample should be bigger than it was. The minimum, for an investigation of this matter, is 300 people. More, most of respondents were from the age group "18-29" and from "Alentejo" and "Lisbon" regions. There was a small variety of respondents. Second, was the inexistence of scales directly appropriate and properly tested for the study in question.

Posteriorly, the elaborate questionnaire could have been better explored and thought in order to have more depth on the research questions. The number of questions was very limited. Another limitation was the fact the investigation was of a quantitative character only. It would have been an asset if it would have been done interviews for people express their real feeling and opinions regarding this subject to gather their perceptions from a different perspective. This limitation like the sample size were not possible to mitigate due to time and resources.

The last limitation was few information of the Innovative Business Models and all the electric vehicle's context in Portugal. Since it is something relatively new and with a long "path to track", made it harder to find proper, relevant, and precise information about the impacts and outcomes.

5.5 Future Investigation

For future research, the first recommendation consists on the possibility of expanding the size of the sample and gathering information for a longer period. Besides the online survey that was conducted through Google Forms, it could be interesting to explore and try to use other forms to collect data. Hand delivered questionnaires and interviews are some available options. Besides, it could also be important to mix a quantitative with a qualitative research as well, where people could express their own opinion and feelings. Second, try to take this investigation to another age groups and regions less represented. Extend the number of questions from the

questionnaire could be important, to have a more variety and deeper perspectives in order to understand better what consumers are looking for on an electric vehicle.

The futures researchers of this subject could also consider explore preferences of consumers regarding other potential IBMs in the future of EV's market. Try to find if it would be valued by the customers, particularly when advanced technologies are integrated, such as autonomous driving and artificial intelligence. Platform Business Models (sharing mobility) are being more and more noticed. To understand if it is something with potential to adopt in Portugal could be a good idea because most people don't user their cars every day.

Chapter VI- References

Albertsen, L., Richter, J. L., Peck, P., Dalhammar, C., & Plepys, A. (2021). Circular business models for electric vehicle lithium-ion batteries: An analysis of current practices of vehicle manufacturers and policies in the EU. Resources, Conservation and Recycling, 172, 105658. https://doi.org/10.1016/j.resconrec.2021.105658

Axsen, J., & Kurani, K. S. (2013). Hybrid, plug-in hybrid, or electric—What do car buyers want? Energy Policy, 61, 532–543. https://doi.org/10.1016/j.enpol.2013.05.122

Barlingen, J. D. S. and W. van. (2021, October 26). How far can an electric car go on one charge? https://blog.evbox.com/far-electric-car-range

Benefits and Incentives - Mobi.e - Liferay 7.3. (2014). Mobi.e. https://www.mobie.pt/en/mobility/benefits-incentives

Benzidia, S., Luca, R. M., & Boiko, S. (2021). Disruptive innovation, business models, and encroachment strategies: Buyer's perspective on electric and hybrid vehicle technology. Technological Forecasting and Social Change, 165, 120520. https://doi.org/10.1016/j.techfore.2020.1205207

Bob, J., Vrösch, Gonçalo, J., & Pernas. (2018). Consumer' acceptance of electric vehicles in Lisbon partial requirement for the conferral of Master in International Management. https://repositorio.iscte-iul.pt/bitstream/10071/18980/1/master_bob_alexander_vrosch.pdf

Bohnsack, R., Pinkse, J., & Kolk, A. (2014). Business models for sustainable technologies: Exploring business model evolution in the case of electric vehicles. Research Policy, 43(2), 284–300. https://doi.org/10.1016/j.respol.2013.10.014

Bohnsack, R., & Pinkse, J. (2017). Value Propositions for Disruptive Technologies: Reconfiguration Tactics in the Case of Electric Vehicles. California Management Review, 59(4), 79–96. https://doi.org/10.1177/0008125617717711

Budde Christensen, T., Wells, P., & Cipcigan, L. (2012). Can innovative business models overcome resistance to electric vehicles? Better Place and battery electric cars in Denmark. Energy Policy, 48, 498–505. https://doi.org/10.1016/j.enpol.2012.05.054

Cao, J., Chen, X., Qiu, R., & Hou, S. (2021). Electric vehicle industry sustainable development with a stakeholder engagement system. Technology in Society, 67, 101771. https://doi.org/10.1016/j.techsoc.2021.101771

Carros elétricos: apoios à compra e condições. (n.d.). Deco Proteste. https://www.deco.proteste.pt/auto/automoveis/noticias/carros-eletricos-apoios-compra-condicoes/incentivo-do-governo

Carley, S., Krause, R. M., Lane, B. W., & Graham, J. D. (2013). Intent to purchase a plug-in electric vehicle: A survey of early impressions in large US cites. Transportation Research Part D: Transport and Environment, 18, 39–45. https://doi.org/10.1016/j.trd.2012.09.007

Costa, C. M., Barbosa, J. C., Castro, H., Gonçalves, R., & Lanceros-Méndez, S. (2021). Electric vehicles: To what extent are environmentally friendly and cost effective? – Comparative study by european countries. Renewable and Sustainable Energy Reviews, 151, 111548. https://doi.org/10.1016/j.rser.2021.111548

Costa, S. e L. Farinha (2012), "Inquérito à situação financeira das famílias: metodologia e principais resultados" [Online]. Disponível em: https://www.bportugal.pt/sites/default/files/anexos/papers/op201201.pdf. [visualizado em: 11-fevereiro-2020]. Relatório sobre a situação financeira das famílias, maio de 2012, Banco de Portugal.

Consumidores têm falta de informação sobre benefícios de veículos elétricos. (n.d.). Retrieved January 28, 2022, from AWAY magazine website: https://away.iol.pt/mobilidade/eletrica/consumidores-tem-falta-de-informacao-sobre-beneficios-de-veiculos-eletricos/20220118/61e692b90cf2c7ea0f13d6ae

Cronin, J. J., Smith, J. S., Gleim, M. R., Ramirez, E., & Martinez, J. D. (2010). Green marketing strategies: an examination of stakeholders and the opportunities they present. Journal of the Academy of Marketing Science, 39(1), 158–174. https://doi.org/10.1007/s11747-010-0227-0

De Waard, K., Brookhuis, R., Wiczorek, F., Di Nocera, R., Brouwer, P., Barham, C., Weikert, A., Kluge, W., Gerbino, A., Toffetti, Bühler, F., Franke, T., Cocron, P., Schleinitz, K., Neumann, I., Ischebeck, M., & Krems, J. (2013). In D Driving an EV with no opportunity to charge at home - is this acceptable? https://www.hfes-europe.org/wp-content/uploads/2014/06/Buehler.pdf

Diamond, D. (2009). The impact of government incentives for hybrid-electric vehicles: Evidence from US states. Energy Policy, 37(3), 972–983. https://doi.org/10.1016/j.enpol.2008.09.094

Egbue, O., & Long, S. 2012. Barriers to widespread adoption of electric vehicles: An analysis of consumer attitudes and perceptions. Energy Policy, 48: 717–729.

Eggers, F., & Eggers, F. (2011). Where have all the flowers gone? Forecasting green trends in the automobile industry with a choice-based conjoint adoption model. Technological Forecasting and Social Change, 78(1), 51–62. https://doi.org/10.1016/j.techfore.2010.06.014

Enabling factors for alternatively-powered cars and vans in the European Union MAKING THE TRANSITION TO ZERO-EMISSION MOBILITY. (n.d.). https://www.acea.auto/files/ACEA_progress_report_2021.pdf

Endres, H., Stoiber, K., & Wenzl, N. M. (2019). Managing digital transformation through hybrid business models. Journal of Business Strategy, ahead-of-print(ahead-of-print). https://doi.org/10.1108/jbs-07-2019-0142

Faisal, A., Kamruzzaman, M., Yigitcanlar, T., & Currie, G. (2019). Understanding autonomous vehicles: A systematic literature review on capability, impact, planning and policy. Journal of Transport and Land Use, 12(1), 45–72. https://www.jstor.org/stable/26911258?seq=5#metadata_info_tab_contents

Fuel types of new cars: battery electric 7.5%, hybrid 19.3%, petrol 41.8% market share in Q2 2021. (n.d.). Webcache.googleusercontent.com. https://webcache.googleusercontent.com/search?q=cache:6fhrECx51c8J:https://www.acea.auto/files/20210723_PRPC-fuel_Q2-2021_FINAL.pdf+&cd=1&hl=pt-PT&ct=clnk&gl=pt

Fundo Ambiental: 10 milhões de euros de apoio para mobilidade suave e veículos elétricos. (n.d.). Www.portugal.gov.pt. Retrieved April 25, 2022, from https://www.portugal.gov.pt/pt/gc22/comunicacao/comunicado?i=fundo-ambiental-10-milhoes-de-euros-de-apoio-para-mobilidade-suave-e-veiculos-eletricos

Gavrilescu, I. (2017). Effective business models for electric vehicles. Proceedings of the International Conference on Business Excellence, 11(1), 36–44. https://doi.org/10.1515/picbe-2017-0004

Ge, Y., MacKenzie, D., & Keith, D. R. (2018). Gas anxiety and the charging choices of plug-in hybrid electric vehicle drivers. Transportation Research Part D: Transport and Environment, 64, 111–121. https://doi.org/10.1016/j.trd.2017.08.021

Geotab Energy (2020). Addressing the barriers to EV adoption. https://storage.googleapis.com/geotab_wfm_production_cms_storage/CMS-GeneralFiles-production/NA/White_papers/NEW-geotab-energy-whitepaper-addressing-the-barriers-to-ev-adoption(north-america)-DS02001(web)%20(2).pdf

Gonçalves De Almeida, S. (n.d.). Perceção do consumidor sobre mobilidade elétrica: Caso dos veículos elétricos. Retrieved from https://repositorio.ucp.pt/bitstream/10400.14/32118/1/Sara_Almeida_355418063_TESE_Atualiza%C3%A7%C3%A3o.pdf

Graham-Rowe, E., Gardner, B., Abraham, C., Skippon, S., Dittmar, H., Hutchins, R., & Stannard, J. (2012). Mainstream consumers driving plug-in battery-electric and plug-in hybrid electric cars: A qualitative analysis of responses and evaluations. Transportation Research Part A: Policy and Practice, 46(1), 140–153. https://doi.org/10.1016/j.tra.2011.09.008

Guffarth, D., & Knappe, M. (2018). Patterns of Learning in Dynamic Technological System Lifecycles—What Automotive Managers Can Learn from the Aerospace Industry? Journal of Open Innovation: Technology, Market, and Complexity, 5(1), 1. https://doi.org/10.3390/joitmc5010001

Hardman, S., Jenn, A., Tal, G., Axsen, J., Beard, G., Daina, N., Figenbaum, E., Jakobsson, N., Jochem, P., Kinnear, N., Plötz, P., Pontes, J., Refa, N., Sprei, F., Turrentine, T., & Witkamp, B. (2018). A review of consumer preferences of and interactions with electric vehicle charging infrastructure. *Transportation Research Part D: Transport and Environment*, *62*, 508–523. https://doi.org/10.1016/j.trd.2018.04.002

Hawkins, T. R., Singh, B., Majeau-Bettez, G., & Strømman, A. H. (2012). Comparative Environmental Life Cycle Assessment of Conventional and Electric Vehicles. Journal of Industrial Ecology, 17(1), 53–64. https://doi.org/10.1111/j.1530-9290.2012.00532.x

Heffner, R. R., Kurani, K. S., & Turrentine, T. S. (2007). Symbolism in California's early market for hybrid electric vehicles. Transportation Research Part D: Transport and Environment, 12(6), 396–413. https://doi.org/10.1016/j.trd.2007.04.003

Hidrue, M. K., & Parsons, G. R. (2015). Is there a near-term market for vehicle-to-grid electric vehicles? Applied Energy, 151, 67–76. https://doi.org/10.1016/j.apenergy.2015.04.051

Hidrue, M. K., Parsons, G. R., Kempton, W., & Gardner, M. P. (2011). Willingness to pay for electric vehicles and their attributes. Resource and Energy Economics, 33(3), 686–705. https://doi.org/10.1016/j.reseneeco.2011.02.002

Hjorthol, R. (2013). Attitudes, ownership and use of Electric Vehicles - a review of literature. https://www.toi.no/getfile.php/1332442-

1369641668/Publikasjoner/T%C3%98I%20rapporter/2013/1261-2013/1261-hele%20rapporten%20nett.pdf

Huang, Y., & Qian, L. (2021). Consumer adoption of electric vehicles in alternative business models. Energy Policy, 155, 112338. https://doi.org/10.1016/j.enpol.2021.112338

Huang, Y., Qian, L., Soopramanien, D., & Tyfield, D. (2021). Buy, lease, or share? Consumer preferences for innovative business models in the market for electric vehicles. Technological Forecasting and Social Change, 166, 120639. https://doi.org/10.1016/j.techfore.2021.120639

International Trade Administration (2021, October). Automotive and Automotive Parts. https://www.trade.gov/country-commercial-guides/portugal-automotive-and-automotive-parts

Irle, R. (2020). EV-Volumes - The Electric Vehicle World Sales Database. Www.ev-Volumes.com. https://www.ev-volumes.com/

Istiqomah, S., Sutopo, W., & Astuti, R. (2020). Lesson Learned of Business Strategy for Commercializing An E-Motor Cycle Technology: A Comparative Study. http://www.ieomsociety.org/detroit2020/papers/234.pdf

Jindal, P., & Aribarg, A. (2020). EXPRESS: The Importance of Price Beliefs in Consumer Search. Journal of Marketing Research, 002224372098297. https://doi.org/10.1177/0022243720982979

Ke, W., Zhang, S., He, X., Wu, Y., & Hao, J. (2017). Well-to-wheels energy consumption and emissions of electric vehicles: Mid-term implications from real-world features and air pollution control progress. Applied Energy, 188, 367–377. https://doi.org/10.1016/j.apenergy.2016.12.011

Kley, F., Lerch, C., & Dallinger, D. (2011). New business models for electric cars—A holistic approach. Energy Policy, 39(6), 3392–3403. https://doi.org/10.1016/j.enpol.2011.03.036

Kodama, M. (2019). Boundaries knowledge (knowing)—A source of business innovation. Knowledge and Process Management, 26(3), 210–228. https://doi.org/10.1002/kpm.1603

Krishna, G. (2021). Understanding and identifying barriers to electric vehicle adoption through thematic analysis. Transportation Research Interdisciplinary Perspectives, 10, 100364. https://doi.org/10.1016/j.trip.2021.100364

Liao, F., Molin, E., Timmermans, H., & van Wee, B. (2019). Consumer preferences for business models in electric vehicle adoption. Transport Policy, 73, 12–24. https://doi.org/10.1016/j.tranpol.2018.10.006

Mandys, F. (2021). Electric vehicles and consumer choices. Renewable and Sustainable Energy Reviews, 142, 110874. https://doi.org/10.1016/j.rser.2021.110874

Mendes, J., & Ribeiro, P. (2012). ELECTRIC MOBILITY IN PORTUGAL -THE BEGINNING. Retrieved October 17, 2021, from https://repositorium.sdum.uminho.pt/bitstream/1822/23474/1/Paper585_10-52-10.pdf

Mestrado Marketing Trabalho Final de Mestrado Dissertação Motivações e Barreiras à Compra de Veículos Elétricos João Rui Martins Mendes Nogueira. (n.d.). Retrieved from https://www.repository.utl.pt/bitstream/10400.5/15797/1/DM-JRMMN-2016.pdf

MIT Sloan School of Management. (2017, August 3). The real barriers to electric vehicle adoption | MIT Sloan. MIT Sloan. https://mitsloan.mit.edu/ideas-made-to-matter/real-barriers-to-electric-vehicle-adoption

Nayum, A., & Klöckner, C. A. (2014). A comprehensive socio-psychological approach to car type choice. Journal of Environmental Psychology, 40, 401–411. https://doi.org/10.1016/j.jenvp.2014.10.001

Neubauer, J., & Wood, E. (2014). The impact of range anxiety and home, workplace, and public charging infrastructure on simulated battery electric vehicle lifetime utility. Journal of Power Sources, 257, 12–20. https://doi.org/10.1016/j.jpowsour.2014.01.075

Nocera, S., & Cavallaro, F. (2016). The competitiveness of alternative transport fuels for CO2 emissions. Transport Policy, 50, 1–14. https://doi.org/10.1016/j.tranpol.2016.05.013

Nova aposta das marcas impulsiona venda de elétricos. (2021, October 5). Retrieved January 28, 2022, from Dinheiro Vivo website: https://www.dinheirovivo.pt/empresas/eletricos-batem-recorde-de-vendas-em-nove-meses-14188767.html

Nunes, P., Pinheiro, F., & Brito, M. C. (2019). The effects of environmental transport policies on the environment, economy and employment in Portugal. Journal of Cleaner Production, 213, 428–439. https://doi.org/10.1016/j.jclepro.2018.12.166

Lane, B., & Potter, S. (2007). The adoption of cleaner vehicles in the UK: exploring the consumer attitude–action gap. Journal of Cleaner Production, 15(11-12), 1085–1092. https://doi.org/10.1016/j.jclepro.2006.05.026

Lusa, A. (n.d.). Governo vai "tentar encontrar forma" de aumentar apoio à compra de veículos elétricos. Retrieved January 28, 2022, from Observador website: https://observador.pt/2021/10/20/governo-vai-tentar-encontrar-forma-de-aumentar-apoio-a-compra-de-veiculos-eletricos/

Portugal com 5.a maior percentagem de venda de carros elétricos da Europa - DN. (n.d.). Www.dn.pt. Retrieved November 10, 2021, from https://www.dn.pt/dinheiro/portugal-com-a-quinta-maior-percentagem-de-venda-de-carros-eletricos-da-europa-12909144.html

Quanto demora a carregar um elétrico? #GoElectric. (n.d.). Kia Portugal. Retrieved April 25, 2022, from https://kia.pt/goelectric/tempo-carregamento/

Quanto demora a carregar um veículo elétrico? | Wallbox. (2021, January 28). EVOLVE. https://blog.wallbox.com/pt-pt/quanto-demora-a-carregar-um-veiculo-eletrico/

Rennings, K. (2000). Redefining innovation — eco-innovation research and the contribution from ecological economics. *Ecological Economics*, *32*(2), 319–332. https://doi.org/10.1016/s0921-8009(99)00112-3

Ribau, J., & Ferreira, A. (2014).International Journal of Energy and Environment Life cycle analysis and environmental effect of electric vehicles market evolution in Portugal. Journal Homepage: Www.IJEE.IEEFoundation.org ISSN, 5(5), 2076–2909. https://www.ijee.ieefoundation.org/vol5/issue5/IJEE_01_v5n5.pdf

Sarasini, S., & Linder, M. (2018). Integrating a business model perspective into transition theory: The example of new mobility services. Environmental Innovation and Societal Transitions, 27, 16–31. https://doi.org/10.1016/j.eist.2017.09.004

Scarinci, R., Rast, F., & Bierlaire, M. (2017). Needed reduction in mobility energy consumption to meet the goal of a 2000-watt society. Transportation Research Part A: Policy and Practice, 101, 133–148. https://doi.org/10.1016/j.tra.2017.05.010

She, Z.-Y., Qing Sun, Ma, J.-J., & Xie, B.-C. (2017). What are the barriers to widespread adoption of battery electric vehicles? A survey of public perception in Tianjin, China. *Transport Policy*, *56*, 29–40. https://doi.org/10.1016/j.tranpol.2017.03.001

Sierzchula, W., Bakker, S., Maat, K., & van Wee, B. (2014). The Influence of Financial Incentives and Other socio-economic Factors on Electric Vehicle Adoption. *Energy Policy*, *68*, 183–194. https://doi.org/10.1016/j.enpol.2014.01.043

Skippon, S., & Garwood, M. (2011). Responses to battery electric vehicles: UK consumer attitudes and attributions of symbolic meaning following direct experience to reduce psychological distance. Transportation Research Part D: Transport and Environment, 16(7), 525–531. https://doi.org/10.1016/j.trd.2011.05.005

Skippon, S. M. (2014). How consumer drivers construe vehicle performance: Implications for electric vehicles. Transportation Research Part F: Traffic Psychology and Behaviour, 23, 15–31. https://doi.org/10.1016/j.trf.2013.12.008

Tempo de Carregamento de Carros Elétricos. (2021, November 12). Hyundai | Blue Academy. https://blueacademy.hyundai.pt/artigo/tempo-carregamento-carros-eletricos/

Town, G., Taghizadeh, S., & Deilami, S. (2022). Review of Fast Charging for Electrified Transport: Demand, Technology, Systems, and Planning. *Energies*, *15*(4), 1276. https://doi.org/10.3390/en15041276

van Bree, B., Verbong, G. P. J., & Kramer, G. J. (2010). A multi-level perspective on the introduction of hydrogen and battery-electric vehicles. Technological Forecasting and Social Change, 77(4), 529–540. https://doi.org/10.1016/j.techfore.2009.12.005

van den Bergh, J. C. J. M. (2011). Environment versus growth — A criticism of "degrowth" and a plea for "a-growth." *Ecological Economics*, *70*(5), 881–890. https://doi.org/10.1016/j.ecolecon.2010.09.035

Veit, D., Clemons, E., Benlian, A., Buxmann, P., Hess, T., Spann, M., Kundisch, D., Leimeister, J. M., & Loos, P. (2014). Business Models - An Information Systems Research Agenda. Business & Information Systems Engineering, 6(1), 45–53. https://aisel.aisnet.org/bise/vol6/iss1/8/

Vladimirova Ivanova, E., António, J., & Correia Vieira Da Silva. (2018). How do policy incentives influence the adoption of Electric Vehicles? partial requirement for the conferral of Master in International Management Supervisor. https://repositorio.iscte-iul.pt/bitstream/10071/18361/1/master_elitza_ivanova.pdf

Weiller, C., Shang, A., Neely, A., & Shi, Y. (2013). Competing and co-existing business models for EV: Lessons from international case studies. 2013 World Electric Vehicle Symposium and Exhibition (EVS27). https://doi.org/10.1109/evs.2013.6914776

Weiss, M., Zerfass, A., & Helmers, E. (2019). Fully electric and plug-in hybrid cars - An analysis of learning rates, user costs, and costs for mitigating CO2 and air pollutant emissions. Journal of Cleaner Production, 212, 1478–1489. https://doi.org/10.1016/j.jclepro.2018.12.019

Wrålsen, B., Prieto-Sandoval, V., Mejia-Villa, A., O'Born, R., Hellström, M., & Faessler, B. (2021). Circular business models for lithium-ion batteries - Stakeholders, barriers, and drivers. Journal of Cleaner Production, 317, 128393. https://doi.org/10.1016/j.jclepro.2021.128393

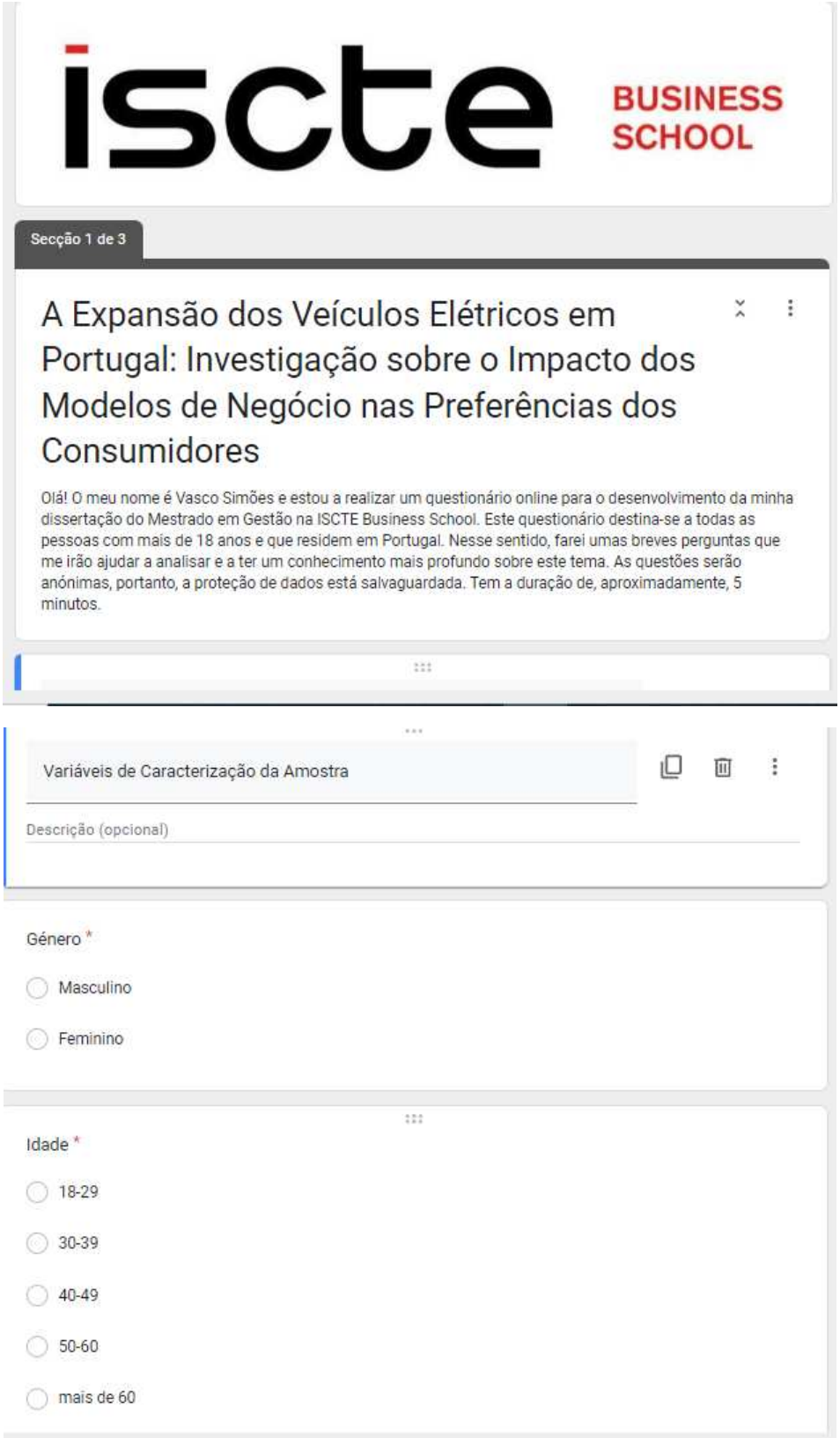
Xu, G., Wang, S., Li, J., & Zhao, D. (2020). Moving towards sustainable purchase behavior: examining the determinants of consumers' intentions to adopt electric vehicles. *Environmental Science and Pollution Research*, *27*(18), 22535–22546. https://doi.org/10.1007/s11356-020-08835-9

Xu, G., Wang, S., & Zhao, D. (2021). Transition to sustainable transport: understanding the antecedents of consumer's intention to adopt electric vehicles from the emotional research perspective. *Environmental Science and Pollution Research*, *28*(16), 20362–20374. https://doi.org/10.1007/s11356-020-12006-1

Yilmaz, M., & Krein, P. T. (2013). Review of Battery Charger Topologies, Charging Power Levels, and Infrastructure for Plug-In Electric and Hybrid Vehicles. IEEE Transactions on Power Electronics, 28(5), 2151–2169. https://doi.org/10.1109/tpel.2012.2212917

Zarazua de Rubens, G., Noel, L., Kester, J., & Sovacool, B. K. (2020). The market case for electric mobility: Investigating electric vehicle business models for mass adoption. Energy, 194, 116841. https://doi.org/10.1016/j.energy.2019.116841

Chapter VII – Appendix



- Pós-Graduação
- Doutoramento

Tempo de carta de condução *

- Não tenho
- até 3 anos
- 4-6 anos
- 7-9 anos
- 10 ou mais anos

Tempo de condução por dia *

- menos de 30 minutos
- 30 minutos < 1 hora
- 1 hora < 2 horas

Área de residência em Portugal *

- Norte
- Centro
- Lisboa
- Alentejo
- Algarve
- Açores
- Madeira

Habilitações Literárias *

- Ensino Básico
- Ensino Secundário
- Licenciatura
- Mestrado

2 horas < 3 horas

3 horas < 4 horas

mais de 4 horas

Rendimento Bruto por ano *

menos de 20 000€

20 000 a 40 000€

40 000 a 60 000€

60 000 a 80 000€

mais 80 000€

Prefiro não dizer

Possui algum Veículo Elétrico? *

Sim

Não

Se a resposta à questão anterior for "sim", quantos possui?

1

2

mais de 2

Após a secção 1 Continuar para a secção seguinte

Secção 2 de 3

Questão de Controlo

Descrição (opcional)

Qual é a diferença entre um Veículo Elétrico (VE) e um veículo convencional? *

Os VEs possuem um motor elétrico alimentado por energia elétrica armazenada em baterias, enquanto ...

- Os VEs são alimentados por energia elétrica enquanto que os veículos convencionais sao alimentados a...
- Os VEs são alimentados a óleo enquanto que os veículos convencionais funcionam através de energia e...
- Os VEs funcionam através de combustiveis fósseis enquanto que os veículos convencionais funcionam ...

Após a secção 2 Ir para a secção 3 (Questões do Questionário)

Secção 3 de 3

Questões do Questionário

Descrição (opcional)

Como classifica o seu interesse sobre os veículos elétricos? 1 significa "Nenhum interesse de todo" e 5 significa "Muito interessado" *

	1	2	3	4	5	
Nenhum interesse de todo	○	○	○	○	○	Muito interessado

Classifica os seguintes fatores que considera ser a maior barreira na adoção de VEs, até aquele que considera ser a menor barreira. 1 significa "maior barreira" e 5 significa "menor barreira" *

	Falta de conhe...	Custos altos	Autonomia da ...	Tempo de carr...	Infraestruturas
1	○	○	○	○	○
2	○	○	○	○	○
3	○	○	○	○	○
4	○	○	○	○	○
5	○	○	○	○	○

Na sua opinião, os incentivos governamentais para adoção de VEs são: *

- Fundamentais: Só através dos incentivos governamentais é possível comprar um VE;
- Importantes: Pode acelerar a introdução dos veículos elétricos no mercado;
- Úteis: Pode ser uma boa ajuda para a sua compra;

- ◯ Desnecessários: As características técnicas de um VE são mais importantes;
- ◯ Maus para o mercado: No sentido do mercado ficar dependente do Governo;

Classifica os seguintes que considera ser a maior motivação para a adoção de um VE, até aquele que considera ser a menor motivação. 1 significa "maior motivação" e 4 significa "menor motivação". *

	Incentivos Govern...	Performance	Preço dos combut...	Benefícios Ambien...
1	◯	◯	◯	◯
2	◯	◯	◯	◯
3	◯	◯	◯	◯
4	◯	◯	◯	◯

Quão familiarizado está com os Modelos de Negócio Inovadores na compra de VEs (EV-leasing; Battery-Leasing; EV-sharing economy)? 1 significa "Nada familiares" e 5 significa "Muito familiares" *

	1	2	3	4	5	
Nada familiares	◯	◯	◯	◯	◯	Muito familiares

Caracterização dos Modelos de Negócio Inovadores

EV-leasing: os consumidores são cobrados por uma taxa mensal ou anual de leasing e têm acesso exclusivo ao veículo elétrico. Depois de terminar esse contrato leasing, os clientes podem renovar o atual contrato ou mudar para um novo VE. Adicionalmente, estão isentos do registo do carro e do processo de licenciamento uma vez que os veículos elétricos estão licenciados localmente nos serviços de aluguer. Este modelo pode relaxar os encargos financeiros dos consumidores e transferir o risco de depreciação de valor de mercado para os fornecedores de serviço.

Battery-leasing: Permite aos consumidores comprar apenas a carroçaria (tudo excepto a bateria) com um custo de capital inicial menor que o modelo convencional da compra total e alugar a bateria com pagamentos anuais. Providencia uma melhor gestão profissional do tempo de vida da bateria do VE e também reduzir o impacto ambiental negativo que resulta do despojo da bateria.

EV-sharing economy: Providencia um acesso mais flexível e sob demanda aos veículos elétricos, de maneira a atender às necessidades de mobilidade instantânea dos consumidores. Os consumidores ganham acesso ao fazerem um pedido numa app de telemóvel e vão buscar os carros ao serviço de aluguer. Este serviço é cobrado por horas/minutos ou por distância conduzida. Entre os 4 modelos de negócio, este é aquele que oferece uma barreira financeira mais baixa à adoção e que os expõe a uma menor incerteza dinâmica.

Após esta breve explicação sobre os Modelos de Negócio Inovadores, acredita que a introdução dos mesmos pode fazer a diferença para os consumidores no momento de adoção de veículos elétricos? *

Após esta breve explicação sobre os Modelos de Negócio Inovadores, acredita que a introdução dos mesmos pode fazer a diferença para os consumidores no momento de adoção de veículos elétricos? *

- Sim
- Não
- Não sei

Se, neste momento, fosse adotar um VE, por qual dos Modelos de Negócio optaria? *

- Compra total (método tradicional)
- EV-leasing
- Battery-leasing
- EV-sharing economy

Acredita que os Modelos de Negócio adotados são mais importantes que as barreiras, incentivos governamentais e motivações relacionadas com os veículos elétricos? *

- Não sei

Se, neste momento, fosse adotar um VE, por qual dos Modelos de Negócio optaria? *

- Compra total (método tradicional)
- EV-leasing
- Battery-leasing
- EV-sharing economy

Acredita que os Modelos de Negócio adotados são mais importantes que as barreiras, incentivos governamentais e motivações relacionadas com os veículos elétricos? *

- Sim
- Não