**Universidade de Aveiro**
**Ano 2019**
Departamento de Economia, Gestão, Engenharia Industrial e Turismo

**Gabriel Alexandre Lopes Pedrosa**

# OS DESAFIOS DO MERCADO AUTOMÓVEL ATUAL: EXTENSÕES DESCENDENTES DE MARCAS PREMIUM E A ADOÇÃO DE VEÍCULOS ELÉTRICOS

# CHALLENGES OF THE CURRENT AUTOMOTIVE MARKET: DOWNWARD LINE EXTENSIONS OF PREMIUM BRANDS AND THE ADOPTION OF ELECTRICAL VEHICLES

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Tese apresentada à Universidade de Aveiro para cumprimento dos requisitos necessários à obtenção do grau de Doutor em Marketing e Estratégia, realizada sob a orientação científica da Professora Doutora Helena Cristina Rocha Figueiredo Pereira Marques Nobre, Professora Auxiliar do Departamento de Economia, Gestão, Engenharia Industrial e Turismo da Universidade de Aveiro.

*We have two lives, and the second one begins when we realize we only have one.*

Confucius

**o júri**

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**Acknowledgements**

I would like to express my gratitude to my advisor Prof. Dr. Helena Nobre for the continuous support of my PhD study, for her tireless drive, rigour, patience, knowledge and attention to detail. The suggestions and revisions made along the writing have profoundly helped in shaping this thesis and publications.

I would like to thank my parents and my sister for all the support, in such a seemingly endless marathon, finishing “probably in the next month or so”. Also, my grandma, still patiently waiting, and my grandparents and great-aunt, who always trusted that I would graduate far, but, unfortunately, missed to be here at the finishing line.

A special thanks to my PhD colleague Ana Antunes de Sousa, who provided valuable help and support as a fellow runner in the mad race towards submission.

I also thank my friends, professors, and colleagues for all the help, encouragement, and support, and also GOVCOPP for the support in attending the Euromed conference, which was full of new and wonderful experiences.

**palavras-chave**

Extensão Descendente de Marca, Efeito de Propriedade, *Innovativeness*, Comportamento de Procura de *Status*, Veículos Elétricos, VE, Mercado Secundário de VE, Mercado Automóvel *Premium* Europeu

**resumo**

O setor automóvel é um dos mercados mais competitivos e complexos no mundo. As forças dinâmicas que caracterizam este contexto levam os fabricantes a implementar extensões descendentes da marca, reduzindo as diferenças entre as marcas massificadas e marcas *premium*. Através do método experimental, o estudo principal procurou perceber como os consumidores avaliam extensões descendentes de marcas *premium* no mercado automóvel Europeu. Os resultados indicaram que a intenção de compra de uma extensão é dependente da atitude do consumidor face à extensão, da semelhança percebida da extensão face à marca mãe, e da procura de prestígio por parte do consumidor, mas não é dependente da atitude do consumidor à marca mãe, do efeito de propriedade, ou da *innovativeness*.

O segundo estudo teve por objetivo investigar as atitudes dos consumidores face à adoção de veículos elétricos, e ainda a aceitação dos consumidores ao mercado secundário de veículos elétricos. O estudo utilizou fundamentalmente entrevistas em profundidade a condutores de veículos convencionais, complementadas, numa primeira parte, com dados quantitativos recolhidos por inquérito sobre as perceções dos consumidores de automóveis. Os resultados sugerem que a preferência entre os tipos de estações de carregamento de baterias (residencial, local de trabalho, pública) é importante e dependente do contexto do consumidor. A existência de um segundo carro convencional e um sistema de gestão de viagem avançado também foram notadas como potencialmente importantes. Foi ainda sugerido que um mercado secundário de veículos elétricos poderá ser viável, caso sejam garantidas certas condições.

**keywords**

Downward Brand Extension Attitude, Ownership Effect, Innovativeness, Status-Seeking Behaviour, Electric Vehicles, EV, Secondary EV Market, European Premium Automotive Market

**abstract**

The automotive sector is one of the most competitive and complex markets in the world. The dynamics of this context push manufacturers into implementing downward brand extensions, blurring the differences between value and premium brands. Through an experimental approach, the main study aimed to understand how consumers evaluate a downward brand line extension in the European premium automotive market. Results indicated that the extension purchase intention is dependent of the consumer's extension attitude, the extension perceived fit, and the status-seeking behaviour, but not of the parent brand attitude, the ownership status, or the innovativeness.

The second purpose to the study was to investigate the consumer attitudes towards the adoption of electrical vehicles (EVs) and also to analyse the influence of consumer attitudes on EV adoption in an EV secondary market context. The study relied mainly on in-depth interviews of drivers of conventional vehicles, complemented, in the first part, with quantitative data collected by a survey on drivers' attitudes. Results suggest that the preference between battery charging point types (personal, workplace, public) is important and dependent on the driver context. The existence of a second conventional car and an advanced range management system were also noted as potentially important. A secondary market of EVs was also suggested as potentially viable, if certain conditions are met.

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## List of Abbreviations

| | |
|---|---|
| ANOVA | Analysis of Variance |
| AVE | Average Variances Extracted |
| CFA | Confirmatory Factor Analysis |
| CFI | Comparative Fit Index |
| CV | Conventional-Fuelled Vehicle |
| EFA | Exploratory Factor Analysis |
| ETA | EV Trip Assistant |
| EV | Electrical Vehicle |
| EXAT | Extension Attitude |
| OEM | Original Equipment Manufacturer |
| PB | Parent Brand attitude |
| PEV | Perceived Emotional Value |
| PFIT | Perceived Fit |
| PI | Purchase Intention |
| PPV | Perceived Price Value |
| PSV | Perceived Social Value |
| MANOVA | Multivariate Analysis of Variance |
| MPV | Multi-Purpose Vehicle |
| RMSEA | Root Mean Square Error of Approximation |
| RO | Research Opportunity |

| | |
|---|---|
| SEM | Structural Equation Modelling |
| SRMR | Standardized Root Means Residual |
| SRO | Specific Research Objective |
| SUV | Sports Utility Vehicle |
| TLI | Tucker-Lewis Index |

# Chapter 1 - Introduction

## 1.1 Brand extensions in the European automotive market

For more than 50 years, automobiles have been an important part of transportation and personal expression. Automobiles are elements covered by extensive regulations, dependent on fuel and infrastructures such as roads and parking spaces, and also play a role in the evermore challenging management of resources, especially in emerging economies (Gao, Hensley, & Zielke, 2014). Over the last century, car culture has spread across the globe taking a major part in the evolution of society and the economy. Like many others, this industry is subject to constant change and dynamics with increasingly demanding environmental laws and new players in the market, such as China (Mohr et al., 2013). The automotive *original equipment manufacturers* (OEMs) are large multinational corporations with links to a massive net of dedicated suppliers (classified as Tier 1) and sub-suppliers (classified as Tier 2), devoted to providing automotive products for consumers as well as sales and after-sales activities and services. Throughout this study, the term *consumer* refers to buyers and drivers of light passenger's car (corresponding to the M1 vehicle category in Europe).

The OEMs' profits are expected to rise almost fifty percent by 2020, namely due to growth in emerging markets. The projections indicate that, by that time, China will lead new car sales along with the US and other markets, but the premium automotive markets will thrive in higher numbers in North America, Japan, and in Europe (Gao et al., 2014; McKinsey & Co., 2013). Although the European automotive market falls behind in both production and sales growth when compared to emerging economies, Europe remains one of the most developed manufacturing centres in the world, and home of the world's most powerful OEMs (Mohr et al., 2013). The European market is one of the most competitive (with tight regulations both on vehicles and production sites) and mature markets (as automobiles are not a novelty for most consumers). Europe holds the second largest number of cars per 1000 inhabitants and the highest number of passenger cars in use - about 250 million cars (*Automobile Industry Pocket Guide*, 2015). By 2020, estimated premium car sales are expected by to rise, especially in European countries, such as Germany (+2%), United

Kingdom (+1%), Italy (+4%), France (+3%) and Spain (+5%) (McKinsey & Co., 2013). The sales increase in premium brands can be linked, amongst other factors, to the efforts made by OEMs to reach more consumers by going downscale on the automotive market segments, using *brand line extensions* (McKinsey & Co., 2013; Mohr et al., 2013).

Brand extensions are a popular growth strategy for companies, where an existent brand is used to introduce a new product into the market with the objective of increasing market share and sale volumes while preserving the parent brand's value (D. Aaker & Keller, 1990; Smith & Park, 1992). A brand extension can either be a product category (i.e. horizontal) extension or a line (i.e. vertical) extension. In the latter one, defined as a *brand line extension*, a new product is introduced into a new market segment in the same product category and under the parent brand (Keller, 1998). A brand line extension brings challenges to the brands, either in the mass, premium, and luxury markets (Magnoni & Roux, 2012; Zoellner & Schaefers, 2015), as any of the vertical directions (step-up or step-down) may have a negative impact in the consumer evaluation (Caniato, Caridi, Castelli, & Golini, 2011; C. K. Kim, Lavack, & Smith, 2001). Particularly in step-down (or downward) extensions, the consumer may bring out associations about lower quality and lower prices, hindering both the extension and the parent brand (Lei, de Ruyter, & Wetzels, 2008). According to Michel and Salha (2005), consumer attitudes towards the brand extension depend mostly on their parent brand attitude and also how they perceive the match (*i.e.*, the fit) between the parent brand and the extension in terms of price, quality, and status. The consumer acceptance of a brand extension is important in durable items, especially as those are typically associated with high levels of perceived risk due to the substantial financial investment (Hem, de Chernatony, & Iversen, 2003) and with high purchase intervals (Grewal, Mehta, & Kardes, 2004). It is, therefore, necessary to create, develop and market the brand extension with the consumer reception in mind, to ensure the success of the extension. In the automotive sector, a *downward brand line extension* takes place when the parent brand enters a new segment by stepping down on price and vehicle size (Mohr et al., 2013).

In the case of premium automotive OEMs resorting to downward brand line extensions, many uncertainties remain, as premium automotive OEMs are not accustomed to these segments, and can fail to succeed if the consumer expectations are not properly acknowledged and handled. We have identified in the literature a broad and relevant research

opportunity (RO1) dealing with the *consumer evaluation of downward brand line extensions in the premium automotive OEM European context*. This research opportunity englobes four major gaps.

The first gap deals with the market segments into which the premium automotive OEMs are extending into – the smaller size segments. Smaller automotive segments are accounting already for thirty percent of the global sales, being estimated to reach thirty million new vehicles by 2020. They are one of the biggest growth opportunities for premium OEMs, especially in the European market where the larger segments are evermore constrained due to emissions, taxes and space (Lansley, 2016; Mohr et al., 2013; Truong, Simmons, McColl, & Kitchen, 2008). Premium automotive OEMs are increasingly pressured to offer better value also through downward brand extensions, which further leads them into the previously unexplored smaller size segments, mostly explored and dominated by the value OEMs (McKinsey & Co., 2013; Mohr et al., 2013).

Research on automotive downward brand line extensions remains limited in a few aspects. First, it generally employs a simulated extension that is a cheaper version of an existing automotive product of a brand, thus failing to take a step further and test an actual incursion into a smaller size segment (e.g. Allman, Fenik, Hewett, & Morgan, 2015; Fang & Lin, 2017; C. Kim, Lavack, & Smith, 2001; Kirmani, Sood, & Bridges, 1999; Michel & Salha, 2005; Riley, Pina, & Bravo, 2013, 2015; Royo-Vela & Voss, 2015). Additionally, the automotive small size segment is also becoming understudied from a European market perspective when compared to other markets (e.g. Belgiawan, Schmöcker, Abou-Zeid, & Fujii, 2017; Bonilla, Schmitz, & Akisawa, 2012; Qu, Liu, Zhu, & Liu, 2014; Swar, 2018), thus missing to provide adequate and updated knowledge for premium OEM managers and brand extension researchers. We further argue that it is pertinent to explore the premium OEM downward line extensions into smaller automotive segments in Europe, due to the high complexity and risks of incompatibility with the brand image in a durable and visible product context (Grewal et al., 2004; Y. Kim & Wingate, 2017; Truong et al., 2008).

Moreover, automotive brand research tends to select brands according to pretests in which respondents evaluate attributes on a Likert scale. While widely used, this method generates inconsistency as the attributes are not standardized. For instance, both BMW and Lexus brands have been associated with the term *prestigious* (e.g. Allman et al., 2015; Fang & Lin,

2017; C. Kim et al., 2001; Kirmani et al., 1999); Audi has been associated with either the term *premium*, *luxury* or *prestigious* (e.g. Baumeister, Scherer, & Wangenheim, 2015; Fu, Ding, & Qu, 2009; Riley et al., 2013); and Porsche has been associated with the term *luxury* (Riley et al., 2013). Some research also condenses brand classes, for example by agglutinating the luxury class and the premium class into a single one (e.g. Riley, Pina, & Bravo, 2015). Royo-Vela and Voss (2015) highlight a lack of tangible definitions and stress it out as an important topic to address in future studies.

The second gap refers to the similarity, or common aspects, between the brand extension and the parent brand, which reflects the level of fit of a brand extension. The perceived fit is the evaluation made by the consumer on how close or distant this relation is based in several dimensions and items, such as product-feature similarity or brand-concept similarity (Park, Milberg, & Lawson, 1991). Most of the brand line extension research limits the focus on a narrow dimension of fit, usually price (e.g. Allman et al., 2015; Fang & Lin, 2017; Goetz, Fassnacht, & Rumpf, 2014), and employs extensions that present a moderate level of fit with the parent brand (Chun, Park, Eisingerich, & MacInnis, 2015). Yet it has been noted that more detailed definitions of fit should be used (Fu et al., 2009). By using a more advanced understanding of fit, it would be possible to achieve truer results about the consumer perceived fit of brand extensions in the market under study. Moreover, researchers have raised importance on the need to use more elaborated and closer-to-reality extensions and detailed treatments in brand extension research (Dens & Pelsmacker, 2016; Kottemann, Plumeyer, & Decker, 2018).

It is also important to note that research typically supports that a high level of fit will guarantee brand extension success, as the parent brand values and associations will be transferred straight from the parent brand to the brand extension (D. Aaker & Keller, 1990; Boush & Loken, 1991; Broniarczyk & Alba, 1994; Martinez & Chernatony, 2004). Yet, a low level of fit may be preferred (especially by the more innovative consumers) as it will give out the impression that the brand is taking a new course and exploring other markets while retaining core values and associations (Chun et al., 2015; C. Kim et al., 2001; Klink & Smith, 2001; Lane, 2000; Riley et al., 2015). These divergent conclusions in research generate doubts on what would be the ideal level of fit in brand extensions on a premium automotive OEM European context.

A third gap exists about the consumer ownership status, which also plays a role in brand extension. Fu et al. (2009) defined three levels: owners of the parent brand, non-owners of the parent brand and non-users of the product class. In downward brand line extensions, the brand owners tend to be more concerned than non-owners, as such extensions would make the brand available to more people, thus reducing perceived status and perceived exclusivity (Kirmani et al., 1999). Despite brand extension research concerning the ownership effect having been conducted before (e.g. Baumeister et al., 2015; Fu et al., 2009; Kirmani et al., 1999), the amount of studies in this area remains small (e.g. John, 2016). Researchers have also appealed for more studies in order to obtain more insight on the ownership effect (Baumeister et al., 2015; Goetz et al., 2014), though with no yield, as many studies still persist in not considering it, despite recognising this limitation (e.g. Allman et al., 2015; Fang & Lin, 2017; Heath, DelVecchio, & McCarthy, 2011; Riley et al., 2015).

The final gap deals with the influence of some consumer personal traits on brand extension evaluation. The first trait to be analysed is innovativeness, which influences product evaluation, and thus, depending on the level of fit, a brand extension can be differently evaluated according to the effect of this trait (Chun et al., 2015; Hem et al., 2003; C. Kim et al., 2001; Klink & Smith, 2001; Salinas & Pérez, 2009). It is expected that extensions with a lower perceived fit with the parent brand (or a higher distance from) will be more positively appraised by innovative consumers (Eren-Erdogmus, Akgun, & Arda, 2018; Xie, 2008). However, research on brand line extension often avoids measuring respondents' individual characteristics and using the data to make conclusions (e.g. Allman et al., 2015; Riley et al., 2015), even though it was noted as valuable for research to measure more individual consumer characteristics in the brand extension context (Chang & Tseng, 2015; Dens & Pelsmacker, 2016). Another consumer trait, the need for status, also plays an important role in automobile consumer behaviour, especially considering the visible consumption that this type of product implies (Qu et al., 2014; Truong et al., 2008). Heath et al. (2011) further note that consumer status-seeking behaviour is one of the most important aspects of the premium market. Fang & Lin (2017) addressed the status differentiation in automotive vertical brand extensions, but, missed to include behavioural outcomes such as purchase intention. Pontes, Palmeira, & Jevons (2017) prompted for more brand extension studies assessing possible social influences on consumer evaluation of line extensions. We argue that collecting and

using data on both the innovativeness and need for status would add knowledge on the consumer profile and attitudes in the brand extension research field.

## 1.2 The electrical vehicle market

Among the automotive segments that OEMs are currently extending into lay the electric vehicle (EV) segment, either through electric versions of existing products or through fully new EV models (Moons & Pelsmacker, 2015). As the emission and transport legislation change, OEMs are pressured to develop and implement more eco-friendly models in their portfolios, such as EVs. The smaller size segments are the most appropriate for this market incursion, especially due to size, weight and price specifications. EVs have several benefits, such as improving global environmental performance by reducing dependency on fossil fuels and lowering carbon dioxide emissions. However, EVs still struggle with a low adoption rate when compared to conventional-fuelled vehicles (ACEA, 2017b; Rezvani, Jansson, & Bodin, 2015). Among the major top barriers to EV adoption are the lack of charging points, limited range, high price, and long charging times (Brand, Cluzel, & Anable, 2017; Burgess, King, Harris, & Lewis, 2013; Mersky, Sprei, Samaras, & Qian, 2016; Nilsson, 2011; Pearre, Kempton, Guensler, & Elango, 2011; Rauh, Franke, & Krems, 2017; Schneidereit, Franke, Gunther, & Krems, 2015; Zhang et al., 2018).

Despite the efforts and recent developments in EV technology, some gaps in consumer research remain active. Even though EVs have significantly improved since the first models, consumer attitudes are still not fully responded to, in part due to the failure of EV manufacturers and policymakers in identifying the needs and preferences of consumers (Buhler, Cocron, Neumann, Franke, & Krems, 2014; Burgess et al., 2013). With EV technology maturing and becoming massified and cheaper, comes a unique opportunity to develop updated research matching the present EV models (Graham-Rowe et al., 2012). Along the literature review, we have identified a second research opportunity (RO2) dealing with the *electric vehicle future of small size segments in the European context*. This research opportunity is grounded on two major gaps, which we follow to present.

The first gap deals with mobility concerns that stem from the range limitation, charging points infrastructure, and mobility context, on which consumers reflect upon when

considering the purchase of an EV (Dutschke, Schneider, & Peters, 2013; Franke, Georg, Mcilroy, & Stanton, 2016; Han, Wang, Zhao, & Li, 2017; Karlsson, 2017; Lebeau, Mierlo, Lebeau, Mairesse, & Macharis, 2013; Vassileva & Campillo, 2017). Despite concerns and barriers on EV adoption being a well-studied research topic, some issues were deemed to be lacking attention. First, in spite of the role of the different types of charging points having been addressed before (e.g. Bunce et al., 2014; Dutschke et al., 2013; Franke and Krems, 2013a; Lebeau et al., 2013; Plotz et al., 2014; Skippon and Garwood, 2011), previous research was found not to differentiate between them, thus bundling all types together (e.g. Biresselioglu et al., 2018; Bunce et al., 2014; Degirmenci & Breitner, 2017; Egbue & Long, 2012; Franke, Günther, Trantow, & Krems, 2017; Lebeau et al., 2013; Morrissey, Weldon, & Mahony, 2015). Furthermore, previous research misses to measure how the driver preferences and infrastructure context influence the preference of charging point type (e.g. Morrissey et al., 2016; Jeremy Neubauer & Wood, 2014; Vassileva & Campillo, 2017). This limits the knowledge on the relative importance of charging point types, on which Zhang et al. (2018) note the still-existing need to examine in a more detailed way the drivers' relative preferences. Understanding such preferences among potential EV adopters is thus a pertinent matter, as well as urgent, as all types of charging points are becoming more common and more rapid in the charging process (Denton, 2016; Morrissey et al., 2016).

The existence of mobility alternatives has been linked with better EV attitude (Jakobsson, Gnann, Plötz, Sprei, & Karlsson, 2016; Jensen, 2013; Lieven, Mühlmeier, Henkel, & Waller, 2011; Plotz et al., 2014; Schuitema, Anable, Skippon, & Kinnear, 2013; Tamor & Milačić, 2015). A mobility alternative in the form of a second conventional car, for instance, has been related with greater rates of EV adoption (Figenbaum & Kolbenstvedt, 2016; Karlsson, 2017; Khan & Kockelman, 2012; Tamor & Milačić, 2015). However, the reviewed literature on this alternative remains mostly based on value, range, distance, and trip routine feasibility, missing to consider the consumer perceptions and attitudes. Apart from a few studies differentiating the purchase intention of an EV as a main or as a second car (e.g. Schuitema et al., 2013; Wang et al., 2018), no studies were found on how important or decisive the existence of a second conventional car would be. Furthermore, the previous research tends, intentionally or not, to measure the consumer EV purchase intention as a replacement of the main car, thus possibly biasing the data.

Third, range management also influences mobility concerns, especially as drivers tend to exaggerate their needs of range (Dimitropoulos, Rietveld, & Ommeren, 2011; Franke, Neumann, Bühler, Cocron, & Krems, 2012; J Neubauer, Brooker, & Wood, 2012). On-time detailed information on energy consumption and available range helps drivers to better manage their EV range (Carroll, Authorised, & Walsh, 2010; Franke & Krems, 2013a; Graham-Rowe et al., 2012; Rauh, Günther, Franke, & Krems, 2017). Although the effect of range management systems on the EV driving performance has been analysed in the literature before, we found that researchers generally miss in measuring the drivers' attitudes towards such systems. The necessity for more knowledge on designing range management systems has also been noted (e.g. Rauh, Franke, et al., 2017). We argue that assessing the importance of these systems for the drivers could be very valuable, as it simplifies the EV usage by eliminating complex range calculation tasks and thus decreases perceived risk, fostering more positive attitudes towards EV adoption.

Finally, the representativeness of the population of potential EV adopters remains limited, as most studies rely on trials implying some form of payment, such as a leasing fee (e.g. Franke et al., 2017). Hence, participants are likely to be strong potential buyers of EVs, and, therefore, the samples are not representative of the majority of the population (Dutschke et al., 2013; Franke, Rauh, & Krems, 2016; Rauh, Franke, et al., 2017; Rauh, Günther, et al., 2017; Schneidereit et al., 2015).

The second research gap concerns the future of the EVs secondary car market (i.e. second-hand market). In 2016, the total EVs stock accumulated around 750,000 units in China, 500,000 units in the US, and 750,000 units in Europe and Japan, bringing the global stock to 2 million EVs (IEA, 2017). However, as the first units reach the 10-year-old mark, their future in the secondary market remains uncertain. Other than one remark suggesting the unpredictability of the value of EVs on the secondary market as one of the reasons for the declining industrial interest in EVs during the end of XX century (i.e. Harding, 1999), no literature was found specifically addressing the secondary EV market, in particular, consumer attitudes, concerns, and purchase intentions towards EV adoption. Even in a recent review and global research agenda on the EV adoption (Rezvani et al., 2015), there is not a single mention of the EVs' secondary market. Research in the conventional car secondary market also remains limited (Prieto, Caemmerer, & Baltas, 2015; Singh, Ratchford, &

Prasad, 2014). Most studies found in this area are economy-based and do not take into account consumer characteristics (e.g. Bento et al., 2018; Chen et al., 2011; Esteban & Shum, 2007; Gavazza et al., 2014; Johnson & Waldman, 2003; Kihm & Trommer, 2014; Prieto & Caemmerer, 2013; Schiraldi, 2011). Handling a successful EV secondary market might improve EV adoption and extend product life cycle, keeping EVs more years on the roads (Mersky et al., 2016; Zhou, W, Johnson, Wang, & Hao, 2015).

## 1.3 Research questions and objectives

The following research questions, objectives and studies that make up this doctoral dissertation are the outcome of an extensive literature review, which allowed to understand in detail the concepts, as well as to detect and describe research gaps and relevant opportunities for both theory and practice. The main objective of this study, in a first phase, was to further understand how consumers evaluate a downward brand line extension in the European premium automotive market, and, in a second phase, to understand the attitudes and concerns towards the adoption of the EVs market segment. Hence, Study 1 aimed to answer to the main research question: how does the introduction of a smaller and cheaper vehicle (downward brand line extension) of a premium brand affect the consumer attitudes towards the brand line extension (brand extension attitude), and, ultimately, the consumer purchase intention? Next follows a summary of the identified gaps, turned into specific research objectives (SRO):

**SRO1:** To understand downward brand line extensions in a premium automotive OEM European context.

**SRO2:** To achieve a detailed understanding of consumer perceived fit and fit preferences of a brand line extension.

**SRO3:** To understand how the diverse consumer ownership statuses influence the consumer evaluation of a brand line extension.

**SRO4:** To understand how consumer innovativeness and need for status influence the consumer evaluation of a brand line extension.

Study 2 aimed to answer the main research question: what role do consumer mobility concerns and secondary market attitude play in the EV adoption intention in the European market context? Hence, the specific research objectives of Study 2 based on the previously identified gaps were:

> **SRO5:** To understand how the consumer mobility concerns influence the consumer attitude and purchase intention towards EVs.
>
> **SRO6:** To understand how consumers would evaluate the possibility of purchasing an EV in the secondary market.

## 1.4 Methodology and structure

Marketing research, as a social research, typically starts with identifying a real-life issue, or question that needs to be answered (Churchill, 1995; Crotty, 1998). This leads to the research question and research objectives, which influenced the selected methodology and methods. Methodology is the strategy design, or plan of action, associated with the use of the methods, which are the techniques that serve the purpose of collecting and analysing the data. From then, the theoretical perspective and epistemology are considered upon, until picking the ones that better match the selected methodology and methods, and also the researcher's philosophical stance. In detail, the theoretical perspective is the philosophical stance that provides the context for the methodology, and the epistemology is the theory of knowledge embedded. In order to prevent any confusion and mislabelling, the terminology in this study followed the one proposed by Crotty (1998).

A research design consists of a plan to conduct a study, serving as a guide in collecting and analysing data while ensuring efficacy and efficiency (Malhotra, 2010). In marketing research, Churchill (1995) advises that the research design of the investigation should stem from the problem, as any given type of study may serve several purposes, and presents three types of the most used research designs, or methodologies: (1) the *exploratory research design*, used to discover ideas and insights that are not well-known; (2) the *descriptive research*, used to determine the frequency with which something occurs in a relationship, typically guided by hypothesis; and (3) the *causal research design* (also referred to as experimental research) which seeks to determine cause-and-effect relationships through

experiments. These two latter types are also classified under the term *conclusive* (Malhotra, 2010).

Study 1 aimed to understand the downward brand extension evaluation process considering a range of consumer attitudes, perceptions and profile traits. More specifically, to examine the consumer attitudes towards different versions of brand extensions (high-fit and low-fit extension), or in other words, to obtain evidence if different levels of perceived fit can cause different consumer attitudes. In this way, it was intended to obtain an *X-causes-Y* conclusion, inferring on causal relationships with outcomes for research and practice. A *causal,* or *experimental, design* is more capable of supplying evidence of causality as it allows to control independent variables. Additionally, studies of brand extensions typically use the experimental research design to assess the different versions' efficacy (D. Aaker, Kumar, & Day, 2001; Churchill, 1995). Therefore, the causal, or experimental, research design was considered the most appropriate methodology for Study 1.

In order to increase the potential of sample size and thus increase the results quality and generalization through statistical analysis, an online questionnaire was selected as the most adequate tool for data collection, although some researchers criticize the over-use of such quantitative methods (e.g. Davis, Golicic, Boerstler, Choi, & Oh, 2013). This questionnaire measured all the variables, such as ownership status, innovativeness, and need for status, using validated quantitative scales retrieved in the literature review. The experiment was built into the online questionnaire, which allowed for the automatic creation of the experiment groups. The experiment consisted of two different treatments in the shape of simulated advertisements of a new brand extension (a high-fit version, and a low-fit version). The initial sample of respondents was divided into two major groups according to the version of the treatment. In the end, the data were analysed using the software IBM® SPSS® 21 and the IBM® SPSS® AMOS 21.

Study 2 first part aimed to understand the influence of consumer charging point preferences, mobility profile, and context (Study 2.1), and Study 2 second part aimed to analyse secondary market attitude on the EV adoption intention (Study 2.2). Throughout the literature review and comparison of methodologies and methods used in similar studies, the variety and complexity of the data which needed to be gathered became obvious. This further raised the risk of not capturing all of the nuances concerning the variables useful for the

research objectives, as existing instruments lacked satisfactory detail. For instance, mobility profiles and contexts could vary greatly across individuals in the sample, and relevant data could have been missed to be analysed. Previous research on the automotive secondary market was considered as insufficient regarding instruments that could be used in this study. As such, an exploratory research design was deemed the most appropriate, as this methodology seeks to obtain a better understanding of a topic on which little or no previous research has been done, by discovering new ideas and insights, providing grounds for more conclusive research (Churchill, 1995; Creswell, 2014).

Thus, Study 2 followed an exploratory research design based on content analysis of primary data collected through semi-structured interviews. This method holds great potential of identifying new data and obtaining information about perceptions, opinions, and intentions (Churchill, 1995; Mack, Woodsong, McQueen, Guest, & Namey, 2011). The use of qualitative tools contributes to the maintenance of diversity in the marketing research literature, which has been criticized due to a heavy reliance on quantitative methods (Davis et al., 2013). Data were examined using the analysis software package ATLAS.ti (version 7.5.7). Additionally, some quantitative data was also collected in the first part of Study 2 (Study 2.1). By using both qualitative and quantitative data, Study 2.1 followed a *mixed methodology*, where both types of data are integrated in order to provide a broader analysis and aid the interpretation of the results (Creswell, 2014; Davis et al., 2013). The second part of Study 2 (Study 2.2) used qualitative data collected through the semi-structured interviews, as the knowledge on concerns and motivations of potential second-hand EV adopters is still scarce in the literature, especially regarding quantitative research instruments.

Following the design construction directions from Crotty (1998), the theoretical perspective and epistemology can now be looked upon. The methodology from Study 1 is given in a context of logic and criteria which comes close to the theoretical perspective of positivism - positivism states that there is an absolute truth of knowledge that can be measured and understood using the scientific method, where the researcher begins with a theory, collects data that either confirm or refute and makes the necessary revisions and conducts additional tests (Creswell, 2014). In Study 2, the qualitative methods become too-frequently associated with constructionist or subjectivist epistemology (Crotty, 1998), yet these methods can also be used in a critical realism setting (Creswell & Plano Clark, 2001). The methodology in

Study 2 is aimed at understanding a complex phenomenon using mixed-methods (qualitative and quantitative) to build theory on a topic that is little understood, thus, this study falls under the critical realism domain (Bhaskar, 1997). In the end, Study 1 and Study 2 were categorized as following an objectivist and critical realist epistemology, respectively.

This doctoral dissertation is divided into three parts. Part I comprises Study 1 on downward brand extension, starting with a Theoretical Background in Chapter 2. This chapter describes research hypotheses according to the objectives of the study, which are afterwards assembled into a proposed conceptual model. Chapter 3 provides a short market context on the European OEMs. Chapter 4 presents methods, including research design, measures, data collection and data analysis procedures. Chapter 5 offers the analysis and discussion of results and Chapter 6 delivers the conclusions from Study 1, detailing the theoretical and practical contributions along with the limitations and future research venues. Part II comprises the two parts of Study 2. Study 2.1 addresses the SRO5 presented in Chapter 7, and Study 2.2 addresses the SRO6 presented in Chapter 8. Both of these chapters follow the same structure: introduction, literature review, methods, results and discussion, and finally, the main conclusions along with recommendations, limitations and future research opportunities. Finally, Part III delivers the general conclusions of this dissertation, including the conclusions from Study 1 and from Study 2.

# PART 1 - STUDY 1

# Chapter 2 – Theoretical Background

## 2.1 Introduction

In the automotive industry the idea of *one-size-fits-all* is long gone and the products offered are not only global but take in consideration national and regional scope (Schlie & Yip, 2000). Consumers are placing more emphasis on brand associations rather than on technical specifications as cars represent a stand on personal choice to differentiate from or associate to certain lifestyles. This leads to automotive OEMs constantly executing and monitoring brand and market strategies for each market segment (Mohr et al., 2013).

It is possible to apply segmentation on the automotive market based on multiple characteristics. Price and class, for instance, can be one of the simplest ways of categorizing this market. In this study, the European market is considered as made of three distinct brand classes: the luxury OEMs, the premium OEMs, and the value OEMs. In order to clearly distinguish each class, the following definitions will be taken into consideration: the *luxury OEM brands* are associated with high quality, performance, and state-of-the-art design, with distinct elements over the premium and value brands such as prestige, exclusivity and symbolic value (Jean Noel Kapferer, 2014; Nobre, 2010; Tynan, McKechnie, & Chhuon, 2010). *Premium OEM brands* lack these associations, even though they are able to match (and even overcome) luxury brands in tangible attributes such as quality and product performance (Cailleux, Mignot, & Kapferer, 2009; Jean Noel Kapferer & Bastien, 2009). Nonetheless, premium brands also manage to have some status associations that in turn separates them from the value brands (Cailleux et al., 2009). The *value OEM brands* are considered to be globally inferior to both previous classes and to market non-prestigious and good value-for-money mass-products, in spite of some of their higher-end products matching products from premium OEMs (McKinsey & Co., 2013).

One other popular segmentation method makes use of the vehicle size and other tangible aspects like body shape, interior space, and engine size (Lansley, 2016). The most relevant classification standards in the European market are described below. This study follows the Euroncap standard as it is the most complete standard, with eleven segments.

- The *European Automobile Manufacturers Association* considers four segments: the small segment, the lower-medium segment, the upper-medium segment and the executive segment;
- The *Society of Motor Manufacturers and Traders* makes use of a nine scale segment: segment A (mini); segment B (small); segment C (lower-medium); segment D (upper-medium); segment E; (executive); segment F (luxurious); segment G (sports); segment H (dual purpose) and segment I (multi-purpose);
- The *Euroncap* applies a scale of eleven segments: supermini, small family car, large family car, executive, small multi-purpose vehicle (MPV), large MPV, small off-road, large off-road, pickup, roadster sport, business, and family van.

The main purpose of this chapter is to present the theoretical background that led to the formulation of the hypotheses and conceptual model from Study 1. First, comes a brief theoretical introduction on brand extension attitude, which is followed by a description of each brand extension attitude variable along with the development of the hypotheses. In the end, a conceptual model is offered, summarizing the hypotheses.

## 2.2. Brand extension attitude

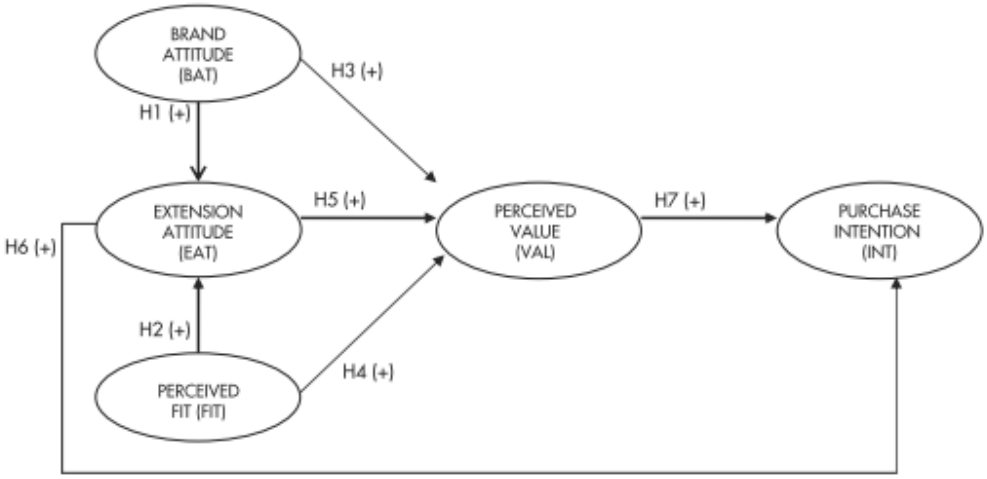
A brand is a concept consisting of multiple elements, attributes, and associations that help to distinguish an organization or product from its competitors, becoming more advantageous the stronger the brand value, or equity, is (Keller, 1998). One advantageous way for a company to grow in share size or enter new markets is to leverage this brand equity onto a brand extension, also managing to decrease introduction costs (D. Aaker & Keller, 1990; Michel & Salha, 2005). In general terms, this procedure is most effective when the parent brand is highly valued and the brand extension is made into a similar product category: research indicates that consumers will transfer positive associations of the parent brand into a brand extension that presents strong similarities (Broniarczyk & Alba, 1994).

Brand extensions exist in two main forms: horizontal and vertical. The horizontal brand extension consists in the use of an existing brand for a new product, either in a similar category or in a more distant category. The vertical (or line) extension consists of introducing a new product in the same product category with a different aspect that supplements the

current product line (such as different quality, size, formulation or price) and it can be either a step-up extension or a step-down extension (Broniarczyk & Alba, 1994; Goldsmith & Foxall, 2003; C. Kim et al., 2001; Michel & Salha, 2005).

The consumer attitude towards the brand extensions (brand extension attitude) is essentially dependent on how the consumer evaluates it based on the antecedents and the information available (D. Aaker & Keller, 1990; Broniarczyk & Alba, 1994; Heath et al., 2011). Brand extensions research is usually supported by two theories. The *schema theory* posits that the consumer organizes acquired knowledge in frameworks or structures called schema, which are modified when information is updated or added in order to achieve a comforting sense that one understands the world (Fiske & Taylor, 1991). These schemas can vary and refer to concepts, attributes and the relationships among them, and may be passed onto a new product within that schema, such as a new brand extension. The Fishbein's *attitude theory* states that consumers who hold a set of beliefs (evaluation) towards a concept (e.g. a brand) will likely transfer these onto a highly similar concept (e.g. a brand extension). However, should the individual have its beliefs challenged - for example by exposure to a non-similar concept such as a new brand extension - the evaluation of the concept will be weakened (Fishbein & Ajzen, 1975).

The conceptual model proposed by Riley et al. (2015) was adopted as a basis for the developing of this study (see Figure 1). This conceptual model measures how the purchase intention (thus brand extension success) is influenced by variables such as consumer attitude towards the brand extension and consumer perceived brand extension fit. This model has been tested before and used in the context of automotive brand line extension research, so it was deemed appropriate for this study.




Source: Riley et al. (2015)

Figure 1 - Riley et al. (2015) model for purchase intention of brand line extensions

This study specifically addresses the premium OEMs line extension into the European small and supermini automotive segments defined according to Euroncap standard. This move is accurately classifiable as a *brand line extension* since this extension (1) enters new segments in the same product category as the other brand products (light passenger vehicles) and (2) makes use of the same parent brand name. Research is coherent with this viewpoint, as several automotive brand extension studies regard incursions into new segments as brand line extensions (e.g. Allman et al., 2015; Heath et al., 2011; Keaveney, Herrmann, Befurt, & Landwehr, 2012; C. Kim et al., 2001; Kirmani et al., 1999; Magnoni & Roux, 2012; Michel & Salha, 2005; Riley et al., 2013, 2015; Royo-Vela & Voss, 2015).

However, it is important to note that a brand extension into a small or supermini segment might look like a category extension rather than a line extension due to fundamental differences to the current portfolio. This issue is observable in the brand extension research literature where category boundaries are unclear or not easily defined within industry specifications (e.g. Broniarczyk & Alba, 1994). For example, either Jaguar, Bentley and Lamborghini have recently introduced sports utility vehicles (SUV) which are classifiable as line extensions, but one can argue that the high level of dissimilarity from the brands' history, image, and current product portfolio makes them category extensions (e.g. Fu et al., 2009). Furthermore, as previously discussed, there is a lack of consensual or official automotive taxonomy which clearly defines what is a *category* or a *segment* in the

automotive market. To maintain consistency with previous research, this study addresses premium OEM extensions into the small and supermini segment as brand line extensions. Still, due to some similarities with category extensions, it was considered reasonable to source knowledge from category extension research and ambiguous brand extension research where appropriate. Next, each of the variables that play a role in brand extension attitude is presented, along with the development of the hypotheses.

### 2.2.1 Consumer parent brand attitude

A parent brand can be leveraged to facilitate the acceptance of a brand extension through the transfer of the brand's equity and associations (D. Aaker & Keller, 1990; Gierl & Huettl, 2011; Keller, 2003; Michel & Salha, 2005). The consumer attitude towards the parent brand (parent brand attitude) is considered to be a fundamental predecessor of the consumer brand extension attitude. A consumer who displays a strong positive attitude towards the parent brand will tend to be more welcoming and supportive of a new brand extension even at a moderate level of similarity (Bottomley & Holden, 2001; Boush & Loken, 1991; Broniarczyk & Alba, 1994; Chun et al., 2015; Fedorikhin, Park, & Thomson, 2008; Heath et al., 2011; Riley et al., 2015; Salinas & Pérez, 2009; Volckner & Sattler, 2006). Hence, the following hypothesis is proposed:

> **H1**: The consumer attitude towards the parent brand (parent brand attitude) has a positive effect on the consumer attitude towards the downward brand extension (extension attitude).

Moreover, the automotive market is highly complex information-wise, and the low consumer knowledge on the product coupled with different information sources can lead to consumer confusion. In this setting, a positive parent brand attitude will provide additional support to the consumer brand extension attitude (Mitchell, Walsh, & Yamin, 2005). It is also important to note that a reciprocal effect may exist as well: introducing a brand extension can be viewed as a transgression and induce negative consumer reactions towards the parent brand (J. Aaker, Fournier, & Brasel, 2004), although other researchers state that the parent brand is not affected by a poorly evaluated brand extension (Riley et al., 2013). In this study, only the relationship in the direction of the brand extension was considered, focusing on how the parent brand attitude can influence the brand extension attitude.

### 2.2.2 Brand extension perceived fit

The fit, congruity, similarity or typicality of a brand extension compared to the parent brand can be split into two major components: the supply-side (e.g. know-how, distribution and sales systems) and the demand-side (consumer response by transferring beliefs and associations to the brand extension). According to the objectives of this study, only the demand-side shall be addressed, therefore only the consumer response. There is not a universally accepted definition or measure of fit in brand extension research (Klink & Smith, 2001). Usually, the perceived fit of a brand extension is defined as the level of perception a consumer has on how proximate or distant the new product is from the parent brand in several dimensions - a high-fit extension would be closer to the parent brand than a low-fit extension (e.g. Boush & Loken, 1991; Lane, 2000; Eva Martinez Salinas & Chernatony, 2004). Aaker & Keller (1990) established three dimensions of the perceived fit: the *complement* dimension indicates how far the extension is similar to the original products referring to the consumer need which these are able to satisfy; the *substitute* dimension indicates to which extent the consumer can see the extension as a substitute for the original; and the *transfer* dimension, that indicates how the consumers perceive the ability of the brand in producing this extension. Bottomley and Holden (2001) tested this model and found support across several outsourced research data. Also, each dimension can be individually used as a measure of the perceived fit (e.g. Smith & Andrews, 1995). Park, Milberg, and Lawson (1991) defined the perceived fit as a composite of *product-feature-similarity* and *brand-concept-consistency*. The product-feature-similarity is composed of a concrete element (e.g. the matching of tangible features and attributes) and an abstract element (e.g. the context or activities in which the product is used). The brand-concept-consistency represents how consistently the product can match the subjective parent brand concepts (such as high status). In prestigious brand extensions, the brand-concept-consistency has a greater impact on the consumer perceived fit than in functional brands.

The perceived brand extension fit is a key factor in the brand extension attitude: it is conceptualized as the consumer perception of the common associations between the parent brand and the brand extension that leads to positive outcomes on extension evaluation (Boush & Loken, 1991; Evangeline & Ragel, 2016; Fedorikhin et al., 2008; J. Kim & Yoon, 2013; Lei et al., 2008; Riley et al., 2015). It is commonly accepted that the level of fit

between the parent brand and the brand extension will determine the consumer evaluation and acceptance of the extension, essential for the brand extension success (Allman et al., 2015; Boush & Loken, 1991; Broniarczyk & Alba, 1994; Gierl & Huettl, 2011; C. Kim et al., 2001; Martinez & Chernatony, 2004; Park et al., 1991; Volckner & Sattler, 2006) as well as preserving the parent brand from dilution effects (Allman et al., 2015; Chun et al., 2015; C. Kim et al., 2001; Martinez & Pina, 2003). The high fit also reduces the chance of the consumer activating thought processes to analyse the extension in a more attentive way (D. Aaker & Keller, 1990) and also prevents the risk of the consumers feeling betrayed by a brand they trust in (J. Aaker et al., 2004; Royo-Vela & Voss, 2015).

These notions also hold true in the case of a downward line extension (Heath et al., 2011; C. Kim et al., 2001; Royo-Vela & Voss, 2015). This can further benefit from the fact that the expertise of the brand is not being challenged as opposed to an upwards extension (Pontes et al., 2017). In the automotive market, Riley et al. (2013) find that downward extensions of luxury cars are less well evaluated as opposed to prestigious (i.e. premium) downward extensions. As the small and supermini segment is addressed in this study, it is relevant to note that consumer perception is at risk as the parent brand associations might be incompatible and fail at achieving consumer acceptance (Evangeline & Ragel, 2016). For instance, tangible characteristics such as comfort and performance are usually associated with medium-size and large-size vehicle segments and not with smaller size segments.

Price is yet another attribute that helps the consumer to evaluate the extension, thus price congruency with the parent brand must be positively perceived by the consumer in order to prevent misevaluation of both the brand extension and the parent brand (Michel & Salha, 2005; Riley et al., 2013). A too extreme step-down move might contaminate the acceptance of the brand extension by consumers (Srivastava & Sharma, 2012). Therefore, a downscale extension into a smaller size segment can risk to carry out the same effect as a lower quality or cheaper extension (Heath et al., 2011).

Still, the fact that perceived fit can be composed of several dimensions does not imply that an extension should strive for a high score on each one of these dimensions to be favourably perceived as a good-fit extension. Consumers may evaluate an extension based on only one or two perceived fit dimensions and not give importance to other dimensions (Bottomley & Holden, 2001). Broniarczyk and Alba (1994) support that it is not necessary to expect

consumers to perform evaluations based on the fit of, for example, the original brand category versus the extension category because other brand associations and characteristics will prevail. With this knowledge in mind, a global construct of the consumer perceived fit was sourced for this study, based on the fit elements defined by Park et al. (1991), from both the product-feature-similarity and the brand-concept-consistency.

In conclusion, it is expected that a downward brand extension with a high level of perceived fit would be well accepted by the consumers, leading to a positive brand extension evaluation (D. Aaker & Keller, 1990; Bottomley & Holden, 2001; Boush & Loken, 1991; Broniarczyk & Alba, 1994; Fu et al., 2009; Martinez & Chernatony, 2004; Park et al., 1991; Riley et al., 2015; Salinas & Pérez, 2009; Smith & Andrews, 1995). Hence:

> **H2**: The consumer perceived fit of the brand extension (extension perceived fit) has a positive effect on the consumer attitude towards the downward brand extension (extension attitude).

It is important to add that premium automotive OEMs employ subtle distancing techniques to simulate a high perceived fit and yet maintain some distance to avoid contamination of the parent brand. For example, the Mercedes-Benz A-Class used quality brand associations rather than status associations, thus creating a distanced-yet-close brand extension (Michel & Salha, 2005; Riley et al., 2013). Riley et al. (2013) further warn that prestigious brands should ensure some distance when introducing line extensions in order to reduce risks for the parent brand, by means of techniques like larger price gaps. Component sharing among the brand's products should also be refrained, as the consumer view on the higher-positioned products will be negatively affected (Verhoef, Pauwels, & Tuk, 2012).

### 2.2.3 Purchase intention antecedents

Consumer attitudes trigger and influence behavioural intentions such as praising, expressing a preference, increased purchase volume or paying a premium price (Brown, Barry, Dacin, & Gunst, 2005; Zeithaml, Berry, & Parasuraman, 1996). Brand extensions in which the consumer parent brand attitude is high are expected to trigger better consumer attitudes towards their extensions, which will in turn also lead to better scores on the perception of value and purchase intention (D. Aaker & Keller, 1990; Broniarczyk & Alba,

1994; Lei et al., 2008; Musante, 2007; Taylor & Bearden, 2002). Riley et al. (2015) advocate that both the parent brand attitude and brand extension attitude are the most important determinants of the extension perceived value. Adding to the perceived value antecedents, the perceived fit is also acknowledged to promote perceived value, leading consumers into adopting the extension into their brand's schema (Musante, 2007) even though this was not fully confirmed in other research linking perceived fit and perceived value (e.g. Riley et al., 2015). Hence, the hypotheses were formulated as follows:

> **H3**: The consumer attitude towards the parent brand (parent brand attitude) has a positive effect on the consumer brand extension perceived value (extension perceived value), in the dimensions emotional value (H3a), perceived price value (H3b) and perceived social value (H3c).
>
> **H4**: The consumer attitude towards the downward brand extension (extension attitude) has a positive effect on the consumer brand extension perceived value (extension perceived value), in the dimensions emotional value (H4a), perceived price value (H4b) and perceived social value (H4c).
>
> **H5**: The consumer perceived fit of the brand extension (extension perceived fit) has a positive effect on the consumer brand extension perceived value (extension perceived value), in the dimensions emotional value (H5a), perceived price value (H5b) and perceived social value (H5c).

Finally, the brand extension perceived value influences the brand extension purchase intention: by attributing value to a product in several ways, such as in functional terms (e.g. price or quality), in terms of the enjoyment or pleasure obtained from the product, and in terms of the social consequences that the product includes, consumers will be more predisposed to purchase it or to recommend it (Riley et al., 2015; Sweeney & Soutar, 2001). This introduces the hypothesis:

> **H6**: The consumer brand extension perceived emotional value (H6a), perceived price value (H6b), and perceived social value (H6c) have a positive effect on the consumer brand extension purchase intention (extension purchase intention).

### 2.2.4 Consumer ownership status

Automobiles are durable items, representing a high investment, high visibility and extended repurchase intervals (Grewal et al., 2004). Consumers will consider a wide range of aspects when deciding on the purchase and remain attentive to the brand image and reputation, as they will have prolonged ownership of the item. It is expected that consumers who are present owners will make a closer evaluation of a new brand extension and be more demanding about the sustainability of the brand concepts due to a higher connection and investment. On a global perspective, owners feel more welcome towards brand extensions, though keener on step-up extensions rather than on step-down extensions (Baumeister et al., 2015; Fu et al., 2009; Heath et al., 2011; Kirmani et al., 1999). On the same line of thought, owners of a more expensive model of the brand should be less welcoming of a downward extension than owners of a cheaper model of the same brand (Kirmani et al., 1999).

Hence, brand extension attitude towards step-down extensions is expected to be lower in owners than in non-owners as the former may feel threatened by a decrease of the parent brand status and perceived exclusivity, as the brand will become more available and commonplace (Lei et al., 2008; Michel & Salha, 2005; Royo-Vela & Voss, 2015). Even though this is more pertinent in luxury brands, it is reasonable to foresee a similar effect on the premium brands. Should owners not detect any of these threats (i.e. a high-fit, thus expensive, brand extension) the ownership status will likely contribute to a positive evaluation of the brand extension. In the case of a brand extension that is further distanced from the parent brand (i.e. low-fit, thus cheaper, brand extension), owners will be concerned about the brand equity and will be less receptive. Non-owners, by contrast, are expected to form a more positive attitude towards the low-fit brand extensions, as it will give them easier access to a premium product, even if compromising quality or performance (Truong et al., 2008). Hence the following hypothesis was formulated as:

> **H7**: The ownership status will have an effect on the brand extension perceived fit (H7a) and also on the brand extension attitude (H7b), as owners will display a more positive brand extension attitude and brand extension perceived fit towards high-fit brand extensions compared to non-owners; and non-owners will display a more positive brand extension attitude and brand extension perceived fit towards low-fit extensions compared to owners.

### 2.2.5 Consumer innovativeness

In the domain of human behaviour and perceptions, innovation is anything (e.g. an idea, item or practice) that is perceived as new by an individual or a group (Rogers, 1983). A product that is perceived as new or unusual for a certain brand will be perceived as innovative, and will thus generate interest in innovative consumers (i.e. innovators and early adopters), which are more willing to purchase new brands or products and be more venturesome and less risk-averse (Bartels & Reinders, 2011; Goldsmith & Foxall, 2003; Hem et al., 2003; Roehrich, 1995).

Brand extension research points out that low-fit extensions (or discontinuous, more radical extensions) may be more positively evaluated by innovative consumers (Chun et al., 2015; Hem et al., 2003; C. Kim et al., 2001; Klink & Smith, 2001). As noted by Klink and Smith (2001), the effect of perceived fit on extension evaluation decreases as the consumer innovativeness trait increases. Salinas and Pérez (2009) further indicate that consumer innovativeness moderates the relationship between perceived fit and extension attitude in the category fit: a low-fit extension will attract good evaluations from innovative consumers, thus building on the brand extension attitude. This introduces the hypothesis:

> **H8**: The consumer innovativeness (innovativeness) moderates the relationship between the consumer perceived fit of the brand extension (extension perceived fit) and the consumer attitude towards the downward brand extension (extension attitude) (H8a), and between the consumer perceived fit of the brand extension (extension perceived fit) and the consumer perceived value of the downward brand extension (extension perceived value) (H8b).

### 2.2.6 Consumer status-seeking behaviour

Prestige brands rely on an impression of exclusivity – hence, introducing a downward line extension may disturb the exclusivity aura once created, making it a more commonplace brand (Sharp, 1993). Status-seeking consumers may be especially suspicious of downward brand extension as it may pose a threat of banalization through wider availability, hindering the brand status and thus its evaluation (C. Kim et al., 2001; Lei et al., 2008; Riley et al.,

2013). The status factor is even more relevant in highly visible and durable items, like automobiles (Grewal et al., 2004; Qu et al., 2014; Truong et al., 2008).

The status-seeking behaviour, or prestige-seeking behaviour, is one of the most important aspects of the premium market (Heath et al., 2011). Two concepts are usually associated with the status-seeking consumer: the *status consumption* and the *conspicuous consumption*. The status consumption is "the behavioural tendency to value status and consumer products that provide status to the individual", while the conspicuous consumption is the "tendency for individuals to enhance their image, through overt consumption of possessions which communicates status to others" (page 34, O'Cass & McEwen, 2005). Researchers also source the *social adjustive function* in order to explain consumer status-seeking behaviour: this function stems from the *functional theory of attitudes* built by Katz and other researchers in the 1950s and 1960s stating that people will display attitudes in order to facilitate the planning and pursuit in response to one's needs (Grewal et al., 2004). The social adjustive function, amongst other attitudes that influence consumer behaviour, has been identified in the past as an antecedent for brand attitude and buying behaviour: consumers will purchase items that fit the image or increase the status they want to transmit to others, especially through highly visible items (Grewal et al., 2004; O'Cass & Siahtiri, 2013; Schade, Hegner, Horstmann, & Brinkmann, 2016; Wilcox, Kim, & Sen, 2009). It is hypothesized that high-fit brand extensions (i.e. retaining of brand's status associations) will be better evaluated by status-seeker consumers due to a moderator role of the status-seeking behaviour variable, which introduces the hypothesis:

> **H9**: The consumer status-seeking behaviour (need for status) moderates the relationship between the consumer perceived fit of the brand extension (extension perceived fit) and the consumer attitude towards the downward brand extension (extension attitude) (H9a), and between the consumer perceived fit of the brand extension (extension perceived fit) and the consumer perceived value of the downward brand extension (extension perceived value) (H9b).

## 2.3 Conceptual model

As retrieved in the literature review the consumer acceptation of a brand extension, and ultimately his purchase behaviour, will depend on a series of antecedents and moderators depicted in the study hypotheses. In order to test these, a conceptual model comprising the nine main research hypotheses, seven constructs and one control variable was developed (see Figure 2).

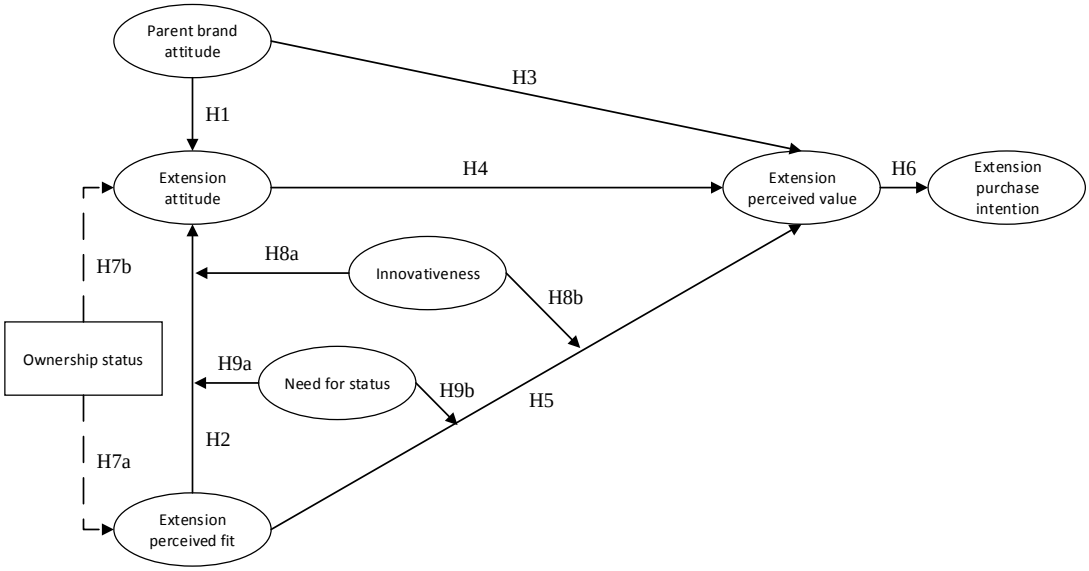



Figure 2 – Conceptual model for Study 1

# Chapter 3 – Market Context

The automotive industry is a vast and active world where brands are subject to intense marketing efforts. The competitiveness of this industry makes it necessary to understand more deeply alterations of brand image and value that can be caused by any manoeuvre, as products and brand portfolios are created and modified frequently in view of the consumer mind (C. Kim et al., 2001). For decades, Japanese, North American, and European OEMs formed the largest market, producing most of the world's automobiles. South Korea has since then taken its place amongst automotive leaders, and China is also presenting a large growth despite still focusing on the domestic market and not yet exporting automobiles in a significant way (Gao et al., 2014).

One of the key challenges is the diverging markets in which automotive OEMs need to adapt to changing regional and segment patterns of demand, according to their product portfolios. If the product is not sufficiently aligned with demand, there is a risk of portfolio mismatch (Schlie & Yip, 2000). In the most recent years of the automotive industry, more derivatives were created in order to expand the portfolios of OEMs, resulting in growth and profit. However, in the long-term, this method poses risks since differentiation becomes harder to achieve: brands must differentiate themselves by means of new elements such as design, infotainment, brand experience, interaction and also comfort and safety innovations (Mohr et al., 2013). Differentiation is especially important in the premium OEM sector, as competitors (especially value brands) can easily copy tangible attributes. Brands must remain active in creating and maintaining value that is coherent with the premium aura (Temporal, 2002).

This chapter aims to describe the market of automotive OEMs, specifically their brand extensions. First, a brief listing of the automotive brands active in the European market with respective sales data is presented, followed by a comprehensive presentation on how and why value and premium OEMs resort to brand extensions, and a detailed list of the smaller automobiles offered by premium OEMs.

## 3.1 Premium OEMs in Europe

Excluding the luxury OEMs and the value OEMs, Sha et al. (2013) consider the following list of premium automotive OEMs: Acura, Aston Martin, Audi, Bentley, BMW, Cadillac, Ferrari, Infiniti, Jaguar, Jeep, Land Rover, Lamborghini, Lexus, Lincoln, Lotus, Maserati, Mercedes-Benz, Mini, Porsche, Rolls-Royce, Smart, Volkswagen Phaeton, Volkswagen Touareg, and Volvo. It is possible further to trim down this group by selecting only the premium brands which sold more than 10'000 units in the year 2018 in the European market, thus remaining the following brands: Audi, BMW, DS[1], Jaguar, Jeep, Land Rover, Mercedes-Benz, Mini, Porsche, Smart, and Volvo. These most popular premium brands alone comprise 23.54% of the total of new car registrations in Europe (see Table 1). Even though the European automotive market is mostly comprised of small and lower-medium sized segments (usually non-premium), this analysis reveals that three out of the top ten most-sold brands in 2017 are premium brands (i.e. Audi, BMW, and Mercedes-Benz). All of the eleven premium brands had a positive sales growth, expected for only three of them (*New passenger car registrations by manufacturer*, 2018).

Table 1 - New car sales growth by automotive brand in Europe

| OEM | New passenger vehicles registered in 2016 | New passenger vehicles registered in 2017 | Change (%) |
|---|---|---|---|
| Alfa Romeo | 66,176 | 85,646 | 29.42 |
| Suzuki | 202,675 | 244,660 | 20.72 |
| Seat | 350,163 | 400,329 | 14.33 |
| Toyota | 604,607 | 684,083 | 13.15 |
| Dacia | 412,656 | 461,470 | 11.83 |
| Mercedes-Benz | 847,716 | 910,450 | 7.40 |
| Kia | 435,055 | 466,763 | 7.29 |
| Peugeot | 864,522 | 925,042 | 7.00 |
| Skoda | 663,569 | 704,293 | 6.14 |
| Citroen | 545,230 | 572,381 | 4.98 |
| Fiat | 744,764 | 779,342 | 4.64 |

[1] DS became a stand-alone premium brand in 2014 (https://www.telegraph.co.uk/motoring/car-manufacturers/citroen/11087420/DS-brands-split-from-Citroen-confirmed.html)

| OEM | New passenger vehicles registered in 2016 | New passenger vehicles registered in 2017 | Change (%) |
|---|---|---|---|
| Renault | 1,097,937 | 1,145,624 | 4.34 |
| Volvo | 289,628 | 301,295 | 4.03 |
| Jeep | 104,545 | 108,085 | 3.39 |
| Hyundai | 502,134 | 518,104 | 3.18 |
| Porsche | 71,016 | 73,151 | 3.01 |
| Nissan | 547,558 | 562,810 | 2.79 |
| Mini | 208,987 | 214,617 | 2.69 |
| Jaguar | 67,125 | 68,458 | 1.99 |
| Land Rover | 165,052 | 168,193 | 1.90 |
| BMW | 821,620 | 826,798 | 0.63 |
| Ford | 1,047,870 | 1,043,085 | -0.46 |
| Audi | 829,746 | 824,962 | -0.58 |
| Volkswagen | 1,718,939 | 1,703,100 | -0.92 |
| Mazda | 236,631 | 231,655 | -2.10 |
| Mitsubishi | 116,862 | 113,798 | -2.62 |
| Subaru | 38,654 | 36,777 | -4.86 |
| Opel | 991,612 | 942,366 | -4.97 |
| Smart | 105,426 | 100,157 | -5.00 |
| Lancia | 67,204 | 60,679 | -9.71 |
| Honda | 159,435 | 138,396 | -13.20 |
| DS | 62,848 | 43,924 | -30.11 |

Source: adapted from New passenger car registrations by manufacturer, 2018.

## 3.2 Extensions in OEMs

Automotive OEMs have a very strong brand identity, however, the dynamics and quick changes of market segments and product categories are ever-faster, leading consumers to find themselves stuck in their brand memories when confronted with a change (C. Kim et al., 2001). The use of extensions remains an attractive and resourced option by automotive OEMs. Value OEMs, in particular, have been extending into the premium segment, sometimes going as far as using premium advertising or even creating a new brand (Guitart, Gonzalez, & Stremersch, 2018; Mohr et al., 2013; Temporal, 2002). This way, value OEMs aim for higher profits and create a higher variety of available models and higher sales targets, making the market more challenging for premium OEMs (McKinsey & Co., 2013). This is especially significant as value OEMs are experienced in leveraging advantages from a global

network of suppliers and a low-cost business model, making products competitive to rival premium OEMs (Mohr et al., 2013).

Two tactics are used: (1) raising the tangible aspects and brand associations of their parent brand products in terms of quality, options, safety, and performance, drawing closer to the premium market standards; and (2) creating or acquiring premium OEM brands. The latter is common in large OEMs (see Table 2). This table lists the premium OEMs that were either created or acquired mostly by value OEMs and are currently brand extensions holding a distinct brand name with various levels of association visibility. The most known examples are the premium OEM's Acura and Lexus created by Honda and Toyota respectively, to compete in the United States upper-end car market (Temporal, 2002).

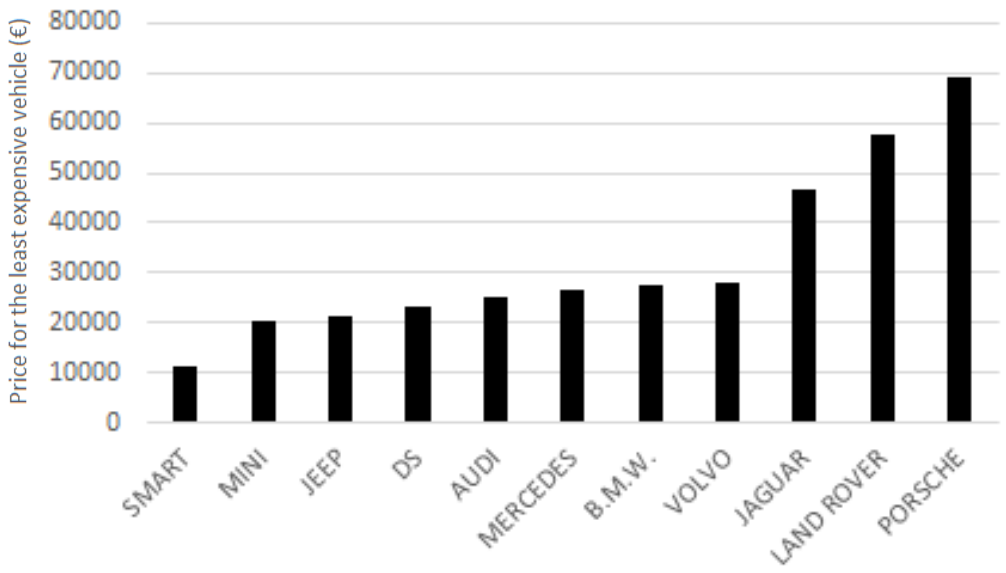
Table 2 - Origin of premium brand extensions

| **Premium OEM** | **Parent OEM** | **Premium OEM origin** |
|---|---|---|
| Acura | Honda Motor Company | Created |
| Audi | Volkswagen Group | Acquired |
| Bentley | Volkswagen Group | Acquired |
| Cadillac | General Motors | Acquired |
| DS | PSA Group | Created |
| Ferrari | Fiat Chrysler Automobiles | Acquired |
| Maserati | Fiat Chrysler Automobiles | Acquired |
| Infiniti | Nissan Motor Company | Created |
| Jaguar | Tata Motors | Acquired |
| Jeep Wrangler | Fiat Chrysler Automobiles | Acquired |
| Lamborghini | Volkswagen Group | Acquired |
| Land Rover | Tata Motors | Acquired |
| Lexus | Toyota Motor Corporation | Created |
| Lincoln | Ford Motor Company | Acquired |
| Mini | BMW Group | Acquired |
| Porsche | Volkswagen Group | Acquired |
| Rolls-Royce | BMW Group | Acquired |
| Smart | Daimler AG | Created |

As value OEMs increase competitiveness, the premium OEMs need to offer better value for money and brand equity, such as by creating extensions into new market segments. A downward line extension is an increasingly popular solution to grow sales and foster

conditions for upselling, though care must be taken not to dilute or damage the core brand image (McKinsey & Co., 2013; Mohr et al., 2013). The 1996 Porsche Boxster and the Mercedes-Benz A-Class are successful examples of such extensions.

When premium OEMs employ a downward extension, two main tactics are used, which are often combined: (1) increasing the offer of cheaper models competing with the upper-end range of the value OEMs and (2) introducing smaller models available and thus entering the smaller car segments, governed by the value OEMs. In the first tactic, premium OEMs step downwards while remaining in the same size segment by offering entry-level products at value prices. Currently, of the eleven most popular premium OEMs in Europe, eight of them have entry-level automobiles starting below €30,000 (see Figure 3), close to the value OEMs high-end models price range.




Source: based on official OEMs' websites for the Portuguese market

Figure 3 - Entry model prices for premium OEM's automobiles in 2019, Portugal

In the second tactic, premium OEMs create line extensions into the smaller vehicle segments. These segments, mostly explored by value OEMs, are also one of the major growth opportunities in the automotive sector: this market comprises subcompacts, microcars, and superminis, accounting already for 30% of the global sales, and is estimated to reach thirty million new vehicles by 2020. This is also one of the most competitive automotive segments,

with a low-cost business model, limited product diversification and a Lean sales approach (Mohr et al., 2013). The premium OEMs are not indifferent to this market segment, especially in a European urbanized context, where the car and engine size is a major down-point for sales due to higher taxation and lack of practicability – hence a chance for growth by offering a product in a previously unexplored smaller segment and for a lower price (Mohr et al., 2013; Truong et al., 2008).

So far, premium OEMs are not widely present in the Euroncap small family or supermini car segments (see Table 3). For example, the small family car segment is the most popular across value OEMs, being the participation of premium OEMs such as Audi and Mercedes-Benz rather recent, which are positioned in this segment since the late 1990's (Tournois & Chanaron, 2018). Some premium brands have just joined the small family segment for the first time in the current decade, and brands such as Jaguar, Porsche, Jeep and Land Rover have not yet entered any of these segments. The Euroncap supermini market segment is currently explored only by the premium brands Audi, DS, MINI, and Smart.

Table 3 - Premium OEM European models in the Euroncap small size segments

| **Year of introduction** | **Small family model** | **Supermini model** |
|---|---|---|
| 1998-2000 | Audi A3, Mercedes-Benz A-Class | Smart City Coupe |
| 2001-2005 | BMW 1 Series | Audi A2, MINI One |
| 2006-2010 | Volvo C30 | Audi A1 |
| 2011-2017 | BMW 2 Series, Infiniti Q30, Lexus CT200h, Mercedes-Benz A-Class, Mercedes-Benz C-Class Coupe, Mercedes-Benz CLA-Class, Volvo V40 | MINI Clubman, Smart Forfour, DS3 |

Source: based on Euroncap vehicle database website

In conclusion, the premium OEMs must manage brands and portfolios dynamically and thrive to adapt to the market and to respond to both value and premium competitors. The move into smaller segments has been occurring at a modest pace, though it is still uncertain as to whether the remaining premium OEMs will eventually enter the small family car segments, namely the distinctively smaller supermini segment. It is important to note that downward extensions do have risks: moving into the value brands price range and providing

consumers with more value reduces profitability and pressures the supply chain and dealerships, which must sell vehicles in larger quantities (McKinsey & Co., 2013). This poses risks on product quality and on dealership service quality, two major factors in determining consumer loyalty in the automotive premium market (Jorgensen, Mathisen, & Pedersen, 2016).

# Chapter 4 - Methods

## 4.1 Introduction

The main purpose of this chapter is to describe the research methodology and methods that guided Study 1, with a focus on the research design, the data collection tool, and the statistical procedures used to analyse the data. This chapter is divided into five main sections. First, comes the development of the research design, which includes the treatment development and the building of the stimulus tool; second, the scales are detailed; third, the section presents the process and procedures of data collection, sample profile and the tools of data collection. Finally, section four summarizes the data analysis procedures.

## 4.2 Experimental design

As stated in the introductory chapter, Study 1 followed an experimental research design. Experimental research consists of two broad groups of design: *classical design* and *statistical design* (see Figure 4) (D. Aaker et al., 2001). Classical designs, specifically, consider only one treatment level of an independent variable at a time, and typically with a random assignment of respondents to two groups: one exposed to a single version of a treatment and another not exposed to the treatment (i.e. the control group). Statistical designs, on the other hand, are able to examine different treatment levels in several groups and also the impact of two or more independent variables (D. Aaker et al., 2001), which makes this type of design the most adequate for the present study. In experimental studies, observations (or measures) can be made before and after a treatment, or only after it. To assist on the development of Study 1 research design, several experimental studies from the literature on brand research were analysed by looking at characteristics such as the type of treatment and the grouping methods (see Table 4).

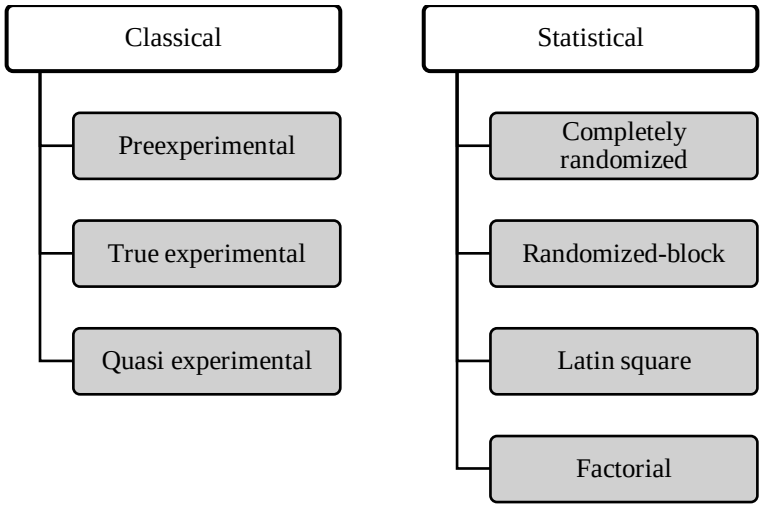



Figure 4 – Types of experimental research designs

Table 4 – Experimental studies characteristics retrieved in the literature

| Source | Variables | Method of manipulation | Treatment | Groups |
|---|---|---|---|---|
| (Allman et al., 2015) | Brand concept | Functional or prestige by varying the parent brand | Description and price of the brand extension | Treatment group: Each respondent exposed to one version<br>Control group: not exposed |
| | Brand extension direction | Upwards or downwards by manipulating price | | |
| | Country of manufacture | Chosen between two countries | | |
| (Gierl & Huettl, 2011) | Brand attitude | Negative, neutral or positive, manipulated by post classification of respondents | Description and image of the brand extension | Treatment group: Each respondent exposed to one version<br>Control group: none |
| | Brand extension fit | Low, moderate or high, by varying the extension category | | |
| | Parent brand | Chosen between different parent brands | | |
| (C. Kim et al., 2001) | Brand extension direction | Step-up or step down | Description and price of the brand extension | Treatment group: Each respondent exposed to three versions<br>Control group: none |
| | Brand concept | Prestige-oriented or function-oriented by varying the parent brand | | |
| | Distance to the core brand | Close or far according to the model name (existing or new). | | |
| (Kirmani et al., 1999) | Brand image | Non-prestige or prestige by varying the parent brand | Description and price of the brand extension | Treatment group: each respondent exposed to one version<br>Control group: none |
| | Brand extension direction | Upwards or downwards according to the price | | |
| | Ownership | Owner or non-owner according to the respondent's answer | | |
| | Branding strategy | Direct or sub-brand by specifying the name of the extension | | |
| (Martinez & Pina, 2003) | Brand extension fit | Similar or distant by varying the extension products | Description of the brand extension | Treatment group: each respondent exposed to six versions<br>Control group: none |
| (Morrin, 1999) | Parent brand type | Dominant or non-dominant by varying the parent brand | Description of the brand extension | Treatment group: each respondent exposed to sixteen versions<br>Control group: none |
| | Brand extension fit | High or low by varying the extension | | |
| | Amount of extension exposures | One, two or five | | |
| (Musante, 2007) | Brand extension fit | Higher-end price or premium price extension for a value parent brand | Description, price of the brand extension and of previous | Treatment group: each respondent exposed to one version<br>Control group: none |

| Source | Variables | Method of manipulation | Treatment | Groups |
|---|---|---|---|---|
| | Previous brand extension | Information was given about a fictitious previous brand extension | fictitious extension | |
| (Park et al., 1991) | Brand name | Varying two brand names of the product category | Description and price of the brand extension | Treatment group: each respondent exposed to four versions<br>Control group: use of a fictitious parent brand |
| | Brand extension fit | Low or high by varying extension products | | |
| | Concept dominance | Function-oriented or prestige oriented by varying extension products | | |
| (Riley et al., 2013, 2015) | Brand concept | Luxury or prestige/premium by varying the parent brand | Description and price of the brand extension | Treatment group: Each respondent exposed to one version<br>Control group: not exposed |
| | Downscale extension magnitude | -25% or -50% varied by extension price | | |
| | Product category | Cars or fashion shoes | | |
| (Taylor & Bearden, 2002) | Brand extension fit | Low or high by varying product categories | Description, price and image of the brand extension | Treatment group: each respondent exposed to one version<br>Control group: use of a price absent condition |
| | Brand extension price | Low or high by varying price | | |
| | Parent brand quality | High or moderate by varying parent brands | | |

As Study 1 focused on the consumer response to different versions of a non-existent product, it was not possible to make product-oriented observations before the treatment (or exposure), therefore, this study followed an *experimental statistical design* with *after-only* observation, where the objective was to estimate the impact of the experimental variable without premeasuring it (D. Aaker et al., 2001). More specifically, this design can also be referred to as a *completely randomized experiment design*, as it allows the assignment of different treatment versions to a randomly distributed sample, just like in the testing of different marketing options or advertising appeals, for instance. The randomization aspect assures that every member of a universe has an equal probability of being selected for a treatment, so that individuals with varying characteristics (e.g. ownership status and need for status) are equally spread among groups, ensuring control over extraneous variables and increasing the reliability of the experiment (Bickman & Rog, 1998).

Hence, Study 1 followed an *experimental statistical design with complete randomization*, in a 2 X 2 layout, to test the effects of perceived fit (high or low), and ownership status (owner or non-owner) (see Figure 5). In the experiment, respondents (owners and non-owners) were randomized (symbolized as $R$) and exposed (symbolized as $X$) to one of two possible treatments in the shape of an advertisement of the brand extension: the high-fit extension ($X_1$) or the low-fit extension ($X_2$). These experiments generated the four experimental groups: $EG_1$ (owners exposed to the high-fit extension); $EG_2$ (owners exposed to the low-fit extension); $EG_3$ (non-owners exposed to the high-fit extension); and $EG_4$ (non-owners exposed to the high-fit extension). The observations (symbolized as $O_1$ and $O_2$)

corresponded to the self-reported respondents' attitudes towards the extension, collected by a questionnaire.

$$\begin{array}{cccc} EG_1 & R & X_1 & O_1 \\ EG_2 & R & X_2 & O_2 \\ EG_3 & R & X_1 & O_3 \\ EG_4 & R & X_2 & O_4 \end{array}$$

Figure 5 – Experimental research design layout

### 4.2.1 Stimulus building

The construction of the stimulus to be used in the experiment is a critical task: advertising stimulus, in particular, must be both realistic and controllable. These must be of high quality, truthful and to look like real advertisements. Advertisements should be developed to clearly reflect the desired manipulation intended, yet, to be as simple as possible (Geuens & Pelsmacker, 2017). The selection of the parent brand, model, price and construction of the stimulus are detailed below.

Brand extensions research, specifically, requires the use of existing parent brand names (Geuens & Pelsmacker, 2017). Previous empirical studies made use of a pretest where respondents were asked to rank brands and to give out ideas of extensions for the brands addressed (or rate a pre-set list of extensions), in order to use the data as input for the building of the treatment (e.g. Boush & Loken, 1991; Fu et al., 2009; Park et al., 1991; Riley et al., 2015). In this study, the brand selection was required to comply with the following requirements: (1) to be classified and active as a premium automotive OEM in the European market; and (2) not to have any currently available product in the supermini segment. Among the premium OEMs presented in Chapter 3, the BMW was selected, as it was the best fitting of the criteria and already used in previous premium brand research (e.g. Allman et al., 2015; Kirmani et al., 1999). Moreover, this brand revealed aspects that improved the extension's credibility: BMW had produced a supermini automobile in the 1950's - the BMW Isetta - which could be sourced to support the reintroduction in the market to compete against the newer versions of the Fiat 500 and of the Renault Twingo using heritage equity (Dion & Mazzalovo, 2016; Rose, Merchant, Orth, & Horstmann, 2016; Wiedmann, Hennigs, Schmidt, & Wuestefeld, 2011).

Furthermore, BMW has made recent extensions into the small family car segment (with the BMW 1 Series introduced in 2004 and the BMW 2 Series Active Tourer introduced in 2014) and into the smaller multi-purpose vehicle segment (with the BMW 2 Series Active Tourer). Such experience in extensions would lead to a more favourable evaluation of future extensions, according to Keller & Aaker (1992), and are also in line with the compatible innovations concept of Rogers (1983), in which moderate innovations will ease the acceptance of less moderate innovations later on. Consumers will then tend to evaluate the brand as broader and thus more capable of managing extensions (Boush & Loken, 1991). Still, previous research warns that cannibalization effects of the extension can occur if the consumers believe that the new product is a substitute for a similar product in the brand's current portfolio (Michel & Salha, 2005; Sullivan, 1990). A too-similar design will also lead to consumer mistakes and confusion in distinguishing models of the same brand, hence a low evaluation of the brand; for instance, a Porsche 911 being mistaken for a lower-priced Porsche Boxster (Keaveney et al., 2012). The simulated model will thus be a two-seat model in order to avoid the cannibalization effect with the small family cars BMW i3, BMW 2 Series Active Tourer and BMW 1 Series currently available. This choice will also bring an obvious rival to the consumer mind: the Mercedes-Benz's Smart Fortwo, which is currently the only two-seater available in the European OEMs, excluding sports cars and quadricycles.

Price was carefully addressed, by investigating the current small and supermini family cars available from premium OEMs (see Table 5). Looking at the supermini premium rivals, the Audi, DS and MINI cars have an average price of about €23,000. As these are four-seat competitors, it meant that the price for the simulated BMW must be lower. However, it should also be sufficiently distant from the Smart average €12,000 price, in order to maintain a higher level of status. The midpoint between the two values is about €17,500, which was selected as the price for the high-fit version. Additionally, this value also manages to stand well under the price of the small family car from BMW (the 1 Series), in order to preserve its value, thus becoming the cheapest BMW available – an expected outcome as it belongs to the smaller size segment. The low-fit version was priced at €12,000, the average price of the two Smart vehicles: at this price, the low-fit version was likely to be regarded as incongruent with the parent brand image, thus leading to lower perceived fit and extension evaluations.

Table 5 - Premium OEM European models price by segment

| Segment | Brand | Model | Price (€) |
|---|---|---|---|
| Small family | Audi | A3 | 28,029 |
| | BMW | 1 Series | 27,500 |
| | | 2 Series | 29,650 |
| | Mercedes-Benz | A-Class | 26,400 |
| | | CLA-Class | 31,350 |
| | Volvo | V40 | 27,779 |
| Supermini | Audi | A1 | 24,974 |
| | DS | DS3 | 21,773 |
| | MINI | Mini | 20,500 |
| | | Clubman | 26,300 |
| | Smart | City Coupe | 11,350 |
| | | Forfour | 12,250 |

Source: based on official OEMs' websites for the Portuguese market

In past empirical studies the treatment, or stimulus, consisted of a written scenario describing the extensions characteristics with lettering and brand presentation elements to simulate the fit (e.g. C. Kim et al., 2001). Recent empirical studies on brand extensions have used stimulus with just one or two elements, usually price and a short description of the extension (e.g. Allman et al., 2015; Riley et al., 2015). Images were sourced only when the study on the extension evaluation is design-oriented (e.g. Keaveney et al., 2012; Landwehr, Wentzel, & Herrmann, 2013). However, researchers stress the importance of a new product design being familiar, recognizable, consistent and appropriate to the brand and to the portfolio, as design features are among the most complex features of evaluating and defining, especially in automobiles where the design and aesthetics are becoming an ever-crucial factor in vehicle differentiation rather than technology, quality and performance (Creusen & Schoormans, 2005; Karjalainen, 2007; Ranscombe, Hicks, Mullineux, & Singh, 2012; Ravasi & Lojacono, 2005). Several design cues can be used to achieve visual and value recognition, including shapes, forms, colours, materials, surfaces, textures, graphical elements and logos. Other official advertisements can also be studied to copy the elements and make it more realistic (Geuens & Pelsmacker, 2017).

In this study, the treatment poster was constructed using the graphic editing software Adobe Photoshop CS2™ and following recommendations from the literature review, thus bringing the experiment closer to a real-world situation. Elements and design cues were included to pursue a high extension perceived fit by sourcing out information from the parent brand's

official products. In the BMW case, strong shapes, dynamic forms, and the distinctive (and consistent) kidney-shaped grille were identified as communicating the brand values but also aiding recognition (Karjalainen, 2007; Ranscombe et al., 2012). The poster for the high-fit extension was designed in accordance with the parent brand style cues (kidney grille, headlights, wheels, and trims) to attain high resemblance to official products and posters (see Figure 6). The poster for the low-fit extension did not include elements that would induce a perception of fit, but rather generic ones[2] (see Figure 7). The layout for both fit versions consisted of an image displaying the front view of the vehicle, as this view is the most central single element to trigger brand recognition, rather than a side or rear view (Karjalainen, 2004; Ranscombe et al., 2012).

Figure 6 – High-fit simulation

[2] Source for design elements: https://www.dreamstime.com/royalty-free-stock-photo-electric-car-charging-station-isolated-white-background-image32945355

Figure 7 – Low-fit simulation

Summing up, the final simulated high-fit extension was a recognizable two-seat BMW supermini car, named BMW i2 (in order to follow the BMW models name standard), with electric-drive option (to seem a rival of the electric-drive Smart) and in track with the electric-drive innovation line of BMW's current electric-drive. In order to bring further realism, respondents were provided with an introductory text about the parent brand and its heritage. This allowed to improve consumer knowledge on the product and hence getting more accuracy on the extension evaluation (Keaveney et al., 2012; Sujan, 1985). The low-fit extension was presented with a generic introductory text, based on Fu et al. (2009): "BMW is considering the introduction of a new supermini two-seater car at a price of €12,000, for which the design and technical parameters have not been yet revealed".

## 4.3 Measures

This section describes the selection of the measures used in Study 1. Some of the variables were not directly observed, but constructs or latent variables. Sample's demographic data included gender, country, age, student/job status, educational level and income, as observed in other studies (e.g. Boush & Loken, 1991; Kirmani et al., 1999; Salinas & Pérez, 2009). Apart from the demographic questions, all variables were measured using a 7 point Likert scales, based on previous research.

### *Familiarity*

In brand extension research, it is common to measure the level of the respondents' familiarity with the brand (e.g. Broniarczyk and Alba, 1994; Kim et al., 2001; Park et al., 1991; Riley et al., 2013; Taylor and Bearden, 2002). Pontes et al. (2017) assess familiarity with several items: category familiarity, general category knowledge, category knowledge relative to the circle of friends, and category price knowledge. In this study, respondents were asked about brand familiarity through a 7 point Likert semantic scale with the anchors "Never heard of / Very aware of" and "Not familiar / very familiar". We also measured the level of knowledge on the product category with the anchors "Not at all knowledgeable with the category / very knowledgeable with the category" (Martinez & Chernatony, 2004).

### *Prestige*

In the literature, one can find several measures to assess consumer perceptions on the level of prestige or status of the brand. Kirmani et al. (1999) measured prestige as an average of three items rated on a 7 point Likert scale: prestigious, exclusive and high status. Heath et al. (2011) also measured it in three items: prestige, sophistication, and elegance. Riley et al. (2013) measured brand image status in three items by asking if the product "can indicate a person's social status", "it is a symbol of achievement" and "it is a symbol of wealth". For instance, Broniarczyk and Alba (1994) asked how much the brand conveyed an image of prestige, ranging from "Not at all" to "Very much". In this study, a question on whether a product from the parent brand "can indicate a person's social status", "is a symbol of achievement" and " is a symbol of wealth" measured on a 7 point Likert scale ranging from "Not at all / Very much" was included, based on Riley et al. (2013).

### *Ownership*

Research on brand extension that measures the ownership status of respondents is relatively small and does not employ very detailed questions. Fu et al. (2009) defined three groups: owners, non-owners, and non-users of the product category. Chun et al. (2015) questioned if respondents have ever owned a (brand) branded product and if they currently own a (brand) branded product. Kirmani et al. (1999) indicated as potentially valuable to further segment the owners according to the owned model or owned brand class. They argue

that the interest and reception to brand extensions may differ amongst owners of differently ownership status due to a different investment. It is also reasonable to assume that owners are the most frequent users of the vehicles they own, and vice-versa, to assume that the vehicles are owned by those who most frequently use them. However, this assumption may not hold true in specific cases such as in family households, where ownership does not necessarily match the vehicle usage. To detour such cases, *owner* was considered as "the most frequent user of the vehicle", and the ownership status variable measured according to the questions presented in Table 6.

Table 6 – Items addressing consumer ownership status

| **Items** |
|---|
| Please write down the brand, model and year of the vehicle you most frequently use. |
| What was the age of the car when you bought it? (0-new, 1 year, 2 years…) |
| Which brands have you owned or frequently used in the past? |

*Innovativeness*

There are several methods to measure consumer innovativeness. For this study, a brief literature analysis on the retail and branding context was taken up, as presented in Table 7. Concerning the scale types Klink and Smith (2001) measured innovativeness using 7 point Likert scales anchored with "strongly disagree"/"strongly agree". Also in brand extension research, Hem et al. (2003) anchored their measures with "Totally disagree / Totally agree" with 6-point Likert scale. Other researches present in general 7 point Likert scales (e.g. Goldsmith & Hofacker, 1991; Salinas & Pérez, 2009; Volckner & Sattler, 2006).

Table 7 - Measures of consumer innovativeness

| **Source** | **Scale items** |
|---|---|
| (Goldsmith & Hofacker, 1991) | In general, I am the last in my circle of friends to buy a new (product) when it appears.* |
| | If heard that a new (product) was available in the store, I would not be interested enough to buy it.* |
| | Compared to my friends I own few (product). |
| | In general, I am the last in my circle of friends to know the titles of the latest rock albums. |
| | I will buy a new (product), even if I haven't heard of it yet |
| | I know the names of new (product) before other people do. |
| (Hem et al., 2003) adapted from (Steenkamp & Baumgartner, 1995) | I am continually seeking new ideas and experiences |
| | When things get boring, I like to find some new and unfamiliar experience |
| | I sometimes like to do things involving some danger |

| | |
|---|---|
| | I like surprises |
| | I like to experience novelty and change in my daily routine |
| (Salinas & Pérez, 2009) sourced on (Roehrich, 1995) | I am more interested in buying new than known products |
| | I like to buy new and different products |
| | New products excite me |
| | I am usually among the first to try new products |
| | I try new products before my friends and neighbours |
| | I know more than others on latest products |
| (Volckner & Sattler, 2006) adapted from (Hem et al., 2003; Klink & Smith, 2001; Midgley & Dowling, 1978) | Overall, I enjoy buying the latest products. |
| | I like to purchase new products before others do. |
| | Overall, it is exciting to buy the latest products |

* negatively worded

In this study, we used a 7 point Likert scale from the research carried out by Salinas and Pérez (2009) as it was previously used to confirm the moderator effect of consumer innovativeness on the extension fit and extension attitude. This scale includes six items: "I am more interested in buying new than known products", "I like to buy new and different products", "New products excite me", "I am usually among the first to try new products", "I try new products before my friends and neighbours" and "I know more than others on latest products".

*Need for status*

We can find in the literature several scales to assess status-seeking behaviour. To measure how much consumers care about status, Kirmani et al. (1999) proposed to rate the importance of prestige by choosing amongst different product brands in three items: prestige, status, and exclusivity in a 7 item Likert scale. Other, more complex, measures can differentiate both the status consumption and the conspicuous consumption constructs (see Table 8). These two constructs are usually analysed as one single construct, as they are similar and potentially overlapping (Eastman, Goldsmith, & Flynn, 1999; O'Cass & McEwen, 2005). In this study, the social-adjustive function construct was selected to measure the status-seeking behaviour, as it is widely sourced and used in status-seeking behaviour research (e.g. Grewal et al., 2004; O'Cass & Siahtiri, 2013; Schade et al., 2016; Wilcox et al., 2009). The scale is a 7 point Likert "Disagree / Agree" anchors for the six items used by Grewal et al. (2004) in their automotive-focused research work.

Table 8 - Measures of consumer status seeking behaviours

| Source | Scale items |
|---|---|
| (Eastman et al., 1999) – status consumption | I would buy a product just because it has status |
| | I am interested in new products with status |
| | I would pay more for a product if it had status |
| | The status of a product is irrelevant to me (negatively worded) |
| | A product is more valuable to me if it has some snob appeal |
| (Grewal et al., 2004) | It is important for my friends to know the brand of car I possess. |
| | Cars are a symbol of social status. |
| | My car helps me fitting in important social situations. |
| | I like to be seen with my car. |
| | The brand of car that a person owns tells me a lot about that person. |
| | My car indicates others the kind of person I am. |
| (Marcoux, Filiatrault, & Cheron, 1997) - conspicuous consumption of Western products | People buy Western products to enhance their image |
| | People buy Western products for their uniqueness, to have products other do not own |
| | People buy western products to be fashionable |
| | By using Western products people intend to please others |
| | People using western products feel more important |
| | People want to have western products owned by their friends and colleagues |
| | People want to have western products owned by their neighbors |
| | People want Western products owned by everybody |
| | People buy Western products to show off, to be noted |
| | Western products are social status symbols |
| | Western products are a symbol of success and prestige |
| | Western products mean wealth |
| | People using western products increase their own value from the point of view of others |
| | Use of Western products allows popularity among friends and colleagues |
| | Using western products induces respect from others |
| | If people could afford it, only Western products would be bought |
| | People buy Western products only because they are more expensive than polish products. |
| (O'Cass & McEwen, 2005) – conspicuous consumption | Noticed by others |
| | Presence of others |
| | Gain respect |
| | Popularity |
| | Show who I am |
| | Seen using it |
| (O'Cass & McEwen, 2005) – status consumption | Symbol of success |
| | Symbol of prestige |
| | Indicate wealth |
| | Indicate achievement |
| | Interested in status |
| | Status is important to me |
| | Status enhances my image |
| (Truong et al., 2008) – conspicuous consumption | To what extent is this brand a symbol of prestige? |
| | To what extent does this brand attract attention? |
| | Can a person use this brand to impress other people? |
| (Truong et al., 2008) – status consumption | To what extent can this brand indicate a person's social status? |
| | To what extent is this brand a symbol of achievement? |
| | To what extent is this brand a symbol of wealth? |

*Parent brand and brand extension attitude*

Brand research is vast and several brand attitude scales are available, and both the parent brand attitude and the brand extension attitude can be measured using the same scale items (e.g. Gierl & Huettl, 2011; Keller & Aaker, 1992; Kirmani et al., 1999; Lei et al., 2008; Riley et al., 2015). A review and selection of studies containing the discriminated scales was undertaken (see Table 9). Even though there is some variation in the wording used, some items are more sourced out than others and most researchers use a 7 point Likert scale to measure three items for each variable. Alternatively, researchers also measured attitude towards the parent brand by having respondents evaluate individual attitude item such as "positive", "harmful", "desirable", "valuable", "disgusting" and "tense" as did Fedorikhin et al. (2008) based on Fabrigar and Petty (1999). Measurement of brand attitude can also be found sometimes overlapping purchase intention measurement (e.g. Keller and Aaker, 1992; Kim et al., 2001; Klink and Smith, 2001).

Table 9 - Measures for consumer parent brand attitude and brand extension attitude

| | Amount of items used | Likert scale size (points) | Very negative / Very positive | Dislike/Like | Not likable / Very likable | Very bad / Very good | Very unfavorable / very favorable | Weak brand/Strong brand | Low quality/High quality | Undesirable / Desirable | Unpleasant / Pleasant | Dissatisfying/Satisfying | Unappealing/Appealing | Very unattractive / Very attractive | Worthless / Valuable | Poor / Excellent | Inferior product / Superior product | Not at all likely to try(purchase) / Very likely to try (purchase) | Likelihood of trying assuming a purchase was planned in the product class | Unsophisticated / Sophisticated |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (D. Aaker & Keller, 1990) | 2 | 7 | | | | | | | ● | | | | | | | | | | ● | |
| (Boush & Loken, 1991) | 2 | 7 | | | | | ● | | | ● | | | | | | | | | | |
| (Broniarczyk & Alba, 1994) | 1 | 9 | | ● | | | | | | | | | | | | | | | | |
| (Chun et al., 2015) | 2 | 9 | | ● | | | ● | | | | | | | | | | | | | |
| (Fu et al., 2009) | 2 | 5 | | ● | | | | | | | | | | ● | | | | | | |
| (Gierl & Huettl, 2011) | 4 | 7 | | ● | | ● | ● | | | | | | ● | | | | | | | |
| (Heath et al., 2011) | 3 | 7 | | ● | | | ● | ● | | | | | | | | | | | | |
| (Keaveney et al., 2012) | 4 | 7 | | ● | | ● | ● | | | | | | | | | | | | | ● |
| (Keller & Aaker, 1992) | 3 | 7 | | | | | | | ● | | | | | | | | ● | ● | | |
| (C. Kim et al., 2001) | 3 | 7 | | | | | | | ● | | | | | | | | ● | ● | | |
| (Kirmani et al., 1999) | 2 | 7 | | | ● | | | | | | | | ● | | | | | | | |
| (Klink & Smith, 2001) | 2 | 7 | | | | | ● | | | | | | | | | | | ● | | |
| (Lane, 2000) | 3 | 7 | | | | | | | ● | | | ● | ● | | | | | | | |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (Lei et al., 2008) | 3 | 7 | ● | | | | ● | | | | | | | ● | | | | | | |
| (Low & Lamb, 2000) | 3 | 7 | | | | ● | | | | | ● | | | | ● | | | | | |
| (Monga & John, 2007) | 1 | 7 | | | | | | | | | | | | | | ● | | | | |
| (Musante, 2007) | 4 | 7 | | ● | | | ● | | ● | | | | ● | | | | | | | |
| (Park et al., 1991) | 3 | 5 | | ● | | ● | | | | | ● | | | | | | | | | |
| (Pontes et al., 2017) | 3 | 7 | | ● | | | ● | | ● | | | | | | | | | | | |
| (Riley et al., 2013) | 3 | 7 | | ● | | | ● | | | | | | ● | | | | | | | |
| (Riley et al., 2015) | 3 | 7 | | ● | | | ● | | | | | | ● | | | | | | | |
| (Martinez & Chernatony, 2004) | 2 | 7 | | | | | ● | | | | | | | | | | | ● | | |
| (Salinas & Pérez, 2009) | 3 | 7 | | | | | ● | | ● | | | | | | | | | ● | | |
| (Sujan, 1985) | 1 | 7 | | | | ● | | | | | | | | | | | | | | |
| Total | | | 1 | 11 | 1 | 5 | 13 | 1 | 7 | 1 | 2 | 1 | 6 | 2 | 1 | 1 | 2 | 5 | 1 | 1 |

Concerning the lead-in sentences, there was found no standard. For the sake of exemplification, Chun et al. (2015) presented the Likert anchors with the sentences "Please rate your opinion of the (brand name) brand on the following scale" and "Please rate your overall opinion of (brand name)'s (extension product) on the following scale". Based on Zinkhan, Locander, and Leigh (1986), Low and Lamb (2000) use the lead-in statement "I think this brand is:" for assessing brand attitude with each and every scale item. Sujan (1985) instructed the subjects to "Based on your impression, on the scale below, please indicate your overall evaluation". In this study, a 7 point Likert scale was used to measure the three items most commonly used to analyse both brand or extension attitude: "Dislike / like", "Unfavourable / favourable", and "Unappealing / appealing", which also match the ones used by Riley et al. (2013; 2015) automotive-focused research. The parent brand attitude was measured prior to stimulus exposure, following the procedure used by C. Kim et al. (2001). The questions for each variable were adapted from Chun et al. (2015): "Please rate your opinion of the BMW brand on the following scale" and "Please rate your overall opinion of BMW's i2 on the following scale".

### *Perceived fit*

The brand extension perceived fit can be measured, in its most simplified form, by asking respondents to rate the similarity between the brand extension and the parent brand (or parent brand products). Previous research usually uses one to three items to measure perceived fit (see Table 10). Gierl & Huettl (2011) use the items "The core product and this extension are very similar/not at all similar", "The core product and this extension possess a very high/very low fit", "I can understand the connection very easily/not at all" and "The extension is logical and makes sense to a very high/very low degree". Chun et al. (2015) present the anchors with the sentences "Please indicate the degree to which the (brand name)

brand goes well with (extension product)" and "How similar is the image of (extension product) to the image of the (brand name) brand?". Fedorikhin et al. (2008) use the sentences "(original product) and (extension) are very similar", "(original product) and (extension) go together really well" and "(extension) is a natural extension for a (original product) company" anchored with the 7-point agree/disagree.

Table 10 - Scales from the literature of consumer brand extension perceived fit

| | Likert scale size (points) | Bad fit / Good fit | Very low fit / very high fit | Very inconsistent / Very consistent | Not at all similar / Very similar | Atypical / Typical | Not at all helpful / very helpful (perceived ability of the company) | Substitute, Complement, and Transfer | Not at all logical / Very logical | Not at all relevant / very relevant | Not at all appropriate / very appropriate | Does not go well together / Goes very well together | I can understand the connection very easily/not at all | The extension is logical and makes sense to a very high/very low | Unrepresentative / Representative of the parent brand |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (D. Aaker & Keller, 1990) | 7 | | | | | | | ● | | | | | | | |
| (Boush & Loken, 1991) | 7 | | | | ● | | | | | | | | | | |
| (Broniarczyk & Alba, 1994) | 9 | | | | ● | | | | | | | | | | |
| (Chun et al., 2015) | 9 | | | | ● | | | | | | | ● | | | |
| (Gierl & Huettl, 2011) | 7 | | ● | | ● | | | | | | | | ● | ● | |
| (Keaveney et al., 2012) | 7 | | | | ● | | | | | | | | | | |
| (Keller & Aaker, 1992) | 7 | ● | | | | | | | ● | | ● | | | | |
| (Lane, 2000) | 7 | ● | | ● | | | | | | | | | | | |
| (Loken & John, 1993) | 7 | | | ● | | ● | | | | | | | | | ● |
| (Monga & John, 2007) | 7 | | | ● | | | | | | | | | | | |
| (Park et al., 1991) | 5 | | | | ● | | | | | | | | | | |
| (Riley et al., 2013) | 7 | ● | | | | | | | ● | | ● | | | | |
| (Riley et al., 2015) | 7 | ● | | | | | | | ● | | ● | | | | |
| (Martinez & Chernatony, 2004) | 7 | | | ● | ● | | | | | | | | | | |
| (Taylor & Bearden, 2002) | 9 | ● | | | ● | | | | ● | | ● | | | | |
| (Volckner & Sattler, 2006) | 7 | | | | ● | | ● | | | ● | | | | | |
| **Total** | | 5 | 1 | 4 | 9 | 1 | 1 | 1 | 4 | 1 | 4 | 1 | 1 | 1 | 1 |

Other approaches in measuring perceived fit were detected in the literature. Klink and Smith (2001) ask respondents to provide similarity assessments on (1) component parts, (2) product features, (3) product functions, (4) needs they satisfy, (5) usage situations, (6) manufacturing

processes and servicing. Smith and Park (1992) measure fit asking respondents how similar they believed the product was with the brand's other products, in a 7 point scale with the anchors not very similar / very similar, in the four dimensions: (1) the types of needs satisfied; (2) the situations where they are used; (3) the skills required to manufacture them; and (4) the physical features. However, this specific type of instruments is deemed more appropriate in the domain of category extensions rather than of line extensions, as the products have a greater distance and difference. Hence, in this study, respondents were asked to evaluate how similar the brand line extension is to the parent brand in a 7-point Likert scale with four items: "Bad fit / good fit", "Not at all similar / very similar", "Not at all logical / very logical" and "Not at all appropriate / very appropriate".

*Perceived value*

The consumer perceived value can be interpreted in various dimensions, such as Sweeney and Soutar (2001) demonstrate on their four-dimensional scale (see Table 11). Research on brand extension, however, does not usually measure perceived value on all of these dimensions, as it focuses solely on the price and value for money when measuring perceived value. To measure the perceived value of extension, Taylor and Bearden (2002) used three items, disagree-agree anchors in a 9 point Likert, partly based on Dodds, Monroe, and Grewal (1991): (1) "Overall I think the (product) will be a good value for the money"; (2) "If I buy the product when it becomes available, I will be getting my money's worth"; (3) and "If I buy the product when it becomes available, I will be getting a good product for a reasonable price". Dodds et al. (1991) used five items in a 7-point Likert scale to measure perceived value: (1) "This product is a: very poor value for the money / very good value for the money"; (2) "At the price shown the product is very uneconomical / very economical"; (3) "The product is considered to be a good buy (strongly disagree /strongly agree)"; (4) "The price shown for the product is very unacceptable / very acceptable"; and (5) "This product appears to be a bargain (strongly disagree / strongly agree)".

Lei et al. (2008) also only used the price dimension items, adapted from Sweeney and Soutar (2001): "Overall I believe I will receive a good value for money, compared to similar (products)", "I think this (product) will be a good buy, compared to similar (products)" and " I think I would value the (product) a lot, compared to similar (product)". Riley et al. (2013,

2015) used three items on a 7-point Likert scale measuring if consumers considered the downscale vertical extension as "a good value for money", "a good buy" and "valued it as compared with similar products" sourced both from both Taylor and Bearden (2002) and from Lei et al. (2008).

In order to understand and gain insight on the consumer evaluation of brand extensions without limiting it to the value or price dimension, this study employed the multi-dimension scale from Sweeney and Soutar (2001) as it was deemed more complete than the global analysed research. The quality dimension of value, however, was excluded from the questionnaire, as we considered that the consumer evaluation of the perceived quality based on the advertisement of a simulated vehicle without detail on the quality aspects was not a viable measure.

Table 11 - Measure scales of consumer perceived value (Sweeney & Soutar, 2001)

| **Items for Quality dimension of value** | **Items for Emotional dimension of value** |
|---|---|
| This product has consistent quality | This product is one I would enjoy |
| This product is well made | This product would make me want to use it |
| This product has an acceptable standard of quality | This product is one that I would feel relaxed about using |
| This product has poor workmanship (*) | This product would make me feel good |
| This product would not last a long time (*) | This product would give me pleasure |
| This product would perform consistently | |
| **Items for Price dimension of value** | **Items for Social dimension of value** |
| This product is reasonably priced | This product would help me to feel acceptable |
| This product offers value for money | This product would improve the way I am perceived |
| This product is a good product for the price | This product would make a good impression on other people |
| This product would be economical | This product would give its owner social approval |
| (*) reversed scored | |

*Purchase intention*

First, a collection of the items commonly used to measure the consumer purchase intention was carried out (see Table 12). Taking this knowledge into account, in this study, subjects answered the question based on Riley et al. (2013, 2015): "How likely would it be that you would consider buying the (extension) the next time you purchased an automobile?"

on a 7-point Likert scale anchored at “very likely/very unlikely”; and “definitely would not consider it/definitely would consider it”, and “not very probable/very probable”.

Table 12 – Measure scales of consumer brand extension purchase intention

| Source | Scale points | Items | Anchors |
|---|---|---|---|
| (Dodds et al., 1991) | 7 | My likelihood of purchasing this product is: | Very-low / very-high |
| | | If I were going to buy this product, I would consider buying this model at the price shown. | Strongly disagree / strongly agree |
| | | At the price shown, I would consider buying the product. | Strongly disagree / strongly agree |
| | | The probability that I would consider buying the product is: | Very low / very high |
| | | My willingness to buy the product is: | Very low / very high |
| (Fedorikhin et al., 2008) adapted from (Mackenzie, Lutz, & Belch, 1986) | 7 | How likely would you be to seriously consider buying the (brand) brand (extension)? | unlikely/very likely |
| | | Assuming they were available, how likely would you be to buy (brand) (extension) the next time you buy (product category)? | Unlikely / very likely |
| | | Assuming they were available, how likely would you be to buy (brand) (extension) the next time you buy (product category)? | improbable/Very probable and |
| | | Assuming they were available, how likely would you be to buy (brand) (extension) the next time you buy (product category)? | Impossible / Possible |
| (Fu et al., 2009) | 5 | — purchase likelihood | *(not available from the author)* |
| | | — suitability for oneself | *(not available from the author)* |
| | | — likelihood of recommendation to other people | *(not available from the author)* |
| (Kirmani et al., 1999) | 10 | — likelihood of buying the item | Not at all likely / Very likely |
| | | — likelihood of buying the item | Not at all probable / very probable |
| (Lei et al., 2008) adapted from (Bloemer, Ruyter, & Wetzels, 1998)<br><br>*(Note: used for services purchase intention)* | 7 | Considering the situation, the product is an appropriate choice | *(not available from the author)* |
| | | I would recommend this (product) to other people | *(not available from the author)* |
| | | I would say positive things about this product to others | *(not available from the author)* |
| | | I would like to choose this (product) for this trip | *(not available from the author)* |
| (Riley et al., 2013, 2015) adapted from (Cass & Grace, 2004) and from (Lafferty, 2007) | 7 | *(not available from the author)* | Unlikely / Likely |
| | | *(not available from the author)* | Would not consider it / Would consider it |
| | | *(not available from the author)* | Not probable / Very probable |
| (Sweeney & Soutar, 2001) | 7 | I would be willing to buy this item at this store | Strongly disagree / Strongly Agree |
| | | I would recommend this item to friends or relatives | Strongly disagree / Strongly Agree |
| | | I would not expect any problems with this item | Strongly disagree / Strongly Agree |
| (Taylor & Bearden, 2002) adapted from (Dodds et al., 1991) | 7 | My likelihood of purchasing this product is: | Very-low / very-high |
| | | The probability that I would consider buying the product when it becomes available is: | Very-low / very-high |

## 4.4 Data collection and data analysis procedures

Data was collected through a questionnaire. Questionnaires are one of the most sourced tools in social research, as they are used to measure characteristics or opinions of a sample of respondents, and to make generalizations about the population through statistical techniques (May, 1993). Moreover, questionnaires have several advantages when online: there is minimal or no cost; respondents can choose a convenient time to answer; a significant number of respondents can be reached; and data manipulation procedures are simplified as data is digital from the start (Cook, Heath, & Thompson, 2000). The use of sampling allowed to make a compromise between technical efficiency and resources (D. Aaker et al., 2001; May, 1993).

One important goal of the data collection phase was the possibility of creating random groups (also named a *randomizer*) within the questionnaire in order to apply the experimental research design version (Bickman & Rog, 1998). The randomization was recreated by means of an A/B test. During the fill-out of the questionnaire, respondents were asked to choose between two identical buttons and were afterwards exposed to either version of the stimulus. This technique was expected to obtain a 50% distribution among the two groups with 3% error[3]. After a brief search for online questionnaire tools, the QuestionPro platform from QuestionPro Inc. was selected, and a Student Research Sponsorship one-year license with extra features was kindly offered by the company for this study. Although QuestionPro did not allow to create customized and appealing designs, it did allow for the configuration of A/B tests into a single questionnaire tool. Moreover, it also had unlimited questions, unlimited answers, and data exporting capabilities into Microsoft Excel™ format. The questionnaire was originally written in English and then translated into Portuguese. A languages professional checked the Portuguese translation.

In self-completion questionnaires, there is no understanding of the process or considerations that respondents made when filling it. Therefore the layout, instructions and questions must

[3] https://www.typeform.com/help/how-to-run-an-ab-test-with-typeform/

be clear and easy to understand (Bickman & Rog, 1998; Churchill, 1995; Malhotra, 2010; May, 1993). As in previous brand extension research (e.g. Allman et al., 2015; C. Kim et al., 2001; Riley et al., 2015; Wiedmann et al., 2011), we performed a pre-test with a small sample of four Portuguese participants. The participants were asked to fill the questionnaire, in order to check for any difficulties, misunderstandings and other suggestions. This first step allowed getting feedback from respondents that helped to improve the questionnaire layout and the understanding of instructions and questions. The average filling time was of 10 minutes. After revising the initial questionnaire with these improvements, the final version of the questionnaire was distributed online, through e-mail messages and social media, including automotive-related social media groups in order to gather respondents who were more likely to be involved and enthusiastic about automotive brands. The questionnaire was available online between April and December of 2018. During this period, the questionnaire gathered 422 responses. In the final stage, though, the size of treatment groups was not as evenly distributed as expected (N = 159 in the high-fit group, and N = 217 in the low-fit group). In order to even the group size, the low treatment version was disabled, thus collecting answers only on the high-fit version. In the end, an improved ratio was attained (N = 202 in the high-fit group, and N = 217 in the low-fit group).

The final version of the questionnaire comprised three main sections (see Appendix I). The first section provided an overview of the study purposes and a confidentiality note. Participants were also given a brief instruction about the questionnaire sections and an estimation of the time required for completing the questionnaire. Afterwards were measured the BMW brand familiarity, automotive familiarity, BMW status, automotive ownership status, innovativeness, need for status, and BMW brand attitude. Then, participants were asked to choose between two identical buttons: each button would follow to a different treatment creating two randomized groups (i.e. one group exposed to the high-fit treatment, and the other group exposed to the low-fit treatment), accompanied by the following text, based on Riley et al. (2013): "BMW is considering the introduction of a new supermini two-seater car model". The second section collected the participants' perceptions on the brand extension, which were dependent on the treatment they have been exposed to earlier. This section measured the brand extension attitude, extension perceived fit, extension perceived value, and extension purchase intention. Finally, in the last section of the questionnaire, participants were inquired about their demographic characteristics, such as age, country of

residence, gender, occupation, and education and income level. The data analysis employed two statistical analysis software. First, the data was analysed resorting to the software IBM® SPSS® 21 (hereafter SPSS). The SPSS was used to perform the exploratory factor analysis (EFA), the one-way analysis of variance (ANOVA), the one-way multivariate analysis of variance (MANOVA), and the moderation analysis through hierarchical linear regression. The software IBM® SPSS® AMOS 21 (hereafter AMOS) was used to run the confirmatory factor analysis (CFA) and the structural equations modelling (SEM).

# Chapter 5 - Analysis and Discussion of Results

## 5.1 Introduction

This chapter analyses the data collected through the online questionnaire and discusses the results obtained. First, a descriptive analysis of the sample profile is presented, which comprises demographic elements, but also extra information such as the owned vehicle brand and age. After, a factor and reliability analysis assessed the measurement instruments, followed by a treatment comparison between the samples, and a structural equation model testing of the conceptual model. The chapter follows with an ownership and moderation analysis and ends with a discussion of the results.

## 5.2 Sample profile

From 422 participants, we obtained a final sample of 419 valid questionnaires. Three cases were removed due to incomplete answers or filling of the requested fields with nonsense data. From the 419 questionnaires used in the main analysis, fourteen of the respondents missed filling the demographic data at the end of the survey. Hence, the demographic data analysis refers to 406 respondents. Of these, 158 were employed, 179 were students, 44 were both employed and students, and 25 were neither employed nor students. The sample was composed of 187 males (46.1%), and 219 females (53.9%). Ages ranged from 18 to 65 years old, with 36.5 % (N = 148) between 18 and 25 years old, 32.0% (N = 130) between 26 and 35 years old, 15.0% (N = 61) between 36 and 45 years old, 11.8 % (N = 48) between 46 and 55 years old, and 4.7% (N = 19) aged 56 years old and/or older. Regarding education, 0.7% (N = 23) of the respondents had an elementary level, 20.9% (N = 85) had a high school or professional training, 5.7% (N = 23) were undergraduates, 32.8% (N = 133) had a bachelor's degree, 32.5% (N = 132) had a master's degree and 7.4% (N = 30) had a doctoral degree. About 78.4% of the respondents had a university degree. After-tax monthly income ranged from up to €1,000 (N = 212; 53.2%), €1,000 to €1,500 (N = 97; 23.9%), €1,500 to €2,500 (N = 55; 13.5%), and over €2,500 (N = 42, 10.3%).

As showed in Table 13, the sample presented a wide array of owned car brands: about 22.4% (N = 91) of the respondents owned a premium brand and 77.6% (N = 315) owned a value

brand. Respondents were also asked about the age of the car they owned. Only 387 informed about the year of their car manufacture: 19.6% (N = 76) of the cars were manufactured in 2000 or before, 46.8% (N = 181) were manufactured between 2000 and 2010, and 33.6% (N = 130) were manufactured in 2010 or later.

Table 13 – Distribution of automobile brands in the sample

| Brand | Number of owners (participants) | Percent (%) |
|---|---|---|
| Alfa Romeo | 5 | 1.20 |
| Audi | 16 | 3.90 |
| BMW | 35 | 8.60 |
| Chevrolet | 1 | 0.20 |
| Citroen | 18 | 4.40 |
| Dacia | 2 | 0.50 |
| Fiat | 13 | 3.20 |
| Ford | 23 | 5.70 |
| Honda | 11 | 2.70 |
| Hyundai | 6 | 1.50 |
| Kia | 3 | 0.70 |
| Lancia | 2 | 0.50 |
| Lexus | 1 | 0.20 |
| Mazda | 9 | 2.20 |
| Mercedes-Benz | 23 | 5.70 |
| Mini | 5 | 1.20 |
| Mitsubishi | 8 | 2.00 |
| Nissan | 6 | 1.50 |
| Opel | 46 | 11.30 |
| Peugeot | 36 | 8.90 |
| Range Rover | 1 | 0.20 |
| Renault | 39 | 9.60 |
| Seat | 26 | 6.40 |
| Skoda | 3 | 0.70 |
| Smart | 3 | 0.70 |
| Suzuki | 1 | 0.20 |
| Toyota | 27 | 6.70 |
| Volkswagen | 30 | 7.40 |
| Volvo | 7 | 1.70 |

## 5.3 Factor and reliability analysis

An exploratory factor analysis (EFA) offers a preliminary structure that aims to explore the data, providing cues that help to interpret and complement the theory. Factors are formed based on a set of highly correlated items, allowing the possibility of discovering

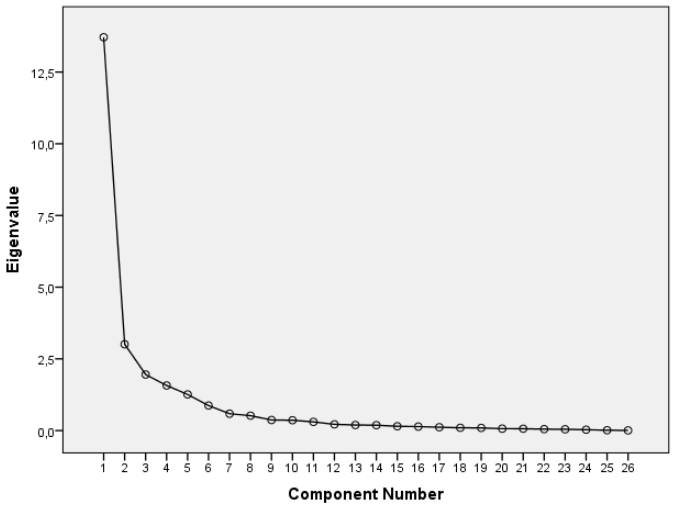
underlying structures that were not predicted before. These might result in variations of the original constructs or even contaminants that may otherwise have gone unnoticed (Hair, Black, Babin, Anderson, & Tatham, 2006). As per Gorsuch (1997), an EFA is necessary to properly evaluate the items, and provide a more complete examination of scale homogeneity rather than using solely the Cronbach's alpha. This knowledge can consequently serve to validate the new variable structure and reduce the number of components to ease the data analysis.

According to the research design, the sample was divided into two samples: one corresponding to the group exposed to the high-fit treatment (N = 202) and one corresponding to the group exposed to the low-fit treatment (N = 217). The size of the samples was considered acceptable, when compared to the recommendations from Comrey and Lee (1992) of 50 (very poor), 100 (poor), 200 (fair), 300 (good), 500 (very good), and 1000 (excellent). Fabrigar et al. (1999) pointed out that a size of at least 200 is usually recommended. Everitt (1975) and Nunally (1978) additionally suggested a case-to-variable ratio of 10 to 1, meaning that for every item, at least 10 cases should exist. The samples used in this study have a ratio of 7.77 to 1 for the high-fit group and 8.35 to 1 for the low-fit group, respectively. Nevertheless, ratios of 5 to 1 and even 3 to 1 have been used before in research (Gorsuch, 1997).

In this study, the EFA used the principal components method and the rotated correlation matrix using orthogonal Varimax method, the most commonly used rotation method in research according to Fabrigar et al. (1999) and Henson & Roberts (2006). This test was configured to output a factor solution with a minimum latent root (eigenvalue) of 1, known as Kaiser criterion (Fabrigar et al., 1999; Kaiser, 1960). The EFA generated a first solution comprised of five factors in both groups, with the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy result of 0.904 and 0.918 for the high-fit and the low-fit group, respectively. The Bartlett's tests of Sphericity were significant ($p < .001$), which means that the correlation matrixes were not identical to the identity matrix with the diagonal elements equal to one and the diagonal elements equal to zero.

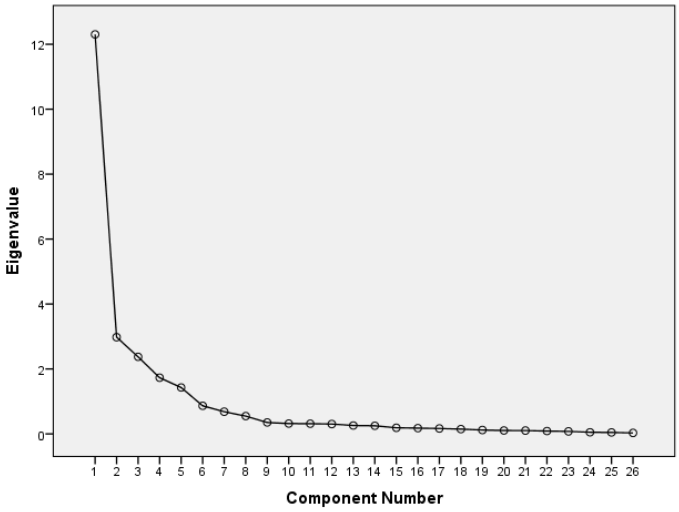
As recommended by Fabrigar et al. (1999) and by Hair et al. (2006), a complement in the form of a scree plot test was performed to identify the optimal number of factors (see Figure 8 and Figure 9). Typically, the ideal number of factors should be set at the point where the

line starts to take a horizontal orientation, that is, when a scree is formed (Cattell & Vogelmann, 1977; Churchill, 1995). However, multiples screes were detected in the plots. Although scree plots may work well with strong factors, they are known for being subjective and ambiguous when multiple breaks are present, so it is recommended to choose the final number of factors based on the criterion of Eigenvalues greater than 1 (Cattell & Vogelmann, 1977; Fabrigar et al., 1999; Hayton, Allen, & Scarpello, 2004).




Source: SPSS output

Figure 8 - EFA Scree plot for high-fit group




Source: SPSS output

Figure 9 – EFA Scree plot for low-fit group

As per the recommendation in EFA reporting from Henson & Roberts (2006), the results were arranged in a full matrix with the communalities and eigenvalues (see Table 14). According to Hair et al. (2006) factor loadings of .300 to .400 can be acceptable; however, .500 should be considered the minimum acceptable for practical significance. From the analyses of the factor loadings, four constructs emerged for both high-fit and the low-fit groups: the parent brand attitude (PB) (Factor 5), the perceived fit (PFIT) (Factor 2), the perceived price value (PPV) (Factor 3 in the high-fit group, or Factor 4 in the low-fit group), and the perceived social value (PSV) (Factor 4 in the high-fit group, or Factor 3 in the low-fit group). The initial constructs of extension attitude (EXAT), perceived emotional value (PEV) and purchase intention (PI) formed a single factor construct (Factor 1). All of the communalities are above .700, confirming a good solution for this structure according to Fabrigar et al. (1999). This EFA solution explained 82.8% and 80.0% of the variance in the high-fit and low-fit groups, respectively. According to Hair et al. (2006), an explained variance of about 60.0% is considered satisfactory in social research, and other researchers point to 75.0% as the minimal level to be achieved (Henson & Roberts, 2006).

Table 14 –EFA results

| Variable | | High-fit | | | | | | Low-fit | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Factor loadings | | | | | C | Factor loadings | | | | | C |
| | | 1 | 2 | 3 | 4 | 5 | | 1 | 2 | 3 | 4 | 5 | |
| PB | Item 1 | .060 | .035 | .029 | .082 | *.990* | .992 | .013 | -.009 | -.033 | .111 | *.930* | .879 |
| | Item 2 | .054 | .038 | .049 | .077 | *.989* | .991 | .032 | .054 | .055 | .178 | *.892* | .834 |
| | Item 3 | .047 | .023 | .030 | .081 | *.988* | .987 | .018 | .011 | .010 | .139 | *.898* | .827 |
| EXAT | Item 1 | *.631* | .556 | .220 | .167 | .093 | .792 | *.685* | .531 | .239 | .056 | .016 | .812 |
| | Item 2 | *.594* | .581 | .266 | .147 | .017 | .782 | *.593* | .516 | .184 | .123 | .177 | .698 |
| | Item 3 | *.622* | .536 | .217 | .171 | -.038 | .753 | *.581* | .642 | .203 | .022 | .060 | .795 |
| PFIT | Item 1 | .227 | *.851* | .051 | .178 | .004 | .810 | .313 | *.777* | .167 | .165 | .019 | .757 |
| | Item 2 | .246 | *.855* | .054 | .219 | .088 | .850 | .272 | *.757* | .133 | .114 | -.035 | .680 |
| | Item 3 | .371 | *.708* | .262 | .138 | -.038 | .728 | .188 | *.775* | .014 | .230 | .016 | .689 |
| | Item 4 | .398 | *.755* | .210 | .120 | .081 | .794 | .271 | *.796* | .074 | .249 | .010 | .774 |
| PEV | Item 1 | *.812* | .338 | .245 | .182 | .019 | .867 | *.830* | .344 | .197 | .102 | .030 | .857 |
| | Item 2 | *.813* | .313 | .243 | .225 | -.043 | .870 | *.842* | .333 | .195 | .158 | .073 | .887 |
| | Item 3 | *.631* | .292 | .421 | .039 | .058 | .665 | *.612* | .453 | .185 | .186 | .072 | .653 |
| | Item 4 | *.731* | .250 | .312 | .301 | -.001 | .785 | *.713* | .366 | .281 | .142 | .082 | .747 |
| | Item 5 | *.747* | .252 | .278 | .331 | .066 | .813 | *.693* | .377 | .333 | .141 | .076 | .758 |
| PPV | Item 1 | .322 | .099 | *.818* | .176 | .005 | .814 | .294 | .182 | .078 | *.815* | .119 | .804 |
| | Item 2 | .415 | .231 | *.771* | .224 | .072 | .876 | .290 | .229 | .175 | *.817* | .160 | .860 |
| | Item 3 | .355 | .266 | *.772* | .231 | -.011 | .847 | .285 | .258 | .142 | *.838* | .103 | .881 |
| | Item 4 | .139 | .068 | *.818* | .174 | .074 | .728 | .146 | .121 | .152 | *.808* | .250 | .775 |
| PSV | Item 1 | .334 | .177 | .174 | *.795* | .040 | .807 | .225 | .104 | *.882* | .129 | .028 | .857 |
| | Item 2 | .282 | .207 | .172 | *.862* | .135 | .913 | .202 | .126 | *.911* | .070 | -.007 | .891 |
| | Item 3 | .312 | .244 | .333 | *.689* | .018 | .743 | .242 | .136 | *.818* | .131 | -.022 | .764 |
| | Item 4 | .214 | .123 | .163 | *.869* | .128 | .859 | .150 | .106 | *.848* | .138 | .041 | .774 |
| PI | Item 1 | *.814* | .230 | .178 | .271 | .096 | .830 | *.823* | .145 | .115 | .363 | -.055 | .846 |
| | Item 2 | *.799* | .216 | .176 | .262 | .146 | .807 | *.841* | .110 | .093 | .360 | -.055 | .861 |
| | Item 3 | *.826* | .194 | .159 | .252 | .056 | .812 | *.829* | .124 | .157 | .343 | -.051 | .848 |
| Initial eigenvalues | | 13.71 | 3.05 | 1.96 | 1.57 | 1.26 | - | 12.30 | 2.98 | 2.37 | 1.73 | 1.43 | - |
| Rotation sums of square loadings | | 7.11 | 4.31 | 3.58 | 3.47 | 3.05 | . | 6.72 | 4.36 | 3.61 | 3.47 | 2.65 | - |

C: communalities
PB: parent brand attitude
EXAT: extension attitude
PFIT: perceived fit
PEV: perceived emotional value
PPV: perceived price value
PSV: perceived social value
PI: purchase intention

In this solution, four out of the initial constructs were preserved as individual factors, while three other constructs were merged into a single factor. This was not the ideal outcome; however, researchers have noted that EFA's primary goal is to identify latent constructs through the understanding of the structure of correlations among measured variables when little prior theory and empirical research is available (Anderson & Gerbing, 1988; Fabrigar et al., 1999; Gorsuch, 1997). Consequently, the final choice of factors "depends on the researcher's assessment of its interpretability and scientific utility" (Tabachnick & Fidell, 1996, p. 636). Fabrigar et al. (1999) and Henson & Roberts (2006) also backed up this stance by stating that the final choice ultimately depends on the researcher's decisions and

definition. In the same vein, Hair et al. (2006) further acknowledged that choosing the factors is subject to interpretation, provided that the following recommendations are respected: (1) keeping an eigenvalue of at least 1, (2) a predetermined number of factors based on the research objectives and reviewed literature, and (3) an explained variance of at least 60%. Taking into account all of these recommendations, the final solution was designed in a seven-factor dimensional structure, corresponding to the seven previously identified constructs in the literature review. Finally, a scale reliability analysis through Cronbach's alpha was performed, outputting coefficients with values ranging from .900 to .995 for both sample groups (see Table 15). As the generally agreed lower limit for Cronbach's alpha is 0.700 (Hair et al., 2006; Pestana & Gageiro, 2005), all the scales passed the test for both groups. Items from each scale were averaged into a latent variable before proceeding with the statistical analysis.

Table 15 – Mean, Standard Deviations, and Cronbach's α of the Variables

| Variable | High-fit | | | Low-fit | | |
|---|---|---|---|---|---|---|
| | **Mean** | **Standard deviation** | **Cronbach's α** | **Mean** | **Standard deviation** | **Cronbach's α** |
| PB | 5.55 | 6.68 | .995 | 5.06 | 1.50 | .913 |
| EXAT | 3.72 | 1.69 | .949 | 3.38 | 1.58 | .930 |
| PFIT | 3.80 | 1.53 | .916 | 3.48 | 1.34 | .900 |
| PEV | 3.26 | 1.80 | .953 | 3.12 | 1.72 | .949 |
| PPV | 3.70 | 1.63 | .920 | 4.11 | 1.63 | .934 |
| PSV | 2.22 | 1.39 | .926 | 2.06 | 1.29 | .924 |
| PI | 2.35 | 1.56 | .982 | 2.50 | 1.64 | .985 |

PB: parent brand attitude
EXAT: extension attitude
PFIT: perceived fit
PEV: perceived emotional value
PPV: perceived price value
PSV: perceived social value
PI: purchase intention

## 5.4 Treatment analysis

In order to validate the treatment effectiveness, we compared the means of the two groups (one exposed to the high-fit version of the treatment, and the other exposed to the low-fit version), as per the recommendations of other experimental studies (e.g. Allman et al., 2015; C. Kim et al., 2001; Wang & Griskevicius, 2014). We used the one-way analysis of variance (ANOVA), and the one-way multivariate analysis of variance (MANOVA). An ANOVA tests the effect of a factor in a dependent variable by comparing the dependent

variable means on each factor category, or group, whereas a MANOVA allows to test the effects of two or more independent variables simultaneously (Hair et al., 2006). In this case, the factor corresponded to the version of the advertisement (high-fit or low-fit), and the dependent variables to the extension evaluation variables (PFIT, EXAT, PEV, PPV and PSV). Although a one-way ANOVA could be used to test the differences individually, it is more vulnerable to Type I errors, in which the null hypothesis is wrongly rejected, leading to the false conclusion that the means are different when they are actually not (Hair et al., 2006). Additionally, in cases where the number of dependent variables is low, the statistical power of the MANOVA can be equal or superior to that of the ANOVA (Cole, Maxwell, Arvey, & Salas, 1994).

First, the assumptions of the ANOVA and of the MANOVA were tested (Hair et al., 2006; Pestana & Gageiro, 2005). The independence of observations was guaranteed by the research design as each participant was only exposed to a single treatment version, hence, no respondents were present in both groups at the same time. The assumption of normal distribution was accessed through the Kolmogorov-Smirnov and Shapiro-Wilk normality tests. Unfortunately, these tests failed in both of the samples to assure the significance of normality distribution. However, the normality of the data can still be accepted providing the data is not heavily skewed (Glass, Peckham, & Sanders, 1972; Hair et al., 2006). The skewness values of the variables in each sample varied between -2 and +2 (see Table 16), which was acceptable according to previous research (Field, 2009; George & Mallery, 2009; Gravetter & Wallnau, 2013; Trochim & Donnelly, 2006). The equality of variances was assessed by Levene's tests for all the five variables. As all tests were non-significant (p-value > .05), no significant difference in the variance matrices existed (see Table 16). For the MANOVA, the equality of the covariances was checked with the Box's M test. As this test was also non-significant (Box's M = 19.5, p = .202), no significant differences in the covariance matrices existed. The assumption of correlation among all dependent variables was tested by means of Bartlett's test for sphericity – the test was significant ($\chi^2$ (10) = 1145.1, p < .001), meaning that intercorrelation does exist. The final assumption deals with the presence of extreme points, i.e. the outliers. This assumption was checked by observation of the boxplots – no outliers were detected in any of the variables in the groups.

Table 16 – ANOVA and MANOVA assumptions testing

| Variable | Group | Skewness | Std error | Mean | Levene p-value |
|---|---|---|---|---|---|
| PFIT | High-fit | .101 | .171 | 3.802 | .056 |
| | Low-fit | .351 | .166 | 3.482 | |
| EXAT | High-fit | .137 | .171 | 3.721 | .517 |
| | Low-fit | .226 | .166 | 3.380 | |
| PEV | High-fit | .493 | .171 | 3.257 | .859 |
| | Low-fit | .465 | .166 | 3.119 | |
| PPV | High-fit | .061 | .171 | 3.699 | .785 |
| | Low-fit | -.134 | .166 | 4.108 | |
| PSV | High-fit | 1.286 | .171 | 2.217 | .370 |
| | Low-fit | 1.227 | .166 | 2.063 | |

PFIT: perceived fit
EXAT: extension attitude
PEV: perceived emotional value
PPV: perceived price value
PSV: perceived social value

The null hypothesis was also verified: this hypothesis states that the mean of all the dependent variables is equal in all levels of the independent variable, i.e. the means are equal across factor groups (Weinfurt, 2000). If the test shows significance (p-value < .05), the null hypothesis is rejected, meaning that there exist differences in the dependent variables. The Hotelling's $T^2$, in particular, allows testing the statistical significance of the differences of the means between two groups (Hair et al., 2006). The output of this test was significant ($F = 5.47$, $p < .005$), confirming that differences among the means of the dependent variables exist. Hence, we could follow on to assess these differences in more detail.

After meeting all of the assumptions came the testing of the differences between groups using the ANOVA and MANOVA (see Table 17). As expected, the means of the PFIT ($F = 5.202$, $p = .023$), and EXAT ($F = 4.562$, $p = .033$), were higher for the high-fit than the low-fit version, and the difference was significant at a .05 level. This was particularly pertinent as it validated the treatment, confirming that the high fit recommendations from the literature were indeed correct. The PPV was also significantly different for the two vehicle versions at a statistically level ($F = 6.567$, $p = .011$), being higher for the low-fit extension (i.e. the cheaper version). The PEV ($F = 0.652$, $p = .420$), and PSV ($F = 1.381$, $p = .241$), however, were not different between the groups at a statistically significant level.

Table 17 – ANOVA and MANOVA between treatment groups

| Variable | ANOVA | | MANOVA | |
|---|---|---|---|---|
| | F | p-value | F | p-value |
| PFIT | 5.202 | .023 | 5.202 | .023 |
| EXAT | 4.562 | .033 | 4.562 | .033 |
| PEV | 0.652 | .420 | 0.652 | .420 |
| PPV | 6.567 | .011 | 6.567 | .011 |
| PSV | 1.381 | .241 | 1.381 | .241 |

PFIT: perceived fit
EXAT: extension attitude
PEV: perceived emotional value
PPV: perceived price value
PSV: perceived social value

## 5.5 Model assessment

Structural equations modelling (SEM) offers great potential for theory development and construct validation in the social sciences (Anderson & Gerbing, 1988; Fornell & Larcker, 1981). A structural equations model is a linear model that establishes the relationships among variables and is composed of two parts: the measurement model and the structural model.

There are several recommendations and techniques about the minimal size of the sample in order to perform a successful SEM analysis. Generally, the literature points to N = 200 as minimum sample size (Fabrigar, Porter, & Norris, 2010; Hoogland & Boomsma, 1998). Nevertheless, Iacobucci (2010) notes that this rule of thumb can be conservative and over-simplistic. For example, the number of items per construct is also relevant, as models with few indicators per construct (e.g. 3 to 4) could function well with a sample of at least N = 100 (Iacobucci, 2010; Marsh & Hau, 1996; Schermelleh-Engel, Moosbrugger, & Müller, 2003).

There are mathematical methods available to calculate the minimum sample size: Westland (2010) proposed the formula that estimates the sample size (N) based on the number of items (p) and the number of latent variables (f) in the model, displayed in Equation (1). In this study, the conceptual model included 26 items and 7 latent variables. According to Equation (1), the minimal number of participants in the sample should be around 119. The high-fit

sample contained 202 participants and the low-fit sample contained 217 participants. Hence, both samples were considered adequate for SEM analysis.

$$N \geq 50 * \left(\frac{p}{f}\right)^2 - 450 * \left(\frac{p}{f}\right) + 1100 \quad (1)$$

### 5.5.1 Measurement model

Before testing the relationships in the structural model, one must access the validity, reliability and fit level of the measurement model (Anderson & Gerbing, 1988; Fornell & Larcker, 1981). Measurement models define how the latent variables are operationalized from the observed variables or items. It is important that measurement models bring valuable insight into the structure and interrelationships among variables, as measurement models with poor fit can lead to inaccurate conclusions about the existence and magnitude of these associations (Segars, 1997).

We performed a confirmatory factor analysis (CFA) to assess reliability, convergent validity, and discriminant validity, and to evaluate how well the theoretical measurement model fitted the correlational structure among the items (Bollen, 1989; Fornell & Larcker, 1981; Segars, 1997). Factorial validity was assessed by examining the standardized factorial weights, or loadings, which should be above .500 (Hair et al., 2006; Marôco, 2014). Construct reliability assesses if the items are sufficiently represented by their respective constructs (Segars, 1997) and should typically be higher than .700 according to Joreskog & Sorbom (1989). Standardized loadings and constructs' reliabilities over than .500 and .700, respectively, confirmed factorial validity and construct reliability (see Table 18).

Convergent validity takes place when the items from each construct are well inter-correlated, thus contribute in explaining the construct (Fornell & Larcker, 1981; Hair et al., 2006). According to Fornell & Larcker (1981), convergent validity can be verified through the average variances extracted (AVE), which indicate the amount of variance that is captured by the construct in relation to the amount of variance due to measurement errors, and should be higher than .500. In this study, the value obtained for each AVE was above .500, which confirmed convergent validity in constructs for both groups (see Table 18).

Table 18 – Validity and reliability tests

| Variable | Item code | Standardized loading | | Cronbach's α | | AVE | |
|---|---|---|---|---|---|---|---|
| | | High-fit | Low-fit | High-fit | Low-fit | High-fit | Low-fit |
| PB | brand_att_3 | .989 | .857 | .996 | .914 | .987 | .721 |
| | brand_att_2 | .995 | .862 | | | | |
| | brand_att_1 | .996 | .930 | | | | |
| PFIT | Fit_4 | .903 | .735 | .915 | .886 | .729 | .666 |
| | Fit_3 | .866 | .651 | | | | |
| | Fit_2 | .838 | .890 | | | | |
| | Fit_1 | .805 | .952 | | | | |
| EXAT | extension_att_3 | .899 | .922 | .950 | .931 | .865 | .817 |
| | extension_att_2 | .935 | .843 | | | | |
| | extension_att_1 | .955 | .944 | | | | |
| PEV | perceived_emotional_value_4 | .894 | .862 | .953 | .948 | .802 | .787 |
| | perceived_emotional_value_3 | .766 | .772 | | | | |
| | perceived_emotional_value_2 | .961 | .972 | | | | |
| | perceived_emotional_value_1 | .936 | .946 | | | | |
| | perceived_emotional_value_5 | .909 | .869 | | | | |
| PPV | perceived_price_value_4 | .705 | .789 | .912 | .936 | .748 | .785 |
| | perceived_price_value_3 | .911 | .955 | | | | |
| | perceived_price_value_2 | .959 | .919 | | | | |
| | perceived_price_value_1 | .863 | .872 | | | | |
| PSV | perceived_social_value_4 | .871 | .807 | .929 | .929 | .768 | .766 |
| | perceived_social_value_3 | .793 | .803 | | | | |
| | perceived_social_value_2 | .963 | .955 | | | | |
| | perceived_social_value_1 | .870 | .925 | | | | |
| PI | ext_PI_3 | .978 | .984 | .982 | .985 | .948 | .957 |
| | ext_PI_2 | .957 | .975 | | | | |
| | ext_PI_1 | .985 | .975 | | | | |

PB: parent brand attitude
PFIT: perceived fit
EXAT: extension attitude
PEV: perceived emotional value
PPV: perceived price value
PSV: perceived social value
PI: purchase intention

To test discriminant validity, we first checked if the constructs' inter-correlations were significantly different from one in both sample groups (Anderson & Gerbing, 1988). That is, if the constructs defined by a set of items were distinct between them (Marôco, 2014). According to the AMOS software output, all of the inter-correlations were statistically different from one. We also tested discriminant validity by comparing the AVE of each

construct with the shared variance between constructs, as per the instructions from Fornell & Larcker (1981). In this test, the matrices of the squared constructs inter-correlations with the AVE value in the second row (see Table 19 and Table 20) showed that the AVE values were always greater than any of the shared variances in the same column, thus fully supporting discriminant validity for both treatment groups (Fornell & Larcker, 1981; Segars, 1997).

Table 19 - Matrix of Squared Constructs Inter-correlations and Construct Extracted Variance for the high-fit group

| | **PB** | **EXAT** | **PFIT** | **PEV** | **PSV** | **PPV** | **PI** |
|---|---|---|---|---|---|---|---|
| **AVE** | **.987** | **.865** | **.729** | **.802** | **.768** | **.748** | **.948** |
| PB | 1 | | | | | | |
| EXAT | .017 | 1 | | | | | |
| PFIT | .014 | .645 | 1 | | | | |
| PEV | .010 | .741 | .501 | 1 | | | |
| PSV | .049 | .310 | .258 | .383 | 1 | | |
| PPV | .015 | .417 | .314 | .500 | .318 | 1 | |
| PI | .026 | .497 | .407 | .651 | .335 | .391 | 1 |

PB: parent brand attitude
EXAT: extension attitude
PFIT: perceived fit
PEV: perceived emotional value
PSV: perceived social value
PPV: perceived price value
PI: purchase intention

Table 20 - Matrix of Squared Constructs Inter-correlations and Construct Extracted Variance for the low-fit group

| | **PB** | **EXAT** | **PFIT** | **PEV** | **PSV** | **PPV** | **PI** |
|---|---|---|---|---|---|---|---|
| **AVE** | **.721** | **.817** | **.666** | **.787** | **.766** | **.785** | **.957** |
| PB | 1 | | | | | | |
| EXAT | .006 | 1 | | | | | |
| PFIT | .007 | .564 | 1 | | | | |
| PEV | .01 | .766 | .397 | 1 | | | |
| PSV | .001 | .215 | .138 | .225 | 1 | | |
| PPV | .081 | .244 | .231 | .306 | .118 | 1 | |
| PI | .003 | .442 | .304 | .612 | .159 | .329 | 1 |

PB: parent brand attitude
EXAT: extension attitude
PFIT: perceived fit
PEV: perceived emotional value
PPV: perceived price value
PSV: perceived social value
PI: purchase intention

When evaluating the model fit, two methods emerge from the literature: the chi-square statistic and the fit indices (Hu & Bentler, 1999). In SEM, the chi-square compares the goodness of fit between the covariance matrix for the observed data and covariance matrix derived from the model (Fornell & Larcker, 1981; Hair et al., 2006). The null hypothesis claims that the population's covariance matrix is not statistically different from the model's estimated covariance matrix (Marôco, 2014; Segars, 1997). In this study, the chi-square test results of the measurement model were 896 ($df = 278$, $p < .001$) for the high-fit group and 685 ($df = 278$, $p < .001$) for the low-fit group. As both tests were significant ($p < .05$), the null hypothesis was rejected. However, the significance of the chi-squared test should not be used as a single basis to assess fit, in part due to sensitivity to sample size and complexity of the model (Fornell & Larcker, 1981; Hu & Bentler, 1999; Schreiber, Nora, Stage, Barlow, & King, 2006). In fact, the chi-square test will usually fail to prove a good fit, even in modest sample sizes (Iacobucci, 2010).

Due to the limitations of the chi-square, the use of fit indices instead is recommended (Schermelleh-Engel et al., 2003). More specifically, Bagozzi (2010) recommends four indices: the Tucker-Lewis Index (TLI), the Comparative Fit Index (CFI), the Standardized Root Means Residual (SRMR) and the Root Mean Square Error of Approximation (RMSEA). On the other hand, Iacobucci (2010) recommends to use solely two items: the CFI and the SRMR, and discards the RMSEA over a tendency to reject true models with samples under $N < 250$ and a high number of variables. Taking into account these recommendations, this study analysed the TLI, the CFI and the SRMR (see Table 21).

Table 21 – Measurement model fit indices

| **Fit Index** | **Treatment groups** | |
|---|---|---|
| | **High-fit** | **Low-fit** |
| TLI | .905 | .926 |
| CFI | .919 | .937 |
| SRMR | .052 | .056 |

TLI: Tucker-Lewis Index
CFI: Comparative Fit Index
SRMR: Standardized Root Means Residual

When assessing the fit quality, Bagozzi (2010) recommends using the value criteria from Hu & Bentler (1999), except for the SRMR, which should be equal or under .070 instead of .080

(Bagozzi, 2010) and ideally as low as possible (Iacobucci, 2010). Both the TLI and CFI values should be equal or above .950 for a very good fit (Hu & Bentler, 1999; Marsh & Hau, 1996; Tanaka & Huba, 1985) although above or equal to .900 is also pointed as acceptable (Schermelleh-Engel et al., 2003). In this study, the TLI and CFI levels of fit were found acceptable, as did the SRMR (see Table 21). Although other fit indices in the software output might cast doubts over the model fit, Fabrigar et al. (2010) note that fit indices do not always agree. Furthermore, it is expected that in general, if the "majority of the indices indicate a good fit, then there is probably a good fit" (Schreiber et al., 2006, p. 327). Therefore, no modifications were applied to the original measurement model as it is preferable do not modify an acceptable model because the modifications may simply be fitting idiosyncratic characteristics of the sample (MacCallum, Browne, & Sugawara, 1996).

### 5.5.2 Structural model

After assuring the quality of the measurement model, the evaluation of the plausibility of the structural model using the same fit indices and reference values takes place (Joreskog & Sorbom, 1993; Marôco, 2014). The fit indices of the global model (composed by the measurement model and structural model) depend mostly on the measurement model and slightly on the structural model, hence, it is not expected to see major changes in the fit indices (Mulaik et al., 1989).

In this study, the indices of the structural models in both groups were only slightly worse when compared to the measurement models (see Table 22). This outcome was coherent with the expectations from Mulaik et al. (1989) when passing from a good fit measurement model into the structural model. Nevertheless, all of the indices managed to keep at an acceptable level of fit, in both groups.

Table 22 – Structural model fit indices

| Fit Index | Treatment groups | |
|---|---|---|
| | High-fit | Low-fit |
| TLI | .900 | .924 |
| CFI | .913 | .934 |
| SRMR | .072 | .066 |

TLI: Tucker-Lewis Index
CFI: Comparative Fit Index
SRMR: Standardized Root Means Residual

Next followed the testing of the hypothesis in the structural model (see Table 23, Figure 10, and Figure 11). The PFIT was only statistically relevant in the path "PFIT → EXAT". The extension attitude was statistically relevant in all the paths towards perceived values: "EXAT → PEV", "EXAT → PPV" and "EXAT → PSV". The path "PEV → PI" was significant, but not the path "PPV→ PI" neither "PSV → PI". None of the paths with the PB as an independent variable were statistically significant. Concerning the explanatory power, the structural model had a value of 65.5% and 63.0% for the PI in the high-fit and the low-fit groups, respectively. The explained variance from the other variables was 36.5% for the PSV, 76.6% for the PEV, 45.7% for the PPV, and 65.0% for the EXAT in the high-fit group. In the low-fit group, the explained variance was 23.0% for the PSV, 77.8% for the PEV, 34.5% for the PPV, and 56.3% for the EXAT.

Table 23 - Model Hypotheses testing

| No. | Hypothesis | High-fit | | | | Low-fit | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | **Beta** | **t** | **p-value** | **Hypothesis supported** | **Beta** | **t** | **p-value** | **Hypothesis supported** |
| H1 | PB → EXAT | .033 | 0.682 | .495 | No | .016 | 0.307 | .759 | No |
| H2 | PFIT → EXAT | .802** | 13.329 | <.001 | Yes | .749** | 10.333 | <.001 | Yes |
| H3a | PB → PEV | -.012 | -0.314 | .754 | No | .031 | 0.793 | .428 | No |
| H3b | PB → PPV | .039 | 0.693 | .488 | No | .238** | 3.819 | <.001 | Yes |
| H3c | PB → PSV | .151* | 2.533 | .011 | Yes | .004 | 0.054 | .957 | No |
| H4a | EXAT → PEV | .850** | 9.985 | <.001 | Yes | .926** | 11.890 | <.001 | Yes |
| H4b | EXAT → PPV | .614** | 5.292 | <.001 | Yes | .356** | 3.360 | <.001 | Yes |
| H4c | EXAT → PSV | .483** | 4.208 | <.001 | Yes | .459** | 4.134 | <.001 | Yes |
| H5a | PFIT → PEV | .033 | 0.434 | .665 | No | -.064 | -0.991 | .322 | No |
| H5b | PFIT → PPV | .068 | 0.637 | .524 | No | .195* | 1.993 | .046 | Yes |
| H5c | PFIT → PSV | .099 | 0.872 | .383 | No | .027 | 0.257 | .797 | No |
| H6a | PEV → PI | .672** | 10.360 | <.001 | Yes | .662** | 11.008 | <.001 | Yes |
| H6b | PPV → PI | .101 | 1.772 | .076 | No | .214** | 4.138 | <.001 | Yes |
| H6c | PSV → PI | .128* | 2.422 | .015 | Yes | .022 | 0.455 | .649 | No |

PB: parent brand attitude
EXAT: extension attitude
PEV: perceived emotional value
PPV: perceived price value
PSV: perceived social value
PFIT: perceived fit
PI: purchase intention
*p-value < 0.05
**p-value < 0.01

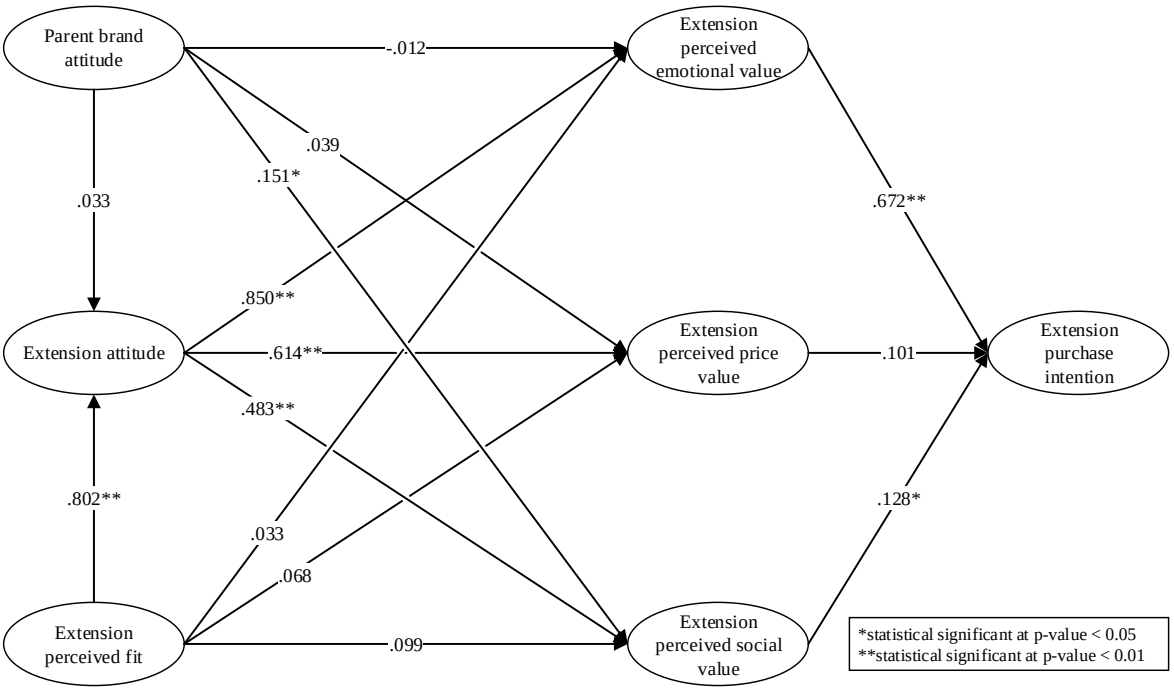



Figure 10 – Structural model for the high-fit group

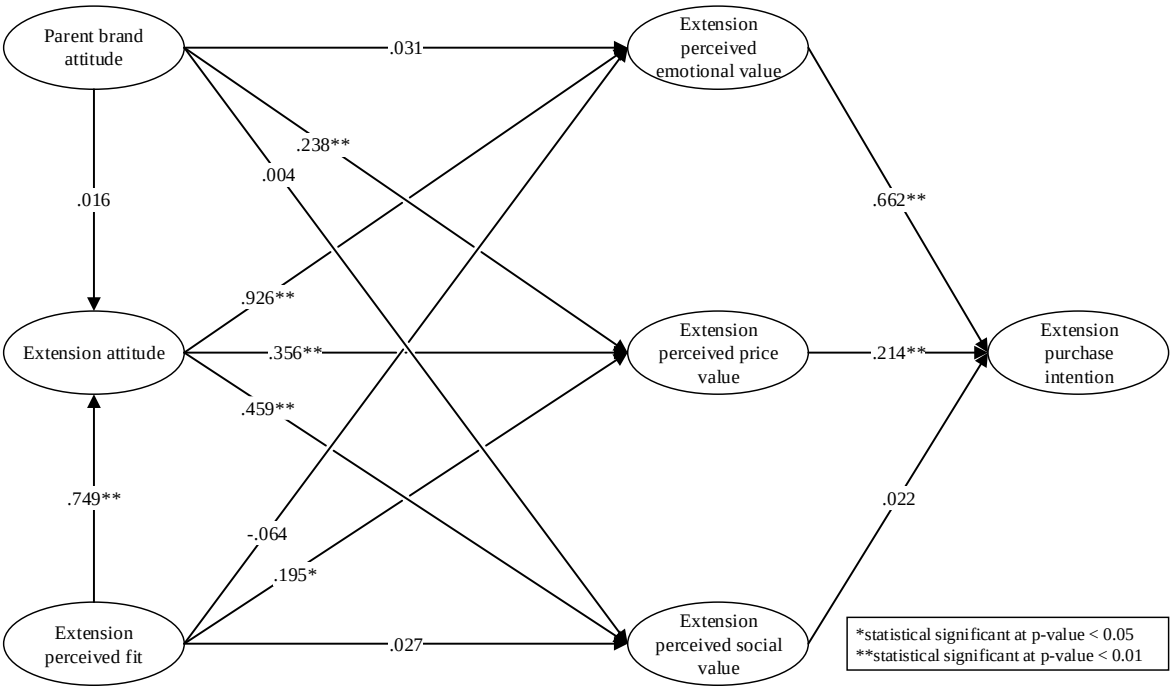



Figure 11 - Structural model for the low-fit group

## 5.6 Ownership analysis

In order to test the effect of the different ownership statuses, as suggested by Fu et al. (2009), the means of PFIT and EXAT were compared using the ANOVA and the MANOVA test in each owner category group. The analyses were conducted in two parts, switching the grouping factor: first by the brand ownership status (BMW and non-BMW), and after by the segment ownership status (premium and value). Before the tests, the assumptions of independence of observations, homoscedasticity, normality, correlation, and outliers were checked (Hair et al., 2006; Pestana & Gageiro, 2005).

First, in the grouping by brand ownership status, the assumption of independence of observations was verified as each participant responded to the questionnaire only once. The homoscedasticity assumption was tested by checking the equality of variances with a Levene's test and the equality of the covariances with a Box's M test. The homoscedasticity was supported for the high-fit group, as all Levene's tests were non-significant, as did the Box's M test (Box's M = 0.938, p = .826). In the low-fit group, however, the EXAT variable failed to support the equality of variances assumption, although the equality of covariances was confirmed (Box' M = 6.357, p = .108) (see Table 24). The assumption of correlation was confirmed through the Bartlett's test of sphericity in both the high-fit group ($\chi^2$ (1) = 164, p < .001), and the low-fit group ($\chi^2$ (1) = 155, p < .001). The assumption of normal distribution was accessed through the Kolmogorov-Smirnov and Shapiro-Wilk tests. These tests failed to prove normality distribution across all of the variables, however, the assumption was met as none of the skewness values was outside of the range -2 and +2 (see Table 24) (Field, 2009; George & Mallery, 2009; Gravetter & Wallnau, 2013; Trochim & Donnelly, 2006). No outliers were found in the boxplots, thus confirming the final assumption.

Second, in the grouping by segment ownership status, the assumption of the independence of observations was again verified as each participant gave one single response to the questionnaire. The equality of variances was confirmed in both fit groups, as all Levene's tests were non-significant. The equality of covariances failed to be supported in the high-fit group (Box's M = 11.364, p = .011), however, the analysis of variance is considered robust against violations of homoscedasticity in samples of at least N = 30 (Allen & Bennett, 2008). In the low-fit group the equality of covariances was confirmed (Box's M = 1.438, p = .703).

The assumption of correlation was confirmed through the Bartlett's test of sphericity in both the high-fit group ($\chi^2$ (1) = 164, p < .001), and in the low-fit group ($\chi^2$ (1) = 155, p < .001). The Kolmogorov-Smirnov and Shapiro-Wilk test also failed to prove normality distribution across all of the variables, and the assumption was sustained by checking that none of the skewness values were outside of the range -2 and +2 (see Table 24) (Field, 2009; George & Mallery, 2009; Gravetter & Wallnau, 2013; Trochim & Donnelly, 2006).

Table 24 – ANOVA and MANOVA assumptions testing

| Variable | Group | High-fit group | | | | Low-fit group | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Levene p-value | Skewness | Std error | Mean | Levene p-value | Skewness | Std error | Mean |
| PFIT | BMW owners | .701 | 0.82 | .524 | 3.68 | .066 | 0.29 | .536 | 3.63 |
| | BMW Non owners | | 0.05 | .180 | 3.81 | | 0.37 | .173 | 3.47 |
| EXAT | BMW owners | .977 | 0.49 | .524 | 3.79 | .014 | 0.42 | .536 | 3.31 |
| | BMW Non owners | | 0.11 | .180 | 3.71 | | 0.21 | .173 | 3.39 |
| PFIT | Premium owners | .931 | 0.30 | .330 | 3.65 | .269 | 0.50 | .361 | 3.19 |
| | Value Owners | | 0.04 | .198 | 3.85 | | 0.30 | .185 | 3.55 |
| EXAT | Premium owners | .759 | 0.31 | .330 | 3.67 | .146 | 0.59 | .361 | 3.12 |
| | Value Owners | | 0.08 | .198 | 3.74 | | 0.14 | .185 | 3.44 |

PFIT: perceived fit
EXAT: extension attitude

When testing the null hypothesis in the grouping by brand ownership status, the output of the Hotelling's T² test was not significant for the high-fit group (F = 0.29, p = .749), neither for the low-fit group (F = 0.39, p = .676), failing to prove the existence of differences among the means of the dependent variables. In coherence, the ANOVA and MANOVA results for the high-fit group indicated that neither PFIT (F = 0.12, p = .726) nor EXAT (F = 0.03, p = .853) were significantly different, as did the results for the low-fit group regarding PFIT (F = 0.22, p = .636) and EXAT (F = 0.03, p = .857).

When testing the null hypothesis in the grouping by segment ownership status, the output of the Hotelling's T² test was also not significant for the high-fit group (F = 0.45, p = .636) neither for the low-fit group (F = 1.26, p = .286), indicating that no differences among the means of the dependent variables existed. In the high-fit group, the ANOVA and MANOVA results indicated that the PFIT was not significantly different (F = 0.65, p = .420), neither the EXAT (F = 0.07, p = .788). In the low-fit group the results also failed to indicate any

significant difference regarding both the PFIT ($F = 2.53$, $p = .113$) and the EXAT ($F = 1.40$, $p = .238$).

## 5.7 Moderation

A moderation effect occurs when a third independent variable changes the strength of a relationship between an independent and dependent variable (Hair et al., 2006; Sharma, Durand, & Gur-Arie, 1981). To identify moderator variables, there are two basic methods: the subgroups analysis and the regression analysis. Regression analysis, in particular, allows to maintain the integrity of the sample and to control and measure the effects of the moderator variable (Sharma et al., 1981). In this study, a regression analysis in SPSS was performed in order to assess if innovativeness or need for status moderated the relationship between the PFIT and the EXAT, PEV, PPV and PSV.

In SPSS the hierarchical (or sequential) regression tool compares different regression models sequentially in order to determine whether the newly added variables show a significant change in the explained variance of the dependent variable. The first model tests the two independent centered variables separated (unmoderated); and the second model tests the effect of the compound variable formed by multiplying the independent variable and the moderator variable (Cohen, West, & Aiken, 2002; Edwards & Lambert, 2007; Iacobucci, 2009). If the difference between models is significant, then moderation exists (Sharma et al., 1981).

Innovativeness failed to prove as a statistically significant moderator in the relationships between PFIT and EXAT, PFIT and PEV, PFIT and PPV, and PFIT and PSV. The need for status, on the other hand, was found to have a significant and positive moderator effect on the relationship between the PFIT and the PSV, carrying an $R^2$ change of 5.4% and 6.3% for the high-fit and low-fit group, respectively. The $R^2$ of the relationship between PFIT and PSV hence raised from 45.2% to 50.6% in the high-fit group, and from 24.8% to 31.1% in the low-fit group under the moderator effect of the need for status. However, no moderator effect from the need for status was found in the relationship between PFIT and EXAT, PFIT and PEV or PFIT and PPV (see Table 25).

Table 25 – Moderation tests for innovativeness and need for status

| Relationship | Moderator | High-fit | | Low-fit | |
|---|---|---|---|---|---|
| | | R Square Change | Significance | R Square Change | Significance |
| Innovativeness | PFIT → EXAT | .000 | .686 | .001 | .529 |
| | PFIT → PEV | .001 | .611 | .003 | .307 |
| | PFIT → PPV | .010 | .102 | .004 | .309 |
| | PFIT → PSV | .002 | .425 | .003 | .392 |
| Need for status | PFIT → EXAT | .002 | .379 | .000 | .723 |
| | PFIT → PEV | .000 | .766 | .000 | .959 |
| | PFIT → PPV | .001 | .658 | .012 | .072 |
| | PFIT → PSV | .054 | .000* | .063 | .000* |

PFIT: perceived fit
EXAT: extension attitude
PEV: perceived emotional value
PPV: perceived price value
PSV: perceived social value
*p-value < .05

## 5.8 Summary of results

Hypotheses H1, H3a, H3b, and H3c stated that PB would be a positive antecedent of EXAT, PEV, PPV, and PSV. However, PB failed to have a significant relationship with any of these dependent variables across both samples, thus failing to confirm H1, H3a, H3b, and H3c respectively, in disagreement with previous research (Broniarczyk & Alba, 1994; Fedorikhin et al., 2008; Heath et al., 2011; Musante, 2007; Riley et al., 2015; Salinas & Pérez, 2009). The PFIT was also tested as an antecedent of EXAT, PEV, PPV, and PSV. Although the significant positive effect on EXAT, supporting H2, PFIT failed to act as an antecedent of PEV, PPV, and PSV, in contrast with previous research (Bottomley & Holden, 2001; Boush & Loken, 1991; Michel & Salha, 2005; Park et al., 1991; Riley et al., 2013; Smith & Andrews, 1995; Srivastava & Sharma, 2012), thus, failing to confirm H5a, H5b and H5c. Results confirmed a positive effect of EXAT on each one of the perceived value dimensions - PEV, PPV, and PSV - supporting H4a, H4b, and H4c. From the three perceived value dimensions, only PEV acted as an antecedent of PI in both groups thus supporting H6a, but rejecting H6b and H6c, against the literature review (Riley et al., 2015; Sweeney & Soutar, 2001). Ownership status failed to influence the PFIT, and also EXAT, failing to confirm H7a and H7b, and in contrast with previous research (Fu et al., 2009; Heath et al., 2011; Kirmani et al., 1999; Truong et al., 2008). Innovativeness failed to act as a moderator in the relationship between PFIT and EXAT, PFIT and PEV, PFIT and PPV, and PFIT and

PSV, thus rejecting H8a and H8b in contrast with the literature (Hem et al., 2003; Klink & Smith, 2001; Salinas & Pérez, 2009). The need for status was confirmed to act as a moderator in the relationship between PFIT and PSV, but not between PFIT and EXAT, PFIT and PEV, or PFIT and PPV, thus partially supporting H9.

# Chapter 6 - Conclusion

## 6.1 Introduction

Study 1 focused on the consumer reception of downward brand extensions in the case of the European premium automotive market, where variables such as perceived extension fit, profile traits, and ownership status were addressed. Study 1 followed an experimental design with two treatments – a high-fit extension and a low-extension. The experiment consisted of four groups of consumers: owners exposed to the high-fit extension; owners exposed to the low-fit extension; non-owners exposed to the high-fit extension; and non-owners exposed to the high-fit extension. A quantitative methodology comprising a number of statistical analysis tools supported the hypotheses tests. This study contributes with detailed insights on automotive brand extensions reception and details the norms and concepts that are part of well-received brand extensions. The next section summarizes the main results and presents the theoretical and practical contributions of the study. The last section presents the limitations of the study and proposes future research venues.

## 6.2 Theoretical contributions

Besides examining in detail the case of automotive extensions in a European context, thus updating existing research in this competitive and evolving market, this study contributes with several theoretical insights and thoughts on brand extensions. The three major areas of contribution of study are brand extension evaluation variables (parent brand attitude, perceived extension fit, and perceived extension value), the ownership moderator effect, the innovativeness moderator effect and the need for status moderator effect.

First, in contrast with the literature review, parent brand attitude failed to prove itself as a relevant antecedent of the extension attitude and extension perceived value (Fedorikhin et al., 2008; Heath et al., 2011; Musante, 2007; Riley et al., 2015; Salinas & Pérez, 2009). One likely reason for this outcome deals with the durable aspect of the automotive market: unlike fast moving consumer goods, the frequency of automobile purchase is much more spaced in time with long purchase intervals and implies a complex purchase decision process (Grewal et al., 2004). Consumers will take into account other variables such as the size, design,

engine, price, prior experience, dealer preference, promotional opportunities, and even new or secondary market availability. This suggests that although parent brand attitude may take a major role in the purchasing process among some smaller and more specific groups of consumers (i.e. strong brand fans), for the majority of the consumers, parent brand attitude will likely take a minimal role compared to other variables in automotive brand extensions evaluation.

A significant difference in the perceived fit between the two treatment versions was achieved, which validates the recommendations on fit elements found in the literature (Creusen & Schoormans, 2005; Fu et al., 2009; Karjalainen, 2004, 2007; Keaveney et al., 2012; Klink & Smith, 2001; Ranscombe et al., 2012; Ravasi & Lojacono, 2005; Sujan, 1985). Elements such as headlights, grilles, exterior openings, colour schemes, exterior trims, and heritage indeed make an important asset for the perceived fit level of an automotive brand extension, rather than just the price or the brand name alone. As it was mentioned in the literature review, fit is a multidimensional aspect in brand extensions which entails a degree of complexity (Boush & Loken, 1991; Evangeline & Ragel, 2016; Fedorikhin et al., 2008; J. Kim & Yoon, 2013; Lei et al., 2008; Park et al., 1991; Riley et al., 2015). The perceived fit was also proved to have a positive influence on the extension attitude. This agrees well with previous research and reinforces the importance of fit in brand line extensions (D. Aaker & Keller, 1990; Fu et al., 2009; Riley et al., 2015). The brand extension must be close to the parent brand, as similarity can foster a positive consumer extension evaluation (C. Kim et al., 2001; Michel & Salha, 2005).

In this study, the perceived value was addressed in a more complete way than previous brand extension research (e.g. Lei et al., 2008; Riley et al., 2015). By measuring perceived value in three separate dimensions, it was possible to see that extension attitude was indeed an antecedent to all of the dimensions of perceived value – a positive attitude towards a brand extension will contribute to a positive extension value appraisal on the perceived emotional value, the perceived price value and the perceived social value. Concerning the effect on the purchase intention, only the perceived emotional value appeared to be significant. Neither the perceived price value nor the perceived social value influenced the purchase intention. This is especially relevant as it suggests that the purchase of brand extensions in the automotive market will depend on emotional (thus intrinsic) feelings about the product,

rather than for social or price value. This conclusion differs from previous extension research, which used perceived price value as a single purchase intention antecedent (e.g. Riley et al., 2015).

The ownership effect was addressed from multiple perspectives through the comparison of the ownership statuses and the treatment versions. In the first stage, two groups were created: one of BMW owners and one of the non-BMW owners. In the second stage, the main sample was split into two groups of premium brand owners and value brand owners. In the tests, each group was divided into two: a group exposed to a high-fit extension and a group exposed to a low-fit extension. The tests compared the means of the extension perceived fit and the extension attitude. Contrary to expectations, a significant difference among these variables was not found. Previous research indicated that owners of the brand would be more favourable of a high-fit extension (Baumeister et al., 2015; Fu et al., 2009; Kirmani et al., 1999), and non-owners would be more favourable of a low-fit extension (or owners of a lower value product) (Truong et al., 2008). Results also found no differences between premium owners and value owners, confirming the inexistence of an ownership effect based on brand type. This outcome was unpredicted, especially as the core studies selected to support the ownership effect hypotheses dealt specifically with automotive brand line extensions (e.g. Fu et al., 2009; C. Kim et al., 2001). With this knowledge, two theoretical insights were drawn. First, consumers can make impartial assessments of any brand extension fit regardless of their own ownership status - this suggests that the evaluation of fit is not subject to a *blind rivalry*: although consumers may have different brand preferences, it does not mean that they will downplay and misevaluate other extensions. This coherence has been hinted in past research where participants were asked to build perceptual groups of car brands, which ended up matching the respective brand images and concepts (Fu et al., 2009; Truong et al., 2008). Second, the consumer brand extension attitude is not influenced by the currently owned brand (or brand type), which indicates that consumers evaluate brand extensions based on other factors, independent of their current ownership status.

Concerning the consumer innovativeness, results did not suggest a significant moderator effect in the relationships between perceived fit and extension attitude or perceived fit and perceived value. This evidence was contrary to previous research which supported a positive role of innovativeness in the evaluation of brand extensions (Hem et al., 2003; Klink &

Smith, 2001; Salinas & Pérez, 2009). However, mixed results were found in a cross-cultural study, leading to the proposal that the influence of consumer innovativeness might vary depending on the cultural context, and possibly apply only on specific fit dimensions, such as brand image fit (Pina, Iversen, & Martinez, 2010). Moreover, Eren-Erdogmus et al. (2018) found that in more luxurious products the innovativeness would not influence the extension evaluation, even when the distance to the parent brand was high (i.e. a low-fit). The authors suggest that even category extensions under the same brand name would likely not be novel or radical enough to attract innovative consumers more than other consumers. Klink & Athaide (2010) found that innovative consumers would more favourably evaluate extensions under a new brand name rather than under the parent brand name, due to risk, daring, and novelty aspects associated with this new and more distant brand. Thus, a brand line extension may not be radical enough to make the influence of innovative traits visible – as opposed to the more drastic, unexpected and innovative horizontal line extension under a new brand name. Looking at premium automotive OEM extensions, entering an unexplored automotive vehicle segment may finally be too obvious (and even expected) by the consumers, as opposed to an extension into a more distant product category such as motorcycles, bicycles or boats, for instance.

The need for status, on the other hand, seems to have a significant moderation effect on the relationship between extension perceived fit and perceived social value. This moderation effect was not visible in the relationship with the perceived price value nor perceived emotional value. However, this situation aligns with the extrinsic or intrinsic aspects of each of the variables (Sweeney & Soutar, 2001): the perceived social value is dependent on the external players (i.e. the value others place in the extension) whereas the emotional and price value are not. Results showed that the relationship between the extension perceived fit and the extension perceived social value is stronger in consumers who are more motivated by the importance of status, as it is suggested by previous brand extension research (e.g. C. Kim et al., 2001; Lei et al., 2008; Riley et al., 2013) and research on the small size segment (Qu et al., 2014).

## 6.3 Practical implications

This study provides several implications for practice directed at automotive OEMs on how to develop and manage their future brand extensions and portfolios. It is relevant to note that the following recommendations may also be applicable in other vehicle categories, such as motorcycles and utility vehicles.

First, premium OEMs aiming to introduce a new downward extension to the brand portfolio must make careful considerations (Heath et al., 2011; Štrach & Everett, 2006). According to this study, when introducing a small size segment extension, practitioners should opt for keeping a high level of fit with the parent brand concepts and current product portfolio to ensure a good perceived fit, leading to a better consumer extension evaluation. As a side advantage, practitioners can leverage already existing brand image and associations for communication, sales, and distribution purposes. Besides, in the BMW case, the brand is well positioned to pursue extensions into new mobility products, as the brand is present in six segments of the motorcycle market (sport, tour, roadster, heritage, adventure, and scooters). This makes an extension into a small vehicle segment more logical, as opposed to the other premium OEMs which currently offer no (or very few) vehicles other than full-size automobiles. Hence, it is more acceptable for BMW as a premium OEM with experience in smaller mobility solutions to pursue a new extension into smaller size segments than any other premium OEM without any previous experience. Some of these premium OEMs (especially the more luxurious ones) may simply be incompatible with a small size segment extension, as they are very narrow in their product scope (Y. Kim & Wingate, 2017). Such brands should steer away from this segment, and prevent brand extension failures such as the Aston Martin supermini car Cygnet.

Some literature recommends that downward line extensions must distance themselves from the parent brand, occasionally going as far as creating a sub-brand (e.g. Michel & Salha, 2005). This is especially important if the extension is too similar to an already existing product, in order to avoid cannibalization and brand dilution (e.g. Caldieraro, Kao, & Cunha, 2015; Royo-Vela & Voss, 2015). In the automotive case, small family cars already available in a brand portfolio may be a potential risk. Yet, looking specifically at a two-seat supermini extension, this risk seems minor as this size segment is sufficiently different from a small family car in terms of functional aspects such as the number of passengers, power, and space.

Such differences would likely aid consumers to clearly distinct the extension from the other products of the brand (Michel & Salha, 2005). Comparing to a real-world example, a two-seater BMW would be less risky than the BMW X1, a compact SUV launched in 2015 with staggering similar functional and segment characteristics to the more expensive BMW X3 launched in 2011[4].

Concerning the consumer innovativeness, this profile trait does not play a significant moderator role in the extension attitude. Therefore, the evaluation of a small-size segment extension by a premium OEM is not subject to the influence by the consumer innovativeness. Still, innovation remains a fundamental piece of the automotive landscape and an important differentiation asset. Practitioners should maintain an innovative vision, but focus it on design, technology, energy sources, safety, and comfort options that can be introduced across the brand portfolio, creating value and appealing to consumers of multiple segments. Such examples of successful cases are the PSA's DS and the Tesla, which are innovative in multiple aspects, yet, mostly conventional and in matured, well-identified, and explored vehicle segments. However, this does not mean that the innovative trait cannot be leveraged by automotive OEMs in the case of more radical extensions.

Consumers purchase items of higher status in an attempt to gain or maintain their own status, in a status-seeking behaviour, especially through conspicuous items such as automobiles (Truong et al., 2008). In this study, it was found that the more status-seeker a consumer is, the stronger the extension perceived fit will generate perceived social value. When designing an extension, practitioners are advised to maintain status indicators, such as in the Mercedes-Benz Class A, which despite being the cheapest Mercedes-Benz available, retains a backdrop of status by design cues, safety, comfort options, and technology (Michel & Salha, 2005; Riley et al., 2013; Tournois & Chanaron, 2018). However, care must be taken not to overdo the status appeal due to the conflict and incoherence between a status aura and a cheaper vehicle segment – a more understated, yet present, type of status leveraging is recommended. It is also pertinent to assert that status should not be a stand-alone sell-point, as it is a mere

[4] https://www.autotrader.com/car-reviews/2015-bmw-x1-vs-2015-bmw-x3-whats-difference-235303

complement to a broader product package. Researchers on downward extensions noted that even in more luxurious brands (typically bought for symbolic attributes), the purchase decision can sometimes depend more on functional and rational attributes (Royo-Vela & Voss, 2015). As such, tangible attributes in the extension must remain faithful, such as quality, technology, mobility, dynamics or even practicability.

Moreover, it seems evident that the extension should not be perceived as a cheaper segment. If so, the brand risks being perceived as dishonest and not trustworthy in their value proposition of other products (Royo-Vela & Voss, 2015). Smaller car segments are cheaper to produce due to saving in components, which can provide some support in justifying a lower price than the small family cars. Although a lower priced extension may still be well received if functional and status aspects are maintained, care must be taken in order not to let the price go below a certain level (Jean Noël Kapferer & Laurent, 2016; Royo-Vela & Voss, 2015). This is relevant also when considering the MINI, which is priced at almost double than a Smart is, but has the components and relative performance much closer to a medium sized car. Practitioners are advised to adjust (and communicate) the price in coherence with both the brand and the size segment. Extra attention is recommended especially as the competitors in the smaller size segments have different marketing approaches: these are more chic, endearing, and functional. Examples are the Smart, the Fiat 500, and Peugeot 107, which follow this line and still manage to keep some status cues in their design.

Although premium brands use downward line extension on occasion to leverage on their prestige and status, and to increase sales volume and revenue, it is necessary for the brands to continue to sell and create products for the high-end market (J.-N. Kapferer, 2014; Lipovetsky & Roux, 2003; Michel & Salha, 2005). Even if designing strategies with the small size segments in sight, premium automotive OEMs should keep exploring the higher ends of the market, especially through new large-size luxury automobiles. Discontinuing these more expensive products would present risks for the brand status, and all the portfolio would suffer from this. This is visible on premium automotive brands that have made downward extensions but still keep developing and expanding their higher-end models, such as Land Rover, Porsche, Jaguar, and Mercedes-Benz.

## 6.4 Limitations and future research

While this study managed to find new insights on consumer evaluation of downward brand extensions in the premium automotive European market, it presents some limitations. Notwithstanding, the study offers a set of promising research venues. Limitations and future research directions are detailed below.

1) The analyses were performed on a single Portuguese sample and did not use any international sample due to its small size. This may pose issues of study generalization over to other European countries. So, a study replication on a sample from other European countries is strongly advised. One other limitation of this study lies with the consumer profile, especially the attitude and purchase intentions towards the small size segment. Automobiles can be differently perceived among the segments, and the purchase intentions can vary greatly. The market for the small size segment, especially the 2-seaters, is small and peculiar. Hence, it is likely that most consumers would not be potential buyers of vehicles from such a size segment. For a future study of extensions into such segments, it is recommended that a sample of carefully selected potential purchasers of such vehicles should be used, as well as measuring the vehicle purchase intentions with a higher level of detail;
2) The brand extension perceived fit was successfully manipulated to observe a significant difference in the treatment groups' evaluation and proved a relevant antecedent of brand extension attitude. Although this was achieved in more detail than previous research (e.g. Allman et al., 2015; Fu et al., 2009; Riley et al., 2015), only a part of the fit aspects was manipulated, namely image, exterior design, and price, implying a limitation. Future research in brand extensions could further deepen other fit aspects, and weigh their relative contribution in separate experiments. These aspects might include different product colours, interior images, functions, options, distribution channels, consumer interaction, and even consumers segments in terms of social class or geography, as well as product category (Raney, Arpan, PashuPati, & Brill, 2003; Salinas & Pérez, 2009). Additionally, a more credible treatment such as simulating a magazine test, or a presentation on a website similar to the official brand version would be insightful;

3) The study used a single automotive OEM brand, which creates a limitation. This was well-justified in the methodology; however, a broader study with more extensions for other premium brands might be useful as a means of supporting generalization (C. Kim et al., 2001; Y. Kim & Wingate, 2017). By creating a set of premium brand extensions, and having them evaluated by respondents (either all extensions or randomly assigned), researchers could compare the receptiveness for extensions in each of the brands and possibly generate new insights, reaching a more complete view of line extensions in the automotive sector;
4) Despite the parent brand effect on the extension evaluation not having been supported, this study was limited as it did not consider more aspects related to the relationship of consumers with the parent brand, only their brand attitude. Future research should assess more variables related to the parent brand, such as loyalty, history of relationship, or previous (or intended) ownership status. As this is a durables market, some conclusions may differ from the global brand extension research literature, especially since a car purchase requires allocation of many resources, such as time, money, research, and predicting the future resale value. Thus, it is complex to find a link between a positive parent brand attitude and a purchase intention for a car of the same brand, as several other variables will play a role. There is also a phenomenon to take into consideration for future research: consumers may have a positive brand attitude towards more than one brand, and even special preferences for same-group or same-image brands – could a Citroen enthusiast be easily willing to consider a Peugeot (i.e. from the same OEM group), rather than any other brand? Would the same situation be observable in a Mercedes-Benz enthusiast when faced with a BMW?;
5) This study did not consider reciprocal effects on parent brand attitude. Researchers have found different conclusions on the effect that new brand extensions cause on the parent brand evaluation. Kirmani et al. (1999) pointed out that a brand extension would not harm the parent brand evaluation, while C. Kim et al. (2001) found contradictory evidence. Researchers advise care as brand extensions into the cheaper segments, like the BMW with its cheaper 1 Series, will potentially damage the parent brand (Truong et al., 2008). Evidently, such a study would require carefully measuring the parent brand attitude before and after the exposure to a simulated (or

real) brand extension. Furthermore, although downward extensions threat parent brand status due to wider availability (Royo-Vela & Voss, 2015; Štrach & Everett, 2006), this may have not been considered by respondents (especially owners) when evaluating the simulated extension in this study. Thus, it remains unknown if perceived future massification influences brand extension evaluation. Future research could seek to understand in more detail if and how consumers may contemplate in advance and feel threatened (or not) by the popularization of extensions in the market;

6) Although refuted, the ownership status might still have some hidden value for research, with more detailed data. Consumers may not currently own the brand they prefer: at the moment of that past purchase, other variables may have come into play (for example, the participation of a family member or friend, or a price discount, or just plain availability). It is important to stress that automobiles are durable products, which are highly expensive, so the purchase decision is somewhat atypical to the majority of brand extension research. Moreover, if one takes into consideration the *ownership intention* (or most preferred brand) rather than the current ownership, which is subject to context, ownership effects could possibly be found in future studies. New knowledge might also be found regarding the effect of *size segment ownership status*. Such could be done by considering currently owned (or desired) size segment. Differences might be found between owners of small to medium size family cars, and owners of medium to large cars, and possibly even owners of motorcycles;
7) Even though this study did not support the innovativeness effect in downward brand line extensions evaluation, we suggest to pursue further research comparing several levels of fit and distance from the parent brand, starting at a close vertical extension, and going to the end of the scale, as far as a horizontal extension under a new brand name. We propose that the innovativeness effect might rise as the distance to the parent brand increases, i.e. as the extension gets more radical and original. It would also be interesting to use multiple product categories (including durables and non-durables) to assess for possible differences. This structure would create additional value for research, as it would imply a close and minacious analysis of the frontiers between vertical extensions and horizontal extensions;

8) In a more detailed analysis of the automotive sector, researchers should also conduct research to assess how automotive brand extensions are in fact vertical or horizontal in other vehicle segments. Recent real-world examples might be sourced to assess how consumers evaluate such extensions: the new Mercedes-Benz pickup truck, Bentley shooting wagon, and the Lamborghini SUV. Future research should also build a framework or scale that would allow identifying if an extension is indeed vertical or horizontal. The less clear areas might provide additional research material in order to confirm or refute knowledge from the brand extension literature. Such studies would be important for both research and practice, especially in selecting appropriate literature for each extension type.

# PART 2 – STUDY 2

# Chapter 7 – Study on the Mobility Concerns on EV Adoption

## 7.1 Introduction

Plug-in battery-electric vehicles (EVs) are vehicles with full-electric drivetrains powered by a battery which is recharged from an external power supply – the charging point. EVs are a solution for multiple environmental and energy issues in the industrialized societies caused by the use of conventional-fuelled vehicles (CVs) (Denton, 2016; IET, 2015; Mersky et al., 2016). Even though EVs have immediate advantages over CVs, such as the inexistence of local pollutant gas emissions and the use of renewable energy sources, the true environmental benefits remain under debate (Bauer, Hofer, Althaus, Del Duce, & Simons, 2015; Casals, Martinez-Laserna, García, & Nieto, 2016; Choma & Ugaya, 2017; Ma, Ke, Han, & Tang, 2017; Souza et al., 2018; Thomas, 2012). Even with these uncertainties, a growing number of automotive OEMs is offering EV versions in their product list. The Renault-Nissan Alliance, in cooperation with Mitsubishi Motors, was alone responsible for the manufacturing of the leading models that represented 424,797 of EVs sold during 2016. The Nissan Leaf is the world's best-selling mass-marketed EV: since its debut in 2010, it reached over 250,000 vehicles. In Europe, the most sold EV in 2016 was the Renault Zoe, reaching close to 22,000 units (NissanNews, 2017). These new models can match CVs from the same class in space, safety, comfort, speed, and passenger capacity.

Range capacity was one of the main limitations of the early EVs, but recently, through the continuous development of battery technology and EV efficiency, EVs' range capacity has significantly improved. For instance, the Nissan Leaf is currently offered with 378 kilometres of range capacity (NissanNews, 2017), when the equivalent conventional fuelled Nissan Micra grants about 600 kilometres of range capacity. Another important improvement of EVs in the last years entails the charging period duration. The fast-charging direct-current stations (also known as rapid charging points) can now charge the equivalent of a 100 kilometres range in just under ten minutes (Denton, 2016). Evidence from real-life condition EV trials show that a daily range between 80 kilometres and 160 kilometres is sufficient for the mobility needs of most of the population (e.g. Denholm and Short, 2006; Franke and Krems, 2013a; Gondor et al., 2007; Graham-Rowe et al., 2012; Pearre et al.,

2011). This data alone suggests that switching from a CV to an EV would not alter the life quality of most drivers. However, in spite of advances in product, technology, market, infrastructure, and financial conditions, EVs still struggle to gain market share (Biresselioglu et al., 2018). EVs only represented 0.1% of the passenger vehicles in use in 2015 in the European Union (ACEA, 2017b), and 1.5% of the new vehicles sold in western Europe in 2016 (ACEA, 2017a).

This chapter presents the first part of Study 2 (Study 2.1) that intends to respond to the specific research objective SRO5 (to understand how the consumer mobility concerns influence the consumer attitude and purchase intention towards EVs). The Study 2.1 thus aimed at exploring how mobility concerns influence CV drivers' attitudes towards EV adoption. In the next section, a theoretical framework on mobility concerns that influence attitudes towards EV adoption is presented followed by the methods employed, the results and the discussion. Finally, the last section offers study implications, recommendations for practice, limitations and suggestions for future research. Following the suggestion from Rezvani et al. (2015), non-rechargeable electric vehicles (known as hybrids) were considered out of the scope of this article, as they can be viewed as more fuel-efficient CVs rather than actually EVs. In line with Denton's (2016) work, this study focused solely on battery-powered electric vehicles that can only be recharged in electric charging points, thus also excluding EVs with an internal combustion engine as a range extender.

## 7.2 Theoretical framework

EVs have specific mobility characteristics that may not suit all of the individuals' needs or habits (Peters & Dutschke, 2014). Drivers quickly become concerned about the range capacity and charging times of their vehicles, fearing they may not respond to their daily demands (Buhler et al., 2014; Cheron & Zins, 1997; Egbue & Long, 2012). Considerations on the access to charging points and mobility alternatives are also important and influence decisions on EVs adoption. A theoretical framework was built around each of the three core topics – charging point type, second conventional car availability and range management systems – that influence mobility concerns when considering EV adoption (see Figure 12).

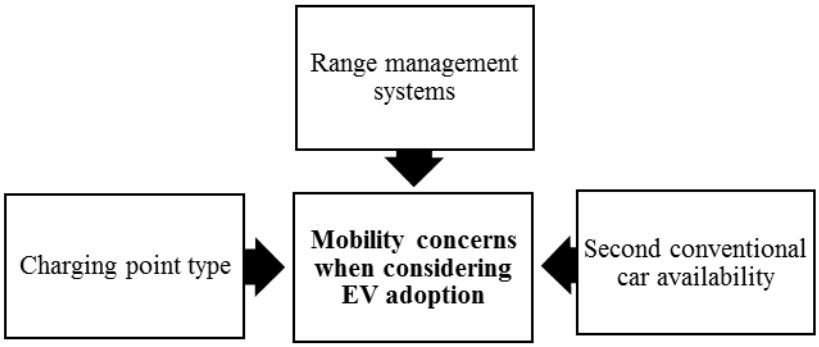



Figure 12 – Mobility concerns when considering EV adoption

### 7.2.1 Charging point type

One fundamental piece of the EV landscape are the public charging points. The highest EV market shares in the European market are found in the countries with the highest ratio of public charging points (see Table 26). Access to charging points has been noted as one of the major concerns and a requirement from consumers interested in adopting an EV (Dutschke et al., 2013; Lebeau et al., 2013). Efforts in understanding the charging behaviours of EV users are crucial in actions for designing successful and effective charging infrastructures (Morrissey et al., 2016).

Table 26 - EV public charging points ratio in Europe (ordered by EV market share)

| Country | EV charging points | Total registered EVs | Total light passenger vehicles | EV charging points per 1000 cars | EV market share |
|---|---|---|---|---|---|
| Norway | 11,472 | 97,615 | 2,592,390 | 4.43 | 3.77% |
| Finland | 965 | 1,259 | 261,922 | 3.68 | 0.48% |
| Denmark | 2,616 | 9,416 | 2,404,091 | 1.09 | 0.39% |
| Switzerland | 4,040 | 14,446 | 4,503,865 | 0.9 | 0.32% |
| France | 24,327 | 95,463 | 31,915,493 | 0.76 | 0.30% |
| Luxembourg | 429 | 1,075 | 381,105 | 1.13 | 0.28% |
| Sweden | 5,775 | 12,147 | 4,669,063 | 1.24 | 0.26% |
| Netherlands | 35,875 | 21,115 | 8,336,414 | 4.3 | 0.25% |
| Austria | 4,128 | 11,860 | 4,748,048 | 0.87 | 0.25% |
| Estonia | 387 | 1,156 | 676,592 | 0.57 | 0.17% |
| Belgium | 1,814 | 8,610 | 5,587,415 | 0.32 | 0.15% |
| Germany | 25,431 | 63,018 | 45,071,209 | 0.56 | 0.14% |
| United Kingdom | 18,020 | 45,623 | 33,542,448 | 0.54 | 0.14% |
| Ireland | 1,046 | 1,948 | 1,985,130 | 0.53 | 0.10% |
| Portugal | 1,578 | 4,007 | 4,538,000 | 0.35 | 0.09% |
| Slovenia | 496 | 736 | 1,130,907 | 0.44 | 0.07% |
| Spain | 5,089 | 10,404 | 22,355,549 | 0.23 | 0.05% |

| Country | EV charging points | Total registered EVs | Total light passenger vehicles | EV charging points per 1000 cars | EV market share |
|---|---|---|---|---|---|
| Latvia | 73 | 312 | 677,561 | 0.11 | 0.05% |
| Hungary | 580 | 1,093 | 3,192,132 | 0.18 | 0.03% |
| Czech Republic | 666 | 1,140 | 5,115,316 | 0.13 | 0.02% |
| Italy | 3,124 | 7,516 | 37,351,233 | 0.08 | 0.02% |
| Slovakia | 451 | 341 | 2,037,806 | 0.22 | 0.02% |
| Croatia | 481 | 185 | 1,489,338 | 0.32 | 0.01% |
| Lithuania | 102 | 148 | 1,244,063 | 0.08 | 0.01% |
| Romania | 116 | 377 | 5,153,182 | 0.02 | 0.01% |
| Poland | 582 | 846 | 20,723,423 | 0.03 | 0.00% |
| Greece | 43 | 134 | 5,104,908 | 0.01 | 0.00% |

*Public charging points* are the most noticeable type of charging point, and especially critical in urban areas in contributing to boost local EV adoption (Carley et al., 2013). This type of charging point is especially important for drivers in such areas, who are not able to have a personal charging point due to the lack of a private garage or a parking space. Although EVs can be charged in a standard socket outlet, the charging rate is significantly lower than in a more capable charging station. Moreover, the installation of charging stations must comply with precise regulations concerning the free space around, protection against vehicle impact, and ventilation (IET, 2015). Drivers with no access to a personal charging point are then exposed to the inconveniences of using public recharging stations, and, therefore, show higher levels of concern when considering EV adoption (Buhler et al., 2014). Previous research has also found that EV drivers feel embarrassed to ask hotel clerks, parking attendants, and property managers for permission to recharge their vehicles when in a needed situation (Kurani, 2007). Besides, the installation of public charging infrastructures in most European countries depends on the public sector and local authorities, thus the coverage and number of charging points are limited (Biresselioglu et al., 2018). However, increasing the number and visibility of public charging stations in selected communities, for instance, could increase EV adoption in those areas (Carley et al., 2013). As EV drivers also tend to exacerbate their range needs and take every opportunity to charge the cars, a wide offer of public charging points also decreases range concern, even if used for short periods of time (Bunce et al., 2014).

*Personal charging points*, on the other hand, are also one of the most significant charging points in EV adoption. Studies have shown that drivers with a personal charging point could perform most of their routines without resorting to public charging points (Bunce et al.,

2014; Franke & Krems, 2013a; Skippon & Garwood, 2011). Over half of the 135 participants on a three-month EV trial in the UK pointed out that a home charging point as the single charging point would not deter them from purchasing an EV (Bunce et al., 2014). Drivers who live in urban areas will likely not have individual garages or other infrastructures available to install home charging points (Dutschke et al., 2013; Plotz et al., 2014). Securing access to a personal charging point decreases the perception of risk by drivers and helps them to cope with their mobility constraints (Bunce et al., 2014).

One new type of charging point is a *workplace charging point*. Many businesses are now starting to provide charging stations for staff and visitors (Denton, 2016). Since people who live in urban areas are not able to have domestic charging stations installed, the charge-at-workplace solution could significantly increase the number of EV potential adopters and help EV adoption (Pearre et al., 2011). Skippon and Garwood (2011) found that most drivers have positive attitudes towards charging their EVs at work and go as far as pointing out that this would be the most important charging point for them. The existence of a charging point at the workplace would considerably favour the predisposition to purchase an EV (Skippon & Garwood, 2011). This option is especially interesting in industrial areas, as these sites have access to more powerful electrical infrastructures which allows for rapid charging stations, and also space for suitable parking spaces, easing the load of the city's public charging points (IET, 2015).

### 7.2.2 Second conventional car availability

Generally, drivers expect that an EV would cover most of their mobility needs over time, and not just the average daily travel (Pearre et al., 2011). There is sometimes the need to make longer trips: in a study involving 484 drivers from Atlanta, Georgia (US), Pearre et al. (2011) concluded that consumers occasionally drive for more than 160 kilometres, but only 23 days in the full year, on average. In another study involving 227 drivers in St. Louis, Missouri (US), Gonder et al. (2007) referred 18 days per year, on average. Hence, the lack of versatility of an EV to make longer trips, such as in vacations, remains a potential barrier to EV adoption as the main household car (Buhler et al., 2014; Egbue & Long, 2012; Jakobsson et al., 2016).

The existence of a second conventional car may decrease mobility concern and foster EV acceptance in a significant part of the population (Pearre et al., 2011; Skippon & Garwood, 2011; Tamor & Milačić, 2015). In a six-month EV testing by a sample of 79 drivers from Berlin (Germany), Buhler et al. (2014) concluded that EVs were already acceptable and suitable as a main mobility option when a second conventional car is available. Accordingly, other studies point out that mobility concern is prominent in drivers with more than one car (Franke & Krems, 2013a; Jensen, 2013; Lieven et al., 2011; Plotz et al., 2014; Schuitema et al., 2013). Furthermore, most of the potential EV buyers live in suburban and rural areas, to whom the mobility alternatives for daily routines are critical, as such areas tend to be less served with walking-distance facilities or adequate public transportation (Dutschke et al., 2013). The lack of public transportation further increases the reliance on private transportation and thus pushes people to choose vehicles that are more dependable – i.e. CVs (Galatoulas, Genikomsakis, & Ioakimidis, 2018; Sang & Bekhet, 2015). EVs need time to be charged periodically, which is perceived as a limitation comparing to CVs, especially in the absence of transportation alternatives, leading to greater mobility concerns (Franke & Krems, 2013b; Nilsson, 2011).

Although the multi-car layout has been proposed in research at the beginning of the century (i.e. Garling & Thogersen, 2001) and also suggested by drivers themselves (Graham-Rowe et al., 2012), the EV market and research keep being assertive towards the EV as a stand-alone vehicle, even if this solution would not be practical in many households with several range needs (N. Wang et al., 2018). Nevertheless, the existence of a second conventional car may decrease mobility concerns and increase EV acceptance in a significant part of the population (Pearre et al., 2011; Skippon & Garwood, 2011; Tamor & Milačić, 2015). In a six-month EV testing by a sample of 79 drivers from Berlin (Germany), Buhler et al. (2014) concluded that EVs are already acceptable and fully suitable as the main mobility option under the condition that a second conventional car would be available. Consequently, other studies pointed out that mobility concerns seem to be less strong in consumers with more than one car (Franke & Krems, 2013a; Jensen, 2013; Lieven et al., 2011; Plotz et al., 2014; Schuitema et al., 2013). Karlsson (2017) details the most probable patterns of vehicle usage in multi-car households that adopt EVs: at first, the EV would replace the CV in shorter trips and in daily commuting – taking into account that the range of such use is the smallest, the EV would perform satisfactorily and not fail in fulfilling the driving needs. The EV would

also be used in place of the CV in other times, aiding in flexibility and increasing the EV portion of the global travel distance. Hence, having a CV available would be here an important backup option, even if not used on a frequent basis.

### 7.2.3 Range management systems

Researchers note that limited range concern is more of a perceived psychological barrier than an actual barrier (Franke et al., 2012; Skippon & Garwood, 2011). When interrogated about EV's range desirability, drivers tend to overemphasize their range needs, putting them above their real needs (Dimitropoulos et al., 2011; Egbue & Long, 2012; Jensen, 2013; Lebeau et al., 2013; Turrentine, 1994). This situation derives from the perceived risk of having a breakdown or running out of energy in a risky situation (Cheron & Zins, 1997). Franke and Krems (2013a) coined the term *range paradox*, derived from the inconsistency between range preference and range need. Although OEMs could provide higher-than necessary range by adding battery capacity, this would result in higher prices for the already expensive EVs, deterring adoption (Franke et al., 2017; J Neubauer et al., 2012). Recharging an EV takes considerably more time than refuelling a CV, hence, recharging should be planned in advance and, for instance, it should be done overnight (Carley et al., 2013; Cheron & Zins, 1997; Lebeau et al., 2013). Unplanned trips have the potential to increase range concerns, as drivers will need to calculate beforehand if the charge level is enough, facing the risk of being stranded due to insufficient range (Daziano & Chiew, 2012; Pearre et al., 2011). In a six-month study involving 40 drivers, using an EV in Berlin (Germany) Franke and Krems (2013b) found that stressful low range situations occurred on average once a month.

Due to range anxiety, EV drivers tend to use substantial buffers for psychological benefits (Bunce et al., 2014; Carroll et al., 2010; Franke et al., 2012). Carroll et al. (2010) observed in a six-month trial that 90% of the journeys started with the battery at over 50% of charge. This usage method prevents an efficient use of EVs and increases the demand on recharging points. EV drivers must learn new behaviours and adapt routines, especially when planning the charging occasions considering how, when, where, and how long (Buhler et al., 2014; Bunce et al., 2014).

One strategy used to decrease range concern and improve EV capacity usage is to provide knowledge about the EVs' range capacity and encourage drivers to charge their EVs less often and drive with the battery's on lower capacity (Franke & Krems, 2013a; Graham-Rowe et al., 2012). Updated information about the driving style, energy saving methods, consumption, and trip profile can be used in decreasing range concerns (Rauh et al., 2017b). Information on battery charge also influences the driving style: in an EV-trial study with 190 UK participants, Carroll et al. (2010) found that the efficiency of EV use was higher when the battery was below 50% of charge due to the driving style. Drivers in other EV trials have also shown interest in having information on the charging progress remotely, as by an SMS, making them feel relaxed and less concerned about the range capacity (Bunce et al., 2014). More recently, Rauh, Günther, et al. (2017) described a hypothetical *tutor system*, in which drivers would be assisted in the management of their EV range. In this range management system, range capacity and range-affecting driving style would be supervised and presented, thus guiding the drivers to prevent critical range situations and use the range capacity completely. The authors also noted that such system should be integrated into the EV in a comprehensible and clear tool (such as by a heads up display), and also customizable according to the driver's preferences (for instance, to display less auxiliary information, as each driver gets more independent in EV driving). This more experienced user configuration mode would prevent confusion, distraction, and annoyance during the trip.

## 7.3 Methods

Study 2.1 consisted of a qualitative study based on in-depth interviews with CV drivers aimed at gaining a deeper understanding of their attitudes on their mobility concerns. Quantitative data, collected through a self-reported questionnaire to measure the available charging points and the importance of mobility alternatives for drivers, complemented the qualitative study. Each data collection and procedures parts are described below.

### 7.3.1 Qualitative study

Participants were directly invited to participate in the study, and data were collected through phone semi-structured interviews, which were recorded and transcribed. To obtain information about perceptions, opinions, and intentions, it is advised the use of in-depth

interviews as a qualitative research method (Churchill, 1995; Mack et al., 2011; Nobre & Faria, 2017). This method is more effective in triggering participants to share their personal feelings, opinions, and experiences than in group settings, thus proving an opportunity to gain deeper insight (Mack et al., 2011). Phone interviews offer facilitated participant access and a support to record the interview. Moreover, they allow some interaction between the interviewer and the participant, such as reactions and clarification of some questions in order to obtain more detailed responses (Opdenakker, 2006). Data were collected until the point of theoretical saturation, i.e. when no additional insights regarding the research problem were added by new interviews (Mack et al., 2011).

The qualitative study was developed around four main categories of analysis: (1) global attitudes and concerns towards EV adoption; (2) charging points; (3) second conventional car availability; and (4) range management systems. Based on the categories of the analysis, the interview script comprised sixteen questions measuring drivers' knowledge, perceptions and attitudes towards EVs, mobility profile and context, and EV usage intentions (see Appendix II). At the beginning of each interview, the study was briefly described to each participant, along with information on the interview procedure and objectives as advised by Mack et al. (2011) to foster an environment for a smooth and productive interview. The interviews were transcribed and analysed on the qualitative analysis software package ATLAS.ti (version 7.5.7), following the Hwang's guide (2008). When analysing the data, all pieces of relevant information such as a quote, a concept or an idea, were assigned a code. These codes were then organized into families, to support the analysis and development of theories and facilitate the arrangement and understanding of the knowledge (Hwang, 2008; Mack et al., 2011).

Assessing the quality of qualitative research requires maintaining a strong rigour along the research execution in order to ensure validity and reliability (Leung, 2015). In the qualitative study, data validity was guaranteed by sending back a summary of the responses to each of the participants enquiring about the data accuracy (Golafshani, 2003; McKeganey & Bloor, 1981). In turn, reliability, which deals with the accuracy of the process or results replicability (Lincoln & Guba, 1985; Patton, 2002), was achieved by analyzing the transcribed data in a coding frame through a software-guided analysis (Mays & Pope, 1995).

*Sample profile*

The sample included 17 Portuguese participants, 13 males and four females. Age ranged from 22 to 38 years old. All participants were employed and had higher education (see Table 27). Over half of the participants (70%) owned diesel-fuelled cars and 24% owned gasoline-fuelled cars. This ratio matches the Portuguese vehicle landscape, as 64% of drivers uses diesel-fuelled cars and 35% uses gasoline-fuelled cars (PORDATA, 2017). The sample also showed a balanced mix between rural (42%) and urban residents (68%), which made possible to collect data from both types of residents. This aspect was especially pertinent for the purpose of this study, as the type of residence is expected to influence the availability of certain types of charging points.

Table 27 - Demographic characteristics of the participants

| Participant | Personal vehicle fuel type | Gender | Age | Education | Monthly Income (€) | Location |
|---|---|---|---|---|---|---|
| 1 | Gasoline | Female | 22 | Bachelor degree | <1,500 | rural |
| 2 | Diesel | Male | 26 | Master degree | <1,500 | rural |
| 3 | Diesel | Male | 34 | Bachelor degree | 1,500 to 2,000 | urban |
| 4 | Diesel | Male | 27 | Bachelor degree | <1,500 | urban |
| 5 | Hybrid | Female | 33 | Master degree | 1,500 to 2,000 | urban |
| 6 | Diesel | Male | 27 | Bachelor degree | <1,500 | urban |
| 7 | Diesel | Male | 28 | Master degree | <1,500 | urban |
| 8 | Diesel | Male | 29 | Bachelor degree | 1,500 to 2,000 | rural |
| 9 | Gasoline | Male | 37 | Master degree | 1,500 to 2,000 | rural |
| 10 | Diesel | Male | 27 | Bachelor degree | <1,500 | urban |
| 11 | Diesel | Female | 38 | Master degree | <1,500 | rural |
| 12 | Diesel | Female | 31 | Bachelor degree | <1,500 | urban |
| 13 | Gasoline | Male | 29 | Master degree | <1,500 | urban |
| 14 | Gasoline | Male | 29 | Master degree | (no answer) | urban |
| 15 | Diesel | Male | 31 | Master degree | 1,500 to 2,000 | urban |
| 16 | Diesel | Male | 28 | Master degree | <1,500 | urban |
| 17 | Diesel | Male | 29 | Bachelor degree | <1,500 | urban |

When inquired about the purchase of their next vehicle, all of the participants showed intentions of buying a CV, except for two participants who were considering a hybrid vehicle. Thus, none of the participants exhibited intentions of adopting an EV as their next car. This aspect is significant as it carries potential for new knowledge on EV research by collecting data on non-EV early adopters. Furthermore, the sample shares relevant common points with the typical profile of EV early adopters: male, young to middle-aged, and educated (Hidrue, Parsons, Kempton, & Gardner, 2011; Junquera, Moreno, & Álvarez,

2016; Mohamed, Higgins, Ferguson, & Kanaroglou, 2016; Peters & Dutschke, 2014; Plotz et al., 2014), which suggests that the participants could become EV adopters in the future.

When analysing qualitative data in the ATLAS.ti software, any piece of relevant information, such as a quote, a concept or an idea, must be assigned a code. These codes were then arranged into families, supporting the development of theories and facilitating the arrangement and understanding of the knowledge (Mack et al., 2011). Throughout the analysis, codes were created and arranged into created families through the code manager tool in the ATLAS.ti (Hwang, 2008). Four families of codes were created, as listed in the first column of Table 28. The second column in the table shows the codes assigned to each family, and the third column shows the number of responses corresponding to each code.

Table 28 - Families and codes on mobility profile and context in EV adoption

| Families | Codes | Number of responses (0-17) |
|---|---|---|
| Global attitudes, concerns, and mobility profile | positive EV adoption attitude | 9 |
| | negative EV adoption attitude | 6 |
| | range concern | 13 |
| | charging time concern | 3 |
| | EV cost concern | 12 |
| | concern about available public charging points | 12 |
| | inadequate public transportation for travel routines | 13 |
| | sufficient services around residence | 12 |
| | limited services around residence | 5 |
| | use of a personal vehicle for daily routine | 13 |
| | occasional long trips | 17 |
| | use of car in long trips | 17 |
| | use of public transports for long trips | 2 |
| Access to charging points | positive attitude towards public charging points | 17 |
| | positive attitude about workplace charging points | 16 |
| | impossibility to install home charging point | 10 |
| | possibility to install home charging point | 7 |
| Second conventional car availability | EV adoption only when the consumer has a CV available | 3 |
| | preference in having a second car | 11 |
| EV trip assistant | positive attitude to range management systems | 17 |

### 7.3.2 Quantitative study

Some structured questions were included in the final section of the Study 1 questionnaire (see Appendix I) and followed the same data collection procedures. After a

small introduction on the study objectives, participants answered the questions about their mobility context, the importance of charging points and mobility alternatives, and attitude towards EVs.

The possibility of installing a home charging point was measured with a categorical "Yes" or "No" answer to the question "Would it be possible for you to install a personal recharging station for an electric vehicle in your house, garage or parking space?". The importance of having a second conventional car available was measured in a single item scale with the question "In case you considered owning an electric vehicle as the main car, how important would it be for you to have a second car available (gasoline or petrol) for occasional trips?". The importance of workplace charging points was measured in a single item scale by the answer to the question "In case you considered purchasing an electric vehicle, how important would it be for you to have access to a recharging station at your workplace?". These two latter questions used a 7-point Likert scale ranging from 1 (Not important) to 7 (Very important).

EV attitude was measured in a three-item scale – the scale of extension attitude used in Study 1 – with the introductory question "Please rate your opinion about electric vehicles". The EV purchase intention was also measured in a three-item scale – the scale of extension purchase intention used in Study 1 – with the question "How likely it would be that you would consider buying an electric vehicle the next time you purchased an automobile?" using the identical 7-point Likert anchors.

*Sample profile*

Three hundred and sixty-four valid responses were retrieved in the EV questionnaire. Concerning the types of fuels of the sample owned cars, the most common were petrol (N = 106) and diesel (N = 240), accounting for 29.1% and 65.9% of the sample. Six participants owned a hybrid vehicle, five owned an EV and seven owned a car powered by liquefied petroleum gas or compressed natural gas. A descriptive analysis of the observed variables and latent variables was also performed (see Table 29). The importance of a workplace charging station scored very high (6.07), and the importance of a second conventional car scored a moderate but positive value (4.35). Both the EV attitude and purchase intention scored high (5.43 and 4.49, respectively). The fourth column of the table displays the

Cronbach's alpha of the scale. Reliability values were considered very good in both variables (Hair et al., 2006).

Table 29 - Mean, Standard Deviations, and Reliabilities of the variables of Study 2.1

| Variable | Mean | Standard deviation | Cronbach's α |
|---|---|---|---|
| Importance of workplace charging point | 6.07 | 1.383 | - |
| Importance of a second conventional car | 4.35 | 1.896 | - |
| EV attitude | 5.43 | 1.449 | .921 |
| EV purchase intention | 4.49 | 1.886 | .982 |

## 7.4 Analysis and discussion of results

Participants of the qualitative study were inquired about the single major advantage and the single major disadvantage of owning an EV, and then asked to list all the other advantages and disadvantages they considered important. Most pointed out the major advantage to be the low cost per kilometre travelled. This advantage was indicated by 12 participants, followed by ecologic benefits by five participants. Four participants also noted the lack of engine noise, and two of them mentioned maintenance simplicity, as further advantages. One of the participants (Participant 5) referred to automatic transmission as an extra advantage.

> "*An EV is ecological, that is very important (...) They are also quiet cars, I think that is important, too*" (Participant 1).

> "*The cost, they are cheap to use*" (Participant 2).

> "*The quietness of the car, it is priceless for the driver (...) and the fact that it has an automatic transmission*" (Participant 5).

When questioned about the major disadvantage of owning an EV, ten participants indicated the low range capacity and six participants the struggle in finding a charging point available when needed. Participants also mentioned long charging times and high purchase cost as further disadvantages. Range capacity was the most mentioned disadvantage, by 11 participants. Four of the participants faulted long charging times, three of them the battery rental and replacement costs, and two pointed out that EVs were not aesthetically appealing.

One participant mentioned poor interior quality and equipment (Participant 7). Although the noise level was earlier pointed out as an advantage, two participants considered it to be a disadvantage, as they were concerned about the driving experience (Participant 3 and Participant 15).

> "*Small range capacity… no guarantee that the battery capacity will last along the years… they are expensive to purchase…*" (Participant 2).

> "*The number of public charging points, they are still insufficient, and the fact that the driver wants to enjoy the car and does not feel the noise and the vibration of the car*" (Participant 3).

> "*The biggest disadvantage (of owning an EV) is still range…*" (Participant 5).

> "*The battery, the range… and the style: they are not very attractive… only Tesla has more attractive models, the others are not very pretty*" (Participant 11).

> "*The lack of noise (…) I am a fan of internal combustion engines*" (Participant 15).

> "*Price, they are still a bit expensive*" (Participant 16).

When requested to name all the EV brands and models they could, participants named BMW, Citroen, Chevrolet, Fisker, Futi, Honda, Lexus, Mercedes-Benz, Mitsubishi, Nissan, Opel, Peugeot, Renault, Smart, Volkswagen, Tesla, and Toyota. Tesla was the brand with the highest awareness, named by 15 participants. The named models were BMW i3, Citroen Berlingo, Citroen C0, Citroen Mehari, Peugeot i0, Nissan Leaf, Nissan NV200, Renault Twizy, Renault Zoe, and Volkswagen GTE.

Most of the participants of the qualitative study (13 of them) used their car for daily commuting. These participants evaluated their public transportation systems as insufficient to respond to their commuting needs due to a lack of adequate schedules, speed and routes, being more critical in the case of residents of rural areas:

> *"I leave my job quite late, and there is no available public transportation*" (Participant 1).

"*The travel time in the public transportation sometimes is too long… if we have a car, we can make the tour in a third of the time"* (Participant 5).

*"The schedules are incompatible and it takes too long to reach my workplace*" (Participant 7).

*"There are no public transport routes that match my route*" (Participant 13).

*"It would take more time to reach my workplace. I would have to leave home one hour earlier and would arrive home one hour later at the end of the day*" (Participant 17).

### 7.4.1 Charging point type preference

*Home charging point*

The impossibility of installing a home charging point was a frequently mentioned barrier to EV adoption along the interviews of the qualitative study. Although almost all of the participants who lived in rural areas were available to install a home charging point as in previous research (e.g. Dutschke et al., 2013; Plotz et al., 2014), ten participants stated impossibility or difficulty in installing a home charging point. Participants who lived in urban areas displayed stronger constraints in installing a home charging point, being it simply impossible for many of them. This is a critical aspect, as access to a personal charging point strongly decreases mobility concerns, and urban residents who do not have the option to install a home charging point will be less willing to consider EV adoption (Axsen & Skippon, 2013; Buhler et al., 2014; Daziano & Chiew, 2012; Lebeau et al., 2013). Restrictions such as not having a personal parking space or a private garage to install a charging point were pointed out by participants as major obstacles towards EV ownership, especially those living in urban areas, which is also coherent with the research (Dutschke et al., 2013; Lebeau et al., 2013):

"*By living in an apartment, there is not much space... (the charging point) would have to be very small and mobile*" (Participant 5).

Participant 10, who had a positive attitude towards EVs, noted the difficulty in accessing charging points three times along the course of the interview:

> "*(EVs) are a good option for people of live in cities, except for one detail: how will the user charge the battery without a private garage (…) it would be impossible for me (to install a charging station)*" (Participant 10).

In the quantitative study, we tested the difference in the EV attitude and EV purchase intention according to the possibility of installing a home charging point. A group means comparison by a one-way MANOVA was employed, in the same manner as the other means test comparisons performed in Study 1. The sample was split into the "Possible" group, which answered that it would be possible to install a home charging point at their residence, and the "Impossible" group, which answered that it would not be possible. The group sizes were N= 231 and N = 133, respectively.

Then came the testing of the MANOVA assumptions (Hair et al., 2006). The independence of observations was assured as each respondent indicated a single answer. In the homoscedasticity assumption, the equality of variances was assessed by Levene's test for the EV attitude ($F = 9.19$, $p = .003$) and for the EV purchase intention ($F = 0.018$, $p = .893$). Unfortunately, the Levene's test was significant for the EV attitude, meaning that a difference in the variance matrices existed, thus failing to prove the equality of variances assumption. Thus, we continued with a one-way ANOVA test for the EV purchase intention only. The normality assumption for the one-way ANOVA was tested by the Kolmogorov-Smirnov and Shapiro-Wilk significance test – as these tests failed the skewness values were checked instead for the -2 to +2 limit value (Field, 2009; George & Mallery, 2009; Gravetter & Wallnau, 2013; Trochim & Donnelly, 2006). The skewness values of the EV purchase intention were of -.457 (std error = .160) for the Possible group and .099 (std error = .210) for the Impossible group.

With the assumptions confirmed, a one-way ANOVA test was performed for the EV purchase intention variable (see Table 30). This table displays the one-way ANOVA test results in the last two columns with the possibility to install a home charging point as a factor. The difference between groups in the EV purchase intention ($F = 18.92$, $p < .001$) proved to be statistically significant, meaning that the EV purchase intention is superior when consumers actually have the possibility of installing a home charging point.

Table 30 - ANOVA for EV purchase intention between groups

| Variable | Group | Mean | F | p-value |
|---|---|---|---|---|
| EV purchase intention | Possible | 4.81 | 18.92 | <.001 |
| | Impossible | 3.94 | | |

*Workplace charging point*

Almost all of the participants of the qualitative study (16 of them) had a positive opinion on workplace charging points, and showed intentions of using them if they owned an EV, confirming the observations of Bunce et al. (2014), Skippon and Garwood (2011), and Pearre et al. (2011). Interestingly, there was even preference displayed in using a workplace charging point rather than personal of public charging points:

"*Of course that (charging at the workplace) would be preferable than charging at home, for example*" (Participant 4).

"*It would be a good alternative, while at work I would leave it (the EV) charging*" (Participant 8).

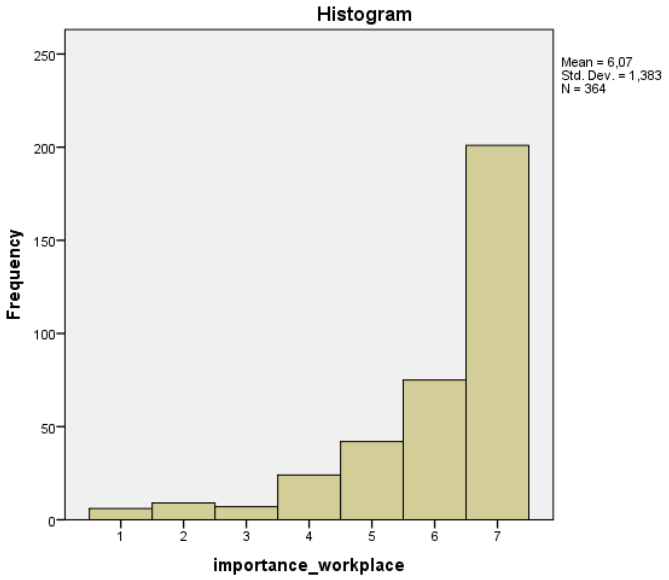
"*It would be very important*" (Participant 13).

Participant 3 noted that his employer had already installed charging points in the firm's parking, which were already frequently used by some of the employees. Two participants indicated that a workplace charging point would be their single option to charge the EV, as they could not install a home charging point nor rely on public charging points:

"*It would be interesting (to charge at the workplace), it would almost be the only option*" (Participant 10).

"*It would be essential*" (Participant 16).

In the quantitative study the importance of a workplace charging point scored a considerably high average (6.07, STD = 1.383). The distribution was strongly skewed towards the highest value (i.e. very important) showing that the majority of the sample was positive of workplace charging points (see Figure 13).




Source: SPSS output

Figure 13 – Histogram on the importance of workplace charging point

*Public charging point*

All of the participants in the qualitative study were positive about having public charging points available, however, concerns arise. Participant 1 noted that public parking points would only be appealing in places where the EV would park for a sufficient time to charge a reasonable amount of energy, such as a shopping mall. Participant 10 displayed concerns about the sustainability of public charging points, for if the number of EVs rise the city managers might face difficulties in providing sufficient charging points. Additionally, Participant 14 noted that public charging points would be very important when travelling longer distances, as recharging in a public charging point would be necessary to make the trip back. Twelve participants showed concerns about the amount of viable public points, regarding their availability and their working condition:

"*The biggest disadvantage (in owning an EV) is the number of public charging points, they are still insufficient*" (Participant 3).

"*It would be important that they (the public charging points) would be functional. I know of a few that are not working well*" (Participant 4).

> "*There should be more public charging stations available*" (Participant 12).

> "*There should be more (public charging points) available, here there are hardly any…*" (Participant 17).

This situation was also verified by data collected on the domestic EV charging point ratio (see Table 26). Specifically, Portugal has a ratio of 0.35 charging points per 1000 cars, where the three countries with the highest ratio (Norway, Netherlands, and Finland) have an average of 4.14 charging points per 1000 cars. The lack of public charging points is a key barrier in EV adoption (Axsen & Skippon, 2013; Daziano & Chiew, 2012), especially for drivers who live in urban areas and cannot install a home charging point. The access to public charging points was not noted as an essential condition for owning an EV by many of the participants, in coherence with Bunce et al. (2014).

The access to multiple types of charging point, such as at home, workplace or public points, seems to be an important aspect when considering EV adoption, and it depends strongly on the drivers' context and available infrastructure. Based on the findings and previous literature, we formulated the following proposition of study:

> **P1**: When considering EV adoption, drivers show in general to accept all types of charging points (personal, work and public), notwithstanding, driver's mobility profile and available infrastructure influence the preference for a specific charging point type.

### 7.4.2 Second conventional car availability

Access to a CV as a second car can be an attractive mobility alternative, and also help to minimize the impact of EV mobility restrictions, especially in longer trips (Jakobsson et al., 2016; Tamor & Milačić, 2015). This is especially relevant, as 15 of the participants reported to perform long trips at least once a year and to use exclusively their personal car. The insufficient range capacity in EVs for longer trips is an important barrier to adoption (Buhler et al., 2014; Egbue & Long, 2012). Moreover, most EVs are designed to be small efficient cars, hence not as comfortable and spacious as medium-sized or large family cars which are more suitable for long trips, such as vacations. Drivers seem to regard EV use as

restricted to short daily trips. In this line of thought, a CV as a second car could be perceived as a viable mobility alternative for long trips, thus reducing the mobility limitation of EVs. Owning a second conventional car, as an occasional alternative to the EV, was pointed out as an attractive solution by most of the participants, and even as an essential condition should one own an EV by a few of them:

> "*I would really prefer to have that option*" (Participant 1).

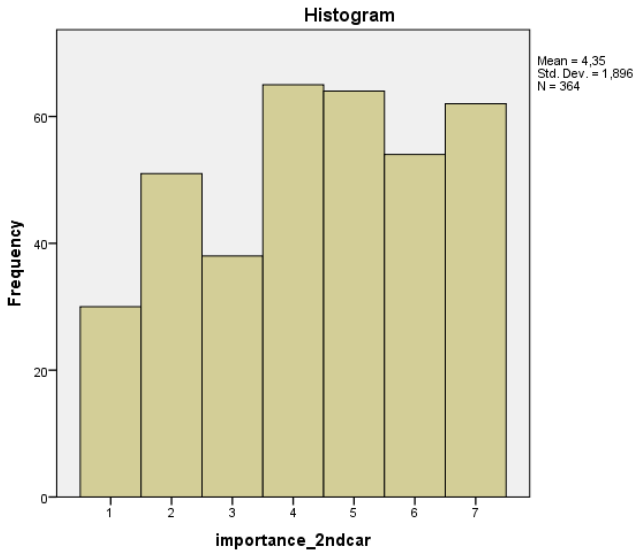
> "*Yes, it would be important*" (Participant 8).

> "*For longer trips, really… it would not be feasible to take the EV… for vacations trips I would always need a second car*" (Participant 12).

Only one of the participants (Participant 17) noted the lack of need for a second conventional car, as he calculated that the EV range would be sufficient to cover his mobility needs. One other participant specifically talked about having a smaller daily car and a larger car for occasional long trips – matching an EV multicar household scenario as proposed by Jakobsson et al. (2016):

> "I*t is an optimal immediate solution to have a second car, a city car like a Smart or a Citroen C1… (…) because most of the households have (already) two cars… to keep a gasoline or diesel one for occasional longer trips, and to have a small EV for daily trips, I think it would be perfect*" (Participant 13).

In the quantitative study, the average of the importance of a second conventional car scored a positive value very close to the middle point (4.35, STD = 1.896) (see Figure 14). The normality Kolmogorov-Smirnov and Shapiro-Wilk tests failed to sustain normality, however, the skewness value (-0.194, std error = .128) was within acceptable range (Field, 2009; George & Mallery, 2009; Gravetter & Wallnau, 2013; Trochim & Donnelly, 2006).




Source: SPSS output

Figure 14 – Histogram on the importance of a second conventional car availability

These generally positive attitudes towards a two-vehicle household (one EV and other CV) match other studies' findings (e.g. Jensen, 2013; Lieven et al., 2011; Plotz et al., 2014; Schuitema et al., 2013; Tamor and Milačić, 2015). A second conventional car would make drivers feel more relaxed about meeting their mobility needs, thus decreasing mobility risks and improving attitude towards EVs. Hence, a second proposition of study emerged:

> **P2**: The existence of mobility alternatives for longer trips in the form of a conventional fuel vehicle (i.e. second conventional car), decreases mobility concerns when considering EV adoption.

### 7.4.3 EV trip assistant

One way to decrease mobility concerns is to give access to information on EV range capacity, especially if this information is customized to fit users' driving style (Rauh et al., 2017b). Participants of the qualitative study were presented with a simulated *EV Trip Assistant* (ETA) based on similar systems retrieved in the literature (e.g. Rauh, Franke, et al., 2017; Rauh, Günther, et al., 2017) but with more advanced capabilities (hence, the use of "assistant"). In the ETA, drivers would receive support in managing route changes, for

example, should an unexpected detour need arise when driving on a normal journey. In such case, the driver could input the new stop into the ETA interface, which would automatically calculate the possibility (or not) of reaching a charging point before battery depletion (which could be pre-set as home, workplace, or a close-by public point). All of the participants had positive attitudes towards this device:

> "*Yes, definitely, I think it would be very useful (...) I think it would help at the beginning*" (Participant 1).

> "*That is important because I think there are people who have no idea on the amount of range they actually need… for older people (...) it would make sense that the car had an app that would help them…*" (Participant 5).

> "*That would be amazing, no doubt*" (Participant 8).

> "*It should be something already built-into the car… all cars should have that, even gasoline or diesel cars should also have it*" (Participant 10).

> "*Yes, it would be important… it would be reassuring*" (Participant 12).

> "*Yes, it would be handy*" (Participant 16).

One participant also mentioned that such a device should also consider traffic dynamics:

> "*It would be important that it considers the traffic and detours, to be more reliable*" (Participant 6).

These reactions suggest that detailed information on how to manage range in EVs would be well received by drivers, in accordance with previous research (e.g. Franke and Krems, 2013b; Graham-Rowe et al., 2012; Rauh, Franke, et al., 2017; Turrentine, 1994). Hence, we formulated a third proposition of the study:

> **P3**: A sophisticated EV trip assistant decreases mobility concerns when considering EV adoption, as it would allow consumers to feel reassured on being able to accomplish mobility needs.

## 7.5 Conclusion

EVs can help to improve air quality, reduce noise in urban areas, and use electricity from a variety of energy sources, especially renewable (Mersky et al., 2016; Peters & Dutschke, 2014). EV energy accumulation in batteries also helps to balance supply and power along the day, as EVs typically charge during the night time (Dutschke et al., 2013). Maintenance complexity is lower than in CVs and uses fewer components (Graham-Rowe et al., 2012; Leitman & Brant, 2013). Although capable of responding to most of the driving needs of the population and being beneficial in multiple ways, EVs still find obstacles in becoming a relevant market share (ACEA, 2017b). One of the most important barriers remains the drivers' mobility concerns (Buhler et al., 2014; Franke et al., 2017).

This study offers knowledge on gaps from three variables that play a role in mobility concerns in drivers when considering EV adoption. First, results confirmed that access to all types of charging points plays an important role when contemplating EV adoption. However, although drivers showed positive attitudes towards all types of charging points, the mobility and infrastructure context can heavily influence their preferences and access. For most of the urban residents in the qualitative study, the existence of a workplace and/or public charging point seemed to be a vital condition for owning an EV, whereas for rural residents (available for installing a home charging station), a public or workplace charging point would not be necessary, although welcomed. The quantitative study showed that EV purchase intentions were higher for drivers who had the possibility of installing a home charging station, in accordance with the suggestions of previous research (Buhler et al., 2014; Bunce et al., 2014; Plotz et al., 2014). This was further reinforced by the fact that the current network of public charging points is not sufficient to support a massive EV adoption, so drivers who cannot install a home charging point quickly dismiss the idea of purchasing an EV due to infrastructure incompatibility. The importance of workplace charging points was very high, suggesting that in the case of owning an EV, the vast majority of drivers would highly value and use this type of charging points.

Second, the availability of a second conventional car was found as potentially relevant in EV adoption, as drivers would not feel compromised in fulfilling all their mobility needs, especially longer trips. Previous studies noted a correlation between multi-car households and EV adoption (i.e. Figenbaum & Kolbenstvedt, 2016; Karlsson, 2017; Tamor & Milačić,

2015), and these study results suggest that the presence of a second conventional car might even be a decisive factor in EV adoption. In the quantitative study, however, a normal distribution of the importance of a second conventional car availability suggests that this mobility alternative may be restricted to some segments of the market - it is possible that factors such as high financial investment, the need for a double parking space, and other variables that come into play by owning two automobiles can cause drivers to lose interest in owning two cars rather than one multi-purpose car.

Third, the advanced range management system EV trip assistant had a general positive acceptation in the qualitative study, as anticipated by research (e.g. Axsen and Skippon, 2013; Daziano and Chiew, 2012). Drivers with access to a sophisticated trip planning system would feel more confident about range management and decrease mobility concerns and anxieties when considering EV adoption. This is especially relevant as range capacity was the most noted major disadvantage in owning an EV. Finally, this study also provides knowledge on the profile of the CV drivers, which make the majority of the potential EV adopters, instead of the EV early adopters as most of the previous research (Rauh et al., 2017b; Schneidereit et al., 2015).

EVs have significantly improved since the first models, but consumer perceptions remain challenging, especially due to the failure of manufacturers and policymakers in identifying consumer needs and preferences (Buhler et al., 2014; Burgess et al., 2013). Next, a few recommendations for practitioners are proposed, followed by the study limitations and suggestions for future research.

### 7.5.1 Recommendations for practice

The access to charging points, either at home, the workplace or public ones, is an important aspect considered by drivers in EV adoption. The complexity increases as it also depends strongly on the drivers' context and available infrastructures, which play a significant role in the future EV charging routines. Automotive marketing managers should segment the EV potential buyers and marketing accordingly with their living context. In this way, marketing efforts might be more efficient by promoting home charging stations in the places with a large rural audience or even alongside roads during traffic periods when city workers are leaving for suburban and rural areas. One other recommendation would be to

communicate rapid charging stations' success cases in firms, driving CV drivers to take initiative and address their employer about installing charging stations at the workplace. The workplace charging (and use) potential should be considered by governments, bringing actions on increasing awareness of EV mobility benefits in industrial areas identified as attractive places for charging stations. Firms might be convinced with benefits in agreeing to have installed charging points for their employers' use, either for free or paying a fee. Having multiple charging points within a single firm drives the installation costs down, and many firms, especially those in larger industrial areas, have suitable power infrastructures to install fast-charging stations – taking the EV charging time from six to eight hours to charge fully in 30 minutes (Denton, 2016). With this trend, faster-charging stations would be available, and CV drivers, who have been dismissing EVs due to the costs and the structural impossibility of installing a home charging station, could become potential EV adopters. As a secondary effect, the need to install a large number of public charging points in the city urban areas would be decreased.

Yet, public charging points should still exist as a complement, especially as many countries still have a low ratio of charging points comparing to the number of active vehicles. Furthermore, public charging points present also an important role on creating EV awareness and decreasing mobility concerns (Axsen & Skippon, 2013; Carley et al., 2013; Egbue & Long, 2012; Mersky et al., 2016). It is therefore recommended to increase the ratio of public charging points, especially taking into account the drivers pursuing long inter-city trips. Having rapid charging stations aimed at serving travellers or seasonal tourists, for example, might be a way to promote EV usage while making charging service also accessible to local residents. However, the overuse of charging points use must be taken into consideration, especially as EV drivers tend to exaggerate their charge needs and take every opportunity they can to charge (Bunce et al., 2014). As the charging process is relatively long, public charging points managers must create protocols to prevent abuse of charging points and assure an effective usage, for instance through penalties for drivers who leave the EV occupying a charging space after a complete charge (Bonges & Lusk, 2016). City municipalities should also provide support in ensuring that access to the public charging point is trouble-free, such as by preventing the parking of CVs in the charging spots. In order to increase the number of public charging points, the public sector is advised to bring in more private investment (Odekerken-Schröder, Hennig-Thurau, & Knaevelsrud, 2010). Benefits

in funding, taxes and privileged locations might attract private businesses to install charging points much like petrol stations, thus increasing the charging infrastructure coverage resorting to both public and private handling.

Although the second conventional car was not supported as a universally accepted mobility alternative in this study, automotive marketers should explore the importance of the second vehicle in CV drivers considering EV adoption, especially in first-time adopters. For instance, though a rental-basis option: could current CV drivers be allured into buying a new EV that included a rental option of a CV car from the dealership? In such a service, the CV would be available for a number of days each year, with minimal or no additional costs. By reducing costs with the rental option of a second vehicle, CV drivers might be convinced to adopt EVs as the main vehicle. With this rental option, dealerships might succeed in attracting supporters of the second-car solution, although an adequate number of cars in stock would be necessary to satisfy high demand periods, such as during vacations. One other solution would be to encourage drivers from single-car households who are purchasing an EV to keep their old CV as a second car. In this way, the EV would be used as the main car for daily trips, yet the CV would be available for longer trips or should the EV be low on charge, decreasing mobility concerns. Furthermore, drivers would not have to worry about driving their EV into a different region where the charging infrastructure would be unfamiliar and possibly not available nor compatible with their EV. Having a reliable mobility alternative promptly available would further contribute to lower range demands, easing the pressure of manufacturers to make EVs capable of ever-longer trips, and focusing instead on more economical and commute-oriented EV (Jakobsson et al., 2016).

Finally, understanding range concern in depth is necessary in order to develop strategies to lessen its effects on the drivers' purchasing process and prevent excessive range demands of EV potential buyers (Franke & Krems, 2013a). Automotive OEMs are advised to invest in improving the range management skills through the use of range management auxiliary systems, in favour of improving driver's attitudes and increasing EV adoption, helping to overcome mobility concerns (Rauh, Franke, et al., 2017; Rauh, Günther, et al., 2017; Zhang et al., 2018). Such systems could be incorporated into the already-existing infotainment and navigation modules of the EV with minimal additional production cost. Also, more advanced versions of the ETA should be designed, for instance, with a voice-commanded route

changer tool where the driver would tell the ETA about a route change. In this case, the ETA would be aware if the driver had a home charging point – if not, the system would calculate the range possibility of making the detour, return home, and drive to work the next day, where a known workplace charging point would be available. Should this situation happen on the day before a weekend, for instance, the ETA would then consider a typical weekend use (for example, an averaged travelled distance or a previously selected weekend range preference), and calculate if the range was sufficient to charge at the workplace charging point on the next working day. In case the range would not sufficient, the ETA could suggest alternative charging routine based on the location and driver's preferences, for instance, "*Calculating the new route. The available range is sufficient to return home and charge at the close-by public parking point X tomorrow morning, to ensure a typical weekend use and to charge at work on Monday*". Such range management system could also include confirmation of alternative routes and charging points from a set list of preferences inputted by the driver, and also integrate route schedules and regular appointments (such as picking up children from school) further decreasing mobility concerns by taking the trouble from the driver's mind. As a side benefit, advanced range management systems would make it possible to collect detailed data on each EV driving and charging patterns. This real-life data would be extremely valuable for manufacturers and governments to optimize charging infrastructure and transportation management (Biresselioglu et al., 2018). Automotive roadshows and selling moments should also include introductory training on handling range, in order to improve range efficiency and raise drivers' confidence and experience. Additionally, automakers would feel less pressured to make vehicles with a higher range than necessary, and resources could be used for other EV improvements.

### 7.5.2 Limitations and suggestions for future research

This study presents some limitations, especially considering its explorative scope. First, this study employs a sample from a single European country, which may prevent generalization to other countries. Hence, a broader study focusing on other countries with more diverse samples, including more ages, driving profiles, and previous experience with EVs, might provide deeper knowledge on the concerns and the role of mobility concerns and context in EV adoption and purchasing.

It would be important to clarify and understand in a deeper way how strategies involving different types of charging points and mobility alternatives could be formulated and implemented, while also identifying the different market segments according to the charging infrastructure and mobility alternative preferences. This knowledge could be afterwards used as input for OEMs, governmental, energy, transport, and environmental institutions to better address, plan and implement actions to move into a higher adoption of EVs and other mobility solutions.

For instance, albeit owning a second conventional car was a valued option in the qualitative part of this study, the quantitative analysis suggested that this solution would not be universally accepted. Further research on identifying the variables that come into play is advised, especially focusing on the role of constraints and trouble of owning two cars. It would be important to also distinguish the property of a conventional second car or a rental option, as these options can be perceived in different ways by consumers. A more advanced study on how to develop advanced range management systems would be particularly useful as it would allow identifying more specifically which functions are most valued by the drivers. Finally, addressing the influence of brand and brand-related features, such as brand reputation, brand experiences, affective attachments, and brand loyalty in the purchasing-decision process of EVs remains an open and relevant research topic. This is an important issue, especially as some of the OEMs are only recently offering EV models while other OEMs still do not include them at all in their global portfolio.

# Chapter 8 – Study on the Future of the Secondary Market of EVs

## 8.1 Introduction

Electric vehicles (EVs) are a trending mobility technology that is expected to replace conventional-fuelled vehicles (CVs) as a more ecologic and efficient transport (Dutschke et al., 2013; Graham-Rowe et al., 2012; IET, 2015; Mersky et al., 2016; Peters & Dutschke, 2014). The global stock of EVs is close to 2 million units and growing (IEA, 2017). As the first modern units from around 2010 reach the secondary market, it is relevant for research and practice to understand how these will be received. This market is relevant for multiple stakeholders (i.e. automotive manufacturers, dealerships, and governments) especially as EVs are typically more expensive than equivalent CVs and their adoption remains low (ACEA, 2017b; Burgess et al., 2013; Mersky et al., 2016). An accessible secondary market of reliable EVs could improve EV adoption and extend the product life cycle. By keeping them more years on the roads, rather than scrapping and recycling them, the application of more incentives for the purchase of new EVs, such as tax benefits or direct subsidies, could be more effective (Mersky et al., 2016; Zhou et al., 2015).

This chapter corresponds to the specific research objective SRO6 analysed in the second part of Study 2 (Study 2.2). Study 2.2 thus aimed to understand how consumers would evaluate the possibility of purchasing an EV from the secondary market, including the willingness to pay for a second-hand EV and the role of battery condition and warranty options in the case of refurbished second-hand EVs. In the next sections is presented the theoretical background, the methods, results and discussion. In the end of the chapter, a conclusion is offered as well as recommendations for practice, limitations and suggestions for future research

## 8.2 Theoretical framework

Secondary markets allow access to consumers of different income segments to several goods, especially durable goods, such as automobiles (Gavazza et al., 2014; Roux & Guiot, 2008). Automobile manufacturers have been increasing the durability and lifetime of their products over the last decades, thus supplying the secondary car market with viable vehicles (Bento et al., 2018). Unlike the new car market, the sellers on the secondary car market can

be franchised dealers, non-franchised dealers, and private resellers (Singh et al., 2014). This market also competes with the new car market, even more as the manufacturers' pursue business fleet sales strategies, making cars from business customers such as rental companies later available for the secondary market in high numbers (Blackwell, 1994).

In the secondary market, there is a greater number of available products, albeit more uncertainty on the availability of a specific model or condition. Age and mileage are the main factors influencing the value of a second-hand car, although its value can be increased by assets such as engine power or extras like air conditioning (Prieto et al., 2015). Purchasing in the secondary market involves more uncertainty and risk, particularly due to asymmetrical information from the unobserved maintenance history and mechanical defects (Dowling & Staelin, 1994). The consumer is also limited to the existing market offer, where a specific brand or model may simply be unavailable (Johnson & Waldman, 2003; Singh et al., 2014). There is also the risk of odometer fraud, where the mileage information of the vehicles is modified to a lower number, thus dishonestly increasing the sale price (Montag, 2017). The secondary car market is also subject to policies, such as scrappage policies, which can influence its volume and quality (Gavazza et al., 2014). Scrappage policies comprise allocative and welfare effects and can force households to scrap cars earlier than they otherwise would. The cost-effectiveness ratio of the scrapping policies remains doubtful in many cases (Wee, Jong, & Nijland, 2011). External economic conditions can affect purchase behaviour of a second-hand car, including when consumers purchase it, how long they keep it, and whether they sell it or scrap it at the end stage (Gavazza et al., 2014). The recent economic crisis in the western markets has benefited the secondary car market, as uncertainties lead consumers to postpone the purchase of a new car and choose a second-hand car instead (Prieto et al., 2015). Second-hand car buyers are also less prone to use credit in the purchase, and more likely come from medium to low-income segments (Prieto & Caemmerer, 2013).

As new EVs' purchasing costs are higher than CVs, and most CV drivers (i.e. those who are not early EV adopters) are not willing to pay a premium for an EV (Larson, Viáfara, Parsons, & Elias, 2014), a secondary EV market could provide a feasible way to increase EV adoption (Gavazza et al., 2014; Roux & Guiot, 2008). In this scenario, consumers who would not

otherwise consider the purchase of a new EV could be receptive to consider an EV from the secondary market.

## 8.3 Methods

This study of exploratory nature used the same sample, the same data collection, and the same data analysis procedures of Study 2.1 (see Table 27). The section of the semi-structured interviews related to the EV secondary market comprised ten extra questions which measured consumer automotive purchase profile, attitudes, and concerns towards second-hand EVs (see Appendix III). Three main categories guided this study: (1) consumer attitudes and concerns toward EVs; (2) automotive purchase profiles; and (3) consumer attitudes toward second-hand EVs.

In Study 2.2 participants were asked how much they would be willing to pay for a used EV compared to a CV, following the technique used in a study from Peters and Dutschke (2014) on new EVs' adoption. Considering the lack of existing literature on refurbished EVs, a basic scenario of a second-hand EV fitted with a new battery and with dealership warranty was simulated and presented to the participants.

The sample's age range (from 22 to 38 years old) was considered proper for this study, as previous research suggests that younger consumers might be more open to considering a second-hand EV (Hidrue et al., 2011; Roche, Mourato, Fischedick, Pietzner, & Viebahn, 2010).

## 8.4 Analysis and discussion of results

The sample in this study was the same as the qualitative study in Chapter 7, with an identical size and demographic characteristics. In the same way, codes were created and arranged into families using the ATLAS.ti software (Hwang, 2008), in this case, it was done so for the automotive purchase profile and the consumer attitudes towards second-hand EVs families (see Table 31).

Table 31 – Families and codes on second-hand EVs

| Families | Codes | Number of responses (0-17) |
|---|---|---|
| Automotive purchase profile | Current car bought new | 3 |
| | Current car bought in second-hand | 14 |
| | Next car to be bought – new | 3 |
| | Next car to be bought – second-hand | 14 |
| | Fuel and price expected for next car | 17 |
| Attitudes toward second-hand EVs | Concern about second-hand EV | 4 |
| | Positive attitude towards a refurbished second-hand EV | 17 |
| | Willingness to consider purchasing of a second-hand EV | 16 |

Participants were asked about their automotive purchasing profile, more specifically if the car they currently owned was purchased new or in second-hand, whether the next car to be purchased would be new or in second-hand, which fuel type, and how much they were thinking of paying for it. Fourteen out of the 17 participants had bought their personal car in the second-hand market. When asked about the purchase of the next car, 15 participants showed intentions of buying a second-hand car, and the average budget was of about €10,676, ranging from €1,000 to €20,000. All of the participants were planning to purchase a standard CV, except for two participants who were considering a hybrid vehicle. None of the participants displayed intentions of considering an EV as their next car purchase.

Participants were then exposed to the possibility of buying a second-hand EV on their next car purchase and were asked about how much they would be willing to pay, comparing to the previously stated CV budget. Four of the participants displayed apprehension about considering a second-hand EV:

> "*…a second-hand EV, that is crazy*" (Participant 2).

> "*I have doubts about the technology, I am not sure if it is viable*" (Participant 3).

> "*At this moment the state of technology is not so… you see? (…) I don't trust it much*" (Participant 8)

> "*Depends… it depends on the value… and the range of the car*" (Participant 11)

Two of the participants showed no interest; three participants said they would consider it but for a lower price than their CV budget, and four participants were willing to pay the same price. Eight participants were willing to pay a premium over their CV budget for a second-hand EV. These pointed out an amount on average about 50% over the initial CV budget, ranging from €500 to €5,000 over the initial CV budget. Other studies on the willingness to pay a premium price for the purchase of new EVs over CVs have found similar numbers: Vyas and Hurst (2012) stated $4000 on average, and Hidrue et al. (2011) stated $2,500 on average. In another study, consumers who were willing to pay a premium pointed out a range of between €2,500 up to €10,000 over the CV price (15% stated €2,500, and 10% about €5,000). Other studies laid forward premium values of £2,000 (Skippon & Garwood, 2011) and of $10,000 by half of the participants (Larson et al., 2014).

When introduced to the purchase option of a second-hand EV refurbished with a new battery and dealership warranty, all of the participants had positive reactions, making statements about the importance of such aspect on a potential second-hand EV purchase:

> "*It would bring more confidence on the purchase… (…) I would not purchase it, but I would consider it, I would be more receptive to it*" (Participant 2).

> "*In that case, yes, there would be no problem. I would pay a bit more, yes*" (Participant 3)

> "*As long as there is a warranty by the dealership… I see no other problem*" (Participant 5)

> "*Well, it would be interesting, yes. Then I would consider it*" (Participant 7)

> "*It would be much better, more appealing*" (Participant 17)

When asked about the purchasing price for the refurbished version, six participants preserved the same price as indicated for the first version of a second-hand EV, while eight participants indicated a higher price, between €3,000 and €5,000, over the first version of the second-hand EV. Two of the participants, who were interested in a lower price for the second-hand EV when compared with the available budget for a CV, were now willing to pay an equivalent amount for the refurbished second-hand EV. Three of the participants, who

referred the possibility of paying a premium price for a second-hand EV over a CV, even pointed out an extra premium for the refurbished EV version.

Positive opinions on the refurbished and warranted option agree with research in both the new car market (Aksezer, 2011) and in the secondary car market (Mishra & Das, 2018; Williams & Paddock, 2003). Consumers are positive about dealership warranties as these reduce the risk of purchasing in the secondary car market (Dowling & Staelin, 1994; Singh et al., 2014; Sultan, 2010). It is also relevant that second-hand cars are likely to have more defects when sold by private owners than when sold by dealers (Emons & Sheldon, 2009). Finally, the battery condition seems to be as relevant as engine or transmission condition in second-hand CVs, where consumers value the condition of these costly parts (Peterson & Schneider, 2014). As such, it is here suggested that battery condition plays an important role in the second-hand EV evaluation.

## 8.5 Conclusion

By extending the product lifetime, environmental pollution and the impact of waste can be reduced, as well as reducing the use of natural resources and energy (Box, 1983). This is especially relevant in EVs as the emissions of pollutants can be retained by keeping old EVs running in the secondary car market and taking the place of CVs, rather than recycling them for components or raw materials. The secondary car market is an opportunity to increase EV adoption if strong arguments and advantages over CVs are in place.

However, there is not much experience in second-hand EV acceptance and purchase. This study is a first step into supporting future research and strategy development on the acceptance of second-hand EVs, especially from the majority of the driver population (i.e. CV drivers). It is proposed that it would be possible to grow a secondary market for EVs, as consumers may be interested in second-hand EVs, and even pay a premium. Results suggest that a refurbished second-hand EV is more attractive to drivers in general, as it assures a good condition of the vehicle and provides the possibility of an upgrade in range. Next, there are provided recommendations for practice, followed by enumerating the study limitations and suggestions for future research.

### 8.5.1 Recommendations for practice

Research contributions can be used by practitioners of the secondary car market, governmental, energy, transport, and environmental institutions to better address and foster the adoption of second-hand EVs. It is important from a managerial perspective to have insight into the used car market consumers to better design retail strategies (Prieto et al., 2015). Consumers of used cars will gather information, engage in price comparison and consider more brands and models than new car consumers (Singh et al., 2014). Automotive practitioners (both brands representative and independent dealerships) must build up on awareness and attractiveness, and engage consumers into the emerging second-hand EV market. Five recommendations for practice are noted below.

First, concern about the battery condition seems to be a major barrier towards second-hand EV's acceptance. The EV's battery is one of the costly parts to be replaced, costing thousands of euros to replace at the end of their lifecycle (Larson et al., 2014; Leijen, 2011). This information can deter most consumers, as the value of automobiles in the secondary car market can also be influenced by the condition of some individual parts of the vehicle and not only by its overall condition (Peterson & Schneider, 2014). This is a critical aspect in second-hand EVs, especially as the deteriorated battery can be troublesome and imply reduced range capacity. The results of this study suggest that refurbishing second-hand EVs with new batteries will reduce consumer concerns and increase acceptance. Batteries are currently undergoing the greatest amount of technical development (Mohamed, Ferguson, & Kanaroglou, 2017; Narins, 2017), and newer batteries will be cheaper, more efficient and provide a higher range. This would create the possibility for second-hand EVs with present-day performance levels, being especially relevant for the early models with smaller ranges and obsolete batteries (such as the 2010 first version of the Nissan Leaf) thus making the second-hand EV more attractive to purchase and saving them from scrapping programs. As a side effect, the need for battery materials, such as lithium, will push corporations to secure unexplored extraction sites like Bolivia, and contribute to the sustainability and growth of the EV industry, as well as to decrease purchasing prices of new EVs (Narins, 2017; Speirs, Contestabile, Houari, & Gross, 2014).

Second, an emphasis on purchase and running costs should be used. Second-hand car buyers are highly cost-concerned, so practitioners should bring attention into the savings of EVs

running costs compared to CVs, both on fuel and on maintenance (Graham-Rowe et al., 2012; Leitman & Brant, 2013). This can be done, for example, by presenting customized simulations of saving estimates between a second-hand EV and a second-hand CV and using it as a sales argument. Although new EV adopters typically come from high-income households, a second segment exists, classified as *emerging early adopter* (Mohamed et al., 2016). This segment does not have such a high income, yet it does have an interest in purchasing EVs. A secondary market would provide a way of facilitating the EV adoption for this less wealthy segment. In the same way, second-hand accustomed buyers would be more likely to consider a second-hand EV rather than a new EV (J Neubauer et al., 2012). Furthermore, the secondary market is not populated exclusively by low-income consumers: several classes of consumers also choose to purchase from this market for other reasons than economic necessity (Williams & Paddock, 2003). More affluent consumers might also be interested in purchasing a second-hand EV.

Third, although EVs are more economical to drive than CVs, and drivers of alternative fuelled cars are prone to driving longer distances (Iwata & Matsumoto, 2016), their limited range prevents high-mileage building. Hence, EVs in the secondary market will likely have lower mileages than, for example, diesel cars with the same age, creating a competitive sales argument on the vehicle overall condition. Fourth, practitioners are advised to also target single-car households. Although EV adoption is facilitated in multicar households (Karlsson, 2017), practitioners could further seek the opportunity of selling a used EV to single-car households, where the old CV would be kept as a second car and the second-hand EV as a daily car for commuting and short trips.

Finally, incentives provided by the government are important in this market, too (Mersky et al., 2016; Rudolph, 2016). By creating incentives to purchase, more consumers will be interested in second-hand EVs, especially as their first-time, less risky, EV purchase. These actions will also reassure and attract more consumers by bringing a positive image to second-hand EVs. Further motivation could be obtained by adding an extra incentive to scrap the old CV at the moment of purchase (Wee et al., 2011). Another recommendation is the creation of EV repurchasing programs to avoid scrapping older EVs, taking them instead to be refurbished with newer batteries and inserted back into the market. Of course, the existing incentives to new EV purchases should be kept active, especially for current EV owners

(Mersky et al., 2016). By continuing to encourage the purchasing of new EVs and supplying the secondary market with more EVs, these incentives gain a double effect by creating two EV purchase opportunities. Hence, governments and policymakers should approach the secondary market for EVs as a solution to keep EVs market share, reduce CV numbers, promote EV adoption and prevent EV scrapping (which were quite likely purchased new with incentives).

### 8.5.2 Limitations and suggestions for future research

This study presents some limitations. First, it was based on a single-country sample from a small number of participants living in Portugal, not contributing for the generalization of results. The sample was also from a restricted age segment (20 to 40 years old), failing to gather insight from consumers beyond this range. Furthermore, it being cross-sectional, the data are very sensitive to change due to the dynamic nature of the secondary car market, which is subject to fluctuations of available models, price and also policies and incentives (Singh et al., 2014). Future research is advised to accompany new EV models and technologies becoming available in the market, as well as a sample of more countries.

Moreover, the study on the secondary market was based solely on a qualitative study. Future research should build a more advanced study on the acceptance of second-hand EVs, creating more detailed hypotheses on the second-hand EV attitude and purchase intention. Hypotheses could be made combining knowledge from this study and more literature on the secondary markets. Also, choosing a sample of participants who are actively looking to purchase their next second-hand vehicle is advised, as these will likely provide more accurate and considerate answers, rather than imagining details about a possible purchase choice that will take place in the next year (or years). In the same way, future research should identify and describe the segments of the most appropriate buyers of second-hand EVs could be sourced, in the same way, it was made for new EV buyers research (e.g. Plotz et al., 2014). Furtherly, more insights into the antecedents of second-hand EV attitudes, other than the vehicle and battery condition, could be explored and tested. It would also be interesting to study the effect of mileage on the value of second-hand EVs. For example, in the European secondary market, the value of a diesel CV is much less affected by high mileage than gasoline CVs (Prieto et al., 2015). As EVs have a limited range, low mileage might be an

asset valued by consumers. Additionally, brand effects were not considered in this study. The influence of brand in second-hand EV adoption is an important topic to investigate, however, care should be taken in the analysis due to the different functionality aspects, technological maturity and availability of EV models across different brands. Lastly, as the secondary market is subject to change, it is advised to follow conjoint research on the impact of these secondary car market incentives, especially regarding EVs. Future research should also analyse the effect of a simulated second-hand EV incentive, and gather knowledge on the reception, providing valuable insights for government practitioners and policymakers.

# PART III – GENERAL CONCLUSION

# Chapter 9 – General Conclusion

## 9.1 Thesis summary and publications

The thesis is divided in two main studies. Study 1 aimed to answer to the main research question: "how does the introduction of a smaller and cheaper vehicle (downward brand line extension) of a premium brand affect the consumer attitudes towards the brand line extension (brand extension attitude), towards the respective parent brand (parent brand attitude) and, ultimately, the consumer purchase intention?" Study 1 investigated the research opportunity RO1, which dealt with the "consumer evaluation of downward brand line extensions in the premium automotive OEM European context". Four specific research objectives (SROs) were derived from RO1: understanding downward brand line extensions in a premium automotive OEM European context (SRO1); understanding consumer perceived fit and fit preferences of a brand line extension (SRO2); understanding how the diverse consumer ownership statuses influence the consumer evaluation of a brand line extension (SRO3); and how consumer innovativeness and need for status influence the consumer evaluation of a brand line extension (SRO4).

From Study 1, two papers were developed. First, an extended abstract with the research global objectives and an early version of the research design was presented and published in the Web of Science proceedings of an international conference (Pedrosa & Nobre, 2017). An empirical study article is currently under review. This article comprises the full Study 1, including the literature review, research design, data analysis and conclusions.

Study 2 focused on answering the research question: "what role do the consumer mobility concerns and secondary market attitude play in the EV adoption intention in the European market context?" It matched the research opportunity RO2 dealing with the "electric vehicle future of small size segments in the European context" which derived into two SROs: understanding how the consumer mobility concerns influence the consumer attitude and purchase intention towards EVs (SRO5); and how consumers would evaluate the possibility of purchasing an EV in the secondary market (SRO6). An exploratory study using a mixed design on EVs was built and applied in order to address the SRO5 in the first part of Study

2 – Study 2.1. The second part of Study 2 – Study 2.2 – addressed SRO6 through an in-depth semi-stricture interview study.

Study 2 resulted into three publications. First, a conference article on the preliminary results on consumer mobility concerns was presented and published (Pedrosa & Nobre, 2018a). Another article – "The influence of consumer mobility concerns on electric vehicle adoption" – is now in press in the World Review of Intermodal Transportation Research Scopus journal (Pedrosa & Nobre, 2019). Finally, the research on second-hand EVs (Study 2.2) was published in the International Journal of Electric and Hybrid Vehicles Web of Science and Scopus journal (Pedrosa & Nobre, 2018b).

Next, this chapter lists the main thesis contributions, both theoretical and practical, divided in Study 1 and Study 2. In the end, the limitations and suggestions for future research are offered.

## 9.2 Main contributions

*Study 1*

Study 1 contributes to the literature on brand extension research on three main areas. In the first place, the brand line extension evaluation variables were reexamined, and their role was checked. The parent brand attitude, which was expected to be a relevant positive antecedent of brand extension attitude, failed to be proven as such, in disagreement with previous research. This leads to the hypothesis that parent brand attitude does not always play a relevant role in the extension evaluation in this specific market. This result may be due to the distinct characteristics of the automotive market dealing with the durable aspect. The role of the extension perceived fit in the extension attitude was confirmed, in line with previous research, leading to the conclusion that a brand line extension will be better evaluated if a strong similarity with the parent brand is fostered. Additionally, a significant difference between the high-fit and the low-fit models was found, which contributed to further assert the significance of the literature recommendations on fit elements such as headlights, grilles, colour schemes, trims, and heritage. The perceived brand extension value was also addressed. It was confirmed that extension attitude is an antecedent to all of the

dimensions of perceived value (emotional, price, and social), yet, of these, only the perceived emotional value appears to play a role in the extension purchase intention. This conception suggests that the purchasing behaviour of brand extensions in the automotive market will depend on perceived emotional value instead of other forms of perceived value.

Second, the ownership status was not found to have any relevance in brand extension evaluation, contrary to previous research. Although several types of ownership statuses were tested (brand ownership and brand type ownership), the study failed to prove an effect in the evaluation of brand extensions. Such results suggest that consumers make impartial assessments of extensions regardless of their ownership status – the evaluation of the extension fit, for instance, is not subject to a blind rivalry derived from the ownership status. Hence, consumers seem to evaluate extensions independently of their current ownership status.

The third area refers to the consumer innovativeness and need for status moderation effects in brand extension evaluation, specifically between the perceived fit and the extension attitude and extension perceived value. In this study, however, results failed to support a significant moderator effect of innovativeness in any of the tested relationships, contrary to the literature. Previous research suggested that in prestigious line extensions under the same brand name, the innovativeness trait would not become apparent at all, due to a high level of similarity. As for the need for status, one moderation effect in the relationship between extension perceived fit and perceived social value was found. But, not in the relationship with the extension perceived price value nor extension perceived emotional value. This outcome agrees with the distinctly extrinsic aspect of perceived social value, which is dependent on the consumer social groups. Hence, the relationship between perceived fit and perceived social value is more relevant in consumers who are more attentive to the need for status.

This study can also contribute to practical applications. The next list presents the recommendations based on the study findings, which are mostly directed to premium automotive OEMs in a European context, yet might also be transferrable to other vehicles segments:

1) When introducing downward line extensions, premium OEMs should strive for a high level of fit, building the brand concept and associations into the extension, including visual indicators typically linked with the parent brand. It would not be advisable, however, to pursue such an extension if the current brand portfolio is narrow, as it might be perceived as illogical and even incompatible with that brand. On the other hand, broader portfolios such as the one from BMW are more adequate to pursue brand extensions;
2) Attention should be taken towards possible cannibalization effects – managers that seek to introduce a new downward line extension must anticipate if the new product might damage an existing product. However, we suggest that a two-seater automobile extension would be sufficiently different from any existing small car under the same brand name;
3) Although the consumer innovativeness effect was not verified, innovation is a fundamental aspect of the competitive automotive landscape. Therefore, OEMs must continue to apply innovations across multiple aspects of their products, both tangible and intangible, constantly creating value and attracting consumers in multiple automotive segments;
4) Products that carry a high level of symbolic status are more attractive to status-seeking consumers. In this study, we found that in status-seeking consumers the perceived fit will positively influence the perceived social value in a stronger way than in the other consumers. Hence, we recommend premium OEM managers to maintain status indicators and cues in the new extension, in order to leverage on this effect. Care must be taken, however, not to over boast on the high status of a smaller and cheaper vehicle model – a moderate approach to status coupled with tangible quality and technological attributes should be pursued, as well as keeping an adequate price level and high-end products (e.g. large-size luxury automobiles) available in the market in order to maintain the brand image and status.

*Study 2*

Study 2 contributes to the literature on brand extension research on two major parts: mobility concerns when considering EV adoption, and the secondary EV market. In the first part, knowledge on three gaps from mobility concerns in EV adoption was taken into

consideration – Study 2.1 contributes at this stage with a set of propositions of study. First, although all types of charging points are important when considering EV adoption, the mobility and infrastructure context of each driver can strongly influence their preferences. Drivers living in urban areas, for instance, would require access to the workplace and/or public charging point, as installing a home charging point is impossible or difficult. This situation is aggravated as the current network of public charging points was regarded as plainly insufficient. Rural residents, on the other hand, would be very keen on installing a home charging point, so as not to have the need to rely on public or workplace charging points. Workplace charging points received a very positive reception, suggesting that most drivers would use this type of charging points if they were to own an EV in the future.

Study 2.1 also analysed the role of availability of a second conventional car in EV adoption. Having a second car available would serve as a mobility alternative especially for longer trips, thus reducing mobility concerns in drivers considering EV adoptions. Previous research has noted a correlation between multi-car households, and this study suggests that this mobility alternative can act as a decisive factor in EV adoption. However, the population of car buyers can be rather varied when it comes to the acceptance level of having two cars instead of one car, so care must be taken by segmenting this option only for some segments of the market, such as multi-car households. Finally, we found that an advanced range management system has a fairly positive reception, in coherence with previous research. This tool can be especially important in fostering confidence about range handling in EV drivers, decreasing mobility concerns. As range capacity was the most noted major disadvantage in owning an EV, a more sophisticated range management system can be a crucial argument in improving EV adoption intention.

The first part of Study 2, Study 2.1, can be used in several practical applications. We hereafter present a set of four recommendations for practice based on this study's findings. These recommendations are aimed at automotive OEMs, but also at governments, policymakers, and businesses related to EVs such as energy providers and charging points installers:

1) Consumers are positive about all types of charging points, yet, their relative importance depends strongly on context and infrastructure. Automotive managers are advised to segment EV potential buyers and perform marketing accordingly, for

instance, by promoting home charging stations in places with a large rural audience. Governments, in turn, should foster the installation of charging stations in the workplace, especially in industrial areas with suitable infrastructure. Businesses could provide charging stations for employers to use, either for free or by paying a fee. This would be particularly important for conventional-fuelled vehicle (CV) drivers who are interested in purchasing an EV but cannot install a home charging station. As a side benefit, the need for public charging points would be lower;

2) The number of public charging points should be increased, not only to maintain awareness and decrease mobility concerns of local residents but also to serve out-of-city travellers and seasonal tourists(Axsen & Skippon, 2013; Carley et al., 2013; Egbue & Long, 2012; Mersky et al., 2016). It is important to note, however, that protocols must be in place to prevent potential abuses, especially as the charging process is relatively long (Bonges & Lusk, 2016). Partnering with the private sector could help to further increase the number of public charging points (Odekerken-Schröder et al., 2010);
3) Practitioners are recommended to explore the second car option, for instance, through a rental-basis option with a CV available at the dealership for long trips at a number of days per year with minimal or no additional costs. One other recommendation is to encourage drivers from single-car households who are purchasing an EV to keep their old CV, decreasing mobility concerns by having an alternative car. Such mobility alternatives would also make range demands lower, reducing the pressure on manufacturers to make long-range EVs and focusing instead on commute-oriented EVs (Jakobsson et al., 2016);
4) Automotive OEMs are advised to develop more advanced range management auxiliary systems, where drivers could input a route change, and calculate in real-time if the range capacity was enough for the detour and return home. Such systems should also have a map of the different charging points available (home, workplace, public) and suggest charging options for the same day (or the next days), according to the inputted trip routine of each driver. Trip assistants could be demonstrated in roadshows and advertisements, also serving as introductory range handling training, and thus favouring driver's attitudes and increase EV adoption (Rauh, Franke, et al., 2017; Rauh, Günther, et al., 2017; Zhang et al., 2018). These systems could also

provide valuable trip and charging routine data for manufacturers and governments to optimize infrastructure and road management (Biresselioglu et al., 2018).

In the second part of Study 2, Study 2.2, a first incursion into the second-hand EVs was performed, bringing contributions to the secondary EV market literature. An initial understanding of the consumers attitudes and concerns about second-hand EV acceptance and purchase has been collected and analyzed. Findings propose that a secondary market for EVs would be possible and attractive for consumers, provided that guarantees on the condition of the vehicle and battery exist. Additional appeal might be gained by retrofitting new batteries on older models for improved range and reliability. Running a successful EV secondary market has several benefits, such as increasing the EV market share and postponing EVs scrapping and recycling. Hence, a set of four recommendations for practice were elaborated based on the study findings:

1) In order to increase market appeal, automotive managers should consider refurbishing new batteries in second-hand EVs. This is a critical aspect, especially as older batteries are far behind the new versions, which are cheaper, more efficient and provide a higher range;
2) As second-hand car consumers are highly cost-concerned, automotive managers are advised to highlight and provide very detailed calculated simulations on the economic advantages of owning an EV. This is especially important for the emerging EV adopters that do not typically have an income level as high as the early EV adopters, yet are quite receptive about considering to adopt EV. Practitioners, especially dealerships, should identify and emphasise the competitive aspects of second-hand EVs when compared to the second-hand CVs, such as a typical lower mileage, due to more commuting short-range type of trips;
3) Targeting single car households could be an interesting strategy, provided the old CV would be kept as a second car, and the EV would serve commuting purposes;
4) Governments are encouraged to extend incentive policies to the second-hand EV market, instead of the new EV market only, such as taxes, scrappage bonus and funding. One other valuable action would be the creation of EV repurchasing programs, aiming to keep EVs from being scrapped or abandoned. Beyond the financial incentives, this move would bring an image of credibility to the second-

hand EVs, reassuring consumers. Furthermore, creating EV repurchasing programs would be a valuable strategy.

## 9.3 Limitations and suggestions for future research

Study 1 and Study 2 responded to the research questions and specific research objectives planned for this doctoral dissertation. However, some limitations are present in both of these studies. The list below describes the limitations together with some future research directions for Study 1 (point 1 to point 8) and for Study 2 (point 9 to point 14):

1) Study 1 used a sample made uniquely of Portuguese citizens, missing to integrate an international sample. Also, a strong focus on the small size segment (especially a 2 seater) may have influenced the collected attitudes, as this type of product may not be well received or considered by a large part of the population of car buyers due to tangible limitations and also preferences. Further studies replicating this research using samples from other European countries and a better-filtered sample regarding segment size purchase intentions are recommended;
2) Although the extension fit was here manipulated to a more complete level than in previous research, it remained strongly dependent on visual-based indicators. Thus, future experimental research on brand line extensions is advised to use more diverse fit indicators and further realistic simulations;
3) Using a single OEM brand in this study constitutes a limitation: future research using more premium brands to support generalization is recommended;
4) The contribution of the parent brand is limited in this study, as only the brand attitude was measured. Future studies should look into more drivers variables concerning the attitude, past and current relationship with the parent brand and other brands, in order to gather more data and generate more far-reaching insights;
5) This study missed considering the reciprocal effects of the extension on the parent brand. As premium brands have particular status associations and brand image, this is an important and relevant research line that could be followed further under the topic of line extensions.
6) Even though the ownership effect was not found relevant, future research should deepen this topic and test it again, for example by differentiating the current

ownership status against the preferred brand, and by also taking into consideration other variables that play a role in durables purchase.

7) Future research on the innovativeness role in brand extension evaluation is also worthy of following – we suggest to test several levels of fit, from close to far, and check if any innovativeness effect would start at a given point of distance. Such research would require to take a minacious analysis of the frontiers between vertical and horizontal extensions.
8) Researchers are also advised to further study and debate on the terminology of automotive extensions, reaching a clear and supported classification model of vertical vs. horizontal extensions, taking into account recent extensions such as the new Mercedes-Benz pickup truck, and the Lamborghini SUV.
9) Study 2 employs a sample from a single European country, Portugal, which may inhibit generalization. We recommend a broader study on other countries employing a more diverse sample (e.g. age, driving profile, and previous experience with EVs) in order to find more detailed knowledge on mobility concerns;
10) Further research would be necessary to test the propositions of study formulated in Study 2.1 and reach a higher level of detail and scope;
11) Although preferences between the types of charging points and mobility alternatives were found, there is still research work to be done, in order to clarify this knowledge and provide detailed strategies for practitioners (i.e. OEMs, governmental, energy, transport, and environmental institutions). Also, identifying consumer segments according to the charging infrastructure and distinguishing the perception of consumers when considering owning a second conventional car or having a rental option could be a fruitful research venue;
12) It would also be important to perform more advanced studies on range management systems, in order to identify which functions are most valued by the drivers, generating valuable recommendations for manufacturers;
13) In the secondary EV market section, the sample is a relevant limitation, as the data collection was cross-sectional, thus not considering secondary market fluctuations of available models, price and also policies and incentives. Also, future research should select the more appropriate type of buyers, especially second-hand EV buyers or

owners, and identify and describe the most appropriate segments for this type of product;

14) Future, more detailed, research on the acceptance of second-hand EVs, to test future hypotheses on attitude and purchase intention considering also more antecedents of second-hand EV attitudes, such as mileage and secondary car market incentives, is advised;
15) In both parts, Study 2 did not consider any effects of brand and related variables, such as brand reputation, brand experiences, affective attachments, and brand loyalty. Future studies could further investigate this topic, especially as some of the automotive OEMs are only recently offering EV models, and will have to rely strongly on brand associations on marketing these new products.

## References


Aaker, D., & Keller, K. (1990). Consumer Evaluations of Brand Extensions. *Journal of Marketing*, *54*(1), 27–41.

Aaker, D., Kumar, V., & Day, G. (2001). *Marketing Research*. John Wiley & Sons, Inc.

Aaker, J., Fournier, S., & Brasel, S. A. (2004). When good brands do bad. *Journal of Consumer Research*, *31*(1), 1–16. http://doi.org/10.1086/383419

ACEA. (2017a). *Trends in fuel type of new cars between 2015 and 2016, by country*.

ACEA. (2017b). *Vehicles in use Europe 2017*.

Aksezer, C. S. (2011). Failure analysis and warranty modeling of used cars. *Engineering Failure Analysis*, *18*(6), 1520–1526. http://doi.org/10.1016/j.engfailanal.2011.05.009

Allen, P., & Bennett, K. (2008). *SPSS for the Health and Behavioural Sciences*. South Melbourne, Australia: Cengage Learning Australia.

Allman, H. F., Fenik, A. P., Hewett, K., & Morgan, F. N. (2015). Brand Image Evaluations: The Interactive Role of Country of Manufacture, Brand Concept, and Vertical Line Extension Type. *Journal of International Marketing*, *24*(2), 40–61. http://doi.org/10.1509/jim.15.0055

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin*, *103*(3), 411–423. http://doi.org/10.1037/0033-2909.103.3.411

*Automobile Industry Pocket Guide*. (2015). European Automobile Manufacturers Association.

Axsen, J., & Skippon, S. (2013). Social influence and consumer preference formation for pro-environmental technology: the case of a UK workplace electric vehicle study. *Ecological Economics*, *95*, 96–107.

Bagozzi, R. P. (2010). Structural equation models are modelling tools with many

ambiguities: Comments acknowledging the need for caution and humility in their use. *Journal of Consumer Psychology*, *20*(2), 208–214. http://doi.org/10.1016/j.jcps.2010.03.001

Bartels, J., & Reinders, M. J. (2011). Consumer innovativeness and its correlates : A propositional inventory for future research. *Journal of Business Research*, *64*(6), 601–609. http://doi.org/10.1016/j.jbusres.2010.05.002

Bauer, C., Hofer, J., Althaus, H. J., Del Duce, A., & Simons, A. (2015). The environmental performance of current and future passenger vehicles: Life Cycle Assessment based on a novel scenario analysis framework. *Applied Energy*, *157*, 871–883. http://doi.org/10.1016/j.apenergy.2015.01.019

Baumeister, C., Scherer, A., & Wangenheim, F. v. (2015). Branding access offers: the importance of product brands, ownership status, and spillover effects to parent brands. *Journal of the Academy of Marketing Science*, *43*(5), 574–588. http://doi.org/10.1007/s11747-015-0440-y

Belgiawan, P. F., Schmöcker, J.-D., Abou-Zeid, M., & Fujii, S. (2017). Analysis of Car Type Preferences Among Students Based on Seemingly Unrelated Regression. *Transportation Research Record: Journal of the Transportation Research Board*, *2666*(1), 85–93. http://doi.org/10.3141/2666-10

Bento, A., Roth, K., & Zuo, Y. (2018). Vehicle lifetime and scrappage behavior: Trends in the U.S. used car market. *Energy Journal*, *39*(1), 159–183. http://doi.org/10.5547/01956574.39.1.aben

Bhaskar, R. A. (1997). *A Realist Theory of Science*. London: Verso.

Bickman, L., & Rog, D. (1998). *Handbook of applied social research methods*. Sage Publications, Inc.

Biresselioglu, M. E., Demirbag Kaplan, M., & Yilmaz, B. K. (2018). Electric mobility in Europe: A comprehensive review of motivators and barriers in decision making processes. *Transportation Research Part A: Policy and Practice*, *109*(October 2017), 1–13. http://doi.org/10.1016/j.tra.2018.01.017

Blackwell, R. D. (1994). Remarketing of Autos Revolution. *Journal of Consumer Marketing*, *11*(2), 4–16.

Bloemer, J., Ruyter, K. de, & Wetzels, M. (1998). Linking perceived service quality and service loyalty : a multi-dimensional perspective. *European Journal of Marketing*, *33*(11/12), 1082–1106.

Bollen, K. A. (1989). *Structural Equations with Latent Variables*. John Wiley & Sons, Inc.

Bonges, H. A., & Lusk, A. C. (2016). Addressing electric vehicle ( EV ) sales and range anxiety through parking layout , policy and regulation. *Transportation Research Part A*, *83*, 63–73. http://doi.org/10.1016/j.tra.2015.09.011

Bonilla, D., Schmitz, K. E., & Akisawa, A. (2012). Demand for mini cars and large cars; decay effects, and gasoline demand in Japan. *Energy Policy*, *50*, 217–227. http://doi.org/10.1016/j.enpol.2012.06.061

Bottomley, P., & Holden, S. (2001). Do We Really Know How Consumers Evaluate Brand Extensions ? Empirical Generalizations Based on Secondary Analysis of Eight Studies. *Journal of Marketing Research*, *38*, 494–500. http://doi.org/10.1509/jmkr.38.4.494.18901

Boush, D., & Loken, B. (1991). A Process-Tracing Study of brand extension evaluation. *Journal of Marketing Research*, *28*(1), 16–28.

Box, J. M. F. (1983). Extending Product Lifetime: Prospects and Opportunities. *European Journal of Marketing*, *17*(4), 34–49. http://doi.org/10.1108/EUM0000000004830

Brand, C., Cluzel, C., & Anable, J. (2017). Modeling the uptake of plug-in vehicles in a heterogeneous car market using a consumer segmentation approach. *Transportation Research Part A: Policy and Practice*, *97*, 121–136. http://doi.org/10.1016/j.tra.2017.01.017

Broniarczyk, S., & Alba, J. (1994). The importance of the brand association in brand extension. *Journal of Marketing Research*, *31*, 214–228.

Brown, T. J., Barry, T. E., Dacin, P. A., & Gunst, R. F. (2005). Spreading the Word : Investigating Antecedents of Consumers ' Positive Word-of-Mouth Intentions and Behaviors in a Retailing Context. *Journal of the Academy of Marketing Science*, 123–138. http://doi.org/10.1177/0092070304268417

Buhler, F., Cocron, P., Neumann, I., Franke, T., & Krems, J. F. (2014). Is EV experience related to EV acceptance? Results from a German field study. *Transportation Research Part F: Traffic Psychology and Behaviour*, *25*(1), 34–49. http://doi.org/10.1016/j.trf.2014.05.002

Bunce, L., Harris, M., & Burgess, M. (2014). Charge up then charge out? Drivers' perceptions and experiences of electric vehicles in the UK. *Transportation Research Part A: Policy and Practice*, *59*, 278–287. http://doi.org/10.1016/j.tra.2013.12.001

Burgess, M., King, N., Harris, M., & Lewis, E. (2013). Electric vehicle drivers' reported interactions with the public: Driving stereotype change? *Transportation Research Part F: Traffic Psychology and Behaviour*, *17*, 33–44. http://doi.org/10.1016/j.trf.2012.09.003

Cailleux, H., Mignot, C., & Kapferer, J. N. (2009). Is CRM for luxury brands? *Journal of Brand Management*, *16*(5-6), 406–412. http://doi.org/10.1057/bm.2008.50

Caldieraro, F., Kao, L.-J., & Cunha, M. (2015). Harmful Upward Line Extensions: Can the Launch of Premium Products Result in Competitive Disadvantages? *Journal of Marketing*, *79*(6), 50–70. http://doi.org/10.1509/jm.14.0100

Caniato, F., Caridi, M., Castelli, C., & Golini, R. (2011). Supply chain management in the luxury industry: A first classification of companies and their strategies. *International Journal of Production Economics*, *133*(2), 622–633. http://doi.org/10.1016/j.ijpe.2011.04.030

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*(1), 39–45. http://doi.org/10.1016/j.trd.2012.09.007

Carroll, S., Authorised, T. S., & Walsh, C. (2010). *the Smart Move Trial*.

Casals, L. C., Martinez-Laserna, E., García, B. A., & Nieto, N. (2016). Sustainability analysis of the electric vehicle use in Europe for CO2 emissions reduction. *Journal of Cleaner Production*, *127*, 425–437. http://doi.org/10.1016/j.jclepro.2016.03.120

Cass, A., & Grace, D. (2004). Exploring consumer experiences with a service brand. *Journal of Product & Brand Management*, *13*(4), 257–268. http://doi.org/10.1108/10610420410546961

Cattell, R. B., & Vogelmann, S. (1977). A comprehensive trail of the scree and KG criteria for determining the number of factors. *The Journal of Multivariate Behavioral Resarch*, *12*, 289–325. http://doi.org/10.1207/s15327906mbr1203

Chang, A., & Tseng, T. H. (2015). Consumer evaluation in new products: the perspective of situational strength. *European Journal of Marketing*, *49*(5/6), 806–826. http://doi.org/http://dx.doi.org/10.1108/MRR-09-2015-0216

Chen, J., Esteban, S., & Shum, M. (2011). How Much Competition is a Secondary Market? *Working Papers*, (Efige 225343).

Cheron, E., & Zins, M. (1997). Electric vehicle purchasing intentions: The concern over battery charge duration. *Transportation Research Part A: Policy and Practice*, *31*(3), 235–243. http://doi.org/10.1016/S0965-8564(96)00018-3

Choma, E. F., & Ugaya, C. M. L. (2017). Environmental impact assessment of increasing electric vehicles in the Brazilian fleet. *Journal of Cleaner Production*, *152*, 497–507. http://doi.org/10.1016/j.jclepro.2015.07.091

Chun, H., Park, C. W., Eisingerich, A., & MacInnis, D. (2015). Strategic Benefits of Low Fit Brand Extensions: When and Why? *Journal of Consumer Psychology*, *25*(4), 577–595.

Churchill, G. A. (1995). *Marketing Research: Methodological Foundations*. The Dryden Press.

Cohen, J., West, S. G., & Aiken, L. (2002). *Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences* (3rd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.

Cole, D. A., Maxwell, S. E., Arvey, R., & Salas, E. (1994). How the power of MANOVA can both increase and decrease as a function of the intercorrelations among the dependent variables. *Psychological Bulletin*, *115*(3), 465–474. http://doi.org/10.1037/0033-2909.115.3.465

Comrey, A. L., & Lee, H. B. (1992). *A first course in factor analysis*. New Jersey: Lawrence Erlbaum.

Cook, C., Heath, F., & Thompson, R. L. (2000). A Meta-Analysis of Response Rates in Web- or Internet-Based Surveys. *Educational and Psychological Measurement*, *60*(6), 821–836.

Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative and Mixed Method Approaches* (4th Editio). Sage Publications, Inc.

Creswell, J. W., & Plano Clark, V. (2001). *Designing and Conducting Mixed Methods*. London: Sage Publications, Inc.

Creusen, M. E. H., & Schoormans, J. P. L. (2005). The different roles of product appearance in consumer choice. *Journal of Product Innovation Management*, *22*, 63–81.

Crotty, M. J. (1998). *The Foundations of Social Research: Meaning and Perspective in the Research Process* (1st ed.). Singapore: Sage Publications, Inc.

Davis, D. F., Golicic, S. L., Boerstler, C. N., Choi, S., & Oh, H. (2013). Does marketing research suffer from methods myopia? *Journal of Business Research*, *66*(9), 1245–1250. http://doi.org/10.1016/j.jbusres.2012.02.020

Daziano, R. A., & Chiew, E. (2012). Electric vehicles rising from the dead: data needs for forecasting consumer response toward sustainable energy sources in personal transportation. *Energy Policy*, *51*, 876–894.

Degirmenci, K., & Breitner, M. H. (2017). Consumer purchase intentions for electric vehicles: Is green more important than price and range? *Transportation Research Part D: Transport and Environment*, *51*, 250–260. http://doi.org/10.1016/j.trd.2017.01.001

Denholm, P., & Short, W. (2006). *An evaluation of utility system impacts and benefits of optimally dispached Plug-in Hybrid electrical vehicles*.

Dens, N., & Pelsmacker, P. De. (2016). Does poor fit always lead to negative evaluations? Extension advertising and perceived brand quality. *International Journal of Advertising*, *35*(3), 465–485. http://doi.org/10.1080/02650487.2015.1057924

Denton, T. (2016). *Electric and hybrid vehicles*. New York: Routledge.

Dimitropoulos, A., Rietveld, P., & Ommeren, J. (2011). Consumer Valuation of Driving Range : A Meta-Analysis. *Tinbergen Institute*.

Dion, D., & Mazzalovo, G. (2016). Reviving sleeping beauty brands by rearticulating brand heritage. *Journal of Business Research*, *69*(1), 5894–5900.

Dodds, W. B., Monroe, K. B., & Grewal, D. (1991). Effects of Price, Brand, and Store Information on Buyers ' Product Evaluations. *Journal of Marketing Research*, *28*, 307–319. http://doi.org/10.2307/3172866

Dowling, G. R., & Staelin, R. (1994). A Model of Perceived Risk and Intended Risk-handling Activity. *Journal of Consumer Research*, *21*(1), 119–134.

Dutschke, E., Schneider, U., & Peters, A. (2013). Who will use electric vehicles? *Fraunhofer Institute for Systems and Innovation Research (Fraunhofer ISI)*, *6*.

Eastman, J. K., Goldsmith, R. E., & Flynn, L. R. (1999). Status Consumption in Consumer Behavior : Scale Development and Validation. *Journal of Marketing Theory and Practice*, *7*(3), 41–52. http://doi.org/10.1080/10696679.1999.11501839

Edwards, J., & Lambert, L. (2007). Methods for Integrating Moderation and Mediation: A General Analytical Framework Using Moderated Path Analysis. *Psychological Methods*, *12*(1), 1–22.

Egbue, O., & Long, S. (2012). Barriers to widespread adoption of electric vehicles: An analysis of consumer attitudes and perceptions. *Energy Policy*, *48*, 717–729. http://doi.org/10.1016/j.enpol.2012.06.009

Emons, W., & Sheldon, G. (2009). The market for used cars: New evidence of the lemons phenomenon. *Applied Economics*, *41*(22), 2867–2885. http://doi.org/10.1080/00036840802277332

Eren-Erdogmus, I., Akgun, I., & Arda, E. (2018). Drivers of successful luxury fashion brand extensions: cases of complement and transfer extensions. *Journal of Fashion Marketing and Management*, *22*(4), 476–493. http://doi.org/10.1108/03090560410539302

Esteban, S., & Shum, M. (2007). Durable-goods oligopoly with secondary markets: The case of automobiles. *RAND Journal of Economics*, *38*(2), 332–354. http://doi.org/10.1111/j.1756-2171.2007.tb00071.x

Evangeline, S. J., & Ragel, V. R. (2016). The Role of Consumer Perceived Fit in Brand Extension Acceptability. *IUP Journal of Brand Management*, *13*(1), 57–72.

Everitt, B. S. (1975). Multivariate analisys: The need for data and other problems. *British Journal of Psychiatry*, *126*, 237–240.

Fabrigar, L. R., & Petty, R. E. (1999). The Role of the Affective and Cognitive Bases of Attitudes in Susceptibility to Affectively and Cognitively Based Persuasion. *Personality and Social Psycology Bulletin*, *25*(3), 363–381. http://doi.org/10.1177/0146167299025003008

Fabrigar, L. R., Porter, R. D., & Norris, M. E. (2010). Some things you should know about structural equation modeling but never thought to ask. *Journal of Consumer Psychology*, *20*, 221–225.

Fabrigar, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods*, *4*(3), 272.

Fang, X., & Lin, S. (2017). Nankai Business Review International Article information.

*Nankai Business Review International*, *8*(4), 404–423. http://doi.org/10.1108/NBRI-10-2016-0035

Fedorikhin, A., Park, C. W., & Thomson, M. (2008). Beyond fit and attitude: The effect of emotional attachment on consumer responses to brand extensions. *Journal of Consumer Psychology*, *18*(4), 281–291. http://doi.org/10.1016/j.jcps.2008.09.006

Field, A. (2009). *Discovering statistics using SPSS* (3rd ed.). SAGE publications Ltd.

Figenbaum, E., & Kolbenstvedt, M. (2016). *Learning from Norwegian Battery Electric and Plug-in Hybrid Vehicle users – Results from a survey of vehicle owners*. Oslo, Norway.

Fishbein, M., & Ajzen, I. (1975). *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*.

Fiske, S. T., & Taylor, S. E. (1991). *Social Cognition*. McGraw Hill.

Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, *18*(1), 39–50.

Franke, T., Georg, M., Mcilroy, R. C., & Stanton, N. A. (2016). Ecodriving in hybrid electric vehicles e Exploring challenges for user-energy interaction. *Applied Ergonomics*, *55*, 33–45. http://doi.org/10.1016/j.apergo.2016.01.007

Franke, T., Günther, M., Trantow, M., & Krems, J. F. (2017). Does this range suit me? Range satisfaction of battery electric vehicle users. *Applied Ergonomics*, *65*, 191–199. http://doi.org/10.1016/j.apergo.2017.06.013

Franke, T., & Krems, J. F. (2013a). Interacting with limited mobility resources: Psychological range levels in electric vehicle use. *Transportation Research Part A: Policy and Practice*, *48*, 109–122. http://doi.org/10.1016/j.tra.2012.10.010

Franke, T., & Krems, J. F. (2013b). What drives range preferences in electric vehicle users? *Transport Policy*, *30*, 56–62. http://doi.org/10.1016/j.tranpol.2013.07.005

Franke, T., Neumann, I., Bühler, F., Cocron, P., & Krems, J. F. (2012). Experiencing Range

in an Electric Vehicle: Understanding Psychological Barriers. *Applied Psychology*, *61*(3), 368–391. http://doi.org/10.1111/j.1464-0597.2011.00474.x

Franke, T., Rauh, N., & Krems, J. F. (2016). Individual differences in BEV drivers' range stress during first encounter of a critical range situation. *Applied Ergonomics*, *57*, 28–35. http://doi.org/10.1016/j.apergo.2015.09.010

Fu, G., Ding, J., & Qu, R. (2009). Ownership effects in consumers' brand extension evaluations. *Journal of Brand Management*, *16*(2), 221–233. http://doi.org/10.1007/s11782-007-0012-1

Galatoulas, N. F., Genikomsakis, K. N., & Ioakimidis, C. S. (2018). Analysis of potential demand and costs for the business development of an electric vehicle sharing service. *Sustainable Cities and Society*, *42*(May), 148–161. http://doi.org/10.1016/j.scs.2018.07.008

Gao, P., Hensley, R., & Zielke, A. (2014). *A road map to the future for the auto industry*.

Garling, A., & Thogersen, J. (2001). Marketing of electric vehicles. *Business Strategy and the Environment*, *10*(1), 53–65.

Gavazza, A., Lizzeri, A., & Roketskiy, N. (2014). A quantitative analysis of the used-car market. *American Economic Review*, *104*(11), 3668–3700. http://doi.org/10.1257/aer.104.11.3668

George, D., & Mallery, P. (2009). *SPSS for Windows Step by Step: A Simple Study Guide and Reference, 17.0 Update*. Needham Heights, MA, USA: Allyn & Bacon, Inc.

Geuens, M., & Pelsmacker, P. De. (2017). Planning and Conducting Experimental Advertising Research and Questionnaire Design. *Journal of Advertising*, *46*(1), 83–100. http://doi.org/10.1080/00913367.2016.1225233

Gierl, H., & Huettl, V. (2011). A closer look at similarity : The effects of perceived similarity and conjunctive cues on brand extension evaluation. *International Journal of Research in Marketing*, *28*(2), 120–133. http://doi.org/10.1016/j.ijresmar.2011.01.004

Glass, G. V, Peckham, P. D., & Sanders, J. R. (1972). Consequences of Failure to Meet Assumptions Underlying the Fixed Effects Analyses of Variance and Covariance. *Review of Educational Research*, *42*(3), 237–288. http://doi.org/10.3102/00346543042003237

Goetz, D. M., Fassnacht, M., & Rumpf, K. (2014). Extending downward is not always bad: Parent brand evaluations after brand extension to higher and lower price and quality levels. *Journal of Brand Management*, *21*(4), 303–324. http://doi.org/10.1057/bm.2014.9

Golafshani, N. (2003). Understanding Reliability and Validity in Qualitative Research - golafshani.pdf. *The Qualitative Report*, *8*(4), 597–607. http://doi.org/10.1111/j.1475-4762.2010.00954.x

Goldsmith, R. E., & Foxall, G. R. (2003). The Measurement of Innovativeness. In L. V Shavinina (Ed.), *The International Handbook on Innovation* (pp. 321–330). Elsevier Science Ltd.

Goldsmith, R. E., & Hofacker, C. F. (1991). Measuring Consumer Innovativeness. *Journal of the Academy of Marketing Science*, *19*(3), 209–221. http://doi.org/10.1007/BF02726497

Gonder, J., Markel, T., Simpson, A., & Thornton, M. (2007). Using GPS travel data to assess the real-world driving energy use of plug-in hybrid electric vehicles (PHEVs). *Transportation Research Board 86th Annual Meeting*. Washington DC: National Renewable Energy Laboratory.

Gorsuch, R. L. (1997). Exploratory Factor Analysis : Its Role in Item Analysis. *Journal of Personality Assessment*, *68*(3), 532–560. http://doi.org/10.1207/s15327752jpa6803

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. http://doi.org/10.1016/j.tra.2011.09.008

Gravetter, F. J., & Wallnau, L. B. (2013). *Statistics for the Behavioral Sciences*. (Wadsworth Cengage Learning, Ed.).

Grewal, R., Mehta, R., & Kardes, F. R. (2004). The Timing of Repeat Purchases of Consumer Durable Goods: The Role of Functional Bases of Consumer Attitudes. *Journal of Marketing Research*, *41*(1), 101–115. http://doi.org/10.1509/jmkr.41.1.101.25090

Guitart, I. A., Gonzalez, J., & Stremersch, S. (2018). Advertising non-premium products as if they were premium: The impact of advertising up on advertising elasticity and brand equity. *International Journal of Research in Marketing*, *35*(3), 471–489. http://doi.org/10.1016/j.ijresmar.2018.03.004

Hair, J., Black, W., Babin, B., Anderson, R., & Tatham, R. (2006). *Multivariate Data Analysis* (6th ed.). Pearson Education.

Han, L., Wang, S., Zhao, D., & Li, J. (2017). The intention to adopt electric vehicles : Driven by functional and non-functional values. *Transportation Research Part A*, *103*, 185–197. http://doi.org/10.1016/j.tra.2017.05.033

Harding, G. G. (1999). Electric vehicles in the next millennium. *Journal of Power Sources*, *78*(1), 193–198. http://doi.org/10.1016/S0378-7753(99)00037-3

Hayton, J. C., Allen, D. G., & Scarpello, V. (2004). Factor Retention Decisions in Exploratory Factor Analysis: A Tutorial on Parallel Analysis. *Organizational Research Methods*, *7*(2), 191–205. http://doi.org/10.1177/1094428104263675

Heath, T. B., DelVecchio, D., & McCarthy, M. S. (2011). The Asymmetric Effects of Extending Brands to Lower and Higher Quality. *Journal of Marketing*, *75*(4), 3–20. http://doi.org/10.1509/jmkg.75.4.3

Hem, L. E., de Chernatony, L., & Iversen, N. M. (2003). Factors Influencing Successful Brand Extensions. *Journal of Marketing Management*, *19*(7/8), 781–806. http://doi.org/10.1362/026725703322498109

Henson, R. K., & Roberts, J. K. (2006). Use of exploratory factor analysis in published

research: Common errors and some comment on improved practice. *Educational and Psychological Measurement*, *66*(3), 393–416. http://doi.org/10.1177/0013164405282485

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. http://doi.org/10.1016/j.reseneeco.2011.02.002

Hoogland, J. J., & Boomsma, A. (1998). Robustness studies in covariance structure modeling: An overview and a meta-analysis. *Sociological Methods & Research*, *26*(1), 329–367.

Hu, L.-T., & Bentler, P. M. (1999). Cutoff Criteria for Fit Indexes in Covariance Structure Analysis: Conventional Criteria Versus new alternatives. *Structural Equation Modeling*, *6*(1).

Hwang, S. (2008). Utilizing qualitative data analysis software: A review of Atlas.ti. *Social Science Computer Review*, *26*(4), 519–527. http://doi.org/10.1177/0894439307312485

Iacobucci, D. (2009). Everything you always wanted to know about SEM (structural equations modeling) but were afraid to ask. *Journal of Consumer Psychology*, *19*(4), 673–680. http://doi.org/10.1016/j.jcps.2009.09.002

Iacobucci, D. (2010). Structural equations modeling: Fit Indices, sample size, and advanced topics. *Journal of Consumer Psychology*, *20*(1), 90–98. http://doi.org/10.1016/j.jcps.2009.09.003

IEA. (2017). *Global EV Outlook 2017*. France.

IET. (2015). *Code of practice for Electric Vehicle Charging Equipment Installation*. London, United Kingdom: The Institute of Engineering and Technology.

Iwata, K., & Matsumoto, S. (2016). Use of hybrid vehicles in Japan: An analysis of used car market data. *Transportation Research Part D: Transport and Environment*. http://doi.org/10.1016/j.trd.2016.03.010

Jakobsson, N., Gnann, T., Plötz, P., Sprei, F., & Karlsson, S. (2016). Are multi-car households better suited for battery electric vehicles? - Driving patterns and economics in Sweden and Germany. *Transportation Research Part C: Emerging Technologies*, *65*, 1–15. http://doi.org/10.1016/j.trc.2016.01.018

Jensen, A. F. (2013). On the stability of preferences and attitudes before and after experiencing an electric vehicle. *Transportation Research Part D: Transport and Environment*, *25*, 24–32.

John, D. R. (2016). Customer-based strategic brand management: past progress and future challenges. *AMS Review*, *6*(1-2), 17–22. http://doi.org/10.1007/s13162-016-0080-5

Johnson, J. P., & Waldman, M. (2003). Leasing, Lemons, and Buybacks. *The RAND Journal of Economics*, *34*(2), 247. http://doi.org/10.2307/1593716

Joreskog, K. G., & Sorbom, D. (1989). *LISREL 7 User's Reference Guide*. Chicago, IL: Scientific Software.

Joreskog, K. G., & Sorbom, D. (1993). *Structural equation modeling with SIMPLIS command language*. Chicago: Scientific Software.

Jorgensen, F., Mathisen, T. A., & Pedersen, H. (2016). Brand loyalty among Norwegian car owners. *Journal of Retailing and Consumer Services*, *31*, 256–264. http://doi.org/10.1016/j.jretconser.2016.04.001

Junquera, B., Moreno, B., & Álvarez, R. (2016). Analyzing consumer attitudes towards electric vehicle purchasing intentions in Spain: Technological limitations and vehicle confidence. *Technological Forecasting and Social Change*, *109*, 6–14. http://doi.org/10.1016/j.techfore.2016.05.006

Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational and Psychological Measurement*, *20*, 141–151.

Kapferer, J. N. (2014). The artification of luxury: From artisans to artists. *Business Horizons*, *57*(3), 371–380. http://doi.org/10.1016/j.bushor.2013.12.007

Kapferer, J. N., & Bastien, V. (2009). The specificity of luxury management: Turning marketing upside down. *Journal of Brand Management*, *16*(5-6), 311–322. http://doi.org/10.1057/bm.2008.51

Kapferer, J. N., & Laurent, G. (2016). Where do consumers think luxury begins? A study of perceived minimum price for 21 luxury goods in 7 countries. *Journal of Business Research*, *69*(1), 332–340. http://doi.org/10.1016/j.jbusres.2015.08.005

Kapferer, J.-N. (2014). The future of luxury: Challenges and opportunities. *Journal of Brand Management*, *21*(9), 716–726. http://doi.org/10.1057/bm.2014.32

Karjalainen, T.-M. (2004). *Semantic transformation in design: communicating strategic brand identity through product design references* (1st editio). Helsinki: University of Art and Design Helsinki.

Karjalainen, T.-M. (2007). It Looks Like a Toyota: Educational Approaches to Designing for Visual Brand Recognition. *International Journal of Design*, *1*(1), 67–81.

Karlsson, S. (2017). What are the value and implications of two-car households for the electric car? *Transportation Research Part C: Emerging Technologies*, *81*, 1–17. http://doi.org/10.1016/j.trc.2017.05.001

Keaveney, S., Herrmann, A., Befurt, R., & Landwehr, J. R. (2012). The Eyes Have It: How a Car's Face Influences Consumer Categorizaton and Evaluation of Product Line Extensions. *Psychology and Marketing*, *29*, 36–51.

Keller, K. (1998). *Strategic Brand Management*. Prentice-Hall, Inc.

Keller, K. (2003). Brand Equity Dilution. *MIT Sloan Management Review*, *45*(1), 11–16.

Keller, K., & Aaker, D. (1992). The Effects of Sequential Introduction of Brand Extensions. *Journal of Marketing Research*, *29*(1), 35–50.

Khan, M., & Kockelman, K. M. (2012). Predicting the market potential of plug-in electric vehicles using multiday GPS data. *Energy Policy*, *46*(1), 225–233. http://doi.org/10.1016/j.enpol.2012.03.055

Kihm, A., & Trommer, S. (2014). The new car market for electric vehicles and the potential for fuel substitution. *Energy Policy*, *73*, 147–157. http://doi.org/10.1016/j.enpol.2014.05.021

Kim, C. K., Lavack, A. M., & Smith, M. (2001). Consumer evaluation of vertical brand extensions and core brands. *Journal of Business Research*, *52*(3), 211–222. http://doi.org/10.1016/S0148-2963(99)00107-1

Kim, C., Lavack, A. M., & Smith, M. (2001). Consumer evaluation of vertical brand extensions and core brands. *Journal of Business Research*, *52*(3), 211–222. http://doi.org/10.1016/S0148-2963(99)00107-1

Kim, J., & Yoon, H. J. (2013). Association Ambiguity in Brand Extension. *Journal of Advertising*, *42*(4), 358–370. http://doi.org/10.1080/00913367.2013.803185

Kim, Y., & Wingate, N. (2017). Narrow, powerful, and public: The influence of brand breadth in the luxury market. *Journal of Brand Management*, *24*(5), 453–466. http://doi.org/10.1057/s41262-017-0043-7

Kirmani, A., Sood, S., & Bridges, S. (1999). The Ownership Effect in Consumer Responses to Brand Line Stretches. *Journal of Marketing*, *63*(1), 88–101. http://doi.org/10.2307/1252003

Klink, R. R., & Athaide, G. A. (2010). Consumer Innovativeness and the Use of New versus Extended Brand Names for New Products. *Journal of Product Innovation Management*, *27*(1), 23–32. http://doi.org/10.1016/j.apradiso.2004.03.060\nS0969804304001459 [pii]

Klink, R. R., & Smith, D. C. (2001). Threats to the External Validity of Brand Extension Research. *Journal of Marketing Research*, *38*(3), 326–335.

Kottemann, P., Plumeyer, A., & Decker, R. (2018). Investigating feedback effects in the field of brand extension using brand concept maps. *Int J Logistics Management*, *13*(1), 41–64. http://doi.org/10.1108/09574090910954864

Kurani, K., Heffner, R. R., & Turrentine, T. S. (2007). *Driving plug-in hybrid electric*

*vehicles: Reports from US Drivers of HEVs Converted to PHEVs*.

Lafferty, B. A. (2007). The relevance of fit in a cause - brand alliance when consumers evaluate corporate credibility. *Journal of Business Research*, *60*(5), 447–453. http://doi.org/10.1016/j.jbusres.2006.09.030

Landwehr, J. R., Wentzel, D., & Herrmann, A. (2013). Product Design for the Long Run: Consumer Responses to Typical and Atypicai Designs at Different Stages of Exposure. *Journal of Marketing*, *77*(5), 92–107.

Lane, V. R. (2000). The Impact of Ad Repetition and Ad. *Journal of Marketing*, *64*(April), 80–91.

Lansley, G. (2016). Cars and socio-economics: Understanding neighbourhood variations in car characteristics from administrative data. *Regional Studies, Regional Science*, *3*(1), 264–285. http://doi.org/10.1080/21681376.2016.1177466

Larson, P. D., Viáfara, J., Parsons, R. V., & Elias, A. (2014). Consumer attitudes about electric cars: Pricing analysis and policy implications. *Transportation Research Part A: Policy and Practice*, *69*, 299–314. http://doi.org/10.1016/j.tra.2014.09.002

Lebeau, K., Mierlo, J. Van, Lebeau, P., Mairesse, O., & Macharis, C. (2013). Consumer attitudes towards battery electric vehicles: a large-scale survey. *International Journal of Electric and Hybrid Vehicles*, *5*(1), 28. http://doi.org/10.1504/IJEHV.2013.053466

Lei, J., de Ruyter, K., & Wetzels, M. (2008). Consumer Responses to Vertical Service Line Extensions. *Journal of Retailing*, *84*(3), 268–280. http://doi.org/10.1016/j.jretai.2008.05.001

Leijen, P. (2011). Hybrid battery knackered? *Motor Equipment News*, (December), 22–23.

Leitman, S., & Brant, B. (2013). *Build your own electrical vehicle* (Third Edit). McGraw Hill.

Leung, L. (2015). Validity, reliability, and generalizability in qualitative research. *Journal of Family Medicine and Primary Care*, *4*(3), 324. http://doi.org/10.4103/2249-

4863.161306

Lieven, T., Mühlmeier, S., Henkel, S., & Waller, J. F. (2011). Who will buy electric cars? An empirical study in Germany. *Transportation Research Part D: Transport and Environment*, *16*(3), 236–243. http://doi.org/10.1016/j.trd.2010.12.001

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage Publications, Inc.

Lipovetsky, G., & Roux, E. (2003). *Le luxe éternel, de l'âge du sacré au temps des marques*. Editions Gallimard.

Loken, B., & John, D. R. (1993). Diluting Brand Beliefs: When Do Brand Extensions Have a Negative Impact? *Journal of Marketing*, *57*(3), 71–84.

Low, G. S., & Lamb, C. W. (2000). The Measurement and Dimensionality of Brand Associations. *Journal of Product & Brand Management*, *9*(6), 350–368. http://doi.org/10.1108/10610420010356966

Ma, Y., Ke, R. Y., Han, R., & Tang, B. J. (2017). The analysis of the battery electric vehicle's potentiality of environmental effect: A case study of Beijing from 2016 to 2020. *Journal of Cleaner Production*, *145*, 395–406. http://doi.org/10.1016/j.jclepro.2016.12.131

MacCallum, R. C., Browne, M., & Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods*, *1*, 130–149.

Mack, N., Woodsong, C., McQueen, K. M., Guest, G., & Namey, E. (2011). *Qualitative Research Methods: A data collector's field guide*. *Qualitative Research Methods: A data collector's field guide*. http://doi.org/10.1108/eb020723

Mackenzie, S. B., Lutz, R. J., & Belch, G. E. (1986). The Role of Attitude toward the Ad as a Mediator of Advertising Effectiveness : A Test of Competing Explanations. *Journal of Marketing Research*, *23*(2), 130–143.

Magnoni, F., & Roux, E. (2012). The impact of step-down line extension on consumer-brand relationships: A risky strategy for luxury brands. *Journal of Brand Management*, *19*(7), 595–608. http://doi.org/10.1057/bm.2012.8

Malhotra, N. K. (2010). *Marketing Research: an applied orientation*. Pearson Education, Inc.

Marcoux, J.-S., Filiatrault, P., & Cheron, E. (1997). The Attitudes Underlying Preferences of Young Urban Educated Polish Consumers Towards Products Made in Western Countries. *Journal of International Consumer Marketing*, *9*(4), 5–29. http://doi.org/10.1300/J046v09n04

Marôco, J. (2014). *Análise de Equações Estruturais: Fundamento teóricos, Software & Aplicações*. Pêro Pinheiro: ReportNumber.

Marsh, H. W., & Hau, K. T. (1996). Assessing godness of fit: Is parsimony always desirable? *The Journal of Experimental Education*, *64*(1), 364–390.

Martinez, E., & Chernatony, L. De. (2004). The effect of brand extension strategies upon brand image. *Journal of Consumer Marketing*, *21*(1), 39–50. http://doi.org/10.1108/07363760410513950

Martinez, E., & Pina, J. M. (2003). The negative impact of brand extensions on parent brand image. *Journal of Product & Brand Management*, *12*(7), 432–448. http://doi.org/10.1108/10610420310506001

May, T. (1993). *Social research: issues, methods and process*. Open University Press.

Mays, N., & Pope, C. (1995). Qualitative research: Observational methods in health care settings. *BMJ (Clinical Research Ed.)*, *311*(6998), 182–184. http://doi.org/http://dx.doi.org/10.1136/bmj.311.6997.109

McKeganey, N., & Bloor, M. (1981). On the retrieval of sociological descriptions: respondent validation and the critical case of ethnomethodology. *International Journal of Sociology and Social Policy*, *1*, 58–69.

McKinsey & Co. (2013). *Upward Mobility: The Future of China's Premium Car Market*. *McKinsey Quarterly*.

Mersky, A. C., Sprei, F., Samaras, C., & Qian, Z. S. (2016). Effectiveness of incentives on electric vehicle adoption in Norway. *Transportation Research Part D: Transport and Environment*, *46*, 56–68. http://doi.org/10.1016/j.trd.2016.03.011

Michel, G., & Salha, B. (2005). L'extension de gamme verticale: clarification du concept. *Recherche et Applications En Marketing*. http://doi.org/10.1177/076737010502000104

Midgley, D. F., & Dowling, G. R. (1978). Innovativeness: The Concept and Its Measurement. *Journal of Consumer Research*, *4*, 229–242. http://doi.org/10.1086/208701

Mishra, V., & Das, B. (2018). Reducing Perceived Risk in Purchase of Uncertified Used Cars : Contributory Factors. *IUP*.

Mitchell, V., Walsh, G., & Yamin, M. (2005). Towards a Conceptual Model of Consumer Confusion. *Advances in Consumer Research*, *32*, 143–150.

Mohamed, M., Ferguson, M., & Kanaroglou, P. (2017). What hinders adoption of the electric bus in Canadian transit? Perspectives of transit providers. *Transportation Research Part D: Transport and Environment*. http://doi.org/10.1016/j.trd.2017.09.019

Mohamed, M., Higgins, C., Ferguson, M., & Kanaroglou, P. (2016). Identifying and characterizing potential electric vehicle adopters in Canada: A two-stage modelling approach. *Transport Policy*, *52*, 100–112. http://doi.org/10.1016/j.tranpol.2016.07.006

Mohr, D., Muller, N., Krieg, A., Gao, P., Kaas, H.-W., Krieger, A., & Hensley, R. (2013). *The road to 2020 and beyond: What's driving the global automotive industry? McKinsey & Company*.

Monga, A. B., & John, D. R. (2007). Cultural Differences in Brand Extension Evaluation : The Influence of Analytic versus Holistic Thinking. *Journal of Consumer Research*, *33*, 529–536. http://doi.org/10.1086/510227

Montag, J. (2017). Identifying odometer fraud in used car market data. *Transport Policy*, *60*, 10–23. http://doi.org/10.1016/j.tranpol.2017.07.018

Moons, I., & Pelsmacker, P. De. (2015). Electric car extensions of car brands: impact on brand personality, extension evaluation, and parent brand feedback. In I. B. Banks, P. Pelsmacker, & S. Okazaki (Eds.), *Advances in Advertising Research* (pp. 267–280). Springer. http://doi.org/10.1007/978-3-658-08132-4

Morrin, M. (1999). The Impact Brand of Memory Brand Extensions Structures and Retrieval Processes. *Journal of Marketing Research*, *36*(4), 517–525.

Morrissey, P., Weldon, P., & Mahony, M. O. (2015). Electric vehicle household charging behaviour in Ireland and aims for a carbon neutral electric fleet by 2020. *World Review of Intermodal Transportation Research*, *5*(4), 336–352.

Morrissey, P., Weldon, P., & Mahony, M. O. (2016). Future standard and fast charging infrastructure planning : An analysis of electric vehicle charging behaviour. *Energy Policy*, *89*(1), 257–270. http://doi.org/10.1016/j.enpol.2015.12.001

Mulaik, S. A., James, L. R., Van Alstine, J., Bennett, N., Lind, S., & Stilwell, C. D. (1989). Evaluation of goodness-of-fit indices for structural equation models. *Psychological Bulletin*, *105*(3), 430–445.

Musante, M. (2007). Brand portfolio influences on vertical brand extension evaluations. *Innovative Marketing*, *3*(4).

Narins, T. P. (2017). The battery business: Lithium availability and the growth of the global electric car industry. *Extractive Industries and Society*, *4*(2), 321–328. http://doi.org/10.1016/j.exis.2017.01.013

Neubauer, J., Brooker, J., & Wood, E. (2012). Sensitivity of battery electric vehicle economics to drive patterns, vehicle range and charge strategies. *Journal of Power Sources*, *209*, 269–277.

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. http://doi.org/10.1016/j.jpowsour.2014.01.075

*New passenger car registrations by manufacturer*. (2018). European Automobile Manufacturers Association.

Nilsson, M. (2011). *Electric Vehicles: the Phenomenon of Range Anxiety*. *ELVIRE Consortium*.

NissanNews. (2017). *Renault-Nissan Alliance delivers significant growth in 2016, extends electric vehicle sales record*.

Nobre, H. (2010). *Intimate Brand Relationships: From intimate interpersonal relationships to consumer-brand relationships*. Lambert Academic Publishing.

Nobre, H., & Faria, J. (2017). Exploring marketing strategies in architectural services: the case of the architecture firms in Portugal. *International Journal of Business Excellence*, *12*(3), 275–293. http://doi.org/10.1504/IJBEX.2017.084438

Nunally, J. C. (1978). *Psychometric theory* (2nd Editio). New York: McGraw Hill.

O'Cass, A., & McEwen, H. (2005). Exploring Consumer Status and Conspicuous Consumption. *Journal of Consumer Behaviour*, *4*, 25–39. http://doi.org/10.1002/cb.155

O'Cass, A., & Siahtiri, V. (2013). In search of status through brands from western and asian origins: examining the changing face of fashion clothing consumption in chinese young adults. *Journal of Retailing and Consumer Services*, *20*(6), 505–515. http://doi.org/10.1016/j.jretconser.2013.05.005

Odekerken-Schröder, G., Hennig-Thurau, T., & Knaevelsrud, A. B. (2010). Exploring the post-termination stage of consumer-brand relationships: An empirical investigation of the premium car market. *Journal of Retailing*, *86*(4), 400–413. http://doi.org/10.1016/j.jretai.2010.09.004

Opdenakker, R. (2006). Advantages and Disadvantages of Four Interview Techniques in Qualitative Research 2 . Advantages and Disadvantages of the Four Interview

Techniques. *Forum: Qualitative Social Research*, *7*(4), 1–9. http://doi.org/10.1177/1468794107085298

Park, C. W., Milberg, S., & Lawson, R. (1991). Evaluation of Brand Extensions: The Role of Product Feature Similarity and Brand Concept Consistency. *Journal of Consumer Research*, *18*(2), 185–193.

Patton, M. Q. (2002). *Qualitative evaluation and research methods*. Thousand Oaks, CA: Sage Publications, Inc.

Pearre, N. S., Kempton, W., Guensler, R. L., & Elango, V. V. (2011). Electric vehicles: How much range is required for a day's driving? *Transportation Research Part C: Emerging Technologies*, *19*(6), 1171–1184. http://doi.org/10.1016/j.trc.2010.12.010

Pedrosa, G., & Nobre, H. (2017). The Effects of Downward Line Extensions on Consumer Brand Attitude: The Case of the European Premium Automotive Market. In D. Vrontis, Y. Weber, & E. Tsoukatos (Eds.), *The 10th Annual Conference of the EuroMed Academy of Business (Global and national business theories and practice: bridging the past with the future)* (pp. 2254–2256). Euromed Press.

Pedrosa, G., & Nobre, H. (2018a). Mobility Concerns and the Drivers' Context in EV Adoption. In *7th International Virtual Conference on Informatics and Management Sciences* (pp. 27–30). Slovakia: EDIS - Publishing Institution of the University of Zilina. http://doi.org/10.18638/ictic.2018.7.1.330

Pedrosa, G., & Nobre, H. (2018b). Second-hand electrical vehicles: a first look at the secondary market of modern EVs. *International Journal of Electric and Hybrid Vehicles*, *10*(3), 236–252. http://doi.org/10.1504/IJEHV.2018.097378

Pedrosa, G., & Nobre, H. (2019). The influence of consumer mobility concerns on electric vehicle adoption. *World Review of Intermodal Transportation Research*, (In press).

Pestana, M. H., & Gageiro, J. N. (2005). *Análise de dados para ciências sociais* (4th ed.). Lisboa: Sílabo.

Peters, A., & Dutschke, E. (2014). How do Consumers Perceive Electric Vehicles? A

Comparison of German Consumer Groups. *Journal of Environmental Policy and Planning*, *16*(3), 359–377. http://doi.org/10.1080/1523908X.2013.879037

Peterson, J. R., & Schneider, H. S. (2014). Adverse selection in the used-car market: Evidence from purchase and repair patterns in the Consumer Expenditure Survey. *RAND Journal of Economics*, *45*(1), 140–154. http://doi.org/10.1111/1756-2171.12045

Pina, J. M., Iversen, N. M., & Martinez, E. (2010). Feedback effects of brand extensions on the brand image of global brands: A comparison between Spain and Norway. *Journal of Marketing Management*, *26*(9-10), 943–966. http://doi.org/10.1080/02672570903458789

Plotz, P., Schneider, U., Globisch, J., & Dutschke, E. (2014). Who will buy electric vehicles? Identifying early adopters in Germany. *Transportation Research Part A: Policy and Practice*, *67*, 96–109. http://doi.org/10.1016/j.tra.2014.06.006

Pontes, N., Palmeira, M., & Jevons, C. (2017). Brand Expertise and Perceived Consistency Reversals on Vertical Line Extensions: The Moderating Role of Extension Direction. *Journal of Retailing and Consumer Services*, *34*, 209–218.

PORDATA. (2017). *Veículos rodoviários motorizados em circulação: total e por tipo de combustível*.

Prieto, M., & Caemmerer, B. (2013). An exploration of factors influencing car purchasing decisions. *International Journal of Retail & Distribution Management*, *41*(10), 738–764. http://doi.org/10.1108/IJRDM-02-2012-0017

Prieto, M., Caemmerer, B., & Baltas, G. (2015). Using a hedonic price model to test prospect theory assertions: The asymmetrical and nonlinear effect of reliability on used car prices. *Journal of Retailing and Consumer Services*, *22*, 206–212. http://doi.org/10.1016/j.jretconser.2014.08.013

Qu, Y., Liu, Y., Zhu, Q., & Liu, Y. (2014). Motivating small-displacement car purchasing in China. *Transportation Research Part A: Policy and Practice*, *67*(2014), 47–58. http://doi.org/10.1016/j.tra.2014.06.002

Raney, A. A., Arpan, L. M., PashuPati, K., & Brill, D. A. (2003). At the movies, on the web: An investigation of the effects of entertaining and interactive web content on site and brand evaluations. *Journal of Interactive Marketing*, *17*(4), 38–53. http://doi.org/10.1002/dir.10064

Ranscombe, C., Hicks, B., Mullineux, G., & Singh, B. (2012). Visually decomposing vehicle images: Exploring the influence of different aesthetic features on consumer perception of brand. *Design Studies*, *33*(4), 319–341. http://doi.org/10.1016/j.destud.2011.06.006

Rauh, N., Franke, T., & Krems, J. F. (2017). First-time experience of critical range situations in BEV use and the positive effect of coping information. *Transportation Research Part F: Traffic Psychology and Behaviour*, *44*, 30–41. http://doi.org/10.1016/j.trf.2016.10.001

Rauh, N., Günther, M., Franke, T., & Krems, J. F. (2017). Increasing the Efficient Usage of Electric Vehicle Range - Effects of Driving Experience and Coping Information. *Transportation Research Procedia*, *25*, 3623–3637. http://doi.org/10.1016/j.trpro.2017.05.326

Ravasi, D., & Lojacono, G. (2005). Managing design and designers for strategic renewal. *Long Range Planning*, *38*, 51–77.

Rezvani, Z., Jansson, J., & Bodin, J. (2015). Advances in consumer electric vehicle adoption research: A review and research agenda. *Transportation Research Part D: Transport and Environment*, *34*, 122–136. http://doi.org/10.1016/j.trd.2014.10.010

Riley, F., Pina, J., & Bravo, R. (2013). Downscale extensions: Consumer evaluation and feedback effects. *Journal of Business Research*, *66*(2), 196–206. http://doi.org/10.1016/j.jbusres.2012.07.013

Riley, F., Pina, J., & Bravo, R. (2015). The role of perceived value in vertical brand extensions of luxury and premium brands. *Journal of Marketing Management*, *31*(7-8), 881–913. http://doi.org/10.1080/0267257X.2014.995692

Roche, M. Y., Mourato, S., Fischedick, M., Pietzner, K., & Viebahn, P. (2010). Public attitudes towards and demand for hydrogen and fuel cell vehicles: A review of the

evidence and methodological implications. *Energy Policy*, *38*(10), 5301–5310. http://doi.org/10.1016/j.enpol.2009.03.029

Roehrich, G. (1995). Innovativités hédoniste et sociale: proposition d'une échelle de mesure. *Recherche et Applications En Marketing*, *9*(2), 19–41.

Rogers, E. M. (1983). Diffusion of Innovations. The Free Press.

Rose, G. M., Merchant, A., Orth, U. R., & Horstmann, F. (2016). Emphasizing brand heritage: Does it work? And how? *Journal of Business Research*, *69*(2), 936–943. http://doi.org/10.1016/j.jbusres.2015.06.021

Roux, D., & Guiot, D. (2008). Measuring Second-Hand Shopping Motives, Antecedents and Consequences. *Recherche et Applications En Marketing (English Edition)*, *23*(4), 63–91. http://doi.org/10.1177/205157070802300404

Royo-Vela, M., & Voss, E. (2015). Downward Price-Based Brand Line Extensions Effects on Luxury Brands. *Business & Economics Research Journal*, *6*, 145–161.

Rudolph, C. (2016). How may incentives for electric cars affect purchase decisions? *Transport Policy*, *52*, 113–120.

Salinas, E., & Pérez, J. (2009). Modeling the brand extensions' influence on brand image. *Journal of Business Research*, *62*(1), 50–60. http://doi.org/10.1016/j.jbusres.2008.01.006

Sang, Y. N., & Bekhet, H. A. (2015). Modelling electric vehicle usage intentions: An empirical study in Malaysia. *Journal of Cleaner Production*, *92*, 75–83. http://doi.org/10.1016/j.jclepro.2014.12.045

Schade, M., Hegner, S., Horstmann, F., & Brinkmann, N. (2016). The impact of attitude functions on luxury brand consumption: An age-based group comparison. *Journal of Business Research*, *69*(1), 314–322. http://doi.org/10.1016/j.jbusres.2015.08.003

Schermelleh-Engel, K., Moosbrugger, H., & Müller, H. (2003). Evaluating the Fit of Structural Equation Models: Tests of Significance and Descriptive Goodness-of-Fit

Measures. *Methods of Psychological Research Online*, *8*(2), 23–74. http://doi.org/10.1002/0470010940

Schiraldi, P. (2011). Automobile replacement: A dynamic structural approach. *RAND Journal of Economics*, *42*(2), 266–291. http://doi.org/10.1111/j.1756-2171.2011.00133.x

Schlie, E., & Yip, G. (2000). Regional follows global: strategy mixes in the world automotive industry. *European Management Journal*, *18*(4), 343–354. http://doi.org/10.1016/S0263-2373(00)00019-0

Schneidereit, T., Franke, T., Gunther, M., & Krems, J. F. (2015). Does range matter? Exploring perceptions of electric vehicles with and without a range extender among potential early adopters in Germany. *Energy Research and Social Science*, *8*, 198–206. http://doi.org/10.1016/j.erss.2015.06.001

Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A., & King, J. (2006). Reporting structural equation modeling and confirmatory factor analysis results: A review. *Journal of Educational Research*, *99*(6), 323–337. http://doi.org/10.3200/JOER.99.6.323-338

Schuitema, G., Anable, J., Skippon, S., & Kinnear, N. (2013). The role of instrumental, hedonic and symbolic attributes in the intention to adopt electric vehicles. *Transportation Research Part A: Policy and Practice*, *48*, 39–49. http://doi.org/10.1016/j.tra.2012.10.004

Segars, A. H. (1997). Assessing the unidimensionality of measurement: A paradigm and illustration within the context of information systems research. *Omega*, *25*(1), 107–121. http://doi.org/10.1016/S0305-0483(96)00051-5

Sharma, S., Durand, R., & Gur-Arie, O. (1981). Identification and Analysis of Moderator Variables. *Journal of Marketing Research*, *18*(3), 291–300.

Sharp, B. M. (1993). Managing Brand Extension. *Journal of Consumer Marketing*, *10*(3), 11–17. http://doi.org/10.1108/07363769310041938

Singh, S., Ratchford, B. T., & Prasad, A. (2014). Offline and online search in used durables

markets. *Journal of Retailing*, *90*(3), 301–320. http://doi.org/10.1016/j.jretai.2014.03.005

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. http://doi.org/10.1016/j.trd.2011.05.005

Smith, D. C., & Andrews, J. (1995). Rethinking the Effect of Perceived Fit on Customers' Evaluations of New Products. *Journal of the Academy of Marketing Science*, *23*, 4–14.

Smith, D. C., & Park, C. W. (1992). The Effects of Brand Extensions on Market Share and Advertising Efficiency. *Journal of Marketing Research*, *29*(3), 296–313.

Souza, L. L. P., Lora, E. E. S., Palacio, J. C. E., Rocha, M. H., Renó, M. L. G., & Venturini, O. J. (2018). Comparative environmental life cycle assessment of conventional vehicles with different fuel options, plug-in hybrid and electric vehicles for a sustainable transportation system in Brazil. *Journal of Cleaner Production*, *203*, 444–468. http://doi.org/10.1016/j.jclepro.2018.08.236

Speirs, J., Contestabile, M., Houari, Y., & Gross, R. (2014). The future of lithium availability for electric vehicle batteries. *Renewable and Sustainable Energy Reviews*, *35*, 183–193. http://doi.org/10.1016/j.rser.2014.04.018

Srivastava, K., & Sharma, N. K. (2012). Consumer attitude towards brand-extension incongruity: The moderating role of need for cognition and need for change. *Journal of Marketing Management*, *28*(5/6), 652–675. http://doi.org/10.1080/0267257X.2011.558383

Steenkamp, J.-B. E. M., & Baumgartner, H. (1995). Development and Cross-cultural Validation of a Short form of CSI as a measure of Optimum Stimulation Level. *International Journal of Research in Marketing*, *12*, 97–104.

Štrach, P., & Everett, a M. (2006). Brand corrosion: Mass-marketing's threat to luxury automobile brands after merger and acquisition. *Journal of Product and Brand Management*, *15*(2), 106–120. http://doi.org/10.1108/10610420610658947

Sujan, M. (1985). Consumer Knowledge: Effects on Evaluation Strategies Mediating Consumer Judgments. *Journal of Consumer Research*, *12*(1), 31–46.

Sullivan, M. (1990). Measuring Image Spillovers in Umbrella-branded Products. *Journal of Business*, *63*(3), 309–329.

Sultan, A. (2010). A model of the used car market with lemons and leasing. *Applied Economics*, *42*(28), 3619–3627. http://doi.org/10.1080/00036840802314556

Swar, B. N. (2018). An Exploration Into the Factors Driving Working Professionals Buying Small Cars. *Global Business Review*, *19*(1), 175–186. http://doi.org/10.1177/0972150917713271

Sweeney, J. C., & Soutar, G. N. (2001). Consumer perceived value : The development of a multiple item scale. *Journal of Retailing*, *77*, 203–220.

Tabachnick, B. G., & Fidell, L. S. (1996). *Using multivariate statistics* (3rd ed.). NewYork: HarperCollins.

Tamor, M. A., & Milačić, M. (2015). Electric vehicles in multi-vehicle households. *Transportation Research Part C: Emerging Technologies*, *56*, 52–60. http://doi.org/10.1016/j.trc.2015.02.023

Tanaka, J. S., & Huba, G. J. (1985). A fit index for covariance structure models under arbitraty GLS estimation. *British Journal of Mathematical and Statistical Psychology*, *38*, 197–201.

Taylor, V. A., & Bearden, W. (2002). The Effects of Price on Brand Extension Evaluations : The Moderating Role of Extension Similarity. *Journal of the Academy of Marketing Science*, *30*(2), 131–140. http://doi.org/10.1177/03079459994380

Temporal, P. (2002). *Advanced Brand Management*. John Wiley & Sons.

Thomas, C. E. S. (2012). How green are electric vehicles? *International Journal of Hydrogen Energy*, *37*(7), 6053–6062. http://doi.org/10.1016/j.ijhydene.2011.12.118

Tournois, L., & Chanaron, J.-J. (2018). Car crisis and renewal: how Mercedes succeeded

with the A-Class. *Journal of Business Strategy*, *39*(1), 3–14.

Trochim, W. M., & Donnelly, J. P. (2006). *The Research Methods Knowledge Base* (3rd Editio). Cincinnati, OH: Atomic Dog Publishing Inc.

Truong, Y., Simmons, G., McColl, R., & Kitchen, P. J. (2008). Status and Conspicuousness – Are They Related? Strategic Marketing Implications for Luxury Brands. *Journal of Strategic Marketing*, *16*, pp. 189–203. http://doi.org/10.1080/09652540802117124

Turrentine, T. (1994). *Lifestyles and Life Politics: towards a green car market*. University of California.

Tynan, C., McKechnie, S., & Chhuon, C. (2010). Co-creating value for luxury brands. *Journal of Business Research*, *63*(11), 1156–1163. http://doi.org/10.1016/j.jbusres.2009.10.012

Vassileva, I., & Campillo, J. (2017). Adoption barriers for electric vehicles: Experiences from early adopters in Sweden. *Energy*, *120*, 632–641. http://doi.org/10.1016/j.energy.2016.11.119

Verhoef, P. C., Pauwels, K. H., & Tuk, M. A. (2012). Assessing Consequences of Component Sharing across Brands in the Vertical Product Line in the Automotive Market. *Journal of Product Innovation Management*, *29*, 559–572.

Volckner, F., & Sattler, H. (2006). Drivers of Brand Extension Success. *Journal of Marketing*, *70*, 18–34.

Vyas, C., & Hurst, D. (2012). *Executive Summary: Electric Vehicle Consumer Survey – Consumer Attitudes, Opinions, Preferences, and Price Sensitivity for Plug- in Electric Vehicles and EV Charging Stations*. Boulder, CO.

Wang, N., Tang, L., & Pan, H. (2018). Analysis of public acceptance of electric vehicles: An empirical study in Shanghai. *Technological Forecasting and Social Change*, *126*(August 2017), 284–291. http://doi.org/10.1016/j.techfore.2017.09.011

Wang, Y., & Griskevicius, V. (2014). Conspicuous Consumption, Relationships, and Rivals:

Women's Luxury Products as Signals to Other Women. *Journal of Consumer Research*, *40*(5), 834–854. http://doi.org/10.1086/673256

Wee, B., Jong, G., & Nijland, H. (2011). Accelerating car scrappage: A review of research into the environmental impacts. *Transport Reviews*, *31*(5), 549–569. http://doi.org/10.1080/01441647.2011.564331

Weinfurt, K. P. (2000). Repeated Measures Analysis: ANOVA, MANOVA, and HLM. In L. G. Grimm & P. R. Yarnold (Eds.), *Reading and Understanding More Multivariate Statistics* (pp. 317–361). Washington DC: American Psychological Association.

Westland, C. J. (2010). Lower bounds on sample size in structural equation modeling. *Electronic Commerce Research & Applications*, *9*(6), 476–487.

Wiedmann, K.-P., Hennigs, N., Schmidt, S., & Wuestefeld, T. (2011). Drivers and Outcomes of Brand Heritage: Consumers' Perception of Heritage Brands in the Automotive Industry. *The Journal of Marketing Theory and Practice*, *19*(2), 205–220. http://doi.org/10.2753/MTP1069-6679190206

Wilcox, K., Kim, H. M. I. N., & Sen, S. (2009). Why Do Consumers Buy Counterfeit Luxury Brands ? *Journal of Marketing Research*, *XLVI*(April), 247–259.

Williams, C. C., & Paddock, C. (2003). The meanings of informal and second-hand retail channels: some evidence from Leicester. *The International Review of Retail, Distribution and Consumer Research*, *13*(3), 317–336. http://doi.org/10.1080/0959396032000101372

Xie, Y. H. (2008). Consumer innovativeness and consumer acceptance of brand extensions. *Journal of Product and Brand Management*, *17*(4), 235–243. http://doi.org/10.1108/10610420810887581

Zeithaml, V., Berry, L., & Parasuraman, A. (1996). The Behavioral Consequences of Service Quality. *Journal of Marketing*, *60*(April), 31–46. http://doi.org/10.2307/1251929

Zhang, Q., Li, H., Zhu, L., Campana, P. E., Lu, H., Wallin, F., & Sun, Q. (2018). Factors influencing the economics of public charging infrastructures for EV – A review.

*Renewable and Sustainable Energy Reviews*, *94*(August 2017), 500–509. http://doi.org/10.1016/j.rser.2018.06.022

Zhou, Y., W, M. Q., Johnson, L., Wang, H., & Hao, H. (2015). Plug-in electric vehicle market penetration and incentives: a global review. In *Mitigation and Adaptation Strategies for Global Change*. Springer. http://doi.org/10.1007/s11027-014-9611-2

Zinkhan, G. M., Locander, W. B., & Leigh, J. H. (1986). Dimensional Relationships of Aided Recall and Recognition. *Journal of Advertising*, *15*(1), 38–46. http://doi.org/10.1080/00913367.1986.10672987

Zoellner, F., & Schaefers, T. (2015). Do price promotions help or hurt premium-product brands? The impact of different price- promotion types on sales and brand perception. *Journal of Advertising Research*, *55*(3), 270–283. http://doi.org/10.2501/JAR-2015-008

## Appendix I – Questionnaire

This questionnaire is part of a doctoral thesis being undertaken at University of Aveiro (Portugal) which is focused on the consumers' attitudes towards the supermini segments of premium automotive brands. The questionnaire is aimed at frequent drivers, and takes around ten minutes to fill in. There are no "right" or "wrong" answers.

The following questions are about your opinions and attitudes about the BMW brand and other general automotive aspects, including electrical vehicles.

The answers to all opinion questions vary from 1 to 7, according to your degree of agreement. They must be filled as the picture shows below, by sliding the button with the mouse and checking the number value in the right side box.


After a first set of questions, you will be asked to click in one of two buttons, to be assigned to a group of analysis. Next you must continue with the filling of the questionnaire.

Thank you for your participation.

1. Please rate your level of knowledge about the BMW automotive brand in a scale of 1 (not familiar) to 7 (very familiar).

2. Please rate your level of knowledge about automobiles in general in a scale of 1 (not familiar) to 7 (very familiar).

3. Please rate your level of agreement with the following statements in a scale of 1 (Fully disagree) to 7 (Fully agree):

    a. A BMW automobile can indicate a person’s social status.

    b. A BMW automobile is a symbol of achievement.

    c. A BMW automobile is a symbol of wealth.

4. Please indicate the brand of the automobile you most frequently drive.

5. Which is the model?

6. In what year was it built?

7. Please rate your level of agreement with the following statements in a scale of 1 (Fully disagree) to 7 (Fully agree):

    a. I am more interested in buying new than known products.

    b. I like to buy new and different products

    c. New products excite me.

    d. I am usually among the first to try new products.

    e. I try new products before my friends and neighbours.

    f. I know more than others on latest products.

8. Please rate your level of agreement with the following statements in a scale of 1 (Fully disagree) to 7 (Fully agree):

    a. It is important for my friends to know the brand of car I possess.

    b. Cars are a symbol of social status.

    c. My car helps me to fit in important social situations.

    d. I like to be seen with my car.

    e. The brand of car that a person owns tells me a lot about that person.

    f. My car indicates others the kind of person I am.

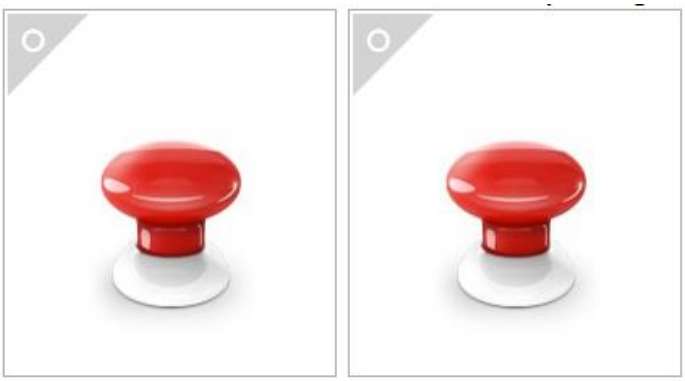
9. Please rate your opinion of the BMW brand on the scale from 1 (Dislike) to 7 (Like).

10. Please rate your opinion of the BMW brand on the scale from 1 (Unfavorable) to 7 (Favorable).

11. Please rate your opinion of the BMW brand on the scale from 1 (Low quality) to 7 (High quality).

12. Please rate your opinion of the BMW brand on the scale from 1 (Unappealing) to 7 (Appealing).

13. Please select one of the two red buttons below by clicking on it just once. Afterwards click "Next" to continue the questionnaire:



| High-fit treatment | Low-fit treatment |
|---|---|
| BMW is considering the introduction of a new supermini car with two seats named BMW i2. This model will be the successor of BMW Isetta, which had a great success in 1950's. This model will cost €17,500.  | BMW is considering the introduction of a new supermini utilitarian car with two seats for €12,000. The technical and design specifications have not yet been announced.  |

14. Please rate your opinion of the BMW i2 on the scale from 1 (Dislike) to 7 (Like).

15. Please rate your opinion of the BMW i2 on the scale from 1 (Unfavorable) to 7 (Favorable).

16. Please rate your opinion of the BMW i2 on the scale from 1 (Low quality) to 7 (High quality).

17. Please rate your opinion of the BMW i2 on the scale from 1 (Unappealing) to 7 (Appealing).

18. Please indicate how well the new BMW i2 fits the BMW brand on the scale from 1 (Bad fit) to 7 (Good fit).

19. Please indicate how similar the new BMW i2 is to the BMW brand on the scale from 1 (Not at all similar) to 7 (Very similar).

20. Please indicate how logical the new BMW i2 is to the BMW brand on the scale from 1 (Not at all logical) to 7 (Very logical).

21. Please indicate how appropriate the new BMW i2 is to the BMW brand on the scale from 1 (Not at all appropriate) to 7 (Very appropriate)-

22. Please indicate how well the price of the new BMW i2 fits the BMW brand on the scale from 1 (Bad fit) to 7 (Good fit).

23. Please indicate how similar the price of the new BMW i2 is to the BMW brand on the scale from 1 (Not at all similar) to 7 (Very similar).

24. Please indicate how logical the price of the new BMW i2 is to the BMW brand on the scale from 1 (Not at all logical) to 7 (Very logical).

25. Please indicate how appropriate the price of the new BMW i2 is to the BMW brand on the scale from 1 (Not at all appropriate) to 7 (Very appropriate).

26. Please rate your level of agreement with the following statements in a scale of 1 (Fully disagree) to 7 (Fully agree):

    a. This product is one I would enjoy.

    b. This product would make me want to use it.

    c. This product is one that I would feel relaxed about using.

d. This product would make me feel good.

e. This product would give me pleasure.

f. This product is reasonably priced.

g. This product offers value for money.

h. This product is a good product for the price.

i. This product would be economical.

j. This product would help me to feel acceptable.

k. This product would improve the way I am perceived.

l. This product would make a good impression on other people.

m. This product would give its owner social approval.

27. How likely would it be that you would consider buying the new BMW i2 the next time you purchased an automobile? Please answer in a scale of 1 (Very unlikely) to 7 (Very likely).

28. How likely would it be that you would consider buying the new BMW i2 the next time you purchased an automobile? Please answer in a scale of 1 (Definitely would not consider it) to 7 (Definitely would consider it).

29. How likely would it be that you would consider buying the new BMW i2 the next time you purchased an automobile? Please answer in a scale of 1 (Not very probable) to 7 (Very probable).

Thank you for your answer on the first part of the questionnaire. The next section focus on a short study on the attitudes towards electric vehicles. Electric vehicles are automobiles that use only electric power motors to move and are supplied by rechargeable batteries, without using any fossil fuel.

30. What fuel does your car use?

a. Gasoline

b. Diesel

c. Hybrid (gasoline or diesel)

d. Electric

e. LPG, CNG

31. Please rate your opinion about electric vehicles on the scale from 1 (Dislike) to 7 (Like).

32. Please rate your opinion about electric vehicles on the scale from 1 (Unfavorable) to 7 (Favorable).

33. Please rate your opinion about electric vehicles on the scale from 1 (Low quality) to 7 (High quality).

34. Please rate your opinion about electric vehicles on the scale from 1 (Unappealing) to 7 (Appealing).

35. Would it be possible for you to install a personal recharging station for an electric vehicle in your house, garage or parking space?

    a. Yes

    b. No

36. In case you considered purchasing an electric vehicle, how important would it be for you to have access to a recharging station at your workplace? Please rate your opinion in a scale from 1 (Not important) to 7 (Very important).

37. In case you considered owning an electric vehicle as a main car, how important would it be for you to have a second car available (gasoline or petrol) for occasional trips? Please rate your opinion in a scale from 1 (Not important) to 7 (Very important).

38. How likely would it be that you would consider buying an electric vehicle the next time you purchased an automobile? Please answer in a scale of 1 (Very unlikely) to 7 (Very likely).

39. How likely would it be that you would consider buying an electric vehicle the next time you purchased an automobile? Please answer in a scale of 1 (Definitely would not consider it) to 7 (Definitely would consider it).

40. How likely would it be that you would consider buying an electric vehicle the next time you purchased an automobile? Please answer in a scale of 1 (Not very probable) to 7 (Very probable).

41. If you would choose an electric vehicle, which of the following brands would you choose?

    a. Honda

    b. BMW

    c. Tesla

Please answer the following questions about your demographic profile.

42. Please write your age.

43. Which is your country of residence?

44. Please state your gender.

    a. Female

    b. Male

    c. Other

45. Please state your professional status:

    a. Student

b. Employed

c. Other

46. Please state the level of education you completed:

a. Elementary

b. High school / Professional

c. Undergraduate

d. Bachelor's Degree

e. Master's Degree

f. PhD

47. Please state your monthly income (pre-tax):

a. <€1000

b. From €1000 to €1500

c. From €1500 to €2500

d. Over €2500

The questionnaire is complete. Thank you for your cooperation.

Please click "Done" to submit.

## Appendix II – Study 2.1 Interview Script

1. Please state your gender, age, household size, income, level of education and occupation.
2. What is the type of fuel of your car? To what extent did the type of fuel influence the buying decision of your car?
3. How knowledgeable do you consider yourself in EVs? Describe a modern EV.
4. Name all the EV models or brands you know of.
5. What is the biggest personal disadvantage of EVs? Point out some of them.
6. What is the biggest personal advantage of EVs? Point out some of them.
7. What are your driving needs and habits? Both frequent and occasional?
8. Do you make long trips? How many times per year? Do you take your car in these trips?
9. Do you live in a rural, suburban or urban area? Can you have access to places without a car, like shops, or entertainment?
10. Would you consider having an EV knowing about its range limitations? What if you had a second conventional car available?
11. Could public transportation cover your frequent mobility needs?
12. Could walking cover some of your frequent mobility needs?
13. Would it be possible for you to have a personal charging point at home?
14. Would you use a work charging point? Would it be important to exist work points?
15. Would you use a public charging point? Would it be important to exist public points?
16. How could information on range and travel intentions help you feel relaxed about range? Would an app in the car with a good user interface to calculate your daily trips intentions for you make you feel more relaxed about using a limited range EV?

## Appendix III – Study 2.2 Interview Script

1. Is your current car whether new or second-hand? Will you buy a new or second-hand car next time? In how many years?
2. If you had to buy a second-hand car soon, how much would you pay and which fuel/technology would it be?
3. How much would you pay over that value for a used EV from a dealership?
4. Would you consider buying a used EV with a new battery and dealership guarantee? Would it be a must?
5. Assuming that this EV had a retrofitted battery with a new technology, and the range was the same as a conventional vehicle, would you be interested in buying? How much over paying would you consider in that situation?