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Field Lab – Technology Strategy with Mercedes-Benz Portugal

Transformation in the Automotive Industry: An Analysis of Mercedes-Benz Business Model and Market Trends

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Abstract

This paper examines global trends fundamentally disrupting the automotive industry and explores emerging opportunities within the transformation. Current literature focuses on elements causing the shift, however, limited examination is conducted on the extent to which automotive companies should find and embrace their role as technology or mobility providers in an increasingly digital and electric ecosystem. To fill the research gap, an exemplified qualitative analysis of Mercedes-Benz is undertaken to provide recommendations on sustaining and improving their business model. As such, strategic partnerships, mergers and acquisitions, investments in digital and electric initiatives, and adaptations to changing customer needs are essential to endure in a new era.

Keywords: Digital and Electric Transformation, Mercedes-Benz, Mercedes-EQ, Business Model, Market Trends, CASE

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1. Introduction

Digitalization and electrification are impacted by changes in governmental regulations, consumer behavior, and technological trends, which significantly transform the automotive industry. Premium original equipment manufacturers (OEMs), like Mercedes-Benz (MB), seek unique opportunities within the transformation process and pursue large-scale efforts to remain competitive. Advances in autonomous driving, the Internet of Things, and digital services redefine the relationship between drivers and their vehicles and create new areas within a more digitized business environment (BCG 2017). As the shift towards electrification is accelerating and new mobility providers and tech firms are entering the market, OEMs must adapt to an intensified competitive space. Innovating the traditional business model is vital to compete in today´s volatile market conditions. Differentiation in products and services with new players entering the market is essential to survival (McKinsey and Company 2016).

This paper was written in collaboration with Mercedes-Benz Portugal (MBP), focusing on the EQ brand. For this reason, insights into the Portuguese automotive industry and electrical infrastructure are presented to illustrate the threats and opportunities that the company faces in order to compete in different business areas in the context of the transformation. The need for innovation within the business model is necessary locally and globally. Therefore, Daimler AG acts as the parent company and pushes the movement to become fully electric by the end of the decade. In this master thesis, Daimler AG was still considered the parent company, even though it split into Mercedes-Benz AG and Daimler Trucks AG on December 1st, 2021 (Daimler AG 2021).

There has been extensive research on trends fundamentally transforming the automotive industry towards an increasingly digital and electric environment (Llopis-Albert, Rubio e Valero 2020, IEA 2021). Despite MB´s long history as a market leader and strong global presence and brand positioning, the EQ sub-brand remains a young entity in a burgeoning

industry compared to the 150-year-old internal combustion industry. Due to the short period of existence, little research or external analysis has been conducted to date that addresses the company and the EQ sub-brand itself in the electric vehicle (EV) industry.

Furthermore, a conclusive understanding of how digitalization affects industries with industrial-aged products (Henfridsson, Kalle und Yoo 2010) has remained relatively unexplored. In particular, the explicit impact of the transformation on business models of traditional OEM´s, operating in a field of primarily physical products, substantially remains tangible in comparison to other digitized industries, such as music or movies businesses, is limited (Hanelt, et al. 2015). Strategy literature examines the transformation of OEM´s business models in general (Riasanow, Galic e Böhm 2017, U. Winkelhake 2019). However, too little prior research on exploring the extent to which automotive firms should find and take in their role as a technology or mobility provider within a digital and electric ecosystem has been initiated. This paper aims to provide a holistic overview of Mercedes-Benz's existence in a severely changing habitat substantially. It further intends to answer the research question, "**how can Mercedes-Benz sustain and improve their competitive position within the digital and electric transformation?**"

This report first presents a theoretical foundation on concepts that are used later to describe the transition of Mercedes-Benz´s business model and to identify MBs competitive positioning. In the following chapter, the transformation in the automotive industry will be analyzed. Based on the evolution of the transformation and the trends that fuel respective changes, the worldwide automotive industry focuses on the Portuguese market. Furthermore, a company analysis in section four aims to portray MB´s business model in various areas of operation. Followed by a description of utilized methodologic approaches, six significant topics within the transformation will be outlined. As digitalization and electrification impact the customer journey along all touchpoints, MB´s shift towards digital sales in section six is the first issue

discussed. Since the sale of electric cars cannot function without a reasonable infrastructure and after the sales process, section seven focuses on how to increase customer experience (CX) by enhancing MB charging.

On the other hand, owning a car is no longer necessary with the appearance of shared and on-demand models existing today. Chapter eight illustrates various future scenarios of the uprising concept of Mobility as a Service (MaaS) and its implications for car manufacturers. MaaS is expected to promote sustainable mobility, in line with the overall shift in consumer demands and regulatory changes towards sustainability. Section nine, therefore, focuses on the analysis of brand reputation in terms of sustainable development in the automotive industry. Continuing the investigation, section ten covers the impact of Formula 1's presence on MB´s brand image and discusses how the technology transfer can impact the company's technological innovations and fuel transformation. Finally, the opportunities and challenges of the digital and electric transformation will be explored to identify future business models for MB. To conclude, recommendations are presented to MB.

2. Theoretical Foundations

The theoretical foundation guiding this research paper integrates Michael Porters Value Chain, the Business Model Canvas by Osterwalder, and the Two-Step Framework by Bergen & Peteraf for competitor identification.

2.1. Value Chain by Michael Porter

The value chain was first developed by Michael Porter (1985) as a methodology to assess a firm's competitive advantage by considering all operations within an organization and their interactions. To achieve and maintain a competitive edge, Porter advises comprehending how a company is integrated into the entire value system and not just focusing on understanding its own corporate value chain. Part of the value system is the value chains of suppliers, the

company itself, channels (several distribution channels), and customers, illustrated in Figure 1 (M. Porter 1985).

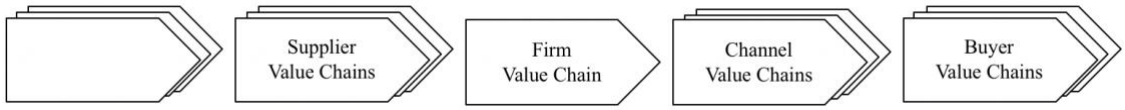

Figure 1: The Value System (M. Porter 1985)

Vertical connections, or links among a firm's value chain and that of suppliers and distribution channels, impact the expenses and performance of a company's operations. Since the company's goods serve as inputs in the buyers' value chain, it is essential to comprehend their value chains. The points of interaction between the two value chains determine the extent to which a company's value chain matches that of the purchaser. Therefore, a possible basis for differentiation is the contact point where the company's and customer's activities encounter. As per Porter, an organization can acquire a sustainable competitive advantage by either lowering the value chain costs and reducing the price for the buyer or increasing its performance by redesigning the value chain in which it performs (M. Porter 1985).

2.2. Business Model Canvas

The Business Model Canvas by Osterwalder is a tool to describe, analyze and design business models (Osterwalder und Pigneur 2010). There are nine different categories divided into customer segments, value proposition, channels, customer relationships, revenue streams, essential resources, key activities, key partnerships, and cost structure, aiming to provide a profound overview of the company´s business model. All "building blocks" are presented in Appendix 1 and display MB´s traditional and current business operations. The categories are described in further detail below (Osterwalder und Pigneur 2010):

- **Value proposition:** This category provides answers to why a customer would choose one company over another and defines in detail the value offered to customers, specifying the needs to be satisfied and the problems to be solved.
- **Customer Segments:** Defines the groups of people or organizations a company aspires to reach and serve.
- **Customer Relations:** Entails the company´s attempts to maintain positive relations with all customers.
- **Channels:** This building block encompasses the interface with the customer and outlines how a company connects with and reaches its client groups to deliver its value proposition.
- **Revenue Stream:** A firm can gain revenue through one-time client transactions or recurring revenues from ongoing payments to deliver the value proposition and provide long-term customer support.
- **Key Resources:** A description of the most important assets that make a business model function and thus allowing a company to create and offer a value proposition, expand into new markets, build and sustain relationships and earn money through new sources.
- **Key Activities:** This block includes the company´s main elements to operate successfully and ensure a value proposition to the customers.
- **Key Partnerships:** Key partners comprise a network of suppliers and partners to optimize their business models, decrease risk and acquire resources.
- **Cost Structure:** The cost structure includes all fixed and variable costs to operate a business model.

2.3. Two-stage Framework by Bergen & Peteraf for Competitor Identification

Identification of competition is essential in strategic management and marketing research (Wu e Olk 2014). According to Bergen & Peteraf (2002), it is crucial to define the competitors before

(1) perusing any defensive strategy against likely competitive incursions, (2) planning offensive moves to develop its position, (3) deciding on how to position its products or services, and (4) exploring whether they have a competitive advantage. To identify and analyze the competitors, the authors developed a two-stage framework. The first stage includes the competitor's identification based on relevant similarities by answering the question "whether two firms serve the same customer needs presently or have the ability to do so in the near future (Bergen e Peteraf 2002)." The second stage focuses on the competitor analysis and evaluation task to compare rivals on their relevant dimensions to answer the following question "how well do two firms serve the same need or how do their capabilities compare?" (Bergen e Peteraf 2002).

Within the scope of this paper, the first stage, "competitor's identification," is depicted in detail. Figure 2 serves as a foundation for the analysis. In contrast, the x-axis is labeled as the "resources similarity," which is classified as "the extent to which a given competitor possesses strategic endowments comparable, in terms of type, to those of the focal firm." (Bergen e Peteraf 2002). The y-axis marks the term "market commonality," implicating the "degree to which a given competitor overlaps with the focal firm in terms of customer needs served" (Bergen e Peteraf 2002).

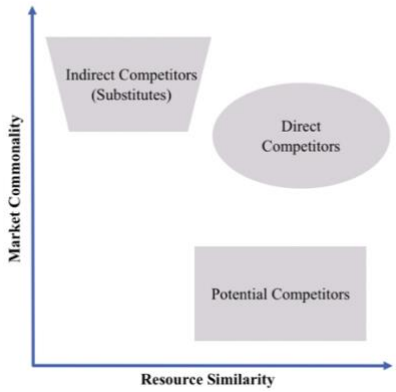

Figure 2: Two-stage Framework – First Step Analysis (Bergen & Peteraf, 2002)

3. Transformation in the Automotive Industry

The transformation from traditional car manufacturers to digital service providers illustrates the shift within the Automotive Industry. Various trends, outlined in the following, are accelerating this change.

3.1. The Evolution of the Automotive Value Chain

Within the traditional automotive sector, the value chain focused on the production and delivery of vehicles to end customers. The value chain consisted of the following six key parts, illustrated below in Figure 3 (Lind 2012). Due to the thesis's scope, this section primarily addresses the automotive industry's value chain issues among OEMs and end customers.

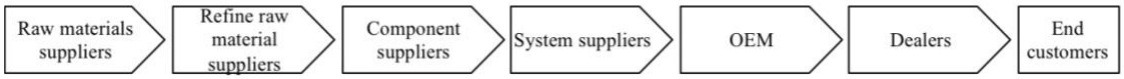

Figure 3: Traditional Value Chain Automotive Industry (Lind 2012)

Despite the solid and rising rivalry among OEMs in the automotive sector, minimal attention was devoted to final customers until the mid-1990s. The main reason for this circumstance was the dominant role of independent dealerships, acting as a buffer between the car manufacturer and their end customers. For decades, new vehicles have been supplied over a network of dealers (Ansart 2006). During this time, OEMs were rather concentrated on cost-cutting and improvements in engineering, while little consideration was given to customer satisfaction and service (Townsend 2013).

It was not until the mid-1990s that OEMs recognized the value of sales and after-sales services and their ability to accumulate profit margins. They also understood that complementary services might become a significant element in influencing consumers' choice of cars and building brand loyalty.

Since the rise of computer technologies, the retail industry has shifted towards the Internet. Around 2006, particular purchases, especially for used vehicles, were made via e-commerce.

Still, the automotive sector remained behind other industries due to the lack of a stable business model for distributing vehicles online (Ansart 2006). However, identifying consumer decision-making became increasingly important in a constantly dynamic and increasingly digital environment (Townsend 2013). To align with those changing consumer behaviors, OEMs and related business players introduced suitable business models (Martinez 2018). Products and services have been increasingly dematerialized. The value chain has ultimately lost its physical dimension, which is why the idea of the value chain has become an ineffective tool for analyzing and uncovering sources of value in many sectors (A.J. Campbell 1996). Over the years, the automotive industry's value chain has evolved from a "traditional vertically integrated structure to a complex network of multiple partners" (Bauernhansl. 2013).

A network approach focuses on the value-creating system directly, in which various economic players, suppliers, allies, partners, and consumers collaborate to co-produce value. A value network can be defined as a "set of relatively autonomous units that can be managed independently but operate together in a framework of common principles" (Peppard 2006).

3.2.Trends Transforming the Automotive Industry

Various market trends shape the transformation process of the automotive industry. Sustainability and the environmental crisis force automotive players to adapt to governmental restrictions and regulations with the overall goal to reduce $C0_2$ emissions. Innovative technologies and digital trends, as well as new market players, are emerging, increasing the pressure for existing firms to position themselves and remain competitive. Furthermore, OEM´s need to adapt to changing consumer behavior and expectations, which demand more transparency and more significant concern about the planet. Moreover, the transformation is also strongly influenced by external factors such as the Covid-19 pandemic.

3.2.1. Environmental Crisis and Sustainability

The planet is currently undergoing an actual environmental crisis, and the population and ecosystems are at great risk. The number of issues is now higher than ever, including climate change, global warming, pollution, overpopulation, loss of biodiversity, among others (Appendix 2).

The transportation sector represents 20% of global CO_2 emissions. Specifically, road travel contributes 75% of emissions for the entire transportation sector, this value coming from passenger vehicles, including buses and cars with 45.1%, and trucks carrying freight accounting for 29.4% (Figure 4). Consequently, a total of 15% of CO_2 emissions are related to road travel. The remaining emissions come from aviation (11.6%), shipping (10.6%), rail (1%), and others (2.2%) (Ritchie 2020).

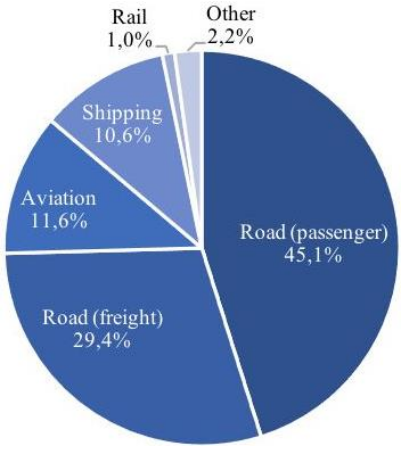

Figure 4: Total CO_2 emissions of the transportation sector divided by type of transportation (Ritchie, 2020)

To decrease these high CO_2 values, different countries have applied several deadlines to ban all types of petrol and diesel cars & vans soon. For instance, Norway aims to be the first country to end the sales of new Internal Combustion Engine (ICE) vehicles by the end of 2025 (Reuters 2020). Germany, on the contrary, decided to leave this decision to individual cities and federal states for now. For instance, Berlin will ban ICE vehicles by 2030 (Proctor 2021). On the other hand, Portugal aims to do so in 2035 (Argus 2021).

To minimize the negative effect of transportation on greenhouse gas emissions (75%), investments into green technologies within the automobile industry are made, where EV provides a sustainable solution (Mourelatou 2019).

Furthermore, the EU proposes a general deadline between 2030 and 2035 for the phase-out of ICEs (Taylor 2021). The only new vehicles allowed to be sold will be battery electric vehicles (BEVs) and hydrogen-powered vehicles (FCEV) that may already exist then. Second-hand cars will remain in the market, allowing petrol and diesel cars to stay on the roads, as well as conventional hybrids with no "significant" zero-emission capability (Griffiths 2020). Accordingly, the automotive industry needs to adapt its business models to accommodate new regulations imposed by governments regarding sustainability metrics.

3.2.2. Technological Breakthroughs and Trends

Advanced technologies and resulting trends are discussed in more detail in the following section, as they significantly accelerate change in the automotive industry.

3.2.2.1. Artificial Intelligence

Artificial intelligence (AI) is expected to be the leading emerging technology in the market. The Covid-19 pandemic accelerated the implementation of AI in business models, which constitute an efficient way for companies to organize, sort, analyze and take actions faster. The number of companies pursuing artificial intelligence and automation to enhance competitiveness is increasing. However, regulations regarding "AI's precision and accuracy," "Appropriate use of consumer data and data privacy," and "Discrimination and bias in decision making" are not fully developed yet, which concerns many players in the market (KPMG 2021). AI is also disrupting the automotive industry as it can be implemented in several stages within the automotive supply chain to reduce costs and increase efficiency. From manufacturing to transportation and services, AI can be a significant company's asset along the value chain. In manufacturing, robots are already working with humans and learning manufacturing skills. In

the future, the prediction is to operate with robots fully. In terms of transportation, AI plays a crucial role in driver assistance technology and autonomous driving technology (FutureBridge 2020).

3.2.2.2. Virtual and Augmented Reality

Virtual reality (VR) is a realistic and immersive computer-generated three-dimensional environment created with interactive software/hardware and experienced or controlled by movement (Dictionary 2021). Augmented reality (AR), on the other hand, is an augmented digital representation of the actual physical world, supplied through technology that includes digital visual features, such as sound. Both technologies are evolving at a rapid speed (Investopedia 2020). Total AR/VR spending worldwide is estimated to be 12 billion U.S. dollars in 2020, although being projected to increase significantly until 2024, set to reach 72.8 billion U.S. dollars (Statista 2020). The objective is to increasingly use these technologies in training and education, retail shopping, online collaboration, marketing, advertising, and gaming (Statista 2020).

The automotive augmented and virtual reality market worldwide was considerably small in 2017, reaching only 213 million U.S dollars. This value is expected to exponentially increase by 2025, achieving a value of 673.6 billion U.S dollars (Statista 2019). VR and AR can be implemented in many stages of the automotive industry’s value chain. From design and virtual prototyping of cars (vehicle design requires continuous improvement, reviews, and testing), testing and pre-production, training and assembly (training engineers), sales (virtual showrooms), to developing the safety of self-driving cars (Relaycars 2020).

3.2.2.3. CASE – Connectivity, Autonomous, Shared, and Electrification

Currently, the automotive industry's value chain is experiencing probably the most remarkable change in its history. The four megatrends of connected cars, autonomous vehicles, shared

mobility, and electric vehicles - abbreviated CASE - have the potential to fundamentally change the face of the industry's value chain (McKinsey and Company 2016).

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First of all, the vehicle of the future is **connected**. Connected automobiles are positioned to evolve into powerful information platforms that will improve driving experiences and unlock new opportunities for companies to create customer benefits. Classic cars will enlarge into information-driven vehicles that provide drivers and passengers a variety of innovative experiences greatly improved by AI and intuitive interfaces that far exceed current capabilities (McKinsey and Company 2016, McKinsey and Company 2019).

The hardware for networking as well as the associated services offer market opportunities but also shift the perception of what constitutes the quality of vehicles. The open-source car operating system "Android Automotive OS" finally heralds Google's entry as a software platform provider in the automotive sector. Additionally, the importance of cloud-based solutions for storing and analyzing vehicle data is increasing rapidly in this area. German manufacturers are primarily dependent on cooperation with large, established providers such as Microsoft, IBM, and Amazon, some of which have ambitions in the automotive sector (McKinsey and Company 2016, Deloitte 2021).

The field of **autonomous vehicles**, which require no human interaction even in complex traffic situations, has the potential to improve personal safety, leverage sustainability, and lower transportation costs through AI technology (Coalition for Future Mobility 2021). Currently, there are six levels to describe automated driving vehicles, starting with level 0, "No automation," ending in level 5, "Fully automated" (Easy Tech 2021). Further explanation of

each level is illustrated in Appendix 3. By 2030, level 3 “conditional automated driving” is expected to be integrated into 41% of vehicles, while high/full autonomy with level 4 and 5 technology is estimated within 19% of the cars (Heineke, Kampshoff und Möller, McKinsey & Company n.d., FutureBridge 2020).

Moreover, autonomous driving offers considerable market potential for suppliers in the field of sensor technology, depending on how this technology establishes itself in the market. Over the past decade, one of the progress drivers has been the exponential development in the processors' performance. As a result, three American chip and internet companies - Intel, Nvidia, and Google's sister company Waymo - now occupy key positions in this field. Given the USA's progress in prototypes and test drives, German automakers must be careful not to lose out on this technology (McKinsey and Company 2019, FutureBridge 2020).

Besides the advantages of autonomous driving, there are technological challenges and customer concerns. Challenges related to technology are the lack of superior quality 5G connection or 5G to allow the self-driving cars to interact to gather data about congestion or obstacles on the roads. Also, some vehicles require extremely detailed maps to function well (Statista 2021). In terms of customer concerns, safety is the most critical factor. Although over 40% of individuals worldwide would be willing to switch to fully autonomous or semi-autonomous cars, around 61% of consumers are worried about potential safety issues due to machine error, whereas 51% are concerned about the human error (Statista 2021).

Connectivity is directly correlated with the topic of autonomous vehicles. For cars to become fully autonomous, they all need to be connected in order to exchange information constantly. Most manufacturers and suppliers are already accessing an increased amount of vehicle data to improve or refine their products. Opportunities abound for other players to share information as new ecosystems form (McKinsey and Company 2019).

Currently, as there are levels of autonomous vehicles, there are also levels of connectivity between cars, going from level 1 (L1), general hardware connectivity, to level 5 (L5), virtual chauffeur (Appendix 4). By 2030, 45% of global new-car sales could be in connectivity at level 3 or above in connectivity (McKinsey and Company 2019).

In the context of rapid digitalization, **shared mobility** has emerged as a significant and complex trend. Technological improvements enable new forms of shared mobility and transform the transportation industry (Sobhani, et al. 2021). The shared-mobility sector can be divided into various categories in today's world, conditional to the car-ownership structure (private versus fleet cars), whether customers drive themselves or are driven, and whether they share their rides with strangers or not. Besides the well-established traditional taxis, rental car services and public transit, the following categories can be defined as shared mobility:

- **E-hailing** services, also called ride-hailing, such as Uber or Bolt, are one of those categories where a customer orders a car through a digital device that picks them up. This service can either be shared with strangers or used individually.
- **Car sharing,** such as Share Now, entails customers being able to use vehicles offered by businesses for a shorter time than renting them. Car-sharing usually remains confined in a geographically limited area.
- **Peer-to-peer (P2P) car-sharing and ridesharing** allow vehicle owners to lend their car to strangers for a fee or enable them to transport paying riders to their destinations, which are usually long trips.
- **Shared micro-mobility** includes light vehicles such as bicycles or e-scooters that are available for common use for a charge, either at a station or in free circulation.
- **Robo-taxis and shuttles** provide the same functions as today's taxi and e-hailing services, but instead of a human driver, they employ self-driving technology (Heineke, Kloss, et al. 2021).

The emergence of these new on-demand service firms, which have established digital platforms to connect demand and supply, exemplifies the speed and scope of change (Hensher, et al. 2020). The Covid-19 pandemic significantly impacted the market for shared mobility services. Revenue dropped for shared mobility by nearly 45% from 2019 to 2020 in the EU, as lockdowns and social distancing norms have pushed people to choose private transportation over public and shared mobility services. Besides that, the sector had grown steadily in the years before (Ward 2021).

The diversity of these new transportation options simplifies people's mobility to get from A to B, but at the same time, it increases complexity for users. MaaS is arising as a viable smart mobility solution that can solve the added complexity and maximize the benefits that all of these choices may provide when combined (Butler, Yigitcanlara und Paz 2021). MaaS is considered the umbrella connecting all developing services with public transportation (Hietanen 2014), further analyzed in *chapter* ***Error! Reference source not found.***. According to MaaS proponents, these goals are frequently associated with notions of "individual freedom" and "collective efficiency" (Pangbourne, Mladenović, Stead, & Milakis, 2020).

Lastly, **electrification** holds a significant position in the transition of the mobility industry and creates great possibilities in all car segments, although the speed and scope of change will vary. Launching new EVs in the market is vital in ensuring a rapid and mass adoption of electric vehicles. Additionally, the entire mobility ecosystem must collaborate to ensure a successful change (PwC 2018). By 2030, the European Union's latest guidelines target an EV share of at least 50%. Mainstream EVs will disrupt the automobile sector and contribute to global decarbonization. However, as electrification accelerates, car manufacturers, their supply chains, and the larger EV ecosystem are under increasing pressure to reach these goals. This is specifically related to putting in place the necessary charging infrastructure (Cornet, et al. 2021).

Further insights into the CASE trends and their impact on the automotive industry (namely Daimler AG), apart from the value chain, will be delivered within *section 10.3.4.*.

3.2.2.4. Digital Commerce

Digital commerce is the act of purchasing and selling products and services through digital channels such as the internet, mobile networks, and commerce infrastructure (Bloomenthal 2021). E-commerce gained massive importance during the pandemic, as people were not allowed to shop physically, leading to an increased demand for online shopping. Delivery systems also improved efficiency and service quality. In 2020, the growth in retail e-commerce sales in western Europe accounted for 16.9%. In the US, the COVID-19 pandemic boosted a 10-year growth for e-commerce in only 90 days (McKinsey and Company 2020). Currently, the future of sales channels is focused on improving the companies' omnichannel. Customer experience is the key to a successful change to online sales, and reliable and efficient delivery is imperative.

For the automotive industry, the connected environment is disrupting the business model. Due to the increase in innovation and the appearance of new competitors, market players need to engage with customers in a more individualized way. By developing a strong omnichannel strategy, with a "seamlessly integrated shopping, buying and owning process regardless of the channel" in which the client interacts, companies will exceed customer experience (Dinsdale, Willigmann e Glueck 2016).

Tesla is already pursuing digital commerce as a core business strategy. The company implemented a whole e-commerce buying experience and moved car sales entirely online. The main objective was to decrease costs and operating expenses for the company. Currently, it is possible to purchase a Tesla via smartphone in only five clicks. This strategy pushes other car companies to do the same (Tesla 2019). The estimated rate of new online car sales in the United

States, Europe, and China is expected to increase in 2050 compared with 2020. In 2050, this rate will achieve a value of 7% in the U.S, 8% in Europe, and 10% in China (Statista 2020).

In October 2020, Deloitte made a consumer study for Japan, Germany, the United States, the Republic of Korea, China, and India to analyze how consumers adapt to new automotive trends. Virtual car sales are growing, and with the improvement of the customer experience and increasing consumer confidence in buying a car online, consumers will slowly shift to buying vehicles virtually. However, the majority of the consumers in India (60%), China (65%), the Republic of Korea (67%), the United States (71%), Germany (76%), and Japan (80%), will still prefer to buy their next vehicle in-person. “In most countries, even those consumers who want a virtual buying process for their next vehicle would still most prefer to interact with an authorized dealer.” Consumers surveyed who would prefer to purchase their next vehicle partially or completely virtually cited convenience as the primary reason.

On the contrary, the main reason for disinterest in purchasing the next vehicle through a virtual process is the need to see and test the car because a new car is a high investment purchase. In addition, some brands are more trustworthy than others in the eyes of customers, which can lead to customers wanting to compare vehicles from some brands to be sure that the vehicle has the quality promised by the company (Deloitte 2021).

3.2.3. The Shift in Consumer Behavior & Customer Expectations

Due to the rapid changes in the business world, customer behavior and expectations regarding services and products are also shifting. The power of the consumer is constantly growing, which is the reason why customer demands more and more impact organizations. The following section describes these shifts in customization, transparency, and loyalty.

First, **customization** has a significant role in businesses, whether in start-ups or well-established brands, as companies are progressively offering more customizable product options. Customized products are not new to the market, but the harder it becomes for a company to

stand out from the competition, the more critical it becomes. The main benefits of customization are increased customer satisfaction (and thus brand loyalty) and word-of-mouth marketing. People appreciate unique products and are more inclined to share them with others (Forbes 2020). This allows the company to charge more for its products and services, as one in five consumers are willing to pay 20% more for a customized product/service and do not mind waiting longer to receive it (Deloitte 2015).

Customization has always been an enemy of mass production in the automotive industry. Toyota, in 1992, for example, attempted mass customization but failed due to increasing costs in production and difficulties in adapting structures and systems (Harvard Business Review 1993). Nowadays, customization is already a very present component in the market, as Toyota, MB, Tesla, BMW, and Nissan, among others, have an online platform (configurator) where customers can build their car according to their preferences. Still, companies have been trying to simplify customization: Tesla, for example, only offers the options of five paint colors, two-wheel types, and two interior colors (Tesla 2021). Traditional car brands like MB have a more comprehensive range of customization options. For instance, the 2021 C300 Sedan offers eight colors, nine-wheel types, and 15 interior colors (Mercedes-Benz 2021). However, MB used to have an even more complex customization process, so the brand decided to simplify it (Marques, Mercedes-Benz Electrc Vehicles 2021).

Transparency: For a long time, large businesses had abused the customers' trust due to scandals such as the Diesel Scandal by Volkswagen from 2014 onwards. Volkswagen's cars were equipped with a device "that could detect when they were being tested, changing the performance accordingly to improve results" (BBC 2015). Such scandals have become more and more common, which is why customers currently demand openness in the supply chain, processes, among others (Forbes 2021).

Loyalty Downturn: Brand loyalty happens when customers are very committed to a product/service despite pressure from their competitors. Recently, there has been a loyalty downturn, as customers have been switching brands at unprecedented rates. During the pandemic, 48% of customers replaced an in-store product with an online option (Radyant 2021). One in four customers states they are switching brands more frequently than they have in the past. Covid-19 was the primary cause: store closures forced consumers to search for options online, and since there is a higher-than-ever online presence in brands and therefore more opportunities, customers will try to find the best choice among them (Marketing Insider Group 2021). Sustainability is a major factor in purchasing decisions for a wide range of customer categories (IMM Cologne 2021).

3.2.4. Excurse: External Impacts on the Automotive Transformation

Covid-19 had a massive impact on the automotive industry. It caused shutdowns of plants and retailers, bottlenecks in the international supply chain and it forced workforces to quarantine themselves, as well as businesses to shut down. Likewise, the pandemic has lagged consumer confidence, directly affecting the economy, leading to visible decreases in car sales. Despite the Covid-19 pandemic and the challenges it brought to the market, the sales of EVs continued to mark a growing trend during this time (Hagenmaier, et al. 2021).

In fact, sustainability goals and targets were set on an intensified timeline by OEM´s, further expediting the transformation to become electric. Automotive companies have even increased investments in electrification during the pandemic, setting more aggressive target dates to shift to fully electric in a timelier matter (Gorner und Paoli 2021). Another long-term impact is the acceleration of the digital transformation, e.g., to develop innovative online sales strategies to increase customer experience with digital systems and technological advancements (Scherpen, Draghici und Niemann 2017).

For Mercedes-Benz in particular, Daimler anticipates revenue and EBIT for this year to be significantly over the prior year´s levels, based on the market development. Through the availability of vaccines in essential markets, the company believes in a full recovery of its business globally (Daimler AG 2021).

Apart from the Covid-19 impact, the semiconductor crisis has severely affected the automotive industry. Semiconductors play a central role in electronic and energy technology and are thus of utmost importance to accelerate automotive OEMs' digital and electric transformation. Due to Covid-19 and growing general demand for technological products, the bottleneck within the production of semiconductors has worsened and remains a severe threat. Many automotive firms (including MB) were forced to shut down their production lines, which ultimately decreased global vehicle sales.

3.3. Current Status of EVs in the Automotive Industry

This section analyzes global EV sales, narrowed down to the three main regional areas (Europe, China, and the United States). The overall automotive market will be mentioned as a benchmark, but the emphasis lies on the EV market.

3.3.1. Global EV Sales

The EV market gained tremendous momentum within the last decade and made significant progress worldwide. While growth rates varied between 43% and 69% every year from 2014 onwards, 2019 was the clear outlier, with only 9%. This happened due to the decline in sales in the two biggest EV markets at the time: USA and China, further explained below (see *3.3.2 Regional EV Sales*). On the other hand, the European market noted rapid growth rates throughout the years, registering a 44% increase in 2019 (EV-Volumes 2021).

The Covid-19 pandemic affected the overall automotive industry as such that general automotive sales (ICE and EV) dropped by almost 16% in 2020. Although the market suffered

from economic repercussions, EV sales increased in 2020 by 40.8% relative to 2019, as did the market share of EVs (which was doubled). This variation is due to very high growth in the second half of the year, as the market only started thriving in July 2020 (Figure 5). From then on, the monthly rate continuously increased (IEA 2021). In absolute terms, three million new electric cars were registered overall in 2020. With 1.16m registrations, China was overtaken by Europe (1.37m registrations) for the first time. The United States was only able to register 295,000 electric cars (IEA 2021). As of today, China still holds the largest fleet of EVs due to their earlier adoption in the region.

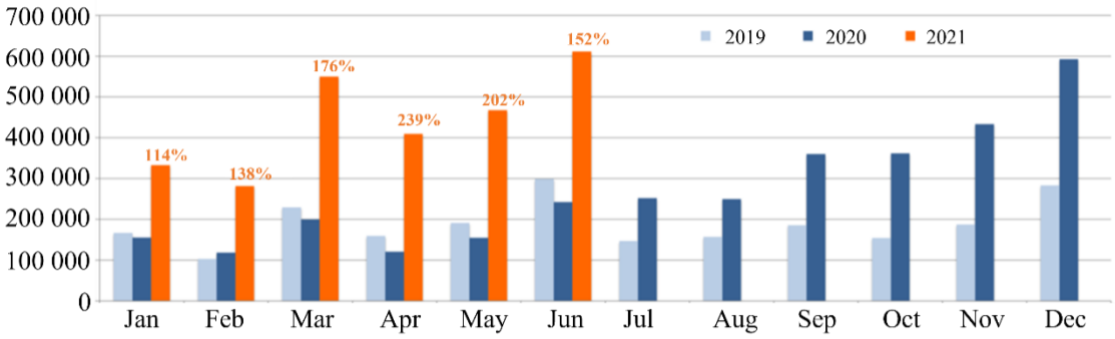


Figure 5: Global Monthly Plug-in Vehicle Sales & YoY Growth, EV-Volumes' original graph (EV-Volumes 2021)

2021 was the strongest year for the EV market thus far. In the first half of the year, new car registrations were up to 2.65 million for EV, which means a variation of +168% compared to one year prior due to the low base of the first half of 2020. The global light vehicle market has not been performing at the same level but has been recovering from the crisis of 2020 (EV-Volumes, 2021).

All in all, most countries have been observing a very strong growth in EV registrations, as the market has been growing three to eight times more than the total light vehicle market. The evolution of the EV registrations in the central regions are presented as follows:

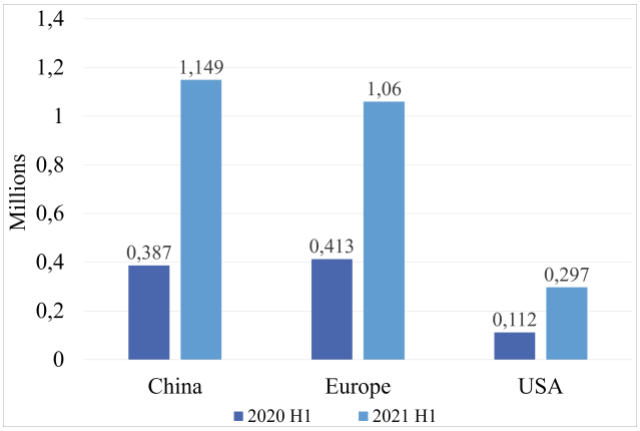


Figure 6 - Car Registrations in the main regions in millions (EV-Volumes 2021)

3.3.2. Regional EV Sales

The following section provides a deep dive into the three central regions and analyzes the EV market developments.

Europe: In 2020, the European vehicle market diminished by 22% due to the impacts of the global pandemic. Nonetheless, new EV registrations more than doubled, representing a 10% market share. “It was the combination of new attractive models, incentive boosts by green recovery funds, the 95g CO_2 mandate, much-improved availability and intense promotion of EVs” (S&P Global 2021). Germany was the European country with the most EV registrations, reaching up to 395,000, whereas France ranked second (185,000). Although Germany marked the highest number in registrations, other countries have higher shares in Plug-in Hybrid Electric Vehicle (PHEV). According to the indicator “Share of Plug-in Electric Vehicles in new passenger car sales in 2020” (

Appendix 5), Norway marks 75% EV sales. In this ranking, the closest country is Iceland, with almost half. Followed by Sweden and the Netherlands with 32.3% and 24.9% respectively, Portugal is placed 8th in the global ranking. This shows the enormous potential in the country with ambitions to accelerate electrification (World Economic Forum 2021).

Most European customers preferred to purchase BEVs (54%) in 2020, slightly outnumbering the share for PHEVs. However, PHEVs had higher growth, as their registrations doubled from 2019, while PHEV registrations tripled. The highest shares of BEVs (in the percentage of all-electric car registrations) are in the Netherlands (82%), Norway (73%), the United Kingdom (62%), and France (60%) (IEA 2021).

China: Within the regional comparison, China was the least affected by the pandemic, as the overall automotive market only decreased by 9% relatively to 2019. In the first half of 2020, new electric car registrations rates were low, as China was the origin of Covid-19. It was, therefore, the first country to deeply suffer its economic consequences. The scenario changed in the second half, as China was able to contain the pandemic while the rest of the world was at its peak. In consideration of the EV registrations, China noted a 9% growth relatively to 2019 and a sales share of 5.7% (+4.8% to the previous year). Around 80% of new EVs registered in 2020 were BEVs (IEA 2021, Business Wire 2021).

USA: The U.S. automotive industry was severely impacted by Covid-19, being the only nation with a decrease of sales in the EV market in 2020 (-10.6%), while the overall car market decreased 23%. Another factor influencing the market downturn was the reduction of federal incentives. Each OEM is only eligible for incentives in the first 200,000 units sold, and Tesla and General Motors have reached the limit and therefore lost their eligibility in early 2020. These two OEMs account for most electric car registrations in the country. About 80% of new electric car registrations were BEVs (IEA 2021).

3.4. Portuguese EV Market Overview

This section focuses on the Portuguese market as an example of how the electric transformation is proceeding. EV sales, prevailing regulations and incentives regarding EVs and the current state of the EV infrastructure (considering the digital structure, EV-roaming, and charging infrastructure) are examined.

3.4.1. Portuguese EV Sales

In Portugal, the number of monthly sales in 2019 and at the beginning of 2020 were consistent, whereas sales increased significantly in the second half of 2020 (UVE 2021). Consequently, Portugal's share of EVs was 13.5% in 2020 (World Economic Forum 2021).

In 2021, sales decreased compared to 2020 due to the country's new confinement rules resulting from Covid-19 (Appendix 6). In March and April of 2021, when the pandemic was more contained, and restrictions were no longer as severe, e-vehicle sales increased in conjunction with the new and larger range of e-vehicle models and new brands in the market. In June, sales nearly reached their maximum number ever (2,940 sales vs. 2020 December's 3,268 sales). As it has been clear from then on, 2021 sales have been consistently higher than the homologous months in the two previous years. Regarding preferences in types of EVs, the Portuguese favor PHEV models. They have continuously been beating BEV in absolute terms and more consistently. From April 2020 onwards, BEV sales only surpassed PHEV in September and October (UVE 2021).

Most recently, the EV market in Portugal set a new record of 1,715 BEVs sold in one month and a monthly share of 25% in overall car sales. This puts Portugal in 5th place in the European ranking of EV shares (H. S. UVE 2021) & (UVE 2021).

3.4.2. Regulations and Incentives

On March 5th, 2021, the Portuguese government published the "Despacho n.º 2535/2021", consisting of the Environmental Fund allocating €4,000,000 in funding in 2021 to incentivize EV ownership. Portugal is committing to achieve carbon neutrality by 2050, and one of the

main pillars is the decarbonization of mobility and transports. Therefore, aware of the urgency, the National Plan of Energy and Climate 2030 set ambitious goals, including a reduction of 40% on the emissions of greenhouse gases on the transports sector, moving towards sustainable mobility (Diário da República 2021).

In practical terms, anyone who buys a fully EV can apply to the State's incentives, which are limited in all categories. The incentive for each category is:

- Type 1) Light passenger vehicle - €3,000 (700 vacancies)
- Type 2) Light merchandise vehicle - €6,000 (150 vacancies)
- Types 3, 4, and 5 in Appendix 7

The only type of vehicle limited to individuals is Type 1, whereas any other type is available to both individuals and companies. Contrary to companies, which can obtain funding for two Type 2 vehicles and four Type 4 vehicles, individuals can only ask for financing up to one car of each kind (Diário da República 2021).

This incentive only regards completely new vehicles, and its maximum price is 62,500€ (VAT included). The beneficiaries are obligated to hold the car for at least 24 months and cannot export them (Diário da República 2021).

However, the demand and pressure from society have been so extensive that every funding vacancy has been filled, which led the Portuguese Government to act and create new vacancies for electric bicycles. This issue strengthens the argument that Portugal does not have enough incentives for EVs, which slows down the process of reaching carbon neutrality (Deco Proteste 2021).

Regarding taxes, there are also a few changes regarding EV incentives. Previously, the owners of fully electric cars did not have to pay ISV (Imposto Sobre Veículos – Tax On Vehicles) and PHEV had a reduction of 75% as long as its autonomy was at least 25km. From 2021 onwards,

this benefit is exclusive to cars that emit less than 50g/km of CO_2 and have autonomy superior to 50km (Caixa Geral de Depósitos 2021).

As a benchmark, the four countries, Norway, Iceland, Sweden, and the Netherlands, with the highest share of PHEV in new passenger car sales in 2020, have similar EV incentive policies. Those policies consist of the "The polluter pays principle" tax system (World Economic Forum 2021). As an example, Norway's political parties decided that "it should always be economically beneficial to choose zero and low emission cars over high emission cars." Cars with high emissions will have high taxes and vice-versa. The tax calculation combines weight and the most pollutant emissions CO_2 and Nitrogen Oxides (NO_X). E.g., Norway, where most EV models are cheaper than non-EV ones, even disregarding gasoline prices (Norsk Elbilforening 2021) (

Appendix 8).

Finally, it is essential to mention the prohibition of petrol and diesel cars. On July 14th, 2021, "The European Union (…) proposed an effective ban on the sale of new petrol and diesel cars from 2035, aiming to speed up the switch to zero EVs as part of a broad package of measures to combat global warming" (Reuters 2021). A new goal was suggested, as the European Commission proposed a 55% cut in CO_2 emissions from cars by 2030 instead of the previous goal of a 37.5% reduction. In Portugal, there is no established or estimated date for the prohibition of combustion cars (Reuters 2021).

3.4.3. Digital & Electric Infrastructure Given in Portugal

Transportation electrification and digitalization are of utmost importance within the move to a greener future. This section deep dives into the Portuguese market and accesses its potential to accelerate in various e-mobility aspects.

3.4.3.1. Digital Infrastructure

In the digital society, complex connectivity and communication are becoming increasingly important. For this matter, the infrastructure is of elementary importance. The ongoing communicative and mobile revolution, based on huge amounts of data, permanent connectivity, and mobility with few restrictions, will be further intensified in the future by the technological transformation and 5G (Bain & Company 2021).

Due to extensive broadband expansion by telecommunications companies, Portugal is in a decent position compared to other EU countries in terms of connectivity. In the EU Digitization Indicator DESI 2021, the country is ranked 15th on this topic. Broadband Internet reaches an increased number of households; the figure for fast and ultra-fast fiber to the home (FFTH) is 87% compared to the EU average of 59% (EU Commision 2021). The country is still lagging in the contractual subscription of fixed-network and mobile broadband, i.e., usage by the population, but is gradually improving.

Based on connectivity, Portugal can develop other strengths: the ability to attract talent (26th place in the World Talent Ranking 2018), establish international research collaborations (for example, MIT, Fraunhofer), and be attractive for international investors (IMD World Competitiveness Center 2021). As the owner of Portugal Telekom, the multinational telecom group Altice is a crucial driver of innovation. To drive the development of 5G services in Portugal, Altice Portugal signed a strategic partnership with Huawei in late 2018. Furthermore, the spectrum auction took place in Portugal at the beginning of 2021. This is critical for developing the 5G network, which is elementary for EV mobility. Several factors are elaborated in the following (German Trade and Invest 2019).

The essential role of mobile operators is the first to be mentioned. In 2035, 5G technology will be responsible for driving 5% of the global economy in almost all industries. In Portugal, this is estimated to be 35 billion USD. Mobile operators are thus an essential link in the digital infrastructure (Roland Berger 2020). Therefore, the network itself is highly dependent on the level of investment made by the government and the mobile operators. Mobile operators have not been able to monetize the increased data volumes in the past, so increased investments are necessary (Bain & Company 2021).

Declining returns for telecommunications providers could further exacerbate this problem. Primarily due to the very low per capita revenues and returns on capital in Portugal (among the lowest in the EU), the introduction of unfair competition would lead to further problems in the future (Roland Berger 2020). Thus, the state must provide competitive framework conditions in the long term.

The dynamics of the market have long given Portugal advantages in the telecommunications sector. However, the unpredictable change and economic sustainability may cause Portugal's global position to be lost in the long term (Roland Berger 2020). To prevent this, the Portuguese government must grant more competition and innovation in the auctions for provider slots.

After all, in the medium and long term, a well-developed 5G network is indispensable for the country's economic success. Since significant investments are necessary, foreign investors should also be brought on board. This will ensure good network quality and digital transformation in the long term. However, fair rules can only guarantee this for various capable providers in future network auctions (Roland Berger 2020).

3.4.3.2. EV-Roaming

One of the biggest challenges in the expansion of e-mobility is the nationwide availability of charging stations and digital infrastructure and ensuring that the charging stations can be used as easily as possible. To ensure that customers can use the EV for both short trips and longer distances, many e-mobility providers offer what is known as charging roaming. By this, they ensure that the densest possible network of charging points is available. This applies to Portugal and the entire EU and other nations (BCG 2021, McKinsey and Company 2021).

The term roaming is based on the idea of mobile providers to make their service available across national borders. The provider uses its infrastructure through partnerships with national companies in this respect. In return, these could access the other provider's network (Virta Global 2020).

Roaming works in a similar way for charging e-cars. To be able to use public charging stations, for example, downtown or on the highway, the user signs up for a charging tariff with an e-mobility provider (EMP for short). This gives them access to all charging stations in the EMP's charging network (BCG 2021, McKinsey and Company 2021).

While roaming in the mobile sector is EU-wide regulated and free of charge, the costs for charging roaming depend on the respective e-mobility provider. In Portugal, the leading providers offer this service with partnerships across almost the entire EU (McKinsey and Company 2021, BCG 2021).

3.4.3.3. Charging Infrastructure

Globally, EV adoption has shown significant growth over the past years, requiring substantial investments into EV infrastructure. According to Statista (2021), the global vehicle charging market will reach 101.59 billion USD by 2028, with the largest region being Asia-Pacific, which is forecasted to reach 30.8 billion US dollars by 2028 (2.6 billion USD in 2021) (Inkwood Research 2021). The European Market (the United Kingdom, Germany, France, Norway, the Netherlands, and the rest of Europe) is worth 1.87 billion USD as of 2021 and is forecasted to reach 24.9 billion USD by 2028, followed by North America with 21.4 billion USD (Inkwood Research 2021). In general, increasing investments in the EV industry sustain market growth and nourish interest in new technologies, such as wireless charging or developments across vehicle-to-grid (V2G) technologies (Inkwood Research 2021).

The threat of climate change is one of the most significant challenges affecting the automotive industry. In order to drastically reduce $C0_2$ emissions and other greenhouse gases, the European electric sector is increasingly engaged in investing in electric infrastructure to further foster the adoption of EVs. Consequently, the EV infrastructure and end-customer solutions are increasing as governments incentivize consumers to buy green (Mourelatou 2019).

To conform with the EU Green Deal, a set of policies established by the European Commission to contain global warming (European Comission 2021), Road2Zero forecasts that Portugal needs to have 41,000 charging stations (Germany: 720,000) installed by 2030 (Statista 2020). Although the electric driving experience is significantly progressing across European countries, accessibility and adoption rate is presently nonuniform across the entire continent.

Concerning Portugal's economic situation and current status quo in electric mobility, the country has been notably affected by the global pandemic, with GDP decreasing by 8.4% in 2020 (IEA 2021). To support economic growth, Portugal took countrywide actions. One of the striking ones and of great importance for this paper is their investments into the energy sector

to fund “sustainable mobility, energy efficiency, renewables, decarbonization and bio-economy” (IEA 2021). Worldwide, Portugal was one of the first countries to set up a “fully interoperable and integrated nationwide network,” managed by Mobi.E system since 2010 (CEiiA 2020). The Mobi.E or National Electric Mobility Network is an essential player in leading and facilitating the transition process of electric mobility in Portugal with a public network of universal EV charging stations. Two thousand stations operate nationally, with more than 450 fast or ultra-fast charging points (Mobi.E 2021). Their model is universal, allowing every user to utilize charging stations, regardless of their connected operator.

In these means, customers of MB, for instance, can also access their network in mainland Portugal, Madeira, and the Azores. Today, Portugal has one of the highest newly sold EV market shares in Europe, as described in section *3.4.1 Portuguese EV Sales.*

The price paid to charge a BEV at home depends on the electricity dealer and which tariff is available or chosen. The EQ Brand by MB (further explained in 4.2. *EQ Brand)* is used to provide an example of charging fees. For an EQA that has a battery of 66.5 Kilowatts per hour (kWh), a range of 426 kilometers (km) to drive electric, a consumption of 17.7kWh/100km, as well as EDP Commercial or Galp as an electricity dealer, the customer would pay from 1.64€ to 3.57€ per 100km (Appendix 9). EDP Comercial and Galp are selected since they are the two biggest Portuguese firms in the energy market. EDP is the leading firm with a 75.3% market share in the Portuguese market as of January 2021, whereas Galp had a 5.1% market share (Silva 2021).

Suppose consumers desire to charge within the public network of charging stations. In that case, they need to consider that each Electricity Dealer for Electric Mobility (CEME) offers a card enabling customers to charge the vehicle (Mobi.e 2021). Therefore, each card is associated with a tariff that changes from CEME to CEME, which means that the price differs accordingly. In Appendix 10, an overview of all CEMEs in Portugal can be found.

Besides the tariff associated with the card used to charge the vehicle, consumers need to pay taxes to the Portuguese government (Mobi.e 2021):

- EGME (Managing Entity of the Electric Mobility Network) Tariff = 0.1657€/kWh
- VAT = 18% in Azores, 22% in Madeira, and 23% in Portugal
- IEC Tax (Special Tax on Electricity Consumption) = 0.0001 €/KWh

By only focusing on EDP Comercial and taking the single fare as an example, consumers would pay between €7.10 and €7.96 (taxes included) for a journey of 100 km with an EQA, illustrated in Appendix 11 (EDP Comercial 2021).

The Ionity network is a favorable option for consumers to charge their EVs in public. Ionity chargers belong to a European network of electric chargers that reach the power of 350 Kilowatt (kW), though they are very expensive at 0.79€/kWh (Ionity 2021). In fact, customers complain that charging an EV from 0% to 100% within the Ionity network can be more expensive than filling the tank of fuel (Lavrador 2021). For MB customers, a subscription plan allows the EV drivers to pay an amount of 0.3€/kWh. Therefore, Appendix 12 demonstrates the charging costs of an EQA between 10.14€ or 21.02€ per 100km (taxes included).

While comparing the price of fuel and considering the example of Galp (being the most prominent Portuguese company in terms of fuel), the customer pays the following rates at today's date (October 27th of 2021):

	Gasoline 98	Gasoline 95	Diesel
Litre/100km	7	7	6
Price per litre (25th October 2021)	1,949€/l	1,809€/l	1,651€/l
Total Cost	13,643€/100km	12,66€/100km	9,906€/100km

Table 1: Fuel price per 100km

In Portugal, the cost of charging an EV is lower than the cost of fueling an ICE. However, in the Ionity network, the price is only lower if the customer does not charge the vehicle fully but

for shorter time periods (e.g., 15 minutes). If the customer charges the battery from 0% to 100%, the kWh/100km cost is higher than per l/100km cost (petrol or diesel).

Another significant factor in Portugal is the overall electric capacity. Even though Portugal has one of the highest rates of renewable energy sources, the system would collapse after an abrupt switch to full electric mobility. The government needs to increase the system's capabilities with the support of the providers to ensure a successful transformation in the future (Daimler AG 2021).

4. Example Analysis on Mercedes-Benz

To understand the positioning of Mercedes-Benz within the digital and electric transformation and give future strategic recommendations, this section will analyze the company´s structure, financials, and business model.

4.1. Daimler AG and Mercedes-Benz

Daimler AG, a pioneer in automotive engineering and a leading firm in the industry, was founded in 1886. Nowadays, the brand is one of the companies to significantly impact the future of mobility through its consistent focus and investments in emission-free driving, autonomous vehicles, connectivity, and new mobility concepts.

Daimler AG, headquartered in Stuttgart, Germany, operates globally and encompasses all the brands inside: Daimler Truck & Buses, Mercedes-Benz Cars & Vans, and Daimler Mobility Divisions (Daimler AG 2021). During the course of this thesis, Mercedes-Benz Cars & Vans and Mercedes-Benz Trucks became independently listed companies due to the spin-off of Daimler AG. Therefore, as of December 1st, 2021, the two are entitled Mercedes-Benz AG and Daimler Trucks AG (Daimler AG 2021). Nevertheless, the following analysis is still based on Daimler AG.

The group owns worldwide production facilities in Africa, Asia, Europe, and America (Daimler AG 2021). To become electric from 2025 onwards, eight new Gigafactory's will be built to produce EVs and technologies, as well as batteries (Daimler AG 2021).

	2nd Quarter of 2021	2nd Quarter of 2020
Worldwide Sales (in units)	736,385 million	541,833 million
	+35.91%	
Worldwide Revenues (in €)	43,482€ million	30,184€ million
	+44.06%	

Table 2: Sales and Revenues of Daimler AG (Daimler AG 2021)

In financial terms, Daimler's sales and revenues have been increasing since 2019. The company anticipated higher growth rates, but Mercedes-Benz (MB) did not fulfill its financial goals due to the global pandemic and the worldwide semiconductor crisis (see chapter *3.2.4 Excurse: External Impacts on the Automotive Transformation*). Globally, the U.S. market for cars and light trucks expanded by around 50% compared to the previous year. With the gradual easing of COVID-19 restrictions in the EU, the market increased by nearly 70%, while the Chinese market remained unchanged to the same prior-year period. In consideration per division, Mercedes-Benz Trucks & Busses marked the highest increase with approximately 61%, followed by Mercedes-Benz Cars & Vans, with an increase of around 49%. Daimler Mobility recorded the lowest growth, being 7%. Daimler AG and all subsequent divisions have presented a positive EBIT in Q2 2021, although the overall group's EBIT was negative in Q2 2020 (-1,065€ million).

Mercedes-Benz follows the "Best Customer Experience 4.0" global sales strategy that aims to offer a seamless luxury experience along the customer journey centered on customer needs in the digital era. There is a consistent omnichannel strategy, both offline and online. Core aspects of this strategy are physical retail as places of experience, an improved Mercedes me app and Mercedes me ID to give customers the freedom to select among channels with just one account

(Mercedes me ID). Since 2013, Mercedes-Benz has invested a three-digit million euro amount on "Best Customer Experience" in collaboration with its global retail partners to guarantee a seamless experience along all channels (Daimler AG 2019).

4.1.1. Mercedes-Benz Portugal

Mercedes-Benz Portugal (MBP) is a subsidiary of Daimler AG, which is located in Sintra and incorporates Mercedes-Benz Retail (MBR), Mercedes-Benz Trucks (MBTP), Mercedes-Benz Financial Services (MBF), Evobus, and Smart. MB in Portugal was owned by the firm C. Santos from 1936 until 1989, when Daimler AG took over and MBP was founded (Mercedes-Benz Portugal 2021).

Considering the financials, indicated in Figure 7, MBP sales have been increasing since 2011 (498,351,246€), reaching the highest value in 2017 (832,125,697€), whereas from 2019 (818,126,976€) to 2020 (647,847,055€), there was the most significant drop in sales (-20.81%) due to COVID-19. Expectations for 2021 are that revenues will decrease as fewer vehicles are sold due to the semiconductor crisis (Orbis 2020).

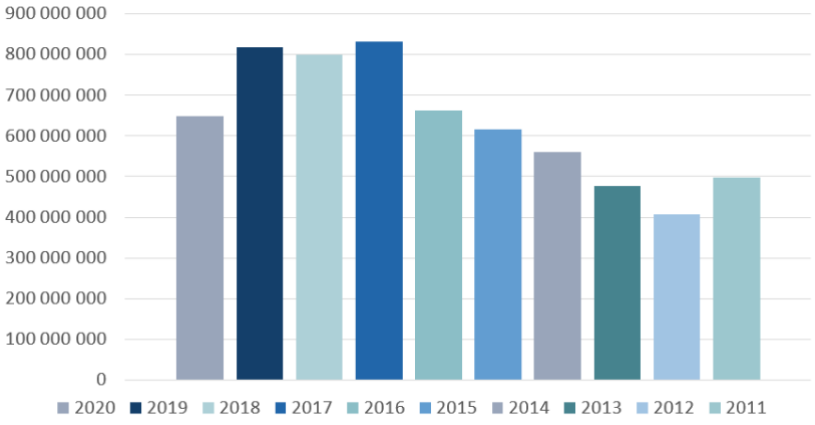


Figure 7: Mercedes-Benz Portugal Sales (Orbis, 2020)

Figure 8 represents the positive EBITDA since 2011. The only negative exception (-590,672€) was in 2012, due to the impact of the financial crisis. In contrast, the highest value was recorded in 2019, reaching 73,510,513€.

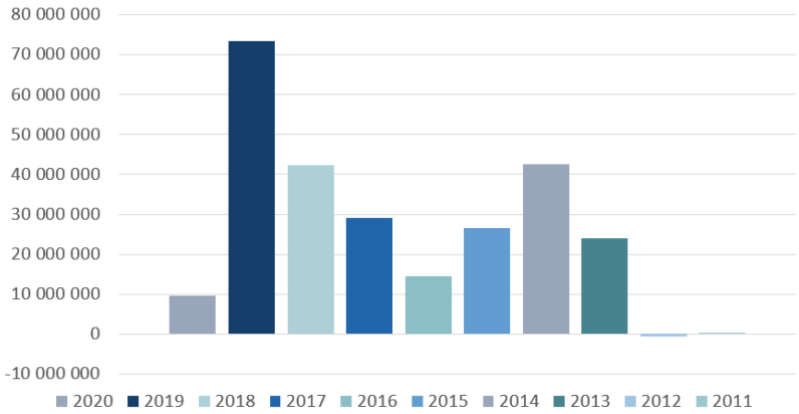


Figure 8: Mercedes-Benz Portugal EBITDA (Orbis, 2020)

The retail structure of Mercedes-Benz Portugal is divided into the North Region, Center Region, Metropolitan Area of Lisbon, Alentejo Region, South Region, and the Portuguese Islands. In total, there are 42 Point of Sales (PoS) selling new MB Light Passenger Cars in Portugal (Appendix 13). At the same time, the total number of retailers selling Mercedes-EQ vehicles adds up to 23. Most sales occur within the Metropolitan Area of Lisbon (8), followed by the Center (7) and North Region (5) (

Appendix 14).

Mercedes-Benz Portugal can be classified into a functional organizational structure. This implies that all activities are ranked based on logical similarity of work functions (e.g., finance, marketing, human resources management, and customer services) and assembled based on dependent responsibilities and shared objectives (Ahmady, Nikooravesh e Mehrpour 2016, 457). The functional organizational structure centers the decision-making authority at the top of the organization and enables MBP to organize activities within their business around areas of specialization (Awa 2016).

4.1.2. Strategy Mercedes-Benz Portugal

According to Holger Marquardt, CEO of MBP, Mercedes-Benz Portugal has the premise to "think and act as a luxury brand" and is viewed as such by the customers. MBPs' local strategic goals align with Mercedes-Benz´s global corporate strategy. The firm intends to provide luxury in all aspects of its service and continuously sets new standards for developing new EVs (Daimler AG 2021, Daimler AG 2020).

To attain profitable growth, ensure the expansion of sub-brands (AMG, G-Class, Maybach, and EQ), embrace the customer and revenue growth, tackle the electric market as well as digital transformation, the company is setting different actions to remain competitive in the future (Appendix 15).

4.2. EQ Brand

The sub-brand Mercedes-EQ was introduced in 2016 and included all battery-electric powered automobiles, related products, and digital services offered by MB, bundled in one brand. A consistent and clear image of sustainable products and services was created (Mercedes-Benz AG 2021).

The EQ was envisioned as the next logical step within the overall sales and marketing strategy "best customer experience 4.0" (explained in 4.1. *Daimler AG and Mercedes-Benz*) aims to take the customer to a new technology adventure in the electric world (Daimler AG 2021). The sub-brand further represents the two MB brand values, "emotion and intelligence" (Daimler AG 2021), and stands for innovative (drive) technologies, sustainable individual mobility solutions, and intelligent digital concepts. Mercedes-EQ is characterized by a sense of openness, lightness, and expansiveness to communicate this aim properly, primarily expressed throughout the balanced imagery and its colors. Some unique star and stage variations are used optionally and exclusively in Mercedes-EQ campaigns, as illustrated in
Appendix 16 (Daimler AG 2021).

The Mercedes-EQ brand is divided into EQA, EQB, EQC, EQS, and EQV models. New models, such as the EQE (available in 2022), EQS Maybach (available in 2023), and the EQG (available in 2024), were introduced at the International Automobil-Ausstellung (IAA) Mobility Salon in Munich (Daimler AG 2021). Appendix 17 represents the EQ brand´s overall ambitions within the field of electric drive and car software.

Since MB just recently created the sub-brand, new elements were developed, namely the star design, brand positioning, and brand equity, to stay consistent with the company´s overall goal of becoming a leader in electrification and digitalization (Daimler AG 2021).

4.2.1. Identification of the Main Competitors

Based on the presented two-stage framework by Bergen & Peteraf (see section *2.3*), the first stage, "competitor's identification," is applied since the goal is to identify the direct competitors of Mercedes-EQ offering BEVs in Portugal. Based on that, diverse automotive brands can be identified, who aim to serve customers who desire to purchase a premium BEV. Depending on the consumer characteristics, each customer will buy the car brand that fulfills their needs to the biggest extend.

A study by Kapustin and Grushevenko (2020) highlights that most OEMs are moving in the same direction and pursuing similar goals concerning products and services. Their analogous strategies evolve around the digital and electric transformation, intending to become carbon-neutral by 2040 and create a portfolio of only electric or hydrogen vehicles. However, these OEMs reach different customer segments with respective prices. According to the two-stage framework and the two main variables (price and autonomy) that customers consider when buying a BEV, Mercedes-EQ competitors can be observed (Deloitte 2020, Tu, Yang e Chung 2019, European Commission 2012).

Based on the mentioned variables, the conducted factor analysis identified "direct competitors*"* of the Mercedes-EQ sub-brand (Appendix 18). The firms within the same quadrant are BMW, Audi, Volvo, Tesla, Porsche, and Jaguar. Although Porsche is not in the quadrants where Mercedes-EQ models can be found, Porsche is still considered as a direct competitor due to a similar price structure: the EQS is pricier than the Porsche Taycan (Battery Plus), Taycan 4 Cross Tourism, Taycan 4S, Taycan 4S (Battery Plus), and Taycan 4S Cross Tourism on the one hand, yet cheaper than other Porsche models.

Indirect competitors of Mercedes-EQ are other automotive companies selling BEV at lower prices, ultimately targeting different customer segments. These are Fiat, Renault, Nissan, Volkswagen, Kia, Citroën, Opel, Peugeot, Hyundai, Ford, Mini, Mazda, Dacia, DS, Honda, and Lexus.

Furthermore, public transportation companies, taxi firms, MaaS companies, as well as other technological players and software firms (e.g., Apple is currently developing a premium EV) (Painter 2021) are identified as "indirect competitors." The mobility providers offer innovative products and digital services, enabling convenient transportation possibilities from point A to B. Finally, "potential competitors*"* are either car manufacturers who do not sell any BEV

alternatives (e.g., Toyota) or those who have not yet entered the Portuguese market with their BEV portfolio.

4.2.2. Competitive Benchmark of EQ Sales

MB's main competitors in the EV market identified in the previous section are BMW, Tesla, Jaguar, Audi, Volvo, and Porsche. Appendix 19 explains the limitations of the analyzed data and includes its sources. BMW did not have any public data on EV sales and was therefore excluded from the competitive analysis.

In absolute terms, Tesla remains the dominant player in the global EV market. In 2020, the company sold around half a million EVs. MB was next to follow Tesla, as EQ sales reached approximately 160,000, roughly three times less than Tesla. Volvo follows closely as another direct competitor, with about 110,000 EV sales, while Jaguar, Audi, and Porsche are still trailing by a significant margin (with sales between 15,000 and 50,000 in 2020). The average sales per quarter from the main competitors are visualized in Figure 9.

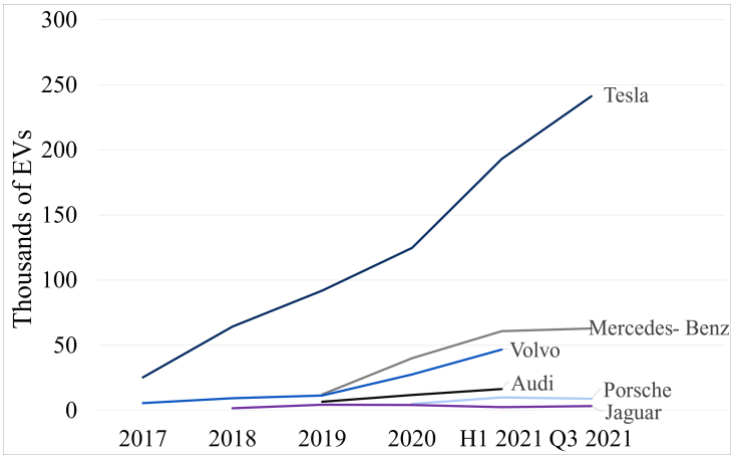


Figure 9 - Average Sales per Quarter of Main Competitors

Tesla has been performing at a high level every year from 2013 onwards, with continuous growth rates averaging slightly over 50%. MB noted strong sales growth in 2020 and the first half of 2021 (about 200% and 50% respectively) but had a setback in the next quarter, as explained below. Volvo's sales have been consistently increasing from 2017 onwards, with growth rates between 60% and 140% (excluding 2019, their worst year, with 23%). The

situation is similar to Audi, as the company registered growth rates of 80% in 2020 yet faced a significant decrease to 40% in the following year (first half of 2021). In consideration of the remaining competitors, Jaguar improved in 2019 relatively to their debut year but has failed to meet that value ever since. In contrast, Porsche was in a comparable position but maintained a stable sales level until Q3 2021.

Specifically for the third quarter of 2021 for MB and its main competitor, Tesla, the situations differed significantly. MB registered almost no growth, while Tesla's reached about 25%. The impact of the semiconductor crisis on the value chain leading to a chip shortage and thus a decrease in sales was one reason for this to happen (Reuters 2021). On the other hand, Tesla has performed better in the face of the crisis by switching to new microcontrollers, allowing them to minimize the damage of this shortage of components (InsideEVs 2021).

In Portugal specifically, the Mercedes-EQ brand sold 225 EVs in 2020 (Daimler AG 2021) and 364 in 2021 (last available data from the end of September) (UVE 2021). The EQC, as the first vehicle in the EQ brand, was only launched in Portugal in October 2019 and its sales numbers until the end of the year were not published. Therefore, the sales numbers in 2019 will be dismissed. From 2020 to 2021, the average growth rate indicated 216.6%. Although the growth rate is high, external impacts such as Covid-19 or the semiconductor crisis have affected the industry in both years (see chapter 3.2.4. *Excurse: External Impacts on the Automotive Transformation*).

4.3. Digital and Electric Transformation within Mercedes-Benz

To understand the impact of digital and electric advancements and the current transition phase of Mercedes-Benz, the Business Model Canvas provides an overview of the traditional and contemporary company profile.

4.3.1. Traditional Mercedes-Benz Business Model

MB envisioned itself as the sole provider of tangible hardware products in the past. Customer interactions were less interconnected and mainly initiated through intermediaries, such as dealerships (BCG 2017). Traditionally, human-driven vehicles powered by ICEs have set the standard in the industry, while the shift towards digital mobility services and autonomous, connected cars are impacting MB´s current and future business model (Deloitte 2021). An overview of the traditional MB business model can be found in Appendix 20.

4.3.2. Current Mercedes-Benz Business Model

Mercedes-Benz advocates the digital experience as one of the brand's unique selling propositions to provide an entirely convenient customer experience. Within their digital transformation process and strategic goal to become a luxury leader in electric mobility, the company aims to reach an EBIT of one billion euros by 2025 through the sales of innovative digital services (Daimler AG 2020). These services include personalized infotainment, AR, Over-the-Air (OTA) updates, a unique Mercedes-Benz User Experience (MBUX) hyper screen, and more to create an "exceptional digital experience" for the customer (Daimler AG 2020).

Currently, Mercedes-Benz is not only investing millions of euros in enhancing functionalities within its vehicles (namely Mercedes-EQ) but continuously introduces major projects influencing the entire company and accelerating the digital transformation within MB. Two significant projects with this objective are "Mercedes me" and the platform "Marketplace." Mercedes me was introduced in Portugal in 2017 (in other European countries in 2013), marking a defining step towards digitalization. The digital ecosystem allows each customer to have a wholistic virtual connection with the vehicle, such as opening doors and windows, knowing where the car is, knowing when to go to the mechanic, workshop contacts, among others (further circumscribed in section ***Error! Reference source not found. Error! Reference source not found.***).

The second significant project within the company, Marketplace, started in 2019 (Automotive 2020) and allowed the customer to request an online proposal to see which new vehicles are available in each country. The goal of the platform is to announce yearly updates until it enables the customer to buy a car entirely online (further circumscribed in section ***Error! Reference source not found.***. ***Error! Reference source not found.***).

In short, MB has been investing in the digitalization process through Mercedes me, as well as the Marketplace, which will allow the brand to start selling vehicles online and enhance the customer experience inside the car. The current Business Model Canvas (Appendix 21) visualizes MB´s activities along with multiple areas of the firm.

4.3.3. Excurse: Business Model Comparison to Apple Inc.

To highlight the emerging opportunities for premium OEMs in the digital age, this section compares Mercedes-EQ to Apple. In general, MB has the objective to adapt to Apple´s business concept, where the customers solely visit the physical stores to reassure their choice and product quality while subsequently purchasing it online (Magalhães 2021).

Apple´s business model is based on five key strategies, the most important one aiming to delight and surprise the high-end market. Apple´s products are continually positioned at the high end of the price spectrum, with a defining combination of design, simplicity, and technology as a trade-off to the customer. The overall goal is to capitalize on the brand itself (Magalhães 2021).

Cost control is yet another crucial factor towards economic success. By outsourcing the production to partner companies and forcing them to maintain low costs, privacy, and secrecy of their products, Apple longs complete control of their supply chain (Lashinsky 2012).

Another effective strategy is maximizing margins and profits through their high-end market share. At its peak, Apple captured up to 94% of the smartphone industry’s profits, despite solely obtaining 14.5% of global sales (Wall Street Journal 2020). To achieve and preserve high-profit margins, the company continuously reinvents and meets high-end market expectations.

Although Apple does not develop innovations but rather improves and combines them, the delivered products are constantly the most advanced in the market.

The presented goals and strategic ambitions are combined in Apple's ecosystem. With the Apple store and multiple cloud and service offers, Apple can interact with the existing customers to increase their buying potential. In fact, the profit margins in services are even higher than the margin of their products (Lashinsky 2012).

The sub-brand Mercedes-EQ intends to learn from companies such as Apple and establish a similar business model based on the above. For example, the Agent Model, further described in section ***Error! Reference source not found.*** has already been implemented in various countries (Doval 2021). With this model, the brand can try to achieve the goal of 25% of total sales being made online by 2025 and 50% of sales being triggered digitally in the future (Daimler AG 2020). Customers can buy additional digital services with the Mercedes me App and the OTA services available in the EQS and future Mercedes-EQ models. These advancements allow customers to be inside an ecosystem of interconnected services, similar to Apple. Above all, the digital advances present a promising ground base to sustain against rising tech players.

5. Methodology

Due to the future-oriented study and to analyze the ongoing transformation of the automotive industry, a qualitative approach of expert interviews was selected. In total, 16 semi-structured in-depth interviews with industry experts from car manufacturers, charging infrastructure networks, automotive consultants and mobility service providers have been conducted to provide the most encompassing study on the digital transformation of the automotive industry to date (Table 3). The methodology of semi-structured interviews allowed for greater overall flexibility during the dialogues as well as the opportunity for the interviewee to address consequences that were not initially expected (Saunders, Lewis und Thornhill 2009).

10. Scientific Analysis of the Challenges and Opportunities in the concept of the Automotive Industry for Mercedes-Benz (Jannik Kessens, 46429)

10.2. Introduction

The current digital and electric transformation process is fundamentally changing MB. Government regulations, as well as customer behavior, are constantly changing the industry (McKinsey and Company 2020). To optimize its market position in the future, innovative business models are crucial for the survival of MB. The following section analyzes the opportunities and challenges of the transformation in more detail. Due to the actuality of the topic, studies and literature are very limited. Therefore, the objective of this study is to design innovative business models to maintain and improve the market position in the long term through technology leadership. To answer this research question, this section begins by laying the theoretical foundation through the drivers and CASE trends of the transformation from the perspective of MB. In the further course, the drivers, inhibitors, opportunities, and challenges are identified and examined in more detail from the information provided by the survey and the expert interviews conducted. This is followed by a SWOT analysis for MB. Based on this, recommendations for innovative business models will be identified as future opportunities for the MB. During the global Covid-19 pandemic the digital transformation has progressed significantly. Scalable innovative business models are therefore more crucial than ever (McKinsey and Company 2020). To identify suitable business models through qualitative insights, 8 in-depth open-ended interviews were conducted with the following industry experts:

- Anonymous, Senior Partner at Bain and Company Germany
- Anonymous, Senior Manager at Porsche Consulting Germany
- Anonymous, Manager Business Development at Tesla Germany
- Anonymous, VC Investment Manager at Plug and Play Tech Center Germany

- Anonymous, Head of EV Technology at Volkswagen AG
- Anonymous, Head of Safety Lead at Lyft USA
- Anonymous, Senior Manager at Boston Consulting Group
- Anonymous, Engagement Manager at McKinsey and Company

10.3. Theoretical foundations

In this section below the theoretical foundations on the main drivers of the transformation process of electromobility and the megatrends of the car industry will be deepened for further understanding of this thesis.

10.3.3. The main drivers of the transformation process to electromobility in the automotive industry

The automotive industry is undergoing a profound transformation. Digitization and artificial intelligence are the two drivers that each individually, but also in combination, have the potential to fundamentally change the business models of the car industry. Traditional automakers are adapting their business models because components that cannot be digitally controlled or integrated are no longer relevant to automotive manufacturing today (McKinsey and Company 2020). Smart mobility as a key element of the smart city is the order of the day, i.e., the increasing networking of transport infrastructure and means of transport, and only vehicles designed to match this are still marketable today (McKinsey and Company 2021). OEMs are making correspondingly great efforts to keep pace with developments and to influence and shape them through technical innovations and the adaptation of their business models. However, in doing so, especially in the all-dominant area of autonomous driving, they are encountering fierce competition from established IT giants, which is ensuring that there is

a growing willingness to enter strategic collaborations in important fields (Roland Berger 2021, Deloitte 2021). The trend toward electromobility is ushering in a radical change for the entire industry driven by climate change and the CO_2 reduction targets set by politicians, car manufacturers and the supplier industry must reposition themselves (McKinsey and Company 2021, Deloitte 2021). Fundamentally, the idea of transforming mobility is a transformation for a better and safer future. The transformation process for MB as well as for the entire automotive industry can be divided into 3 main areas:

The first driver to be mentioned is **government regulations**. Currently governments and cities have massively strengthened their regulations with respect to the classic combustion engine (BCG 2021). The will to sustainability is now a driving factor in politics. The EU has presented the "Fit for 55" program, which combines the strategic issues of climate, energy transition, land use, transportation, and tax policy. Additionally, the was WLTP also standard introduced. The goal is to reduce greenhouse gases by 55% by 2030, and the U.S. government under Biden has also titled the goal of 50% EV by 2030 on American roads. Urban agglomerations are currently trying massively to reduce the number of cars in the private sector, and new mobility offers are being created for this purpose. In Europe alone, more than 150 cities have restricted road traffic due to strict emission and exhaust regulations (European Commission 2020, McKinsey and Company 2021, European Commission n.d.) (Appendix 1).

Another significant driver is the change of **customer behavior**. The behavior of customers, as well as their perception on the topic of sustainability, has changed massively in recent years. Sustainable alternatives are preferred by many customers (Roland Berger 2021). The survey shows that most participants are likely willing to switch to an EV (Appendix 6). In urban areas, alternatives such as e-scooters and car-sharing are gaining massively in importance. Electronically assisted ferry bikes are also increasingly making their mark on the urban landscape (McKinsey and Company 2020, McKinsey and Company 2021). According to the

survey, car-sharing will be significant means of transport for individuals in the future (Appendix 7).

The last main driver to be mentioned is **technology**. The large automotive corporations such as MB are investing massively in the expansion of innovative technologies. In this context, the entire automotive industry has gained nearly $400 billion in investments in the last 10 years, $100 billion of that since the beginning of 2020 (McKinsey and Company 2021). This is attracting many technology companies as well as startups to the industry on the topic of CASE. In the long run, technological innovations will reduce the cost of EV's and drive the mobility revolution (McKinsey and Company 2021, PwC n.d.). In the long term, electromobility will play a fundamental role in the mobility of the future. For the automotive industry, it will offer many opportunities in different vehicle segments (Appendix 2). In order to strengthen and accelerate this process and its adoption by customers, the steady introduction of new EV models as exemplified by MB is a fundamental step. However, the entire transportation ecosystem must work together. This includes not only the manufacturers, but also the supplier's governments, financial institutions, dealers, energy suppliers and charging station providers (McKinsey and Company 2021, MercedesBenz 2021, KPMG 2019) (Appendix 3).

10.3.4. CASE – Intuitive mobility

The future of mobility manifests itself in CASE. Each of these four trends alone has the power to turn the car industry on its head. The real revolution lies in dovetailing them perfectly and offering customers the most compelling total package (McKinsey and Company 2021, Mercedes-Benz 2021). With the four CASE themes as an integral part of MB's corporate strategy, Daimler is creating additional synergy effects, more speed and penetrating power throughout the Group. Daimler acts quickly, flexibly, and innovatively. By focusing on CASE, Daimler is preparing for the age of intuitive mobility and making products and the group fit for the transformation from automaker to mobility service provider. In the following, these trends

will be analyzed in more detail, as well as their direct influence on the automotive manufacturers, in particular MB (Deloitte 2021, Mercedes-Benz 2021, Roland Berger 2021).

The first essential aspect is the **connectivity** of vehicles. By connecting vehicles, end customers not only have access to their vehicle, but also to a large amount of service offers. Aspects such as comfort, safety and entertainment are essential for manufacturers to reach and retain customers in the future (BCG 2021). The increasing number of networked automobiles means that companies in the sector need to build up new competencies in the field of information technology and optimize them in the long term. In general, companies in the automotive sectors benefit mostly form partnerships and cooperation's to better cope with technological leaps (Bain & Company 2021). The greater willingness of manufacturers and suppliers to cooperate is due to the enormous complexity of the value-added structure of networked passenger cars. In addition, the networking of the automobile opens opportunities for cooperation's with new and previously untypical partners in the sector (Bain & Company 2021). On the one hand, there is a need to cover the hardware requirements for numerous new components for image processing, sensor technology, wireless networking and data processing and storage. On the other hand, competencies in software technology - for example, high-performance data evaluation and analysis as well as platform integration - are becoming increasingly important (Bain & Company 2021). In addition, it can be noted that product development cycles in automotive engineering typically take significantly more time than in the software sector (BCG 2021) (Appendix 3). This further increases the complexity of MB's production system and necessitates a strategic reorientation in research and development for companies in the sector. The thesis of a new culture of collaboration contained in the megatrend connectivity is at least supported by the emergence of numerous new cooperative ventures that expand the value creation network of the automotive industry (Roland Berger 2021). While networking has

already made its way into the value creation process of industry companies with the buzzword Industry 4.0, it is now affecting their products per se (McKinsey and Company 2021).

Another significant trend is **autonomous driving** (Further circumstances in section 3.2.2.3). This trend is significantly impacted by the previous trend. MB is currently one of the leading developers of this technology (Focus 2021). The technology is redefining the role of the automobile. Not only aspects such as safety and comfort play a decisive role. By eliminating the need for humans to drive, customers can completely redefine travel time (MercedesBenz 2021, Bain & Company 2021).

In the development of fully autonomous driving motor vehicles, infrastructure aspects play a decisive role in addition to the automobile manufacturers. The global efforts of manufacturers regarding the comprehensive networking of vehicles in road traffic are closely linked to the path of autonomous driving. Companies from various sectors are already working on maps and insurance models and rental concepts for autonomous traffic (BCG 2021, Bain & Company 2019). MB recently announced that they are the first serial car producer that has German governmental clearance for so called semi-autonomous passenger cars, in which the driver can relinquish control of the vehicle in certain situations. (Focus 2021) This corresponds to Level 3 on the scale of the National Highway Traffic Safety Administration, an agency of the United States Department of Transportation (NHTSA 2021). Experts from Lyft and Porsche Consulting expect a delay in the market maturity of the next Level 4, due to both technical and regulatory barriers (Weisling 2021, Askew, Head of safety lead LYFT 2021). Although autonomous driving is not expected to reach market readiness until 2025 (at the earliest), a large market potential for this type of mobility is already predicted today (Bain & Company 2019, BCG 2021).

Another trend to be mentioned is **shared mobility**. The mobility of the future is becoming increasingly flexible. MB already has a wide range of mobility platforms (Car2go, myTaxi,

moovel, etc.) available today (MercedesBenz 2021). While fully autonomous cars will not be ready for the market until the near future, mobility services such as car and ridesharing are already available today (McKinsey and Company 2021, McKinsey and Company 2021). (Further circumstances in section **Error! Reference source not found.**).

The last aspect to be mentioned is the general trend towards **electro mobility**. MB is pursuing the path to completely emission-free intelligent electro driving using batteries or fuel cells (MercedesBenz 2021). While the automotive industry and technology groups portray themselves as drivers, politics in particular plays a central role in the electrification of motor vehicles. Through political and legal framework conditions, they steer the direction of innovations in this area (Bain & Company 2021, Deloitte 2021). In this context, legal requirements for exhaust emissions and CO_2 emissions are gaining exposed relevance and make politics one of the central drivers. To date, ambitious emissions standards have been enforced primarily by those countries in whose national sales markets the global automotive industry generates a large proportion of its sales. In addition to the United States, these include the EU and the People's Republic of China (European Commission 2020, KPMG 2019). The megatrend neo-ecology captures an increasingly socially and ecologically sustainable propensity to consume as part of a new, holistic sustainable development (McKinsey and Company 2021).

Cause	Connectivity	Autonomous Driving	Shared Mobility	Electro Mobility
Market	**Digital industry** (especially Apple and Google) shifts EV into their focus **Manufacturers/start-ups** create competing ecosystems	**Offer**: Series models with hardware for autonomous driving **Demand**: Practical experience reduces concerns	Critical mass of providers and users generate platform effects **Change of preference**: Ownership -> Availability	**Offer**: There is already a large offer of EV's **Demand**: Effective incentives in core markets show success
Technology	Rollout of 5G mobile communications standard enables significantly faster data transfer	Specialized high-performance processors available Successful urban pilot projects with fully autonomous cabs	Increasing offer of diverse infrastructure	**Batteries**: Cost reduction and manufacturing capacities **Charging infrastructure**: priority for investment by industry and governments
Regulations	eCall hardware with Sim connectivity Further security requirements in planning (USA, EU and China)	Legal foundations for autonomous driving have been or are currently being created (USA, EU and China)	Cities and metropolitan areas look for solutions against traffic collapse	Emission requirements force manufacturers to change Climate protection is becoming an increasing priority

Figure 10: Relationship of trends and drivers (own illustration)

10.4. Scientific analysis on the opportunities and challenges of the electric and digital transformation in the automobile industry based on MB

The following section identifies the opportunities, and challenges for MB in the context of the ongoing transformation process. In the further course, a SWOT analysis and concrete recommendations for innovative business models for MB are provided. The electric transformation is based on these drivers or inhibitors from the perspective of the interviewees and the top consulting firms.

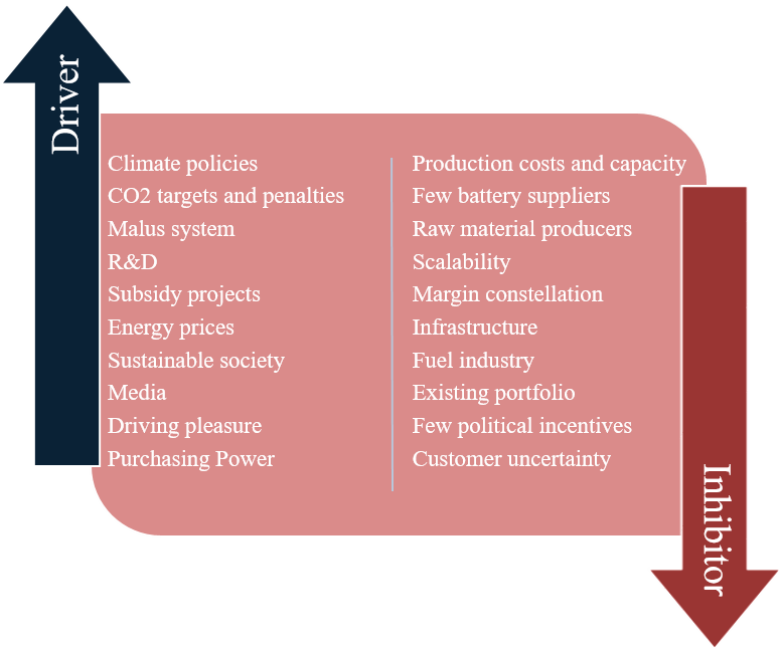


Figure 2: Driver/Inhibitor Analysis: MB's own illustration (Source: Interviews)

10.4.3. What opportunities will the electric and digital transformation create for MB?

Electromobility is creating a significant number of new opportunities for the automotive industry and MB specifically. An important factor here is sustainability and environmental performance. Electric vehicles emit no pollutants while driving and are considerably less noisy than conventional vehicles (McKinsey and Company 2021). According to a study conducted by the Paul Scherrer Institute (PSI), an electric vehicle is less environmentally friendly during the production process, but this balances out after just 50,000 – 100,000km. The long-term study by PSI proves that EVs are the most sustainable option in the long term compared to alternative engines such as natural gas and hydrogen technology. Especially if they are powered by renewable electricity (Berdforff 2020). As 79.5% (Q1 2021) of electrical energy in Portugal is generated from renewable sources, significant impact will be contributed to climate neutrality through e-mobility, especially in the Portuguese market (Portuguese Association of Renewable Energy 2021). Furthermore, the extremely high energy efficiency of the EV, at almost 90%, is two and a half times better than that of the classic combustion engine (U. Winkelhake 2017). By these positive characteristics, the EV contributes to sustainable individual transport and

therefore increases the positive image of the automotive industry in the long term (Strahl 2021). Increased demand for EVs and significant investments in research and development are driving down the cost of EVs in the long term. Increased production numbers reduce the cost per storage capacity through economies of scale, which have led to a reduction in costs of almost 65% for car manufacturers over the last 7 years (Bain & Company 2021, BCG 2021). The exponential increase in sales of EVs is already shown in the section 3.3.

Another significant point is the considerable increase in battery capacities. Within the last 5 years, the driving range increased from 127km to 331km (McKinsey and Company 2021) (Appendix 5). This trend is ascending. The synergy effect brings massive benefits to the end consumer as the price of EVs is decreasing, but the performance of the vehicles is increasing. As a result, the EV becomes more suitable for the masses and sales figures can be increased. In addition, there are lower maintenance costs and government subsidies for the purchase in many EU countries (McKinsey and Company 2021, German Federal Ministry for the Environment 2020).

Opportunities for MB

• Emergence of new business areas	• Reduction of noise pollution in urban areas
• Improvement of air pollution control	• Reduction of overall production costs

• Government subsidies	• Reduction of dependence on fossil fuels
• Improvement of environmentally friendly branding	• Reduction on restrictions for the consumer
• Contribution to climate protection	• Reduction of purchasing prices
• Increased efficiency	• Reduction of energy consumption
• Time for new market positioning	• Continuation of MB and the automotive industry overall

Table 1: Opportunities for MB (Source: Interviews)

The opportunities identified in Table 1 can be used by MB, as well as the entire automotive industry, to establish new business models and business areas. The distribution of vehicles can also be better aligned from a strategic perspective through clear indicators.

10.4.4. What are the key challenges of MB for the successful electric and digital transformation?

In addition to the opportunities just mentioned, the transformation to electromobility poses various challenges for the automotive industry and MB. The technological change in drive systems has a serious impact on the value chain, in both upstream and downstream processes (Further circumstances in section 3.1The Evolution of the Automotive Value Chain). In the future, traditional products and services in the automotive industry will account for only 60% of value creation (McKinsey and Company 2017). Consequently, the industry is undergoing a fundamental change and must already position itself appropriately for the future. The demise of the internal combustion engine will make numerous business areas in the automotive industry redundant. Compared to an internal combustion engine, an electric motor has only 200 components instead of 2500 (Frauenhofer Intitution for Production Technology 2019). Another challenge will be the change in requirements for employees and partner companies. The shift to electromobility also entails a fundamental change in skills and knowledge. MB will have to focus more on electrical engineering and information technology, while traditional areas such as mechanical engineering will increasingly lose their importance (Zollen 2021). Across

industry and governments, the general infrastructure is a critical factor. Not only charging stations, but also parking lots and roads are of elementary relevance in this regard (Further circumstances in section **Error! Reference source not found.** and **Error! Reference source not found.**). Sales will also change for dealers, due to currently higher purchase prices, as a result of increased capital commitment. For end customers, a targeted new form of product consulting will be necessary (Strahl 2021). In addition, the Covid-19 pandemic and the global shortage of raw materials and computer chips are currently creating difficulties for the automotive industry (BCG 2021).

Challenges for MB	
• Traditional jobs are at risk	• Uncertainty of new products
• Reduction of parts and components	• Currently higher acquisition costs for EVs
• Reduction of customer contact in after sales	• Realignment to the new market
• Covid-19	• Raw material and chip shortage
• Reduction of traditional products and services	• New competitors (tech industry and new players)
• Current reduction of profit margins	• Increased consulting intensity in the sales process
• High investments into the infrastructure	• High investments in education of employees

Table 2: Challenges for MB (Source: Interviews)

The challenges identified in Table 2 must be taken by MB, as well the entire automotive industry to hold and improve their market positioning.

10.4.5. SWOT Analysis MB

In the previous section, the opportunities and challenges of MB and the automotive industry were discussed in more detail. In order to take a closer look at the current situation of MB, a SWOT analysis is prepared in the section below. This analysis is based on the current trends of e-mobility, as well as on predictions and analyses of the interview partners.

Figure 3: SWOT Analysis MB own illustration (Source: Interview)

10.5. Recommendations for new business models that MB could develop to benefit from the electric and digital transformation in the long term?

The world is transforming at a highly dynamic pace. Sustainability, the pandemic and climate crisis are among the most pressing issues of our time. MB is also facing up to these challenges. With Mercedes-EQ and Mercedes me, they intend to set standards for tomorrow's sustainable mobility. The management of MB, as well as several top managers and consultants interviewed, share the opinion that individual mobility will persist a basic human necessity in the future. Currently, it is assumed that the market for sustainable luxury in the automotive industry will continue to increase. Passenger and freight transportation will also remain a mainstay of the economy. MB expects this demand to continue to improve worldwide. Growth and profit opportunities are additionally seen in financial services, fleet management, and digital, connected mobility solutions. As an integral part of MB's new business strategy, a clear commitment to CO_2 neutrality is to be made in order to make mobility and freight transport

more sustainable. The core business is intended to continue to grow, with a particular focus on the customer experience. The CASE trends are the focus here. By 2022, MB will offer battery powered EVs in all segments in which the brand is represented (MercedesBenz 2021). From 2025, all new vehicle architectures will be exclusively electric, and customers will have a fully electric alternative to choose from for every model. Even in the course of this accelerated transformation, MB is sticking to its profitability targets. (Further circumstances in section 4.1) The company is significantly accelerating investment in research and development. In total, more than €40 billion is earmarked for investment in battery-electric vehicles between 2022 and 2030. The faster expansion of the range of compelling electric vehicles will accelerate the breakthrough of electromobility (MercedesBenz 2021). To further enhance the corporate strategy and market positioning, a clear recommendation for action emerged from the interviews with experts. MB should focus even more on innovative business models and strategic partnerships with technology and energy companies in the medium and long term. In the first instance, 3 prerequisites are identified for MB to implement or challenge the suggested business models. Probably the most important prerequisite is a **functioning and accessible charging network** to give customers certainty about the range of the EQ models. In addition, **new marketing channels and usage models for e-mobility** must be created. Furthermore, **clarity must be provided on the possibilities of the energy infrastructure** to be able to develop the next generations of charging capacity and charging management. Based on the interviews, survey and research the following business models can be identified and suggested: **Intelligent charging cycle**: Smart meters allow EV fleets to be better bundled, thereby optimally serving energy markets. The customer is supported by optimized charging cycles to avoid peak electricity prices. Since the path to market for the EV remains fundamentally unchanged, only energy innovation can be achieved here.

Energy as a service: Through a strategic partnership between MB and a suitable energy supplier, customers can be offered a specially branded energy tariff. Thus, both private and commercial customers purchase the vehicle and the electricity from MB. MB can be responsible for the battery guarantee and the providing of the energy service.

E-Mobility packages: The customer purchases a certain contingent of vehicle usage time directly from MB. Consequently, the energy sales, the insurance and the vehicle are offered as a combined service. The acquisition costs of an EV are replaced by periodical mobility bills.

E-Mobility Service for public transportation providers: Through a strategic partnership between MB and local governments, customers can be offered Daimler owned services like ShareNow (car sharing) as a part of the public transport system. Issues like patchy area coverage and inconsistent schedules can therefore be solved.

10.6. Conclusion, Limitations, and further Research

The objective of this study was to analyze the opportunities and challenges within the digital and electric transformation process based on MB and to further identify innovative business models that improve MB's future market positioning. The empirical research has shown that the transformation process is influenced by a variety of internal and external factors. These factors will be further driven by the previously mentioned drivers and trends and can create opportunities and threats for MB. Moreover, these findings require early integration into MB's own strategic orientation to derive pioneering strategies for positioning the company.

Technological innovations are fundamentally changing MB's traditional business model. New innovative business models are crucial for MB to emerge as a beneficiary from the electric and digital transformation. Without suitable new business models, other companies will take over the appropriate market segments in the long term. The stated business models require an even closer collaboration with strategic partners, such as governments and corporations, to ensure

MB's long-term success (Appendix 3). MB should keep a constant eye on factors such as market dynamics and the latest trends from competitors and tech companies in strategically important areas. The experts interviewed agree that the ecosystem required for a successful transformation is only achievable through partnerships with strategically suitable associates. Technology leadership and a suitable integrated service portfolio should be the benchmark for MB. The business models created can make a significant contribution.

In the development of the research, various limitations have become visible. In general, new topics and ideas emerged during the interviews, which subsequently influenced the content despite the specific questions asked. In addition, the viewpoints of the experts should be mentioned in this context. These were strongly influenced by the employment of the interview partner. Therefore, further expert interviews from different industries should be conducted based on this thesis. The information from the survey can be further developed through a more extensive representative study.

Due to the scope of the thesis, additional limitations have arisen. Future research should focus on the integration of innovative business models into the existing structures of Daimler AG. Here, the 5 Forces analysis, the McKinsey 7 S framework and the business model innovation matrix can be suggested. The identification of suitable key performance indicators for the evaluation of the models is thereby crucial.

11. Conclusion, Future Outlook and Recommendations

Fundamental innovations in the automotive industry are caused by the electric and digital transformation and are examined using MB as an example. The focus of this report was set on analyses of distinct business areas (i.e., marketing & sales, R&D, innovation, corporate sustainability) within the Daimler organization to provide strategic recommendations for individual areas of interest. Digital sales opportunities, enrichments in the charging experience, new mobility solutions (namely MaaS), impacts of growing sustainability concerns, brand awareness and technology transfer through F1, as well as the elemental opportunities and challenges of the undergoing transformation address a holistic perspective of the discussed evolution in the automotive industry.

The previous sections discuss and evaluate the results of respective analyses and evaluations of the conducted survey, expert interviews, and further methodological approaches. This study has shown that the electric and digital transformation processes will strongly influence the entire automotive industry and various other sectors. The following recommendations for actions can be derived from the insights gained. Furthermore, the aspects are substantial recommendations for MB and successfully implement the transformation process within their internal strategy.

Strategic partnerships supporting MB should be established and strengthened across the business areas mentioned above. External knowledge from established companies with diverse market insights and experiences will bring MB considerable advantages as the transformation process develops. Luxury OEMs like MB must uphold their core technology capabilities through strategic support of allies to succeed and strengthen their position in changing environments (Kearney 2017). Partnerships in the entire electromobility ecosystem will be even more fundamental to the success of MB in the future. Particular attention should be focused on technology companies, mobility providers, public transport companies and platforms. In

addition, the expansion or connection of supply lines in the municipalities should be coordinated among the companies to take advantage of possible synergies.

Moreover, **strategic M&As** (Mergers and Acquisitions) will play a vital role in strengthening the market position and the portfolio of MB. Targeted, inorganic growth is increasingly becoming a strategic competitive advantage. The reasons are the need for transformation and rapidly changing framework conditions (Deloitte 2021). The Deloitte study clearly shows that digital transformation develops from a bottom-up perspective. Indeed, this is occurring even before the unified corporate strategy. In addition, a positive influence through digital technological acquisitions on digital innovative business models can be identified (Hildebrandt, et al. 2015). OEMs must gather external knowledge from M&As to capture the potential of digital innovations (Hildebrandt, et al. 2015).

Another crucial aspect is **investing in digital and electric initiatives**. Currently, MB is investing heavily to adapt to the CASE trends. However, it remains unclear which technologies will prevail. MB needs to continue investments in appropriate measures to adapt to the digital and electric transformation based on this fact. In the long term, this will strengthen the market position through technology leadership.

Conclusion of the four significant strategic recommendations:

Through targeted investments, M&A, and partnerships, MB is capable to:

- create continuous growth toward its strategic goals
- identify and actively address changes and opportunities in the market more quickly
- think through integration scenarios at an early stage and identify synergies
- generate a knowledge advantage and use it in the potential investment, acquisitions, or partnership process
- identify potential target companies more quickly based on their M&A or partnership strategy and analyze them in a targeted manner

Finally, the central goal of these recommendations should be to increase **the customer experience and fulfill the changing customer needs**. Customer experience has been and will keep being a key differentiator in the automotive industry, whether it is in the sales process, the in-car driving experience, or in aftersales (charging). The EV market is still reluctant through the price, the charging experience, and the driving range. Based on this fact, it is crucial for MB to enhance and invest across the value chain and provide even further digital services and new mobility solutions. Digital services must adapt to the changing customer needs. This chance will create new business models for MB (McKinsey and Company 2021).

Within the context of developments within the market, these findings are to be integrated into the strategic orientation of MB at an early stage to derive forward-looking positioning concepts from the results. In doing so, the strategy is to be developed on the foundation of the corporate and environmental analysis. Electromobility enables Daimler AG to position itself for more sustainable and environmentally conscious mobility. The associated image change opens up opportunities for tapping into new customer segments, especially with new sharing and subscription models. To position the company in such a manner, it is necessary to adapt the corporate mission statement to the new strategy and to define clear principles of behavior, goals and identities. The corporate mission statement also communicates the strategic plans to the public.

Adapting to the changing environment calls for action and involves a holistic transformation within the entire MB organization. In the years to come, the traditional automotive industry will not vanish (BCG 2017). However, the challenge of integrating the long-established business model with a digitized one will remain MB´s priority to endure in the long run. As described in this thesis, MB can sustain and improve its competitive position by establishing strategic partnerships, enforcing M&As, investing in digital and electric initiatives, and adapting to

changing customer needs. The company will thus gain an increasingly balanced presence between existent digital and electric trends and its established core competencies.

12. Limitations and Further Research

Several constraints have occurred within this research. First, there are limitations in data availability, second, in survey and data collection, and third, in methodology, which leads to recommendations for future research.

In terms of the competitor analysis in EV sales, the lack of data from some brands in the same periods limited the correct outcome of the research performed. This analysis has to be carried out once again to examine when data is available precisely. Hence, closer cooperation with companies in the industry would be necessary for further research.

Additionally, it is necessary to point out that all subtopics were combined in one survey to obtain the opinion of the same group on the subjects being researched. This approach limited the number of questions related to each subtopic to keep the study from becoming too extensive. In the future, a deeper analysis of the research themes could be achieved through individual and more elaborated surveys. Moreover, the study participants may not represent a truly representative sample, as access to individuals over 30 years old was limited (as was for EV owners). Therefore, findings may become more exact with bigger sample sizes and relevant demographics. In further research, qualitative consumer opinions could be conducted in interviews to understand the reasoning behind the selected answers better.

Finally, due to the extent of the work, not all influencing factors and trends could have been evaluated for the electric and digital transformation. Instead of focusing on only one topic in detail, it was decided to present a range of elements (online sales, charging infrastructure, MaaS, sustainability, F1, as well as threats and opportunities for MB). This allowed generating a coherent picture of the transformation in various areas of business. Due to its unpredictability and the number of elements affecting the shift, the conversion is still in process. Therefore, it

is crucial in a further step to monitor market developments and technological changes to adapt and react quickly.

Glossary

Agent is a dealer that acts on behalf of an OEM and sells the vehicle in the name of and for the OEM. (Accenture 2021)

Agent Model / Direct to customer sales model is a business model of selling vehicles through central distribution via sales departments and decentral distribution via company-owned plant branches, often called “own retail” or through the manufacturer’s online sales model. (Bacher 2020)

AI (Artificial Intelligence) is the science and engineering of making machines with intelligence equal to humans. It would have a self-aware consciousness that has the ability to solve problems, learn, and plan for the future (IBM 2021).

Authorized Dealers are the independent car traders who have a franchise to purchase and sell an OEM’s product. (Marketing Accountability Standards Board 2021)

Battery Electric Vehicle (BEV) is an Electric Vehicle (EV) that only utilizes chemical energy that is stored in rechargeable battery packs (Science Daily 2021).

Customer Experience consists of five types of experiences (sensory, affective, cognitive, physical, and social identity) created through the direct or indirect contact between the customer and the company during the developed relationship (Lemon e Verhoef 2016).

Customer Journey is the interaction of the final customer with the brand/company, service, or product across diverse phases and touchpoints (Lemon e Verhoef 2016).

Digitalization is the phenomenon of transforming analogic signals into digital pieces, which can improve the business relationships between the brand and the customer and bring added value to the company and the society (Reis, et al. 2020).

Driving forces are external factors influencing future dynamics in both predictable and unanticipated ways (Scearce D. 2004).

E-commerce is “The process of buying and selling products or services using electronic data transmission via the Internet and the www” (Grandona e Pearson 2004).

Electric Vehicle (EV) is either partially or fully powered on electric power. This means that they have an electric motor, and they can also have or not have a combustion engine (TWI 2021).

Internal Combustion Engine (ICE) has an engine that produces energy by burning fuel within itself (Cambridge 2021).

Megatrends are driving forces in the long-term that are already visible and will almost certainly have a substantial impact in the future (van der Heijden 2005, 227).

Omnichannel is “The seamless integration and orchestration of all touchpoints and channels. Omnichannel retail puts the customer at the core” (Bacher 2020).

Online Customer Experience (OCE) is the customer experience within the online environment, all the experiential variables related to a website and its environment. (Kumar e Anjaly 2017)

Online Post-Purchase Customer Experience (OPPCE) covers the customer experience regarding the post-purchase specific items such as return and exchange and refund options in an online environment. (Kumar e Anjaly 2017)

Original Equipment Manufacturer (OEM) The company that provides the components in another company's product, working closely with the seller of the finished product, known as the value-added reseller (VAR). Therefore, OEMs make sub-assembly parts to sell to VAR. E.g., Mercedes-Benz is an OEM since it produces its own engines from scratch (Kagan 2021).

Over-the-Air Services (OTA) “Over-The-Air (OTA) is a technology that updates and changes data in the SIM card without having to reissue it. OTA enables a Network Operator to introduce new SIM services or remotely modify SIM cards' contents, already in the field rapidly and cost-effectively” (Thales 2021).

Point of Sales (PoS) "The place at which a retail transaction is carried out" (Lexico 2021). This individual paper is linked to the place where the dealers sell or purchase vehicles.

Trends are explanations of the direction of change. They are typically slow and long-term shifts in the factors that determine the future of an organization, region, nation, sector, or society (EY 2020).

Weak Signals are events or issues from the past or present that have ambiguous origins, meanings, and/or implications. They are uncertain observables that warn us about the likelihood of future events (EY 2020).

Wild cards are discontinuities, surprising events with a low likelihood, enormous impact, and an unexpected character are known as wild cards (EY 2020).

References

A.J. Campbell, D.T. Wilson. 1996. *Managed networks: creating strategic advantage.* London: D. Iacobucci (Ed.), Networks in Marketing, Sage Publishing.

Accenture. 2021. *The future of automotive sales in China.* Accenture, China: Accenture. Accessed November 18, 2021. https://www.accenture.com/_acnmedia/PDF-147/Accenture-Study-The-Future-of-Automotive-Sales-in-China.pdf.

ACEA. 2021. *Water used in car production in the EU.* Accessed November 10, 2021. https://www.acea.auto/figure/water-used-in-car-production-in-eu/.

Aguiar, Jorge, interview by André Vedor. 2021. *Chief Marketing Officer (CMO) in Mercedes-Benz Portugal* (October 29).

Ahmady, Gholam, Aghdas Nikooravesh, and Maryam Mehrpour. 2016. *Effect of organizational culture on knowledge management based.* Report, Dubay: ScienceDirect, 387-395. Accessed October 12, 2021. doi:10.1016/j.sbspro.2016.09.049.

Ansart, S., Chanaron, J-J. and Duymedjian, R. 2006. "Co-production of the car as a “service”: involving customers in the value chain." *International Journal of Automotive Technology and Management* 6 (1): 45–58.

Argus. 2021. *Argus.* Accessed November 2, 2021. https://www.argusmedia.com/en/news/2175706-portugal-proposes-fossil-fuelonly-car-sale-ban-in-2035.

Askew, Garret, interview by Alexandra von Scholler. 2021. *Head of Safety Lead at Lyft USA*

Askew, Garret. 2021. *Head of safety lead LYFT* (November).

Associação de Utilizadores de Veículos Elétricos. 2021. *Vendas de Veículos Elétricos cresceram 40,8% em setembro de 2021.* October 5. https://www.uve.pt/page/vendas-ve-09-2021/.

Audi AG. 2021. *Shaping the future of premium mobility* . https://www.audi.com/en/company/brand.html.

Auto123. 2014. *MERCEDES AMG BOSS SAYS ROAD CARS WILL GREATLY BENEFIT FROM F1 DEVELOPMENTS.* https://www.auto123.com/en/news/mercedes-amg-boss-says-road-cars-will-greatly-benefit-from-f1-developments/36168/.

Automotive. 2020. "Mercedes-Benz com plataforma de vendas online em Portugal." *Automotive* (Automotive). Accessed November 20, 2021. https://automotiverevista.com/mercedes-benz-com-plataforma-de-vendas-online-em-portugal-com-video/.

Autotrader. 2015. *New Autotrader Study: Consumers Want Big Changes.* Market Study, Atlanta: Autotrader Media Room, 4. Accessed 18 November, 2021. file:///C:/Users/abreulu/Downloads/2015-03-31-New-Autotrader-Study-Consumers-Want-Big-Changes-to-the-Car-Buying-Process.pdf.

Awa, Kalu. 2016. "Functional structure and operational issues: An examination of." *Journal of Business and Management* (IOSR) 18 (1): 1-2. Accessed September 11, 2021. file:///C:/Users/Luis%20Abreu/Downloads/5y1.org_2b4c6aa6b956ae427f27efb5044875dc.pdf.

Bachelorprint. 2021. *SMART Goals – Definition, Advantages & Disadvantages.* https://www.bachelorprint.eu/methods-concepts/smart-goals/.

Bacher, Natalie. 2020. *Digital auto customer journey - An analysis of the impact of digitalization on the new car sales process and structure.* Bachelor Thesis, ResearchGate. Accessed November 1, 2021. doi:10.13140/RG.2.2.13942.42560.

Bain & Company . 2021. "Tipping Point in the automotive industry ."

Bain & Company. 2021. 9 29.

Bain & Company. 2019. "Autonomous driving, shared mobility and the rise of electric verhicles will reshape Europes car trade industry."

Bain & Company. 2021. "Electric and autonmous vehicles: The future is now."

Bain& Company, Inc. 2020. *Net Promoter System.* September 8. https://www.bain.com/insights/customer-experience-tools-net-promoter-system/.

Barro, Jason, Pedro Correa, and Stephan Zech. 2021. *What Automakers Need to Know about Customer Delight.* January 15. https://www.bain.com/insights/what-automakers-need-to-know-about-customer-delight-snap-chart/.

Bauer, Pavol, Gautham Ram Chandra Mouli, and Venugopal Prasanth. 2017. "Future of Electric Vehicle Charging ." *19th International Symposium on Power Electronics, Ee 2017.*

Bauernhansl., C. Forster M. Zapp J. Aelker E. Westkämper T. 2013. "Collaborative value chain management between automotive and semiconductor industry: an analysis of differences and improvement measures." *Procedia CIRP* 12: 312-317.

BBC. 2014. *F1 2014: All aboard the 'power train' - new rules explained.* January 24. https://www.bbc.com/sport/formula1/25158104.

BBC News. 2021. October 15. https://www.bbc.com/news/business-58932610.

BBC. 2015. *Volkswagen: The scandal explained.* December 10. https://www.bbc.com/news/business-34324772.

BCG. 2017. *Building the Digital Car Company of the Future.* April 13. https://www.bcg.com/publications/2017/automotive-digital-transformation-building-digital-car-company-future.

—. 2017. *Building the Digital Car Company of the Future.* April 13. https://www.bcg.com/publications/2017/automotive-digital-transformation-building-digital-car-company-future.

—. 2021. *Chasing the Software Defined Dream Car.* February 18. https://www.bcg.com/publications/2021/software-transformation-in-the-automotive-industry.

BCG. 2020. *Estimated rate of new car sales purchased online in the United States, Europe, and China in 2020 and 2025.* Market Study, Statista. Accessed November 8, 2021. https://www-statista-com.eu1.proxy.openathens.net/statistics/1199431/online-car-sales-share-in-selected-markets-worldwide/.

BCG. 2021. "Strengthening the global semiconductor supply chain in an uncertain era."

BCG. 2021. "Today's Mobility Challanges and Opportunities."

BCG. 2021. "Why electric cars can't come fast enough."

BCG. 2021. "Winning the Battle in the EV Charging Ecosystem."

Bednall, D., M. Hirons, M. Sutherland, and J. A Tripodi. 2003. *Cognitive evaluation: prompts used to measure sponsorship.* United Kingdom: International Journal of Market Research.

Bell, David, Santiago Gallino, and Antonio Moreno. 2014. *How to Win in an Omnichannel World.* Article, MIT Sloan Management Review, 11. Accessed November 18, 2021. https://courses.helsinki.fi/sites/default/files/course-material/4482621/17.3_MIT2014%20Bell.pdf.

Berdforff, J. 2020. *Mobility of the Future.* Paul Scherrer Institue.

Bergen, Mark, and Margaret Peteraf. 2002. *Competitor Identification and Competitor.* Article, Managerial and Decision Economics, 157-169. Accessed September 17, 2021. https://assets.csom.umn.edu/assets/71542.pdf.

Bir, Burak. 2021. *Environmental disasters across globe in July 2021.* 08 14. https://www.aa.com.tr/en/environment/environmental-disasters-across-globe-in-july-2021/2334341.

Bloomenthal, Andrew. 2021. *Electronic Commerce (Ecommerce).* September 16. https://www.investopedia.com/terms/e/ecommerce.asp.

BMW. 2021. Accessed November 10, 2021. https://www.press.bmwgroup.com/global/article/detail/T0341522EN/bmw-group-accelerates-co2-reduction-and-focuses-consistently-on-a-circular-economy-with-the-neue-klasse.

BMW Group. 2020. *Press Release.* October 14. https://www.press.bmwgroup.com/global/article/detail/T0318730EN/bmw-charging-and-mini-charging:-expanded-charging-options-for-gen5-market-launch?language=en.

BMW Portugal. 2021. *Sustentabilidade na BMW.* Accessed 11 17, 2021. https://www.bmw.pt/pt/topics/fascination-bmw/electromobility2020/sustentabilidade.html.

BMW. 2021. *Sustainability in Every Car BMW builds.* Accessed November 10, 2021. https://www.bmw.com/en/innovation/sustainability-at-bmw.html.

Bothun et al. 2015. *PwC.* https://eco.nomia.pt/contents/documentacao/pwc-cis-sharing-economy-1-2187.pdf.

Brown, M. R, N.K.L. Pope, and K.E. Voges. 2003. *An examination of the effect of sponsorship stimuli on consumer perceptions.* Adelaide: The University of South Australia.

Business Wire. 2021. *Canalys: China's electric vehicle sales to grow by more than 50% in 2021 after modest 2020.* February 22. https://www.businesswire.com/news/home/20210222005461/en/Canalys-China%E2%80%99s-electric-vehicle-sales-to-grow-by-more-than-50-in-2021-after-modest-2020.

Butler, L., T. Yigitcanlara, and A. Paz. 2021. "Barriers and risks of Mobility-as-a-Service (MaaS) adoption in cities: A systematic review of the literature." *Cities* 109.

Caixa Geral de Depósitos. 2021. *Qual o incentivo fiscal para comprar carros sustentáveis em 2021?* March 25. https://www.cgd.pt/Site/Saldo-Positivo/mobilidade/Pages/incentivo-fiscal-carros-sustentaveis.aspx.

Câmara Municipal de Lisboa. 2020. Accessed November 2021. https://www.lisboa.pt/fileadmin/cidade_temas/mobilidade/documentos/Lisbon_Mobility_Strategic_Vision_MOVE_2030_EN.pdf.

Cambridge. 2021. *Meaning of internal combustion engine in English.* Accessed December 9, 2021. https://dictionary.cambridge.org/dictionary/english/internal-combustion-engine.

Canvanizer. 2021. *Create a new Business Model Canvas.* https://canvanizer.com/new/business-model-canvas.

Capgemini. 2019. *Key Factors Defining THE E-MOBILITY OF TOMORROW.* Capgemini.

Capgemini. 2020. *Percentage of survey respondents in the UK, India, and China who would purchase their future vehicles online after Covid-19.* Market Study, Statista. Accessed November 8, 2021. https://www-statista-com.eu1.proxy.openathens.net/statistics/1124068/online-purchasing-behavior-in-automotive-industry/.

CEiiA. 2020. *Overview.* https://www.ceiia.com/mobility.

Chadha, Sachin, and Gautam Sardar. 2021. *How Automakers Can Enhance Customer Experience in the New Normal.* Cognizant.

CNBC. 2019. *Elon Musk says the tech is 'mind-bogglingly stupid,' but hydrogen cars may yet threaten Tesla.* 02 24. https://www.cnbc.com/2019/02/21/musk-calls-hydrogen-fuel-cells-stupid-but-tech-may-threaten-tesla.html.

—. 2021. *How Mercedes-Benz became so prestigious, and why it is challenged by a new era.* April 7. https://www.cnbc.com/2021/04/07/how-mercedes-benz-became-so-prestigious-and-why-it-is-challenged.html.

Coalition for Future Mobility. 2021. *Highly automated technologies, often called self-driving cars, promise a range of potential benefits.* https://coalitionforfuturemobility.com/benefits-of-self-driving-vehicles/.

Coldwell, J. 2001. "Characteristics of a Good Customer Satisfaction Survey." *Customer Relationship Management* 193-199.

comScore. 2012. *Online Shopping Customer Experience Study.* Market Study, comScore, 2-18. Accessed November 11, 2021. http://www.tychesoftwares.com/wp-content/uploads/2012/12/comScore-Online_Shopping_Cust_Experience_Study.pdf.

Cornet, Andreas , Julian Conzade, Patrick Schaufuss, Stephanie Schenk, Andreas Tschiesner, Russell Hensley, Patrick Hertzke , and Timo Möller. 2021. *McKinsey & Company.* September 7. https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/why-the-automotive-future-is-electric.

Daimler. 2019. Accessed November 8, 2021. https://www.daimler.com/sustainability/resources/circular-economy.html.

—. 2021. Accessed October 10, 2021. https://media.daimler.com/marsMediaSite/en/instance/ko/The-new-EQS-sustainability.xhtml?oid=49580509.

Daimler AG . 2020. *Best Customer Experience.* July 20. https://media.daimler.com/marsMediaSite/en/instance/ko.xhtml?viewType=list&oid=46872898.

Daimler AG. 2021. *"Best Global Brands 2021": Mercedes-Benz once again world's most valuable luxury car brand.* October 20. https://media.daimler.com/marsMediaSite/en/instance/ko.xhtml?oid=51682923&viewType=list.

—. 2019. September 22. https://www.daimler-mobility.com/en/company/news/joint-venture-closing/.

—. 2021. *Business News.* July 22. https://media.daimler.com/marsMediaSite/en/instance/ko/Mercedes-Benz-prepares-to-go-all-electric.xhtml?oid=50834319.

—. 2021. "Business News: Mercedes-Benz prepares to go all-electric." July 22. Accessed September 11, 2021. https://media.daimler.com/marsMediaSite/en/instance/ko/Mercedes-Benz-prepares-to-go-all-electric.xhtml?oid=50834319.

—. 2021. *Business Units: Project Focus.* Accessed October 11, 2021. https://www.daimler.com/company/business-units/project-focus.html.

—. 2021. *Company: Business Units - Go-ahead for Mercedes-Benz Cars and Daimler Truck as independent companies.* 30 July. Accessed September 11, 2021. https://www.daimler.com/company/business-units/210730-project-focus.html.

—. 2021. *Company: Daimler at a Glance.* Accessed October 11, 2021. https://www.daimler.com/company/at-a-glance.html.

Daimler AG. 2021. "Daimler Interim Report Q2 2021." Daimler AG, 4-9. Accessed September 13, 2021. https://www.daimler.com/documents/investors/reports/interim-reports/q2/daimler-ir-interimreport-q2-2021.pdf.

—. 2019. "Best Customer Experience 4.0." *Daimler News*, July 18. Accessed November 12, 2021. https://media.daimler.com/marsMediaSite/en/instance/ko/Best-Customer-Experience-40--Press-Presentation-in-The-Hague-Kick-Off-for-the-luxury-experience-40-Mercedes-Benz-presents-the-next-chapter-of-the-global-sales-strategy-Best-Customer-Experience.xhtml?o.

—. 2021. "Mercedes-Benz at the IAA 2021." *Daimler News*, September 6. Accessed November 11, 2021. https://www.daimler.com/innovation/specials/iaa-2021-preview-2.html.

—. 2020. *Global Media Site.* July 21. https://media.daimler.com/marsMediaSite/en/instance/ko/COVID-19-pandemic-Accelerating-digitalisation-in-sales-and-after-sales-Executive-Update-on-Best-Customer-Experience-40.xhtml?oid=46887550&ls=L3NlYXJjaHJlc3VsdC9zZWFyY2hyZXN1bHQueGh0bWw_c2VhcmNoU3RyaW5.

—. 2021. *Joint Venture IONITY. Elektromobilität auf Langstrecken.* https://www.daimler.com/innovation/case/electric/ionity.html.

—. 2021. *media.daimler.* July 22. https://media.daimler.com/marsMediaSite/en/instance/ko/Mercedes-Benz-prepares-to-go-all-electric.xhtml?oid=50834319.

—. 2021. *Mercedes Benz International website.* https://www.mercedes-benz.com/en/.

—. 2021. "Mercedes-Benz Cars at a Glance: Mercedes-Benz Cars Production Locations." Accessed September 9, 2021. https://media.daimler.com/marsMediaSite/en/instance/ko/Mercedes-Benz-Cars-Production-Locations.xhtml?oid=49066107.

—. 2021. *Mercedes-Benz Cars é a marca automóvel premium mais vendida em 2020.* January 6. https://media.mercedes-benz.pt/mercedes-benz-cars-e-a-marca-automovel-premium-mais-vendida-em-2020/.

Daimler AG. 2021. *Mercedes-Benz Strategy Update: electric drive.* Strategy Report, Daimler AG, 35. Accessed September 15, 2021. https://www.daimler.com/dokumente/konzern/sonstiges/daimler-mercedes-benz-strategy-update-electric-drive.pdf.

Daimler AG. 2020. "Mercedes-Benz: Strategy Update." 79. Accessed September 15, 2021. https://www.daimler.com/dokumente/investoren/praesentationen/daimler-ir-mercedes-benz-strategy-update-2020-presentation.pdf.

Daimler AG. 2021. "Mercedes-EQ." Report, Daimler AG.

—. 2021. *Mercedes-EQ to conclude Formula E success story and refocus resource for electric-only vehicle development.* August 18. https://media.daimler.com/marsMediaSite/en/instance/ko/Mercedes-EQ-to-conclude-Formula-E-success-story-and-refocus-resource-for-electric-only-vehicle-development.xhtml?oid=51036809.

—. 2021. "Mercedes-EQ. A new age of mobility." *Mercedes-EQ. A new age of mobility.* Stuttgart: Daimler News. Accessed September 13, 2021. https://www.daimler.com/innovation/drive-systems/electric/eq-brand.html.

—. 2021. *Outlook.* October 29. https://www.daimler.com/investors/share/outlook/.

Daimler. 2020. *Inauguração oficial da Factory 56 e início da produção do novo Mercedes-Benz Classe S.* 09 03. https://media.mercedes-benz.pt/inauguraco-oficial-da-factory-56-e-inicio-da-produco-do-novo-mercedes-benz-classe-s/.

—. 2021. *SHAREHOLDINGS AND INVESTMENTS.* https://www.daimler-mobility.com/en/innovations/mobility-services/.

Deco Proteste. 2021. *Carros elétricos: apoios à compra e condições.* August 25. https://www.deco.proteste.pt/auto/automoveis/noticias/carros-eletricos-apoios-compra-condicoes/incentivo-do-governo.

Deloitte . 2021. *Value Recovery in the Automotive Industry* . February 04. https://www2.deloitte.com/us/en/insights/industry/automotive/automotive-industry-value-chain.html.

Deloitte. 2017. *It integrates several forms of transportation to provide a customized mobility package, similar to a monthly mobile phone contract.* Accessed October 2021.

https://www2.deloitte.com/content/dam/Deloitte/de/Documents/consumer-industrial-products/CIP-Automotive-Car-Sharing-in-Europe.pdf.
Deloitte. 2021. *2021 Global Automotive Consumer Study.* Deloitte.
Deloitte. 2021. *ansformation of German car manufacturers to electro mobility 2021.* Deloitte .
Deloitte. 2021. *Consumers' main reasons to buy their next vehicle fully or partially virtual as of October 2020, by key country.* Survey, Deloitte, Statista. Accessed November 2, 2021. https://www-statista-com.eu1.proxy.openathens.net/statistics/1253692/reasons-why-car-shoppers-prefer-virtual-purchase-process/.
—. 2020. "Electric vehicles." *Deloitte.* July 28. Accessed March 25, 2021. https://www2.deloitte.com/uk/en/insights/focus/future-of-mobility/electric-vehicle-trends-2030.html.
Deloitte. 2020. *Electric vehicles: Setting a course for 2030.* Deloitte, Deloitte Insights, 32. Accessed November 18, 2021. https://www2.deloitte.com/uk/en/insights/focus/future-of-mobility/electric-vehicle-trends-2030.html.
—. 2015. "The Deloitte Consumer Review. Made-to-order: the rise of mass customization." https://www2.deloitte.com/content/dam/Deloitte/ch/Documents/consumer-business/ch-en-consumer-business-made-to-order-consumer-review.pdf.
Deloitte. 2021. "Transformation of German car manufacturers to electro mobility."
Derbaix, C., and T. Lardinoit. 2001. *Sponsorship and Recall of Sponsors. Psychology and Marketing.* New Jersey: John Wiley & Sons.
Diário da República. 2021. "Ambiente e Ação Climática." March 5. https://www.uve.pt/page/wp-content/uploads/2021/03/05-03-2021-Incentivos-Despacho-2535-2021.pdf.
Dichtl, E., Peter, S. 1996. " Kundenzufriedenheit und Kundenbindung in der Automobilindustrie: Ergebnisse einer empirischen Untersuchung." In *Marktforschung im Automobilsektor*, by H., Dichtl E., Herrmann, A. Bauer, 15-31.
Dictionary. 2021. *Virtual Reality.* Accessed November 2, 2021. https://www.dictionary.com/browse/virtual-reality.
Dinsdale, Andrew, Philipp Willigmann, and Jeff Glueck. 2016. *The foundation of future automotive retail: Omni-channel customer engagement.* Deloitte.
Doval, Pankaj. 2021. "Mercedes goes for direct sales, to slow down dealer expansio." *The Times of India* (The Times of India). Accessed November 19, 2021. https://timesofindia.indiatimes.com/business/india-business/mercedes-goes-for-direct-sales-to-slow-down-dealer-expansion/articleshow/87212431.cms.
Doval, Pankaj. 2021. "Mercedes goes for direct sales, to slow down dealer expansio." *The Times of India* (The Times of India). Accessed 17 November, 2021. https://timesofindia.indiatimes.com/business/india-business/mercedes-goes-for-direct-sales-to-slow-down-dealer-expansion/articleshow/87212431.cms.
Dr. Walton, Bryn, Geneviève Alberts, Jamie Dr. Hamilton, Saskia Fullerton-Smith, Edward Day, and James Ringrow. 2021. *Deloitte.* https://www2.deloitte.com/uk/en/insights/focus/future-of-mobility/electric-vehicle-trends-2030.html.
Dütschke, Elizabeth, Joachim Globisch, Patrick Plötz, and Martin Wietschel. 2019. "Consumer preferences for public charging infrastructure for electric vehicles." *Elsevier.*
Easy Tech. 2021. *Easy Tech: Conditionally automated driving with the DRIVE PILOT.* July 29. https://www.daimler.com/magazine/technology-innovation/easy-tech-drive-pilot.html.
ECA, European Court of Auditors. 2021. *Infrastructure for charging electric vehicles: more charging stations but uneven deployment makes travel across the EU complicated.* Luxembourg: European Union.

EDP Comercial . 2021. *PARCERIAS.* https://www.edp.pt/particulares/servicos/mobilidade-eletrica/parcerias/.

EDP Comercial. 2021. *EDP Comercial: carregar fora de casa.* Accessed October 27, 2021. https://www.edp.pt/particulares/servicos/mobilidade-eletrica/carregar-fora-de-casa/.

EDP. 2021. *PARCERIAS Conheça os parceiros - Mobilidade Elétrica EDP e fique a par de todas as vantagens.* Accessed 11 17, 2021. https://www.edp.pt/particulares/servicos/mobilidade-eletrica/solucoes-para-condominios/.

ESPN. n.d. *A brief history of Formula One.* http://en.espn.co.uk/f1/motorsport/story/3831.html.

EU Commision . 2021. "Digital Economy and Society Index 2021."

European Comission. 2021. *Pacto Ecológico Europeu.* https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_pt.

European Commission. n.d. https://knowledge4policy.ec.europa.eu/foresight/topic/continuing-urbanisation/developments-and-forecasts-on-continuing-urbanisation_en.

—. 2020. January. Accessed October 2021. https://ec.europa.eu/clima/eu-action/transport-emissions/road-transport-reducing-co2-emissions-vehicles/co2-emission_en.

European Commission. 2012. *Attitude of European car drivers towards electric vehicles: a survey.* Survey analysis, European Commission, Milan: Joint Research Centre of the European Commission, 28. Accessed October 12, 2021. doi:10.2790/67556 .

—. n.d. *Competence Centre on Foresight.* https://knowledge4policy.ec.europa.eu/diversifying-inequalities_en.

European Union. 2021. *Climate Challenges.* https://ec.europa.eu/clima/eu-action/adaptation-climate-change/how-will-we-be-affected/environment-challenges_en.

Evans, Claire. 2021. "Chip shortage delays: how long will you have to wait for a new car?" *What Car?* Accessed November 1, 2021. https://www.whatcar.com/news/chip-shortage-delays-how-long-will-you-have-to-wait-for-a-new-car/n23449.

EV-Volumes. 2021. *Global EV Sales for 2021 H1.* Accessed September 17, 2021. https://www.ev-volumes.com/country/total-world-plug-in-vehicle-volumes/.

EY. 2020. https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/megatrends/ey-megatrends-2020.pdf.

EY. 2020. *Expectations of automotive customer when buying and using vehicles.* Market Study, Statista. Accessed November 8, 2021. https://www-statista-com.eu1.proxy.openathens.net/study/85797/report-on-expectations-of-automotive-customers-when-buying-and-using-vehicles/.

Fleck-Dousteyssier, N. 2004. *Une application des modèles de traitement de l'information au parrainage : le rôle de la congruence.* Paris: Dauphine Marketing Stratégie Prospective.

Focus. 2021. *focus.de.* 12 10. https://www.focus.de/auto/ratgeber/unterwegs/schneller-als-tesla-drive-pilot-mercedes-erhaelt-erste-serien-zulassung-fuer-autonomes-fahrsystem_id_24505560.html.

Forbes. 2021. *15 Customer Behavior Trends Emerging This Year.* March 15. https://www.forbes.com/sites/forbesbusinesscouncil/2021/03/15/15-customer-behavior-trends-emerging-this-year/.

—. 2021. *How Green Is Tesla, Really?* Accessed 11 17, 2021. https://www.forbes.com/sites/timabansal/2021/05/13/how-green-is-tesla-really/?sh=2ba49d5f1576.

—. 2020. *Why Product Customization Will Position Your Brand To Win In 2020.* January 10. https://www.forbes.com/sites/stephanieburns/2020/01/10/why-product-customization-will-position-your-brand-to-win-in-2020/.

Formula 1. 2021. *10 things you need to know about the all-new 2022 F1 car.* July 15. https://www.formula1.com/en/latest/article.10-things-you-need-to-know-about-the-all-new-2022-f1-car.4OLg8DrXyzHzdoGrbqp6ye.html.
—. 2020. *FIA announce new F1 regulations to be delayed until 2022.* March 19. https://www.formula1.com/en/latest/article.fia-announce-new-f1-regulations-to-be-delayed-until-2022.1lwtaLmpNcQd0z9SnMEyK8.html.
—. 2021. *Formula 1 announces audience figures for 2020.* February 8. https://corp.formula1.com/formula-1-announces-audience-figures-for-2020/.
—. 2021. *Formula 1 plans for 100% sustainably fuelled hybrid engine.* October 5. https://corp.formula1.com/formula-1-plans-for-100-sustainably-fuelled-hybrid-engine/.
—. 2019. *Grand Prix attendance surpasses 4 million in 2019.* December 19. https://www.formula1.com/en/latest/article.grand-prix-attendance-surpasses-4-million-in-2019.61fEHE3wb7Wl8tHfP8cBTd.html.
—. 2019. *How F1 technology has supercharged the world.* November 7. https://www.mercedesamgf1.com/en/news/2018/10/insight-five-examples-why-f1-is-accelerating-the-future/.
—. 2021. *Race Results.* https://www.formula1.com/en/results.html.
Formula E. 2021. *Driver Standings.* https://www.fiaformulae.com/en/results/standings/driver?championship=2022020.
—. 2021. *History of Formula E.* https://www.fiaformulae.com/en/discover/history.
—. 2021. *Mercedes-EQ Formula E Team.* https://www.fiaformulae.com/en/championship/teams-and-drivers/mercedes-eq.
Frauenhofer Intitution for Production Technology. 2019. "The technological change of the automotive industry."
Frost & Sullivan. 2019. *Online vehicle retail sales worldwide between 2018 and 2025.* Market Study, Statista. Accessed November 8, 2021. https://www-statista-com.eu1.proxy.openathens.net/statistics/379870/online-vehicle-retail-sales-worldwide/.
FutureBridge. 2020. *Artificial Intelligence Reshaping the Automotive Industry.* April 29. https://www.futurebridge.com/industry/perspectives-mobility/artificial-intelligence-reshaping-the-automotive-industry/.
German Federal Ministry for the Environment. 2020. "Subsidies for EV's."
German Trade and Invest. 2019. *Portugals Digtial Infrastructure Report* .
Goodall, W., Fishman, T.D., J. Bornstein, and B. Bonthron. 2017. "The rise of Mobility-as-a-Service." *Deloitte Review* 20: 111-130.
Gorner, Marine, and Leonardo Paoli. 2021. *How global electric car sales defied Covid-19 in 2020.* January 28. https://www.iea.org/commentaries/how-global-electric-car-sales-defied-covid-19-in-2020.
Grandona, Elizabeth, and Michael Pearson. 2004. "Electronic commerce adoption: an empirical study of small and medium US businesses." *Elsevier*, April 9: 197-216. Accessed November 19, 2021. doi:10.1016/j.im.2003.12.010.
GreenSavers. 2021. *Nestlé Portugal está a usar microalgas para melhorar a qualidade do ar na sede.* Accessed 11 17, 2021. https://greensavers.sapo.pt/205581-2/.
Griffiths, Hugo. 2020. *2030 petrol and diesel ban: what is it and which cars are affected?* December 11. https://www.autoexpress.co.uk/news/108960/2030-petrol-and-diesel-ban-what-it-and-which-cars-are-affected.
Grosse-Ophoff, Anne, Saskia Hausler, Kersten Heineke, and Timo Möller. 2017. *McKinsey & Company.* April 18. https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/how-shared-mobility-will-change-the-automotive-industry.

Ha, Lan. 2021. *Euromonitor International.* May 24. https://www.euromonitor.com/article/five-key-trends-shaping-the-global-economy-in-2021-and-beyond.

Hagenmaier, Markus, Christian Wagener, Julien Bert, and Marcel Ohngemach. 2021. *Winning the Battle in the EV Charging Ecosystem.* Boston Consulting Group.

Hanelt, André, Björn Hildebrandt, Robert Gegory, and Everlin Piccinini. 2015. "Digital Transformation of Primarily Physical Industries – Exploring the Impact of Digital Trends on Business Models of Automobile Manufacturers." *12th International Conference on Wirtschaftsinformatik.* Osnabrück: Thomas. O.; Teuteberg, F. 1313-1327.

Harvard Business Review. 1993. *Making Mass Customization Work.* September. https://hbr.org/1993/09/making-mass-customization-work.

Harvey, B. 2001. *Measuring the effects of sponsorships.* Journal of Advertising Research.

Heineke, Kersten , Benedikt Kloss, Timo Möller, and Charlotte Wiemuth. 2021. *McKinsey and Company.* August 11. https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/shared-mobility-where-it-stands-where-its-headed.

Heineke, Kersten, Philipp Kampshoff, and Timo Möller. n.d. *McKinsey & Company.* https://www.mckinsey.com/features/mckinsey-center-for-future-mobility/overview/autonomous-driving.

Henfridsson, Ola, Lyytinen Kalle, and Youngjin Yoo. 2010. "The New Organizing Logic of Digital Innovation: An Agenda for Information Systems Research." *Information Systems Research* 724-735.

Hensher, D.A., C. Mulley, C. Ho, Y. Wong, G. Smith, and J. D. Nelson. 2020. *Understanding Mobility as a Service (MaaS): Past, Present and Future.* Amsterdam: Elsevier.

Hietanen, S. 2014. "“Mobility as a service” – The new transport model?" *Eurotransport* 12 (2): 2-4.

Hildebrandt, Björn, Andre Hanelt, Sebastian Firk, and Lutz Kolbe. 2015. *Entering the Digital Era – The Impact of Digital Technology-related M&As on Business Model Innovations of Automobile OEMs.*

Hoyer, W.D., and D.J. MacInnis. 2001. *Consumer Behaviour. 2nd ed.* Boston: Houghton Mifflin Company.

IBM. 2021. *IBM Cloud Learn Hub: What is artificial intelligence (AI)?* Accessed December 9, 2021. https://www.ibm.com/cloud/learn/what-is-artificial-intelligence.

IEA. 2021. *Portugal 2021 Energy Policy Review* . International Energy Agency .

—. 2021. *Trends and developments in electric vehicle markets.* Accessed September 18, 2021. https://www.iea.org/reports/global-ev-outlook-2021/trends-and-developments-in-electric-vehicle-markets#abstract.

IMD World Competitiveness Center. 2021. "World Talent Ranking ."

IMM Cologne. 2021. *Sustainable purchasing decisions: What customers are really looking for.* https://www.imm-cologne.com/magazine/trendimmpact/sustainability/sustainable-purchasing-decisions-what-customers-are-really-looking-for/.

Inkwood Research. 2021. *GLOBAL ELECTRIC VEHICLE CHARGING SYSTEM MARKET FORECAST 2021-2028.* Inkwood Research.

InsideEVs. 2021. *Here's How Tesla Survived Chip Shortages And Even Grew Production.* July 27. https://insideevs.com/news/522749/tesla-replaced-semiconductors-with-microcontrollers/.

Investopedia. 2020. *Augmented reality.* Accessed November 2, 2021. https://www.investopedia.com/terms/a/augmented-reality.asp.

—. 2021. *Sustainability.* November 15. https://www.investopedia.com/terms/s/sustainability.asp.

IONITY GmbH. 2021. *ionity.eu.* https://ionity.eu/.

Ionity. 2021. *Q&A: How much does it cost to charge at IONITY?* Accessed November 3, 2021. https://support.ionity.eu/en/general-questions/how-much-does-it-cost-to-charge-at-ionity.

Isaac, Mathew, and Ajay Abraham. 2019. "Implementing the Challenger Sales Model at Cars.com: a case study." *Journal of Business & Industrial Marketing*, 291-302. Accessed November 11, 2021. doi:10.1108/JBIM-01-2017-0016.

Jittrapirom, P., V. Caiati, A. Feneri, S. Ebrahimigharehbaghi, M.J.A. González, and J. Narayan. 2017. "Mobility as a service: A critical review of definitions, assessments of schemes, and key challenges." *Urban Planning* 2 (2): 13-25.

Johnson, M.D. 1997. "chieving Customer Satisfaction, Loyalty, and Retention Through Strategic Alignment." In *Customer Retention in the Automotive Industry*, by M.D. Johnson, A. Herrmann, F. Huber and A. Gustafsson. Wiesbaden : Gabler Verlag.

Johnston, M. A., and G. S Spais. 2015. *Conceptual Foundations of Sponsorship.* United Kingdom: Journal of Promotion Management.

Jorge Aguiar. 2021. (November).

Kagan, Julia. 2021. *Business Essentials: Original Equipment Manufacturer (OEM).* Edited by Khadija Khartit. October 29. Accessed December 9, 2021. https://www.investopedia.com/terms/o/oem.asp.

Kantar TNS. 2018. *If given the option, would you consider purchasing your next vehicle online?* Kantar TNS, Statista. Accessed November 8, 2021. https://www-statista-com.eu1.proxy.openathens.net/statistics/976978/willingness-to-buy-cars-online-in-italy/.

Kantar TNS. 2018. *What would give you a reason to purchase online?* Survey, Kantar TNS, Statista. Accessed November 2, 2021. https://www-statista-com.eu1.proxy.openathens.net/statistics/977184/reasons-for-buying-vehicles-online-in-italy/.

Kantar TNS. 2018. *Why wouldn't you consider purchasing your vehicle online?* Survey, Kantar TNS, Statista. Accessed November 2, 2021. https://www-statista-com.eu1.proxy.openathens.net/statistics/977031/reasons-for-not-buying-vehicles-online-in-italy/.

Kapustin, Nikita, and Dmitry Grushevenko. 2020. "Long-term electric vehicles outlook and their potential impact on electric grid." *ScienceDirect*, February: 10. Accessed November 12, 2021. https://www.sciencedirect.com/science/article/pii/S0301421519306901.

Kearney. 2016. "How Automakers can survive in the Self-Driving Era." *ATKearney.*

—. 2017. "kearney.com." 10 01. https://www.kearney.com/automotive/article?/a/how-automakers-can-survive-the-self-driving-era.

Keller, K. L. 1993. *Conceptualizing, measuring and managing customer-based brand equity.* Chicago: American Marketing Association.

Kemp, Simon. 2021. *DATAREPORTAL.* January 27. https://datareportal.com/reports/digital-2021-global-overview-report.

Kim, Sehoon, Timothy Paul Connerton, and Park Cheongyeul. 2021. "Transforming the automotive retail: Drivers for customers' omnichannel BOPS (Buy Online & Pick up in Store) behavior." *Journal of Business Research*, October 13: 411-425. Accessed November 11, 2021. https://reader.elsevier.com/reader/sd/pii/S0148296321007190?token=117FC5E4B8D56623877F78869D3D52D55391FD8D9B8CCCC3A26E011DC30824211EF00DA2D47835331BF70A57A78E0EF5&originRegion=eu-west-1&originCreation=20211109143400.

Koronios, Dimitropoulos, Travlos, Douvis, and Ratten. 2020. *Online Technologies and sports: A new era for sponsorship.* Amsterdam: Elsevier.

KPMG. 2019. Accessed October 2021. https://automotive-institute.kpmg.de/GAES2019/megatrends-beyond-the-obvious/automotive-key-trends.

—. 2021. *Trends in Artificial Intelligence.* February 17. https://home.kpmg/xx/en/home/insights/2021/02/trends-in-artificial-intelligence.html.

Krizansky, Patrik. 2021. "EV charging deployment: What are the next priorities?" *The Economist Newspaper*. https://impact.economist.com/sustainability/project/the-rev-index/ev-charging-deployment/.

Kumar, Amresh, and Bhawna Anjaly. 2017. "How to measure post-purchase customer experience in online retailing? A scale development study." *International Journal of Retail & Distribution Management*, August 21: 1277-1297. Accessed November 11, 2021. doi:10.1108/IJRDM-01-2017-0002.

Lashinsky, Adam. 2012 . *Inside Apple* . John Murray .

Lavrador, Alfredo. 2021. "Postos da Ionity chegam tarde a Portugal, são caros e não cumprem." *Observador*, June 10. Accessed November 3, 2021. https://observador.pt/2021/06/10/postos-da-ionity-chegam-tarde-a-portugal-sao-caros-e-nao-cumprem/.

Lehtinen, Petri. 2015. "The advancement of electric vehicles - case: Tesla Motors." Master's Thesis, Department of Management Studies, University of Tampere. Accessed November 1, 2021. https://trepo.tuni.fi/bitstream/handle/10024/97521/GRADU-1435294550.pdf?sequence=1&isAllowed=y.

Lemon, Katherine, and Peter Verhoef. 2016. "Understanding Customer Experience Throughout the Customer Journey." *Journal of Marketing*, November: 69-96. Accessed November 19, 2021. doi:10.1509/jm.15.0420.

Lexico. 2021. *UK English: Point of Sale.* Accessed November 19, 2021. https://www.lexico.com/definition/point_of_sale.

Lind, L., Pirttilä, M., Viskari, S., Schupp, F. & Kärri, T. 2012. "Working capital management in the automotive industry: Financial value chain analysis." *Journal of Purchasing and Supply Management* 18 (2): 92-100.

Liu, Jian-hua, and Zhan Meng. 2017. *Innovation model analysis of new energy vehicles: taking Toyota, Tesla and BYD as an example.* Report, School of Management Engineering, Zhengzhou University, Elsevier, 965-972. Accessed November 1, 2021. https://reader.elsevier.com/reader/sd/pii/S1877705817302485?token=753850FF10CD9AF6EF68823570958DC82F957F6C6974BC325B7259F9577E9AFBA3DCBD20A71AD4A7217B77ACB5FB2DE3&originRegion=eu-west-1&originCreation=20211029174506.

Llopis-Albert, Carlos, Francisco Rubio, and Francisco Valero. 2020. *Impact of digital transformation on the automotive industry.* Spain: Centro de Investigación en Ingeniería Mecánica (CIIM), Universitat Politècnica de València.

MaaSAlliance. 2020. Accessed November 2021. https://maas-alliance.eu/homepage/what-is-maas/.

Magalhães, Cátia, interview by Luís Abreu. 2021. *Mercedes-Benz Digitalization Process* Lisbon, (November).

Magalhães, Cátia, interview by Luis Abreu. 2021. *Mercedes-Benz Online Marketing* (November 5).

Magalhães, Cátia, interview by Luis Abreu. 2021. *Mercedes-Benz Online Marketing* Lisbon, (November 5).

Maoheng, Wang. 2018. "Research on the brand marketing of Tesla Electric Vehicle." Master thesis, Siam University, Bangkik. Accessed November 1, 2021. https://e-

research.siam.edu/wp-content/uploads/2019/08/IMBA-2018-IS-Research-on-the-Brand-Marketing-of-Tesla-Electric-Vehicle_compressed.pdf.
Marketing Accountability Standards Board. 2021. *A: Authorized Dealer.* Accessed November 19, 2021. https://marketing-dictionary.org/a/authorized-dealer/#cite_note-1.
Marketing Insider Group. 2021. *5 Consumer Behavior Trends Marketers Are Watching in 2021.* July 26. https://marketinginsidergroup.com/content-marketing/5-consumer-behavior-trends-marketers-are-watching-in-2021/.
MarketLine. 2017. *Millennial Consumers: Understanding key trends driving consumer behaviours.* Market Study, MarketLine, 45. Accessed November 11, 2021. https://advantage-marketline-com.eu1.proxy.openathens.net/Analysis/ViewasPDF/millennial-consumers.
Marques, Bruno, interview by Luís Abreu. 2021. *2021* Lisbon, (November).
Marques, Bruno, interview by Alexandra von Scholler. 2021. *MaaS* (November 3).
Marques, Bruno, interview by Luis Abreu. 2021. *Mercedes-Benz Electrc Vehicles* Lisbon, (October 28).
Martinez, M. & Walsworth, J. 2018. "Subscription drive; The Next Big Thing? Automakers, dealers, startups experiment with a new model." *Automotive News* 92 (6824): 1.
McKinsey & Company . 2018. *Charging ahead: Electric-vehicle infrastructure demand.* August 8. https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/charging-ahead-electric-vehicle-infrastructure-demand.
McKinsey & Company. 2020. *Reimagining the auto industry's future: It's now or never.* Market Study, McKinsey & Company, 8. Accessed October 10, 2021. https://digitaldealership.com/wp-content/uploads/2020/11/Reimagining-the-auto-industrys-future-Its-now-or-never-FV-1-1.pdf.
McKinsey & Company. 2021. *The future of EV charging infrastructure: Executive perspectives.* McKinsey & Company .
McKinsey & Company; Amsterdam Roundtable Foundation. 2015. *Electric vehicles in Europe: gearing up for a new phase?* Amsterdam Roundtable Foundation; McKinsey & Company. https://www.mckinsey.com/~/media/mckinsey/locations/europe%20and%20middle%20east/netherlands/our%20insights/electric%20vehicles%20in%20europe%20gearing%20up%20for%20a%20new%20phase/electric%20vehicles%20in%20europe%20gearing%20up%20for%20a%20new%20phase.a.
McKinsey and Company . 2020. https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/five-fifty-the-quickening.
—. 2021. *Defining and seizing the mobility ecosystem opportunity* . March 22. https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/defining-and-seizing-the-mobility-ecosystem-opportunity.
McKinsey and Company . 2021. "EV fast charging: How to build a sustain competitive differantiation."
McKinsey and Company . 2019. *How to win tomorrow's car buyers - Artificial Inteligence in Marketing & Sales.* Market Study, McKinsey Center for Future Mobility, McKinsey, 44. Accessed December 12, 2021. file:///C:/Users/Luis%20Abreu/Downloads/How-to-win-tomorrows-car-buyers-Artificial-intelligence-in-marketing-and-sales-final.pdf.
—. 2019. *The trends transforming mobility's future.* Accessed November 3, 2021. https://www.mckinsey.com/~/media/McKinsey/Industries/Automotive%20and%20Assembly/Our%20Insights/The%20trends%20transforming%20mobilitys%20future/The-trends-transforming-mobilitys-future-vF.pdf.
McKinsey and Company . 2020. "Understanding and shaping costumer behavior in the next normal."

McKinsey and Company. 2016. "Automotive Revolution - perspective towards 2030 - How the convergence of disruptive technology-driven trends could transform the auto industry."
McKinsey and Company. 2020. *Car buying in 2030.* McKinsey, McKinsey. Accessed December 9, 2021. https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/car-buying-in-2030.
McKinsey and Company. 2020. "Innovation in a crisis: Why it is more critical than ever."
McKinsey and Company. 2021. "Mobility's future: An investment reality check."
McKinsey and Company. 2021. "Shared mobility: Where it stands, where it's headed."
McKinsey and Company. 2017. "The automotive revolution is speeding up."
McKinsey and Company. 2020. "The future of micromobility: Ridership and revenue after a crisis."
McKinsey and Company. 2021. "Unlocking growth in battery cell manufactring for EV's."
McKinsey and Company. 2021. "Why the automotive future is electric."
—. 2020. *www.mckinsey.com.* 10 27. https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/reimagining-the-auto-industrys-future-its-now-or-never.
McKinsey. 2019. *U.S. consumers' primary reasons not to purchase a vehicle over the internet as of 2019.* Survey, McKinsey, Statista. Accessed November 2, 2021. https://www-statista-com.eu1.proxy.openathens.net/statistics/276247/main-reasons-for-us-consumers-to-make-an-online-vehicle-purchase/.
McKinsey& Company. 2021. *How charging in buildings can power up the electric-vehicle industry.* McKinsey& Company.
Mercedes AMG F1 Team. 2018. *INSIGHT: Five Examples Why F1 is Accelerating the Future.* https://www.mercedesamgf1.com/en/news/2018/10/insight-five-examples-why-f1-is-accelerating-the-future/.
Mercedes Benz. 2021. https://www.mercedes-benz.com/en/next/.
Mercedes-Benz. 2021. *2021 C 300 Sedan.* https://www.mbusa.com/en/vehicles/build/c-class/sedan/c300w.
—. 2020. "A Mercedes-Benz anunciou uma parceria estratégica com Farasis." 7. https://media.mercedes-benz.pt/download/884443/amercedes-benzanunciouumaparceriaestrateacutegicacomfarasis.pdf.
Mercedes-Benz AG. 2021. *Concept EQ.* https://www.mercedes-benz.de/passengercars/technology-innovation/future-mobility/concept-eq/details.html.
Mercedes-Benz. 2021. *daimler.com.* 12 13. https://www.daimler.com/innovation/case-2.html.
Mercedes-Benz Portugal. 2021. *Carregamento com a GalpElectric.* Accessed 11 17, 2021. https://www.mercedes-benz.pt/passengercars/mercedes-benz-cars/e-mobility/services-charging/charge-at-home/galp-electric.html.
—. 2021. *Conheça o Mercedes-EQ Lounge.* Accessed 11 17, 2021. https://www.mercedes-benz.pt/passengercars/mercedes-benz-cars/electromobility/mercedes-eq-lounge/eq-lounge-stage.module.html.
—. 2021. *Mercedes Me Charge.* Accessed 11 17, 2021. https://www.mercedes-benz.pt/passengercars/mercedes-benz-cars/mercedes-me-charge.html.
—. 2021. *Mercedes-Benz em Portugal.* Accessed September 11, 2021. https://www.mercedes-benz.pt/passengercars/the-brand/em-portugal/stage.module.html.
—. 2021. *Mercedes-Benz Portugal: Configurador Online.* Accessed October 29, 2021. https://www.mercedes-benz.pt/passengercars/configurator.html?group=all&subgroup=see-all&view=BODYTYPE.
—. 2021. *O futuro acontece, rumo a um planeta mais sustentável. Faça parte desta viagem.* December 13. https://www.youtube.com/watch?v=gsf8FJLMHnY.

Mercedes-Benz PT. 2021. *Carregamento com a GalpElectric* . https://www.mercedes-benz.pt/passengercars/mercedes-benz-cars/e-mobility/services-charging/charge-at-home/galp-electric.html.

Mercedes-Benz. 2020. *Strategy Update.* Company's Strategic Presentation, Daimler AG, 79. Accessed November 4, 2021. https://www.daimler.com/dokumente/investoren/praesentationen/daimler-ir-mercedes-benz-strategy-update-2020-presentation.pdf.

Mercedes-Benz. 2021. "The new EQS: passion for electromobility." *Press Information.* https://media.mercedes-benz.com/article/534bd132-c7a7-41ac-a86a-5bc1b0f5598b.

Merkl, Julius, interview by Alexandra von Scholler. 2021. *Development of MaaS until 2030* (November 9).

Mintzberg, H. 1990. "The design school, reconsidering the basic premises of strategic management." *Strategic Management Journal* 11: 171-195.

Mobi.e. 2021. *Rede Mobi.e: Estrutura Tarifária.* Accessed October 27, 2021. https://www.mobie.pt/redemobie/estrutura-tarifaria.

—. 2021. *Rede Mobi.e: Lista de Comercializadores e Operadores.* Accessed October 27, 2021. https://www.mobie.pt/redemobie/comercializadores-e-operadores.

Mobi.E. 2021. *Who we are* . https://www.mobie.pt/en/quemsomos/a-mobi.e.

Mohile, Shally. 2021. "Mercedes Benz India adopts direct selling as new retail strategy." *Business Standard* (Business Standard). Accessed November 17, 2021. https://www.business-standard.com/article/automobile/mercedes-benz-india-adopts-direct-selling-as-new-retail-strategy-121102201358_1.html.

Mohr, Detlef, Hans-Werner Kaas, Paul Gao, and Dominik Wee. 2016. *McKinsey.* https://www.mckinsey.com/~/media/mckinsey/industries/automotive%20and%20assembly/our%20insights/disruptive%20trends%20that%20will%20transform%20the%20auto%20industry/auto%202030%20report%20jan%202016.pdf.

Möller, Timo , Asutosh Padhi, Dickon Pinner, and Andreas Tschiesner. 2019. *McKinsey & Company.* December 19. Accessed December 2021. https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/the-future-of-mobility-is-at-our-doorstep.

Motorsport.com. 2020. *Toto Wolff discusses the future of Formula 1, cost caps and more.* December 16. https://www.motorsport.com/f1/news/mercedes-toto-wolff-future-f1/4927763/.

Mourelatou, Aphrodite. 2019. *Environmental indicator report 2018* . Luxembourg: European Environment Agency.

NASA. 2021. *Global Climate Change.* https://climate.nasa.gov/ .

Netherlands Enterprise Agency. 2019. *Electric Vehicle Charging* . Utrecht: Netherlands Enterprise Agency.

NHTSA. 2021. *Automated Vehicles for safety.*

Norsk Elbilforening. 2021. *Norwegian EV policy.* https://elbil.no/english/norwegian-ev-policy/.

NY Times. 2021. *'Drive to Survive' on Netflix Has Ignited Formula 1.* July 16. https://www.nytimes.com/2021/07/16/sports/autoracing/drive-to-survive-netflix-formula-one.html.

Oliver, R.L. 1997. *Satisfaction: A Behavioural Perspective on the Consumer.* New York: McGraw Hill.

Orbis. 2020. *Resultados Financeiros Mercedes-Benz Portugal.* Financial Report, Orbis, Orbis. Accessed December 5, 2021. https://orbis.bvdinfo.com/version-20211118/orbis/1/Companies/Report.

Osterwalder, Alexander, and Yves Pigneur. 2010. *Business Model Generation.* New Jersey: John Wiley & Sons, Inc.

Painter, Lewis. 2021. "Apple Car release date, design & price rumours." *Macworld.* Accessed November 8, 2021. https://www.macworld.co.uk/news/apple-car-3425394/.

Papadimitriou, Kaplanidou, and Papacharalampous. 2016. *Sport Event-sponsor fir and its effects on sponsor purchase intentions: a non-consumer perspective among athletes, volunteers and spectators.* Bingley: Emerald Group Publishing Limited.

Park Now. 2021. December 13. https://parknowgroup.com/about-us/.

Peppard, J. and A. Rylander. 2006. "From Value Chain to Value Network: Insights for Mobile Operators." *European Management Journal* 24 (2): 128-141.

Population Reference Bureau. 2020. https://www.prb.org/international/indicator/urban/table/.

Porsche AG. 2021. *Vollelektrische Porsche Modelle laden.* https://www.porsche.com/germany/aboutporsche/e-performance/charging-bev/.

Porter, M. E. 1985. *Competitive Advantage: Creating and Sustaining Superior Performance.* New York: The Free Press.

Porter, M.E. 1985. *Competitive advantage: creating and sustaining superior performance.* New York: Free Press.

Portuguese Association of Renewable Energy. 2021. "Report 2021."

Prestige. 2019. *Why Formula 1 is the Most Expensive Sport.* July 3. https://www.prestigeonline.com/th/pursuits/motors/formula-1/.

Proctor, Emily. 2021. *I am Expat.* Accessed November 2, 2021. https://www.iamexpat.de/expat-info/german-expat-news/petrol-and-diesel-vehicles-disappear-berlin-2030.

Professor Walther, Christoph, interview by Alexandra von Scholler. 2021. *Uncertainties regarding the development of MaaS* (November 5).

PTV Group. 2019. https://www.ptvgroup.com/en/mobilitynext/public/media/PTV_MaaS_Modeller_SUC_Oslo_Study.pdf.

PwC. 2020. January 23. Accessed October 2021. https://www.pwc.ro/en/press-room/press-release-2020/the-total-number-of-cars-in-use-in-europe-will-decline-by-2025--.html.

—. n.d. Accessed October 2021. https://www.pwc.co.uk/issues/megatrends.html.

PWC. n.d. Accessed October 2021. https://www.pwc.co.uk/issues/megatrends.html.

PwC. 2016. *Connected Car Report 2016.* PwC.

PwC. 2018. *Experience is everything: Here's how to get it right.* Market Study, United States of America: pwc, 18. Accessed November 18, 2021. https://www.pwc.com/us/en/zz-test/assets/pwc-consumer-intelligence-series-customer-experience.pdf#page=6.

—. 2018. "Five trends transforming the Automotive Industry." https://www.pwc.com/gx/en/industries/automotive/assets/pwc-five-trends-transforming-the-automotive-industry.pdf.

PwC. 2018. *The Future of Automotive Retail.* Market Study, PwC, PwC. Accessed December 9, 2021. https://www.pwc.de/en/automotive-industry/the-future-of-automotive-retail.html.

Quintanilha, Rita, interview by Luís Abreu. 2021. *Mercedes-Benz Marketplace Platform* Lisbon, (October 20).

Raconteur. 2015. *20 brands that defined F1.* March 19. https://www.raconteur.net/20-brands-that-defined-f1/.

Radyant. 2021. *Report: The State of Consumer Behavior 2021.* January 5. https://www.raydiant.com/blog/state-of-consumer-behavior-2021/.

Reis, João, Marlene Amorim, Nuno Melão, Yuval Cohen, and Mário Rodrigues. 2020. *Digitalization: A Literature Review.* Research, Aveiro university; Institute of Viseu;

Afeka Tel-Aviv College of Engineering; School of Technology and Management of Viseu, RCAAP. Accessed 19 November, 2021. https://comum.rcaap.pt/bitstream/10400.26/36935/1/10.1007%40978-3-030-43616-247.pdf.

Relaycars. 2020. *What is the Future of Augmented Reality in the Auto Industry?* September 21. https://www.relaycars.com/blog/future-of-automotive-augmented-reality.

Reuters. 2021. *EU proposes effective ban for new fossil-fuel cars from 2035.* July 14. https://www.reuters.com/business/retail-consumer/eu-proposes-effective-ban-new-fossil-fuel-car-sales-2035-2021-07-14/.

—. 2020. *Fossil fuel-based vehicle bans across the world.* 11 18. https://www.reuters.com/article/climate-change-britain-factbox-idINKBN27Y19F.

—. 2021. *Mercedes-Benz customers waiting more than a year for cars due to chip shortage - CEO in FAZ.* September 24. https://www.reuters.com/business/autos-transportation/mercedes-benz-customers-waiting-more-than-year-cars-due-chip-shortage-ceo-faz-2021-09-24/.

Riasanow, Tobias, Gabriela Galic, and Markus Böhm. 2017. *Digital Transformation in the Automotive Industry: Towards a Generic Value Network.* Conference Paper, Guimarães: ResearchGate, 13. Accessed December 1, 2021. https://www.researchgate.net/publication/319007756_Digital_Transformation_in_the_Automotive_Industry_Towards_a_Generic_Value_Network.

Ritchie, Hannah. 2020. *Cars, planes, trains: where do CO2 emissions from transport come from?* . 10 06. https://ourworldindata.org/co2-emissions-from-transport.

Rogers, Everett M. 1995. *Diffusion of innovations Fourth Edition.* New York: The Free Press.

Rogers, Kristina, and Andrew Cosgrove. 2021. *The CEO Imperative: Make sustainability accessible to the consumer.* June 24. https://www.ey.com/en_gl/consumer-products-retail/make-sustainability-accessible-to-the-consumer.

Roland Berger. 2020. "5G at the heart of Portugal's digital soceity." Lisbon.

—. 2018. *A new breed of cars; Purpose-built electric vehicles for mobility on demand.* Munich: ROLAND BERGER GMBH.

Roland Berger. 2021. "Automotive disruption made by Roland Berger."

Roland Berger. 2021. *Online sales as a percentage of used-car retail sales in Europe and the U.S. between 2017 and 2025.* Market Study, Statista. Accessed November 8, 2021. https://www-statista-com.eu1.proxy.openathens.net/statistics/1231656/online-used-car-retail-sales-europe-us/.

Roland Berger. 2020. *Share of cars bought through online sales channels in 2020, by country.* Market Study, Statista. Accessed November 8, 2021. https://www-statista-com.eu1.proxy.openathens.net/statistics/1226511/share-of-cars-bought-through-online-sales-channels/.

Roland Berger. 2021. "The transformation of the car industry is evolving."

Rose, Susan, Neil Hair, and Clark Moira. 2011. "Online Customer Experience: A Review ofthe Business-to-Consumer Online Purchase Context." *International Journal of Management Reviews*, 24-39. Accessed November 11, 2021. doi:10.1111/j.1468-2370.2010.00280.x.

RTR Sports Marketing. 2020. *The cost of Formula 1 sponsorships.* December 10. https://rtrsports.com/en/blog/cost-formula-1-sponsorships/.

S&P Global. 2021. *Europe overtakes China in EV sales growth in 2020.* September 20. https://www.spglobal.com/platts/en/market-insights/latest-news/coal/012021-europe-overtakes-china-in-ev-sales-growth-in-2020.

Saunders, M., P. Lewis, and A. Thornhill. 2009. *Research methods for business students.* Essex: Pearson Education Limited.

Scearce D., Fulton K. 2004. *WHAT IF? THE ART OF SCENARIO THINKING FOR NONPROFITS.* Global Business Network.

Scherpen, F., A. Draghici, and J. Niemann. 2017. "Customer Experience Management to Leverage Customer Loyalty in the Automotive Industry." *Procedia - Social and Behavioral Sciences* 374 - 380.

Schoemaker, Paul. 2018. *Scenario Planning.* London: Augier M., Teece D.J. (eds) The Palgrave Encyclopedia of Strategic Management. Palgrave Macmillan.

Schoemaker, Paul. 1995. "Scenario Planning: A Tool for Strategic Thinking." *Sloan Management Review* 37: 25-40.

Schwartz, P. 1996. *The Art of the Long View. Planning for the Future in an Uncertain World.* New York: Doubleday Publishing.

Science Daily. 2021. *Battery Electric Vehicle.* Accessed November 19, 2021. https://www.sciencedaily.com/terms/battery_electric_vehicle.htm.

Seaspiracy. 2021. *Seaspiracy.* https://www.seaspiracy.org/ .

Shead, Sam. 2021. "Major automakers fear the global chip shortage could persist for some time." *CNBC.* Accessed November 1, 2021. https://www.cnbc.com/2021/09/06/vw-ford-daimler-fear-chip-shortage-could-persist-for-some-time.html.

Shipley, Lou. 2020. "How Tesla Sets Itself Apart." *Harvard Business Review.* Accessed November 1, 2021. https://hbr.org/2020/02/how-tesla-sets-itself-apart.

Siemssen, Christopher. 2018. *Disruption in the Automotive Industry.* Copenhagen: Copenhagen Business School.

Silva, Bárbara. 2021. "EDP continua a perder clientes no mercado liberalizado de eletricidade, mas ainda tem 75% do total." *ECO.* Accessed October 27, 2021. https://eco.sapo.pt/2021/03/29/edp-continua-a-perder-clientes-no-mercado-liberalizado-de-eletricidade-mas-ainda-tem-75-do-total/.

Silver Arrows. 2020. *Mercedes F1 History.* http://www.silverarrows.net/mercedes-history/.

smile-einfachmobil. 2015. Accessed October 2021. http://smile-einfachmobil.at/index_mobile_en.html.

Sobhani, Anae, Sajjad Shokouhyar, Sina Shokoohyar, and Amirsalar Jafari Gorizi. 2021. "Shared mobility in post-COVID era: New challenges and opportunities." *Sustainable Cities and Society* 67.

Sochor, J., I.C.M. Karlsson, and H. Strömberg. 2016. "Trying out mobility as a service: experiences from a field trial and implications for understanding demand." *Journal of the Transportation Research Board* 2542: 57-64.

Sphera. 2020. *What Is Environmental Sustainability?* May 19. https://sphera.com/glossary/what-is-environmental-sustainability/.

Statista. 2021. *Anzahl verfügbarer Ladepunkte für Elektroautos in der DACH-Region nach Ladedienst der Automobilherstellern (OEM) im Jahr 2021.* Statista.

—. 2019. *Automotive augmented and virtual reality (AR/VR) market worldwide in 2017 and 2025 (in million U.S. dollars).* February. https://www-statista-com.eu1.proxy.openathens.net/statistics/828499/world-ar-vr-automotive-spending/.

—. 2020. *Distribution of carbon dioxide emissions produced by the transportation sector worldwide in 2020, by subsector.* Accessed November 10, 2021. https://www.statista.com/statistics/1185535/transport-carbon-dioxide-emissions-breakdown/.

—. 2020. *Estimated rate of new car sales purchased online in the United States, Europe, and China in 2020 and 2025.* Accessed October 20, 2021. https://www-statista-com.eu1.proxy.openathens.net/statistics/1199431/online-car-sales-share-in-selected-markets-worldwide/.

—. 2020. *Forecasted number of public charging points needed for electric vehicles in European Union member states in 2030.* January 31. https://www-statista-com.eu1.proxy.openathens.net/statistics/1086751/ev-charging-stations-forecast-eu/.

—. 2020. *Historical carbon dioxide emissions from global fossil fuel combustion and industrial processes from 1750 to 2020 (in billion metric tons).* Accessed November 10, 2021. https://www.statista.com/statistics/264699/worldwide-co2-emissions/.

—. 2020. *Investment in augmented and virtual reality (AR/VR) technology worldwide in 2024, by use case (in billion U.S. dollars).* November. https://www-statista-com.eu1.proxy.openathens.net/statistics/1098345/worldwide-ar-vr-investment-use-case/.

—. 2021. *Main concerns among customers worldwide regarding autonomous cars in 2021.* Accessed October 24, 2021. (https://www-statista-com.eu1.proxy.openathens.net/statistics/1231680/concerns-regarding-autonomous-driving-worldwide/).

—. 2020. *Main destinations for plastic waste exports from the European Union in 2020, by country (in metric tons).* https://www.statista.com/statistics/1269996/plastic-waste-export-destinations-european-union/.

—. 2021. *Number of cars sold worldwide between 2010 and 2021 (in million units).* Accessed November 11, 2021. https://www-statista-com.eu1.proxy.openathens.net/statistics/200002/international-car-sales-since-1990/.

—. 2021. *Projected size of the global autonomous car market from 2019 to 2023.* Accessed October 20, 2021. https://www-statista-com.eu1.proxy.openathens.net/statistics/428692/projected-size-of-global-autonomous-vehicle-market-by-vehicle-type/.

—. 2020. *Staista.* Accessed November 2, 2021. https://www-statista-com.eu1.proxy.openathens.net/statistics/737615/ar-vr-spending-worldwide-by-segment/ .

Stephanedes P.E., Yorgos J. , Mihalis Golias, George Dedes, Christos Douligeris, and Sabyasachee Mishra. 2019. "Challenges, Risks and Opportunities for Connected Vehicle Services in Smart Cities and Communities." *IFAC-Papers OnLine* 51 (34): 139-144.

Still, Benedikt. 2021. *Audi MediaInfo.* May 21. https://audimediacenter-a.akamaihd.net/system/production/uploaded_files/19206/file/fe0e8a98a8e6d955382418949bfbce72214050ef/20210521_Audi_pilots_concept_for_quick_charging.pdf?1621513943.

Strahl, Kerstin. 2021. *Senior Manager BCG* (November).

Synopsys. 2021. *The 6 Levels of Vehicle Autonomy Explaine.* https://www.synopsys.com/automotive/autonomous-driving-levels.html.

Taylor, Michael. 2021. *EU Suggests Date For The End Of Combustion-Powered Cars, SUVs.* July 14. https://www.forbes.com/sites/michaeltaylor/2021/07/14/eu-suggests-date-for-the-end-of-combustion-powered-cars-suvs/?sh=70c015e67a67.

Tesla. 2019. *$35,000 Tesla Model 3 Available Now.* February 28. https://www.tesla.com/pt_PT/blog/35000-tesla-model-3-available-now.

—. 2021. *Configurador: Model 3.* Accessed October 20, 2021. https://www.tesla.com/pt_pt/model3/design#overview.

—. 2021. *Design Your Model S.* https://www.tesla.com/pt_PT/models/design#overview.

—. 2020. *Impact Report.* Accessed 11 17, 2021. https://www.tesla.com/pt_pt/impact-report/2020.

Tesla Inc. 2021. *Tesla Support.* November 1. https://www.tesla.com/de_DE/support/non-tesla-supercharging.

Tesla. 2021. *Tesla: Modelos.* Accessed October 29, 2021. https://www.tesla.com/pt_pt.
Teufl, Maximilian, interview by Katharina Jeczawitz. 2021. *Joint Venture Ionity* (November 17).
Thales. 2021. *Digital Identity and Security: OTA (Over the Air).* Accessed December 9, 2021. https://www.thalesgroup.com/en/markets/digital-identity-and-security/technology/ota.
The Hindu. 2021. "Mercedes announces new 'direct to customer' sales model for India." *The Hindu* (The Hindu). Accessed November 17, 2021. https://www.thehindu.com/life-and-style/motoring/mercedes-announces-new-direct-to-customer-sales-model-for-india/article34759871.ece.
The New York Times. 2019. *Formula One Has a Problem, and Everyone Knows It.* July 12. https://www.nytimes.com/2019/07/12/sports/autoracing/formula-one-mercedes-dominant.html.
Townsend, J.D, Calantone R.J. 2013. "Evolution and Transformation of Innovation in the Global Automotive Industry." *Journal of Product Innovation Management* 31 (1): 4-7.
Transit Protocol. 2019. June. https://medium.com/@transitprotocol/what-is-mobility-as-a-service-672259066c87.
Tripodi, J.A. 2001. *Sponsorship: A Confirmed Weapon in a Promotional Armoury.* Bingley: Emerald Group Publishing Limited.
Tu, Jui-Che, Yang, and Chung. 2019. *Key Factors Influencing Consumers' Purchase of Electric Vehicles.* National Yunlin University of Science &Technology, Yunlin: ResearchGate, 1-22. Accessed October 12, 2021. doi:10.3390/su11143863.
TWI. 2021. *Technical Knowledge: FAQs.* Accessed November 19, 2021. https://www.twi-global.com/technical-knowledge/faqs/what-is-an-ev.
United Nations. 2018. *United Nations: Department of Economic and Social Affairs.* May 16. https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html.
Urbaitytė, Viktorija, and Aurelija Ulbinaitė. 2020. *Framework for evaluating the relationship between the omnichannel online sales approach and performance outcome in the case of niche products.* Report, Business Department, Vilnius University, Vilnius: Vilnius University Press, 302-315. Accessed October 10, 2021. https://epublications.vu.lt/object/elaba:65453871/.
US Environmental Protection Agency. 2021. *Sustainability and the ROE.* June 14. https://www.epa.gov/report-environment/sustainability-and-roe.
UVE. 2021. *Vendas de Veículos Elétricos até outubro de 2021 ultrapassam o total das vendas do ano de 2020.* November 4. https://www.uve.pt/page/vendas-ve-10-2021/.
—. 2021. *Vendas de Veículos Elétricos cresceram 40,8% em setembro de 2021.* October 5. https://www.uve.pt/page/vendas-ve-09-2021/.
—. 2021. *Vendas de Veículos Elétricos em agosto crescem 46,7%.* September 6. https://www.uve.pt/page/vendas-de-veiculos-eletricos-em-agosto-crescem-467/.
UVE, Henrique Sánches, interview by TVI. 2021. *Venda de VE bate recordes* (October 15).
van der Heijden, K. 2005. *Scenarios. The Art of Strategic Conversation.* Vol. 2. Chichester: John Wiley & Sons, Ltd.
Viana, Tiago, interview by Katharina Jeczawitz. 2021. *Customer Centricity* (November 2).
Villa, Bernardo, interview by Katharina Jeczawitz. 2021. *EV Charging Infrastructure* (November 16).
Virta Global. 2020. *https://www.virta.global/blog/what-is-roaming-in-ev-charging.* 11 2.
W.R. Huss, E.J. Honton. 1987. "Scenario planning: what style should you use." *Long Range Planning* 20 (4): 21-29.
Wack, P. 1985. "Scenarios: Uncharted Water Ahead." *Harvard Business Review* 63 (5): 72-89.
Wall Street Journal. 2020. *Apple's Empire* . New York City : Wall Street Journal .

Ward, H. 2021. *Statista.* Accessed November 2021. https://www-statista-com.eu1.proxy.openathens.net/outlook/mmo/smart-mobility/shared-mobility/worldwide#revenue.

Weisling, Stefan. 2021. *Senior Manager Porsche Consulting* (November).

Wells, Peter, Xiaobei Wang, Liqiao Wang, Haokun Liu, and Renato Orsato. 2020. "More friends than foes? The impact of automobility-as-a-service on the incumbent automotive industry Author links open overlay panel." *Technological Forecasting and Social Change* (Technological Forecasting and Social Change) 154.

Werwitzke, Cora. 2021. *Energie & Infrastruktur.* June 29. https://www.electrive.net/2021/06/29/porsche-soll-100-eigene-hpc-standorte-in-europa-planen/.

Winkelhake, U. 2017. *The digital tranformation of the automotive industry* . Springer Verlag.

Winkelhake, Uwe. 2019. *Challenges in the Digital Transformation of the Automotive Industry.* Hanover: MTZ Worldwide, 8. Accessed December 1, 2021. https://link.springer.com/content/pdf/10.1007/s38311-019-0074-7.pdf.

Winkler, Markus, Dr James Robey, Caroline Segerstéen Runervik, Philippe Vié, Sebastian Tschödrich, Jerome Buvat, Amol Khadikar, and Gaurav Aggarwal. 2020. *The Automotive Industry in the Era of Sustainability.* Capgemini Research Institute, Capgemini, 36.

World Economic Forum. 2021. *Chart: Which countries have the most electric cars?* February 19. https://www.weforum.org/agenda/2021/02/electric-vehicles-europe-percentage-sales/.

Wu, Jie, and Paul Olk. 2014. *Technological advantage, alliances with customers, local knowledge and competitor identification.* Article, Journal of Business Research, 2106-2114. Accessed September 17, 2021. https://www.sciencedirect.com/science/article/pii/S0148296314001635.

Yale School of Environment. 2021. *EVs Cost 40 Percent Less to Maintain Than Conventional Cars, Energy Department Report Says.* June 23. https://e360.yale.edu/digest/energy-department-report-finds-that-evs-cost-40-percent-less-to-maintain-than-conventional-cars.

Zenloop GmbH. 2021. *Net Promoter Score Glossar.* https://www.zenloop.com/de/glossar#R.

Zollen, Malte. 2021. *Head of EV Technology VW Group* (November).

zukunftsinstitut. 2021. *Megatrend Individualisierung.* Accessed October 2021. https://www.zukunftsinstitut.de/dossier/megatrend-individualisierung/.

Appendix

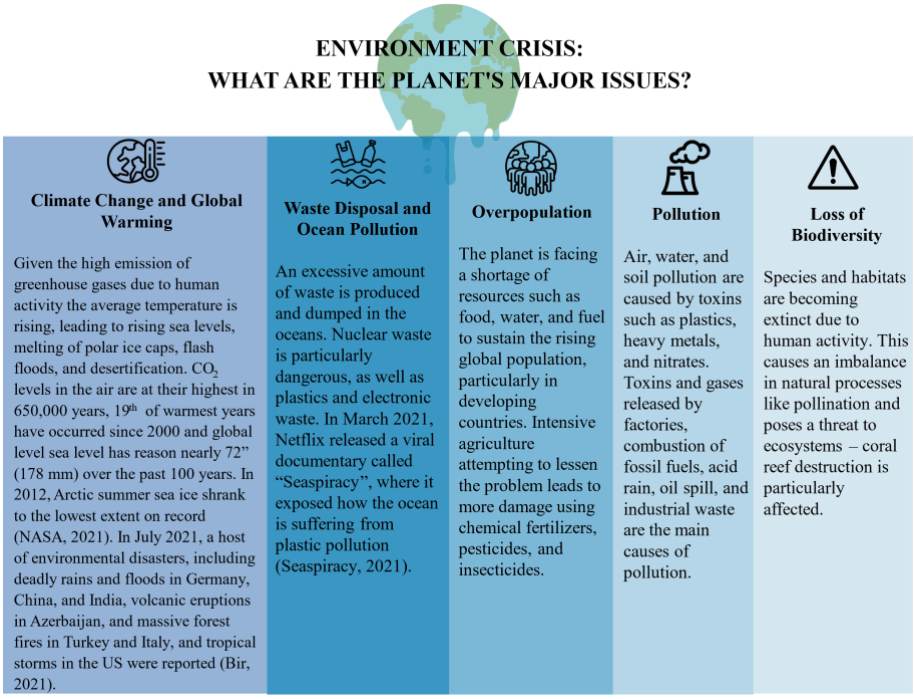
Appendix 1: Business Model Canvas Template (Canvanizer 2021)

Business Model Canvas

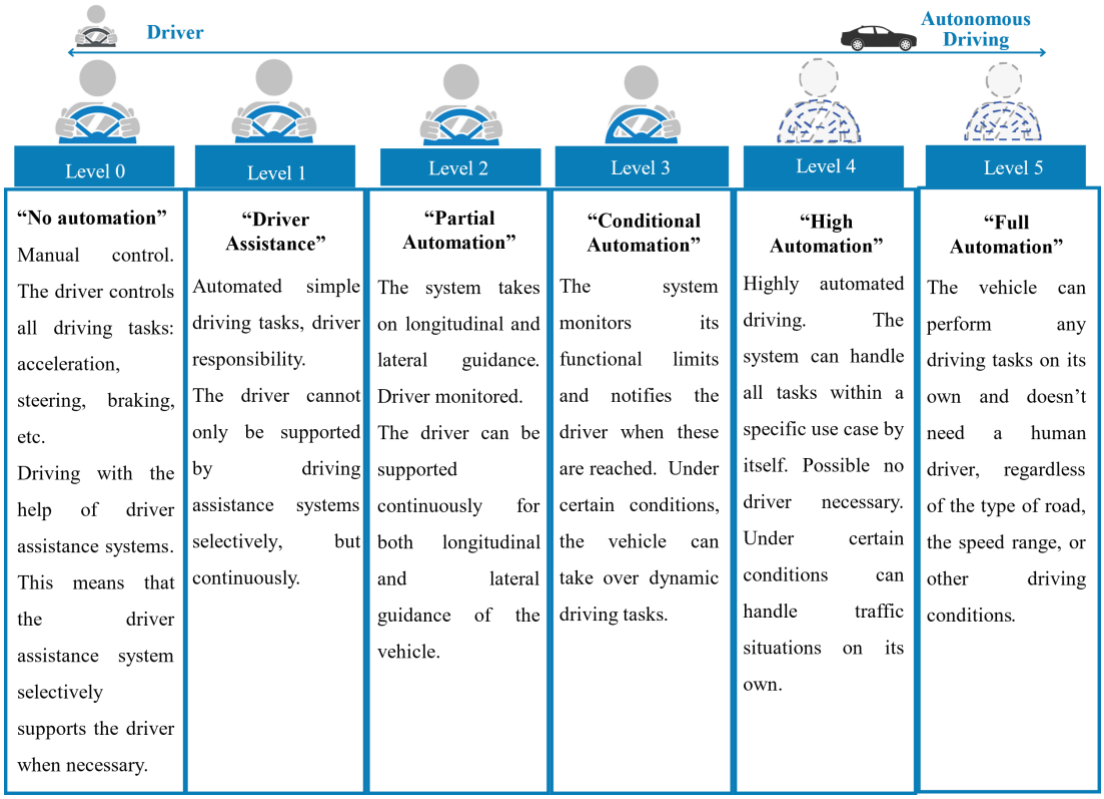
Key Partners	Key Activities	Value Propositions	Customer Relationships	Customer Segments
Who are our Key Partners? Who are our key suppliers? Which Key Resources are we acquiring from partners? Which Key Activities do partners perform? MOTIVATIONS FOR PARTNERSHIPS: Optimization and economy, Reduction of risk and uncertainty, Acquisition of particular resources and activities	What Key Activities do our Value Propositions require? Our Distribution Channels? Customer Relationships? Revenue streams? CATEGORIES: Production, Problem Solving, Platform/Network **Key Resources** What Key Resources do our Value Propositions require? Our Distribution Channels? Customer Relationships Revenue Streams? TYPES OF RESOURCES: Physical, Intellectual (brand patents, copyrights, data), Human, Financial	What value do we deliver to the customer? Which one of our customer's problems are we helping to solve? What bundles of products and services are we offering to each Customer Segment? Which customer needs are we satisfying? CHARACTERISTICS: Newness, Performance, Customization, "Getting the Job Done", Design, Brand/Status, Price, Cost Reduction, Risk Reduction, Accessibility, Convenience/Usability	What type of relationship does each of our Customer Segments expect us to establish and maintain with them? Which ones have we established? How are they integrated with the rest of our business model? How costly are they? **Channels** Through which Channels do our Customer Segments want to be reached? How are we reaching them now? How are our Channels integrated? Which ones work best? Which ones are most cost-efficient? How are we integrating them with customer routines?	For whom are we creating value? Who are our most important customers? Is our customer base a Mass Market, Niche Market, Segmented, Diversified, Multi-sided Platform

Cost Structure	Revenue Streams
What are the most important costs inherent in our business model? Which Key Resources are most expensive? Which Key Activities are most expensive? IS YOUR BUSINESS MORE: Cost Driven (leanest cost structure, low price value proposition, maximum automation, extensive outsourcing), Value Driven (focused on value creation, premium value proposition). SAMPLE CHARACTERISTICS: Fixed Costs (salaries, rents, utilities), Variable costs, Economies of scale, Economies of scope	For what value are our customers really willing to pay? For what do they currently pay? How are they currently paying? How would they prefer to pay? How much does each Revenue Stream contribute to overall revenues? TYPES: Asset sale, Usage fee, Subscription Fees, Lending/Renting/Leasing, Licensing, Brokerage fees, Advertising FIXED PRICING: List Price, Product feature dependent, Customer segment dependent, Volume dependent DYNAMIC PRICING: Negotiation (bargaining), Yield Management, Real-time-Market

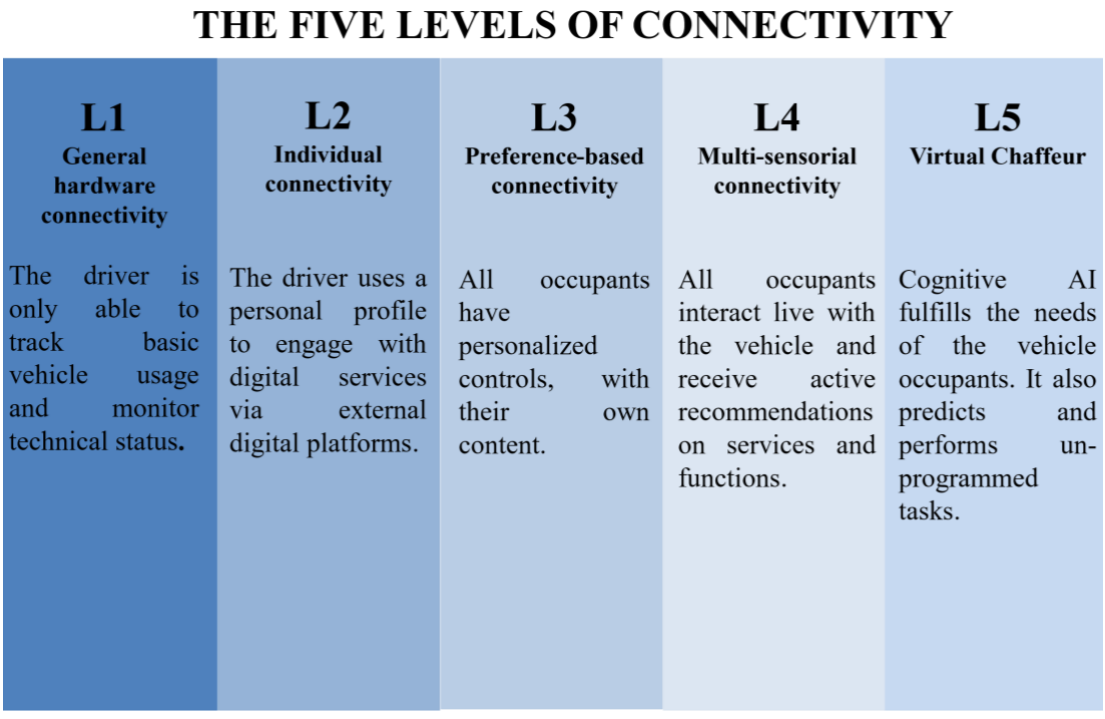
Appendix 2: Environment crisis: What are the planet's major issues? (NASA 2021), (Bir 2021), (Seaspiracy 2021), (European Union 2021)



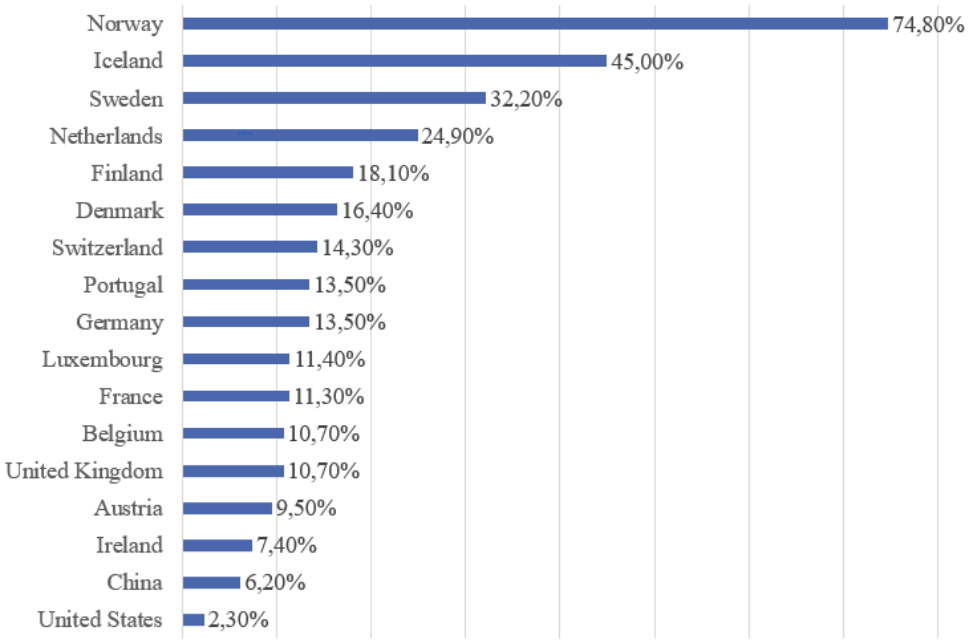
Appendix 3: Driving Automation Levels (Synopsys 2021)



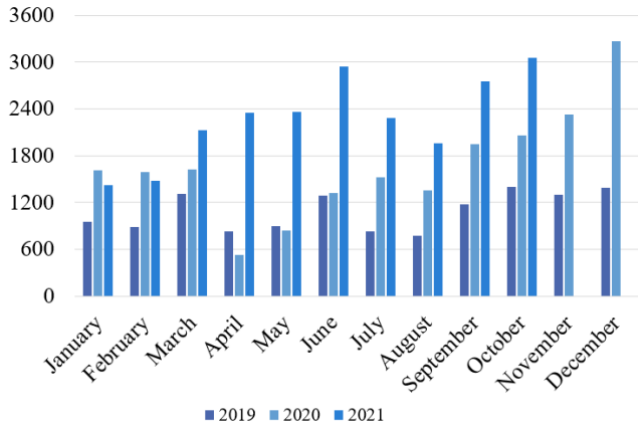
Appendix 4: Connectivity levels (McKinsey and Company 2019)



Appendix 5: Countries with the highest share of plug-in electric vehicles in new passenger car sales in 2020 (World Economic Forum, 2021)



Appendix 6: BEV and PHEV Sales in Portugal, in units (2019 – 2021) (UVE, 2021)



Appendix 7: Types 3, 4, and 5 of Electric Vehicle Incentives in Portugal in 2021 (Diário da República, 2021)

Type of incentive	Benefits
Type 3	50% on a cargo bicycle (with electric assistance), up to a value price of the maximum of 1000€ (300 vacancies)
	50% on a cargo bicycle (without electric assistance), up to a value price of the maximum of 500€ (300 vacancies)
Type 4	Fully Electric City Bicycle, Motorbike, or Moped, up to a value price of the maximum of 350€ (3142 vacancies)
Type 5	20% on a conventional city bicycle, up to a value price of the maximum of 100€ (1000 vacancies)

Appendix 8: Comparison of the Volkswagen Golf and Volkswagen e-golf's prices in Norway, in euros (Norsk Elbilforening, 2021)

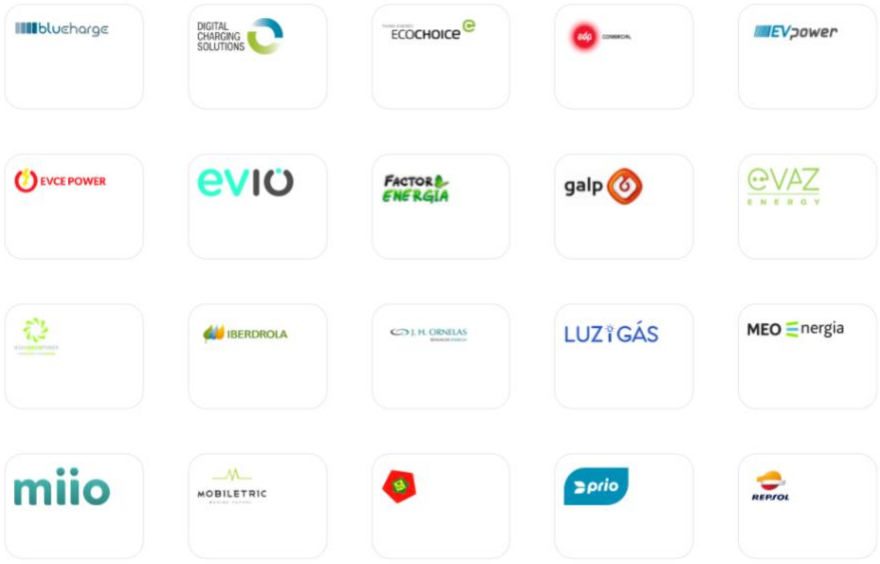
	Volkswagen Golf	Volkswagen e-golf
Import Price	22046	33037
CO2 Tax (113 g/km)	4348	-
NOx tax	206	-
Weight Tax	1715	-
Scrapping Fee	249	249
25% VAT	5512	-
Retail Price	34076	33286

Appendix 9: EQA Charging price at home (EDP Comercial, 2021) (Galp, 2017)

		EDP Comercial (2021)	Galp (2017)
Simple tariff		0,1445€/kWh * 17.7 = 2,56€/100km (rounded)	0,1614€/kWh * 17.7 = 2,86€/100km (rounded)
Bi-hourly tariff	Peak hours	0,1836€/kWh* 17.7 = 3,25€/100km (rounded)	0,2017€/kWh * 17.7 = 3,57€/100km (rounded)
	Off-peak hours	0,0924/kWh* 17.7 = 1,64€/100km (rounded)	0,0939€/kWh* 17.7 = 1,66€/100km (rounded)

		EDP Comercial (2021)	Galp (2017)
Simple tariff		0,1445€/kWh	0,01614€/kWh
Bi-hourly tariff	Peak hours	0,1836€/kWh	0,2017€/kWh
	Off-peak hours	0,0924/kWh	0,0939€/kWh

Appendix 10: CEMEs operating in Portugal (Mobi.e 2021)



Appendix 11: Appendix 11: EQA Charging Price in a Public Charging Point (EDP Comercial, 2021)

	EDP Comercial (2021)	
	Client	Non-Client
Simple tariff	(0,16€/kWh + 0,1657€/kWh + 0,0001 €/KWh) * 17,7 = 5,77 + 5,77 * 0,23 = 7,10€/100km	(0,20€/kWh + 0,1657€/kWh + 0,0001 €/KWh) * 17,7 = 6,47 + 6,47 * 0,23 = 7,96€/100km

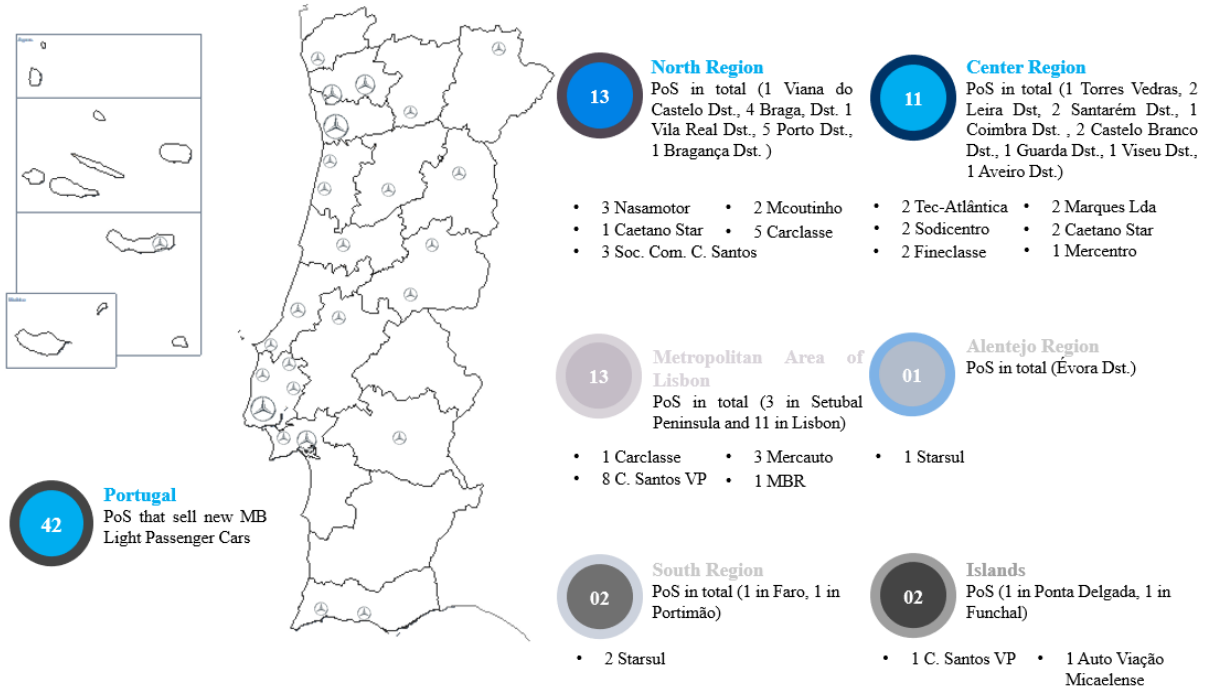
	EDP Comercial (2021)	
	Client	Non-Client
Simple tariff	0,16€/kWh	0.20€/kWh

Appendix 12: EQA Charging cost using an Ionity Charging Point (Ionity, 2021)

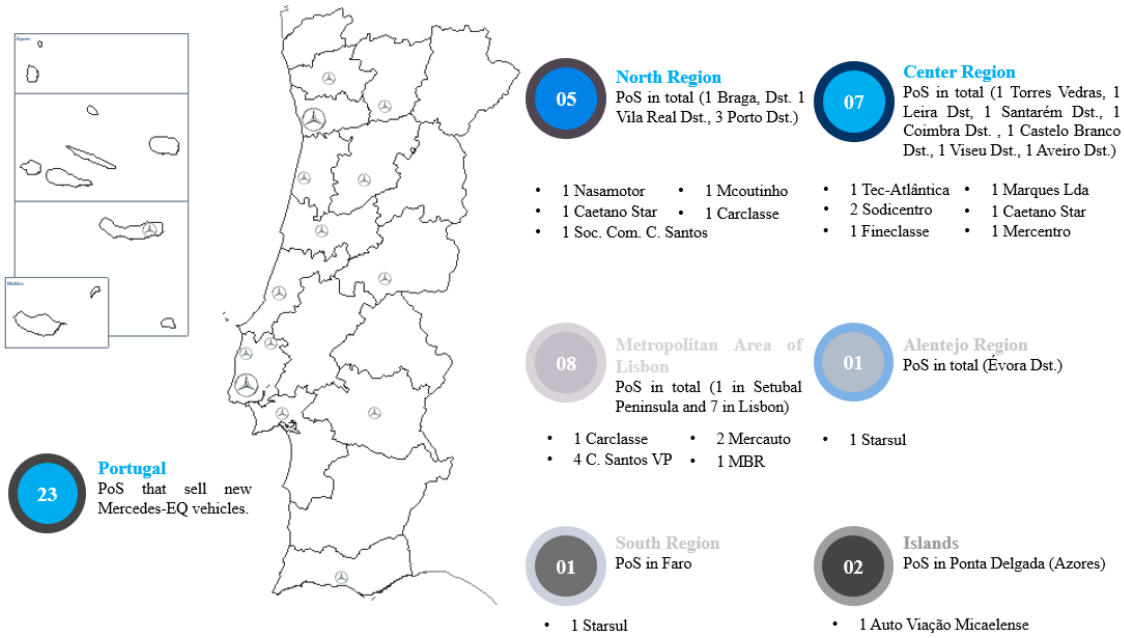
	Ionity	
	MB subscription Plan	Non-Client
Simple tariff	(0,3€/kWh + 0,1657€/kWh + 0,0001 €/KWh) * 17,7 = 8,24 + 8,24 * 0,23 = 10,14€/100km	0.8€/kWh + 0,1657€/kWh + 0,0001 €/KWh) * 17,7 = 17,09 + 17,09 * 0,23 = 21,02€/100km

	Ionity	
	MB subscription Plan	Non-Client
Simple tariff	0,3€/kWh	0.8€/kWh

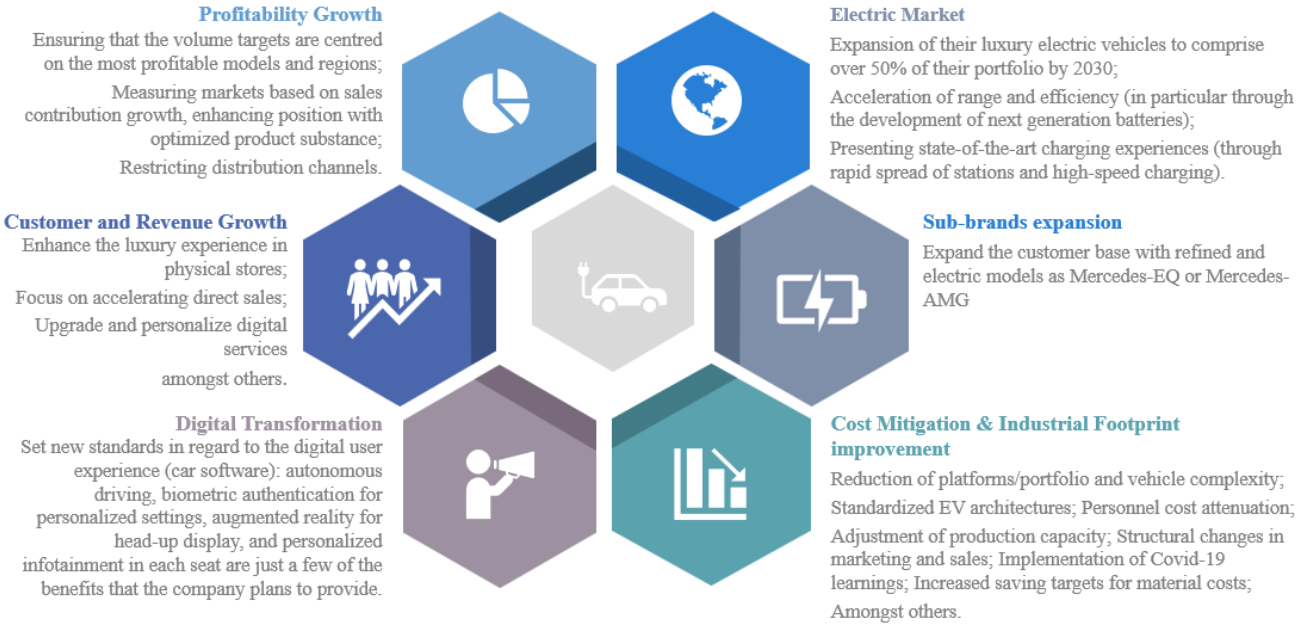
Appendix 13: PoS of Mercedes-Benz Portugal for New Light Passenger Cars in 2021 (own creation)



Appendix 14: PoS of Mercedes-EQ in Portugal for New Light Passenger Cars in 2021 (Own creation)



Appendix 15: Mercedes-Benz Strategy (Daimler AG 2021)



Appendix 16: EQA Launch-Campaign in Germany (Lietsch, 2021)

Appendix 17: Mercedes-EQ brand Strategy & Ambitions (Daimler AG, 2021, pp. 3-19)

Mercedes-EQ Brand Strategy & Ambitions	**Main goal of the brand**: Achieve the carbon-neutrality in 2039
	Until 2025: Have an all-electric model in every segment, Drive the plug-in-hybrid & Battery Electric Vehicles share up to 50%, Establish a green and CO_2-neutral supply chain.
	2025 onwards: New vehicle architectures will be electric-only, Install a capacity of more than 200 Gigawatt hours (GWh) through their eight new battery cell factories around the world (one in US and four in Europe), Have ultra-high performance axial motors (acquisition of YASA Ltd. – company that has in-house development and built of radial motors with outstanding performances), Achieve a real range of over 1000km, and a single digit kWh/100km

	Cost per km (autonomy)			
km	[80€- 120€] (LOW-COST)	]120€-160€] (MEDIUM)	]160€-200€] (MEDIUM-HIGH)	> 200€ (HIGH)
[300 to 400km]	Fiat 500e Berlina Passion Fiat 500e Cabrio La Prima Fiat 500e 3+1 Passion Fiat 500e Berlina Icon Fiat 500e Cabrio Passion Fiat 500e 3+1 Icon Fiat 500e Fiat 500e Cabrio Icon Fiat 500e Berlina La Prima Fiat 500e 3+1 La Prima Renault Zoe 40 R110 Zen Renault Zoe 50 R310 Zen Renault Zoe 40 R135 Intens Renault Zoe 50 R135 Intens Renault Zoe 40 R110 Limited Renault Zoe 50 R135 Limited Renault Zoe 50 R135 Exclusive Nissan Leaf Acenta Nissan Leaf N-Connecta Nissan Leaf Tekna Kia e-Niro 39 kWh Kia e-Soul 39 kWh Citroën ë-C4 Spacetourer Feel Citroën ë-C4 Feel Pack Citroën ë-C4 Shine Citroën ë-C4 Shine Pack Opel Corsa-e Edition Opel Corsa-e Business Opel Corsa-e Elegance Opel Corsa-e GS Line Opel Mokka-3 Edition Opel Mokka-e Elegance Peugeot e-208 Active	BMW i3 Audi Q4 35 e-tron Audi Q4 35 e-tron Sportback Smart EQ Fortwo Smart EQ Forfour Fiat 500e Berlina Action Renault Twingo Electric Zen Renault Twingo Electric Intens Opel Mokka-e GL Line Opel Mokka-e Ultimate Peugeot e-Expert Furgão L1H1 Peugeot e-Expert Furgão L2H1 Peugeot e-Expert Furgão L3H1 Peugeot e-Expert Furgão Semi-glazed L2H1 Hyundai Ioniq EV Ford Mustang Mach-E AWD Mini Cooper SE - Essential Mazda MX-30 Excellence DS 3 Crossback E-tense So Chic DS 3 Crossback E-tense Performance Line DS 3 Crossback E-tense Connected Chic DS 3 Crossback E-tense Grand Chic Honda e Honda e Advance	BMW i3s Smart EQ Fortwo cabrio Mazda MX-30 Excellence Pack Plus Mazda MX-30 Excellent Pack Plus + Pack Premium + TAE Lexus UX300e Executive+	Audi e-tron S Sportback Audi e-tron S Porsche Taycan 4S
]400 to 500 km]	Audi Q4 45 e-tron Audi Q4 50 e-tron Volvo XC40 Recharge Tesla Model 3 Standard Range Plus Nissan Leaf E+ Acenta Nissan Leaf E+ N-Connecta Nissan Leaf E+ Tekna Volkswagen ID.3 Pro Kia e-Niro 64 kWh Hyundai Kauai EV (136cv) Hyundai Kauai EV (204cv) Ford Mustang Mach-E RWD ENYAQ 60 ENYAQ 60 Sportline ENYAQ 80X 4x4 ENYAQ 80X Sportline 4x4	**Mercedes-EQ EQA 250** **Mercedes-EQ EQA 350 4Matic** **EQB 350 4Matic (L)** BMW i4 M50 Audi Q4 50 e-tron Sportback Volvo C40 Recharge Tesla Model Y Performance	**Mercedes-EQ EQC 400 4Matic** BMW iX3 M Sport Audi e-tron 50 Quattro Audi e-tron Sportbak 50 Quattro Jaguar I-PaceEV 400	BMW iX xDrive 40 Audi e-tron 55 Quattro Audi e-tron GT quattro Audi RS e-tron GT Porsche Taycan (Battery Plus) Porsche Taycan 4 Cross Tourism Porsche Taycan 4S (Battery Plus) Porsche Taycan 4S Cross Tourism Porsche TaycanTurbo Porsche Taycan Turbo Cross Tourism Porsche Taycan Turbo S Porsche Taycan Turbo S Cross Tourism
>500km	BMW i4 eDrive40 Audi Q4 40 e-tron Audi Q4 40 e-tron Sportback Tesla Model 3 Long Range Tesla Model 3 Performance Volkswagen ID.3 Pro Performance Volkswagen ID.3 Pro S Volkswagen ID.4 Pro Performance Volkswagen ID.4 GTX Kia EV6 Air Kia EV6 GT-Line Kia EV6 e-GT Hyundai IONIQ 5 Skoda ENYAQ 80 Skoda ENYAQ 80 Sportline	Tesla Model S Long Range Tesla Model Y Long Range	**Mercedes-EQ EQS 450+** BMW iX xDrive 50 Tesla Model X Long Range	**Mercedes-EQ EQS 580 4Matic** Tesla Model X Plaid Tesla Model S Plaid

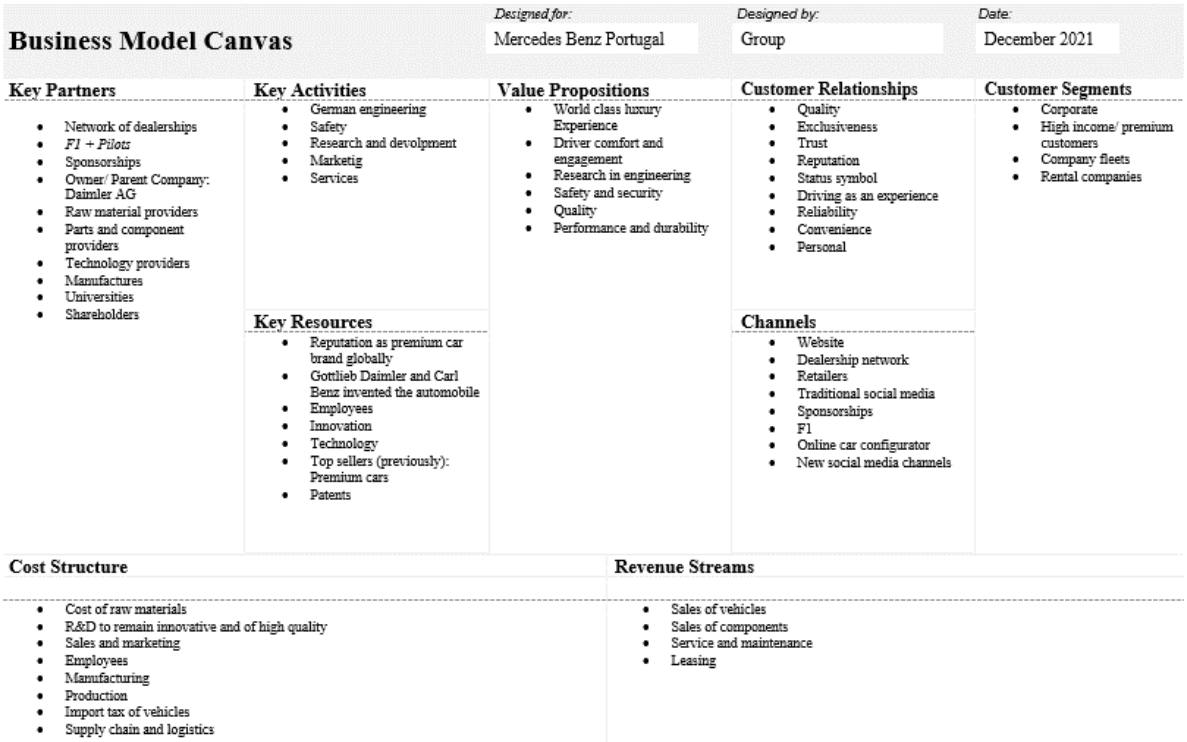
Appendix 18: Mercedes-EQ competitors (Own Creation)

DIRECT COMPETITION OF MERCEDES-BENZ EQ	INDIRECT COMPETITION OF MERCEDES-BENZ EQ
BMW Audi Volvo Tesla Jaguar Porsche	Fiat Renault Nissan Volkswagen Kia Citroën Opel Peugeot Hyundai Ford Mini Mazda Dacia DS Honda Lexus

Appendix 19: Limitations and Data Selection reasoning on Competitors' EV Sales

Brands	Limitations and Data Selection
Mercedes-Benz	Even though MB had PHEV vehicles before, only the Mercedes-EQ vehicles were considered, from 2019 onwards (Mercedes-EQ's first car was launched in 2019, Mercedes-Benz EQC).
Tesla	Tesla had its first car in 2008, the Roadster. However, we are only accounting from 2012 when Tesla stopped production on the Roadster to concentrate on its new Model S sedan.
Jaguar	Jaguar is accounted for starting in 2018, the year of the debut of their first electric car, the Jaguar I-Pace.
Audi	Audi is accounted for in 2019 when their first fully electric e-tron SUV went into production.
Volvo	Volvo is considered from 2016. Even though the brand had been present in the PHEV market a few years prior, there is shortage of data before 2016.
Porsche	Porsche is accounted for from 2020 onwards, since their first electric car was the Taycan, production-ready in 2019 but only sold in 2020.
BMW	BMW was dismissed due to the shortage of data available (little distinction between BMW group brands – BMW, MINI, and Rolls-Royce; little distinction between total car sales and EV sales; overall shortage of data);

Appendix 20: Traditional Mercedes-Benz Business Model (Osterwalder & Pigneur, 2010)



Appendix 21: Current Mercedes-Benz Business Model (Own creation)

Business Model Canvas

Designed for: Mercedes Benz Portugal | *Designed by:* Group | *Date:* December 2021

Key Partners

- Network of dealerships
- Sponsorships
- Owner/ Parent Company: Mercedes Benz AG
- Raw material providers
- Parts and component providers
- Technology providers
- Manufactures
- Major high tech companies
- Governments
- Public transportation providers
- Universties
- Shareholders

Key Activities

- German engineering
- Safety
- Invent the future of mobility
- Mobility Start-up projects, e.g. Car2Go
- Customer service

Key Resources

- Reputation as premium car brand globally
- Employees
- Innovation
- Technology
- Top Sellers today: EVs
- Vision Tokyo Project
- Partnerships with technology companies
- High end raw matereials
- Patents

Value Propositions

- World class luxury Experience
- Driver comfort and engagement
- Research and development
- Qualitative engineering
- Safety and Security
- Quality
- Performance and durability
- To shape the future of safety and sustainably
- Mobility approach through Car2Go and moovel
- Future of autonomous driving
- Electric intelligence
- Economic advantage due to rising fuel cost
- Innovators in the area of electric logistics
- Free parking spaces (car sharing) to fight the lack of space in urban areas

Customer Relationships

- Quality
- Convenience
- Exclusiveness
- Trust
- Reputation
- Status Symbol
- Driving as an experience
- Website as an experience – Car configurator
- Reliability
- Personal

Channels

- Website
- Metaverse
- Dealership Network
- Retailers
- Sponsorships
- F1
- Online Car Configurator
- MercedesMe
- New Social Media Channels
- Apps

Customer Segments

- Corporate
- High income/ premium customers
- Middle/low income customers
- Company fleets
- Rentals companies
- Car sharing companies (partly inhouse)

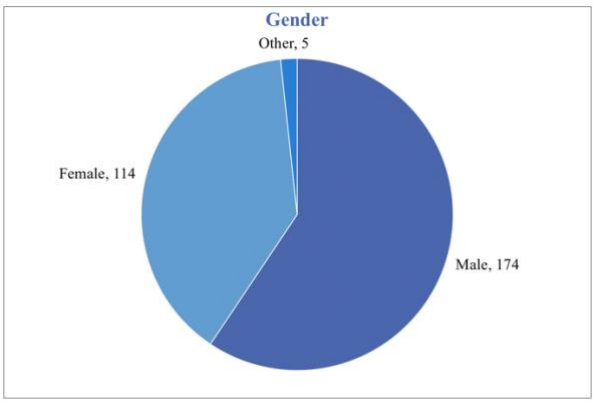
Cost Structure

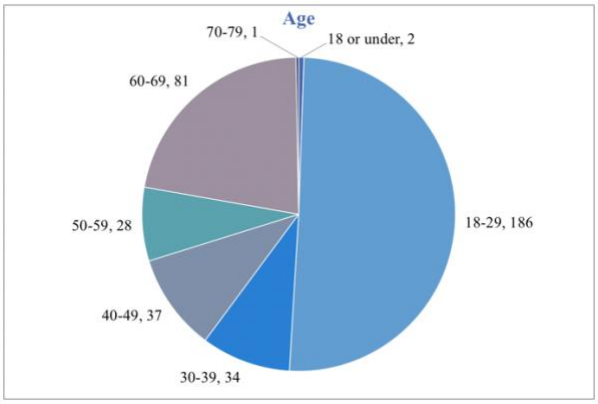
- Cost of Raw materials
- R&D to remain innovative and of high quality
- Sales and Marketing
- Employees
- Manufacturing
- Production
- Import tax of Vehicles
- Supply Chain and Logistics
- IT platforms
- Punitive tariffs

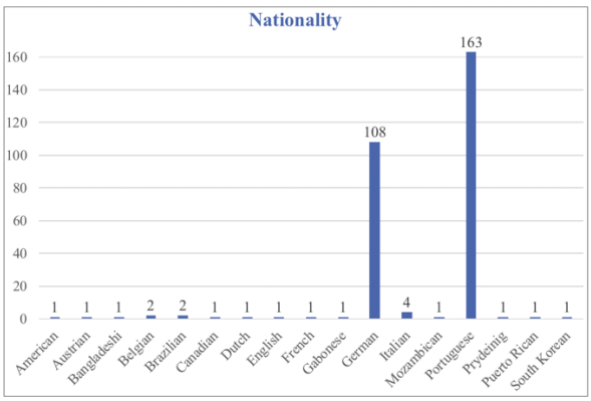
Revenue Streams

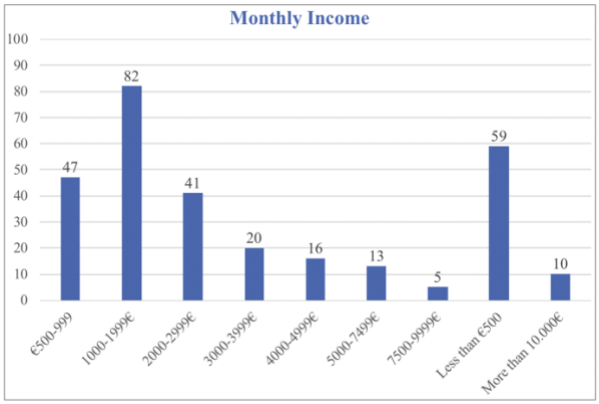
- Sales of vehicles
- Sales of components
- Service and Maintenance
- Licensing
- Mobility as a Service / Vehicle as a Service
- Leasing/ Subscription models / Using fees
- Buyback contracts
- Digital Services: MercedesMe, charging services, etc.

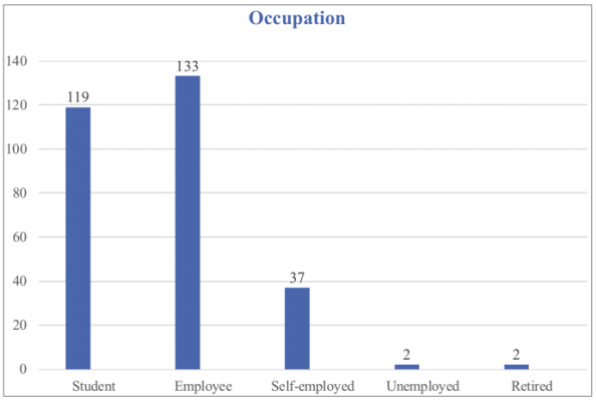
Appendix 22: Survey Results – Demographics





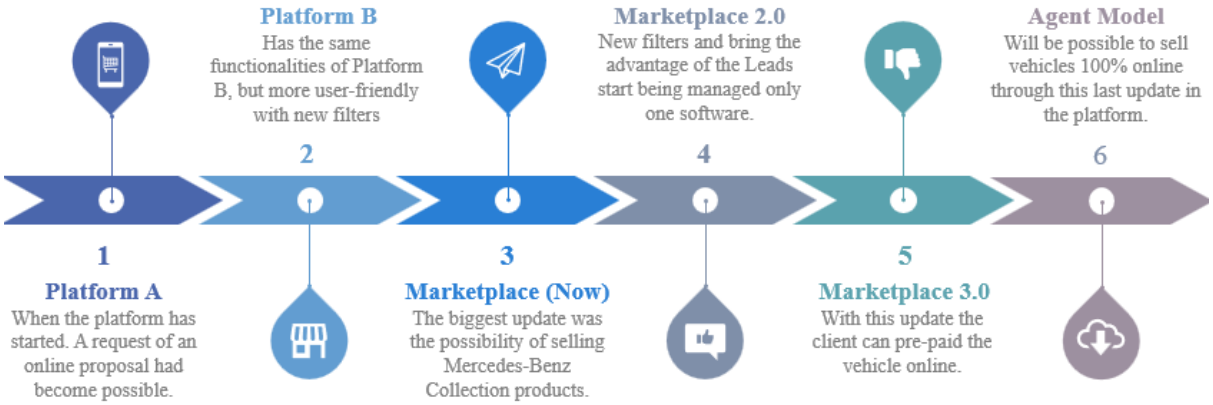




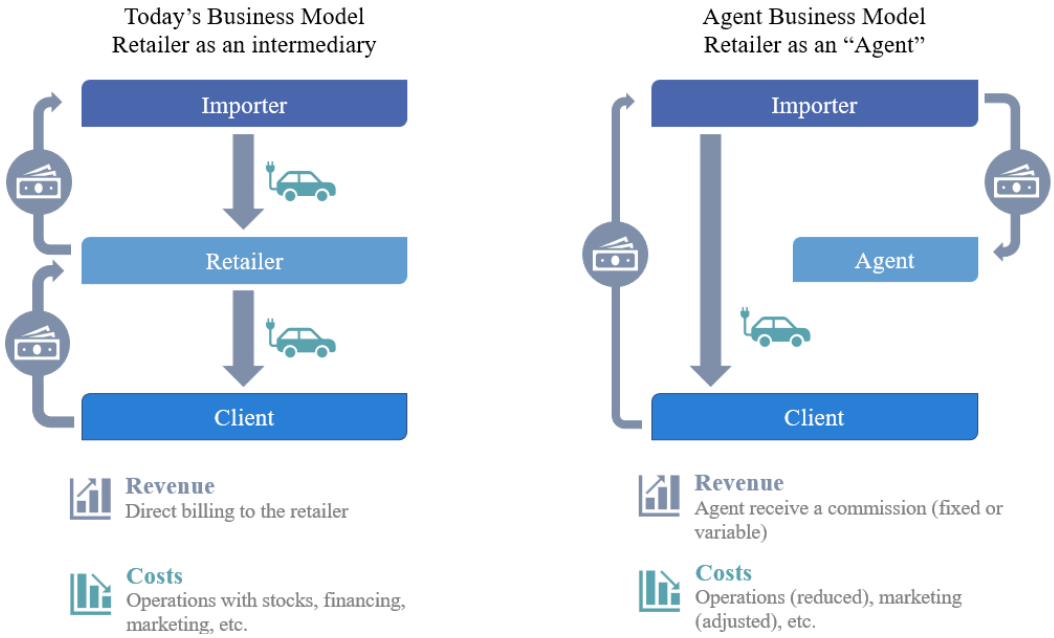

Occupation
140
120
100
80
60
40
20
0
119
133
37
2
2
Student
Employee
Self-employed
Unemployed
Retired

Appendix (Luis Rafael Roberto Abreu, 44833)

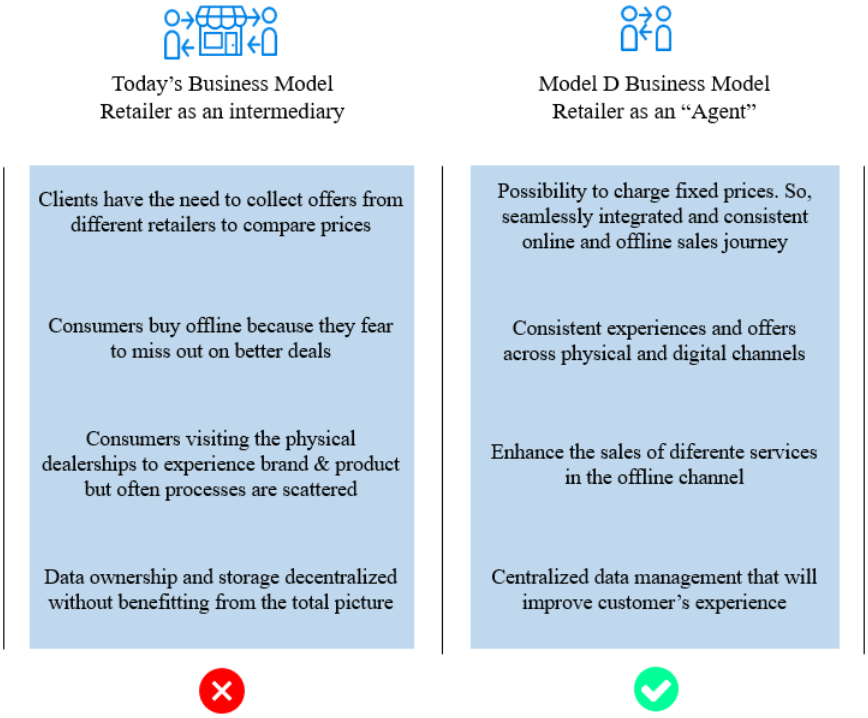
Appendix 1: Marketplace yearly updates (own creation)



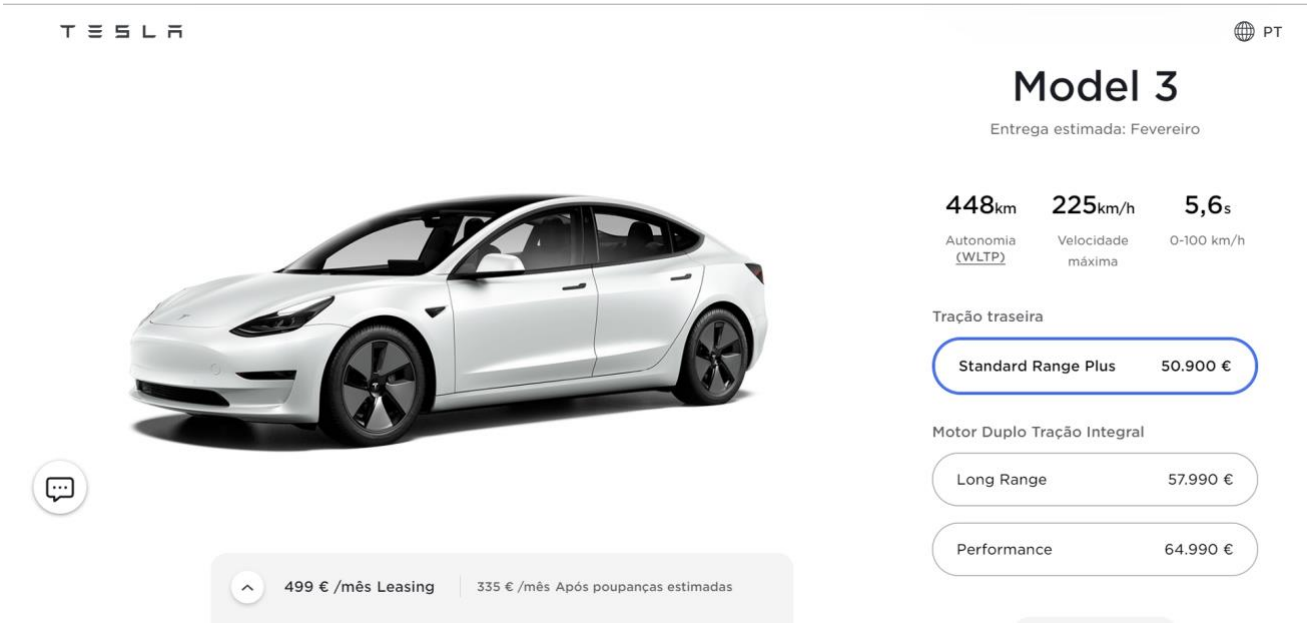
Appendix 2: Agent Business Model (own creation)



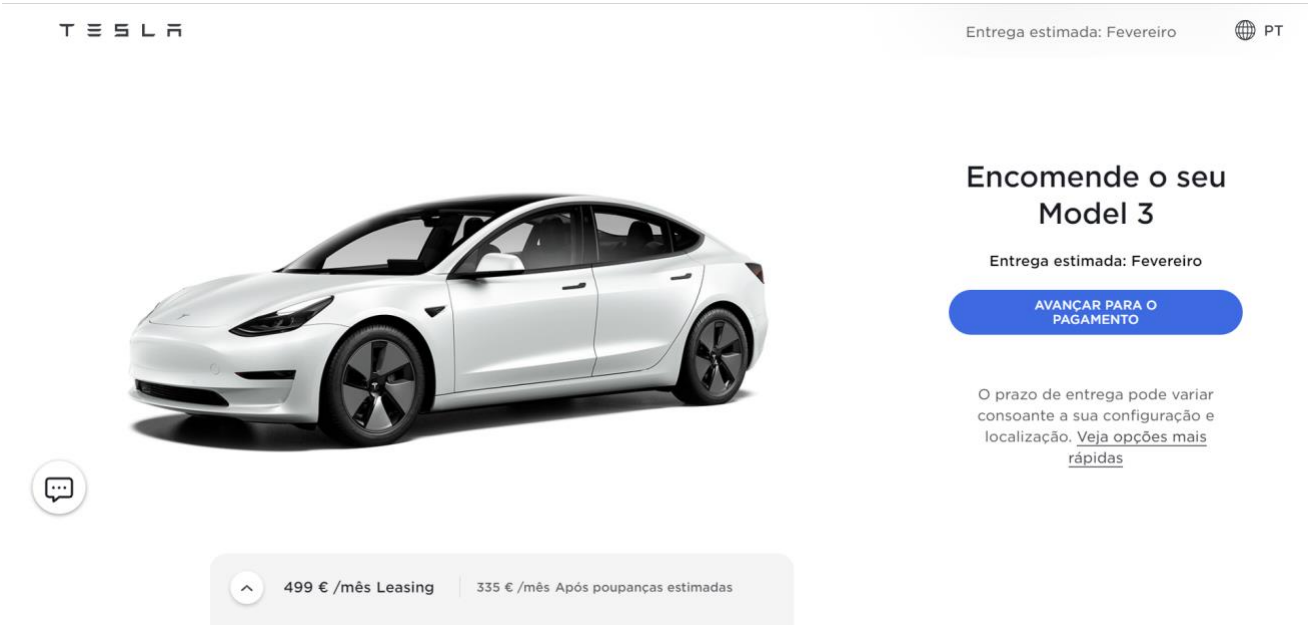
Appendix 3: Agent Business Model Advantages and Disadvantages (own creation)



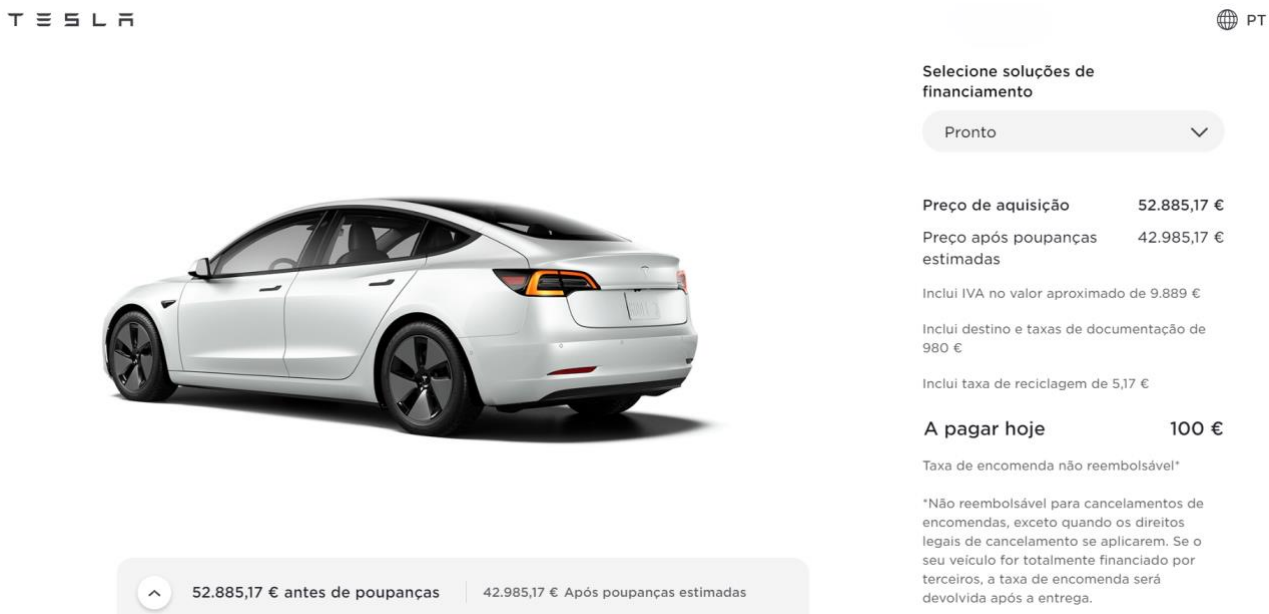
Appendix 4: Model 3 price and characteristics (Tesla 2021)



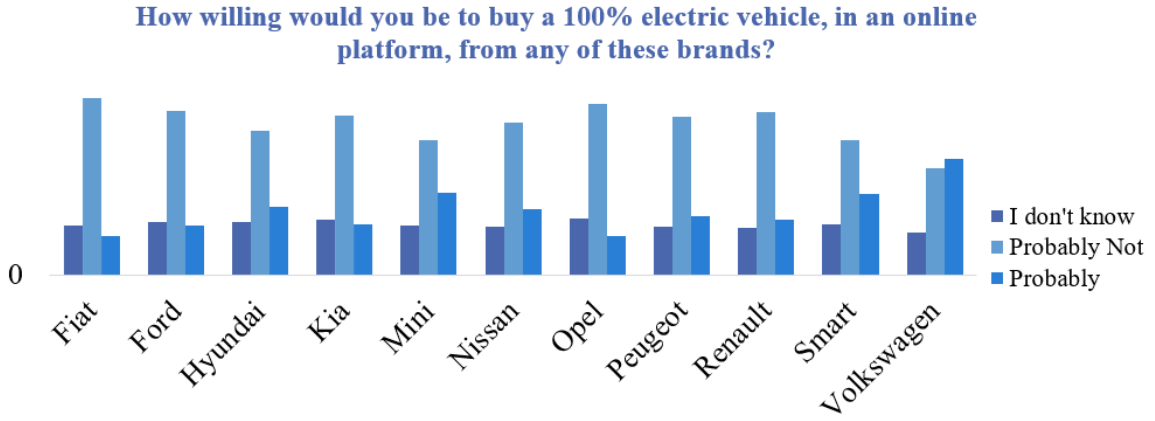
Appendix 5: Model 3 end of Configuration (Tesla 2021)

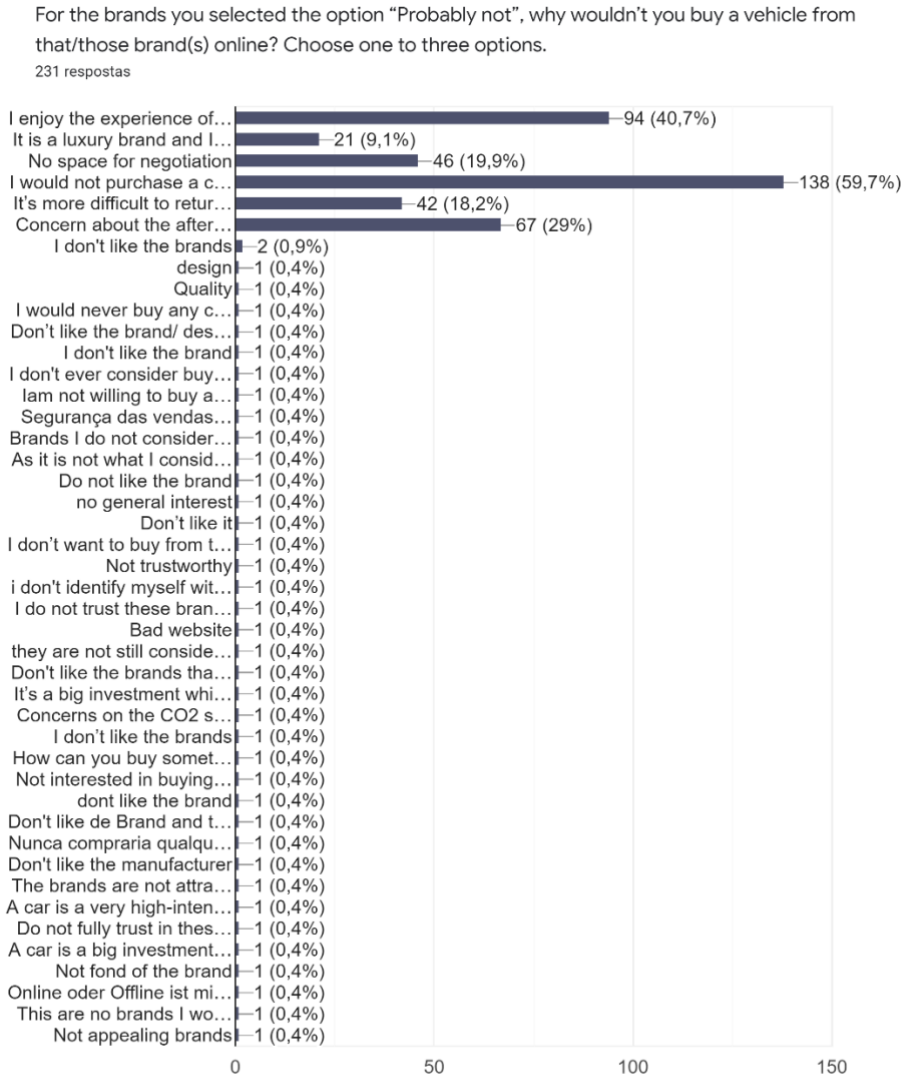


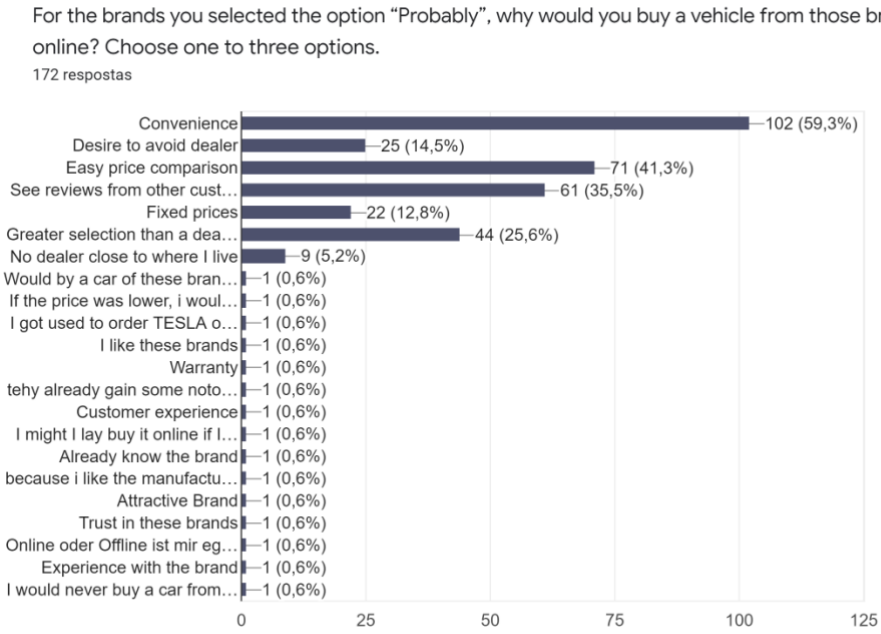
Appendix 6: Model 3 Prompt Payment option (Tesla 2021)

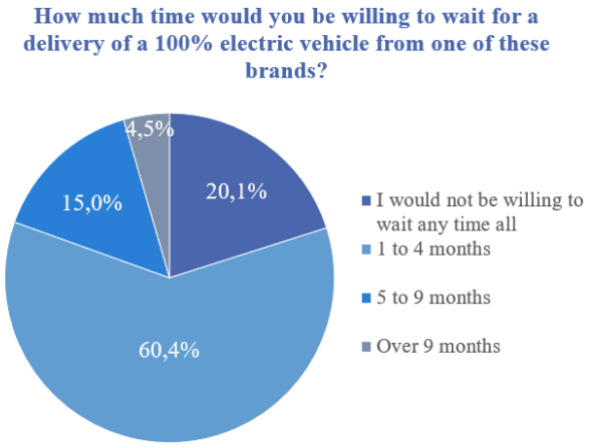


Appendix 7: Survey Construction (Kantar TNS 2018, Kantar TNS 2018, Deloitte 2021, McKinsey 2019, Magalhães, Mercedes-Benz Digitalization Process 2021)

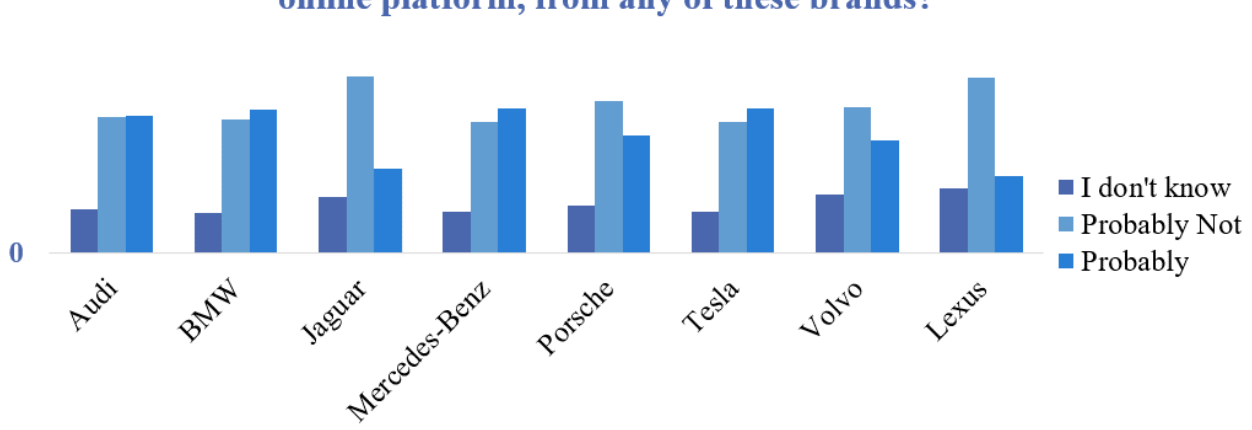


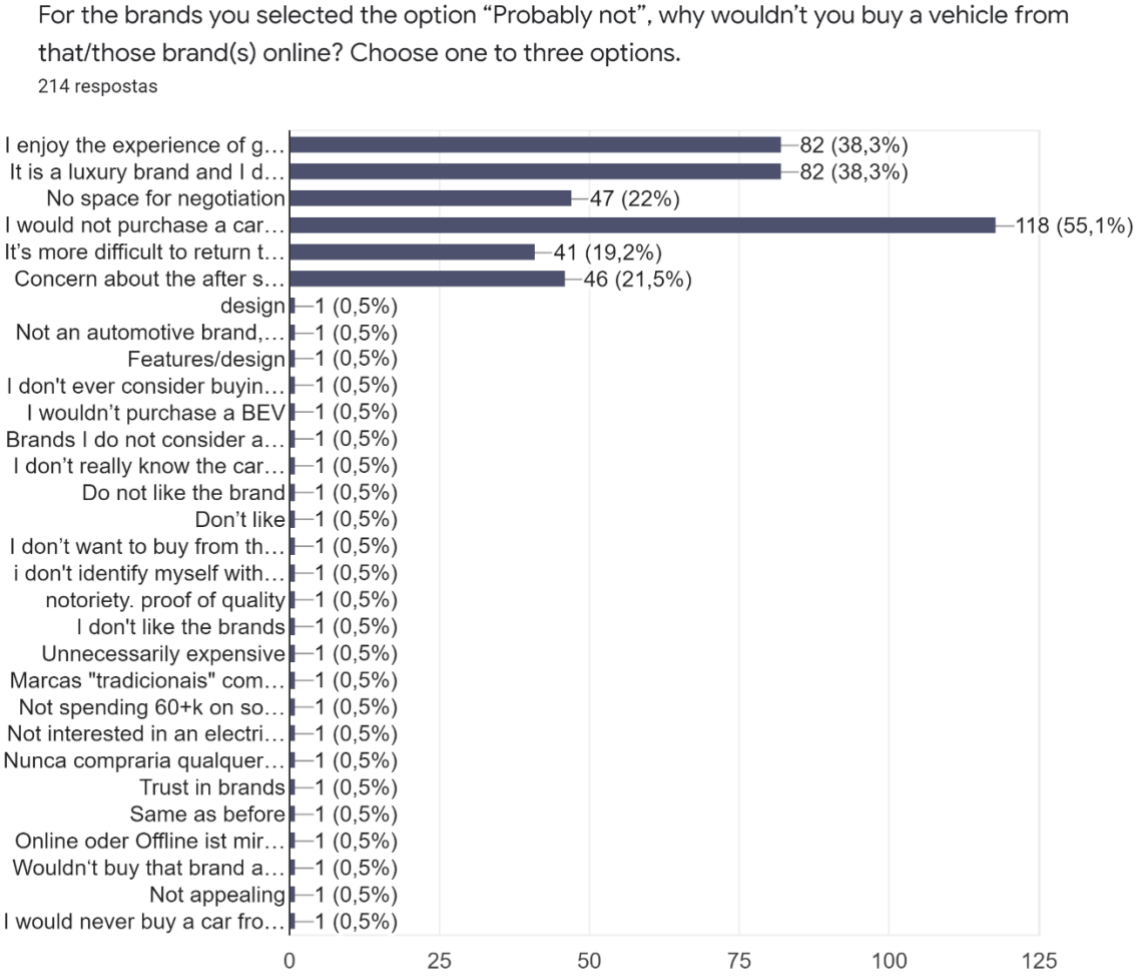


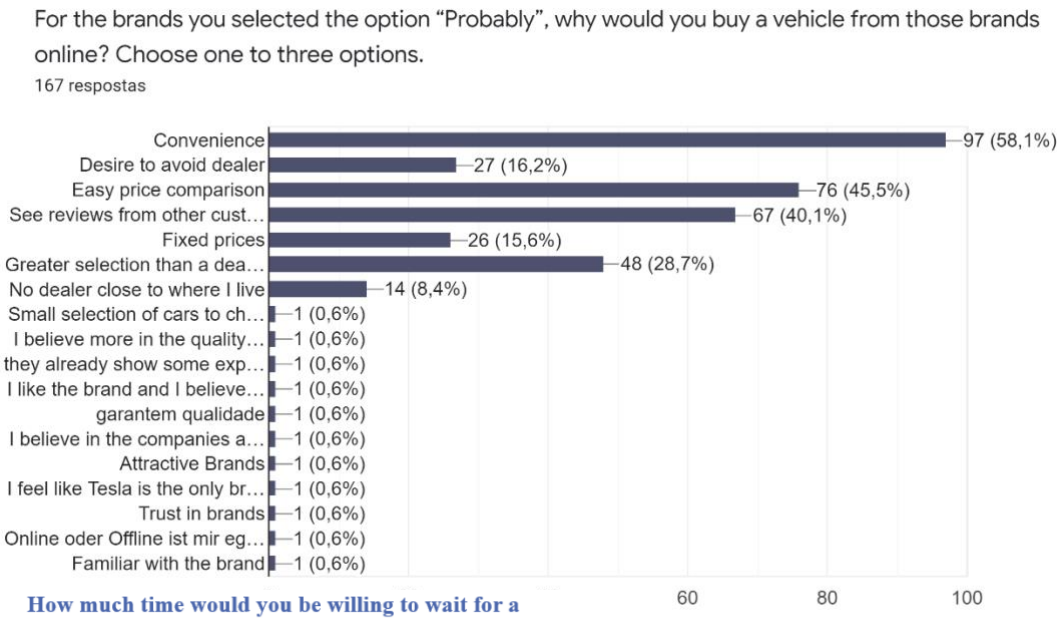


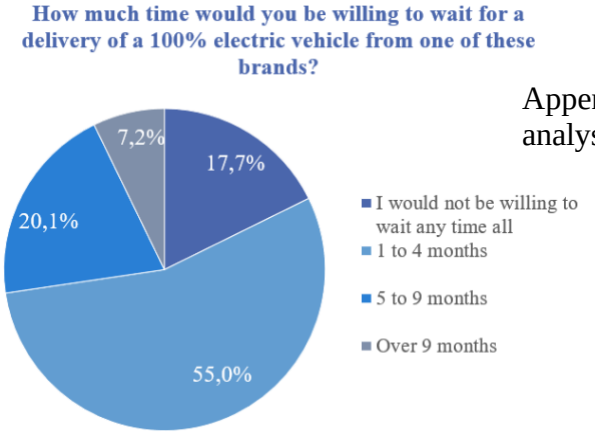


Appendix 8: MB Indirect Competitors analysis (Survey)





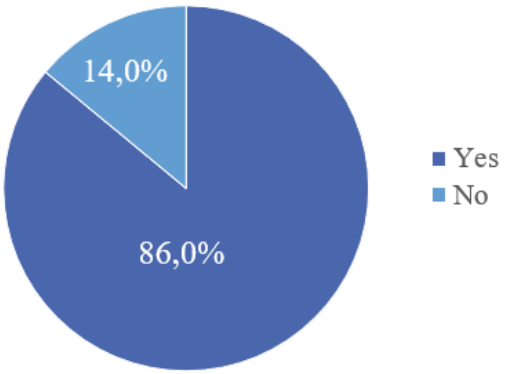




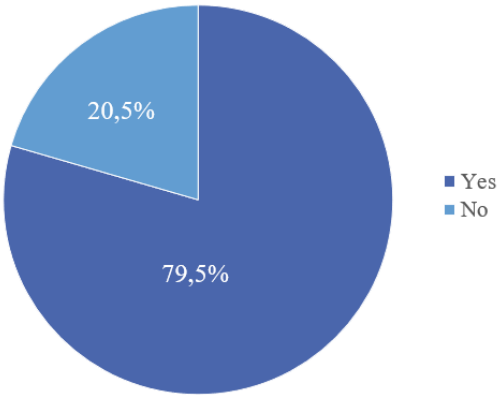
Appendix 9: MB Direct Competitors analysis (Survey)

Appendix 10: Tracking Functionality Data (Survey)

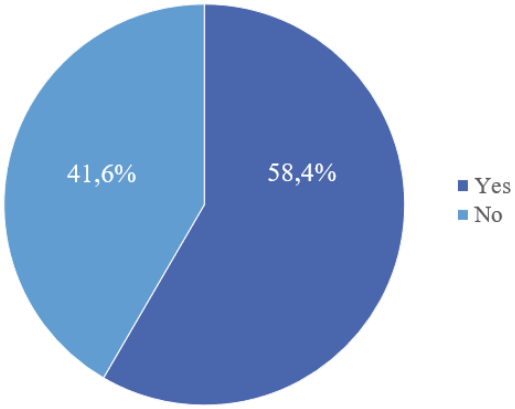
Imagine you could see the stage of the production process, what is done in that specific stage, know how much CO2 is emitted, the responsible person within the process, and which sustainable and non-sustainable materials are used, through an app or a QR code. You could further track your vehicle in real-time and know exactly where it is and when it arrives. Based on that, would this functionality increase your customer experience??



Would this functionality make you more comfortable with the waiting time of the delivery?

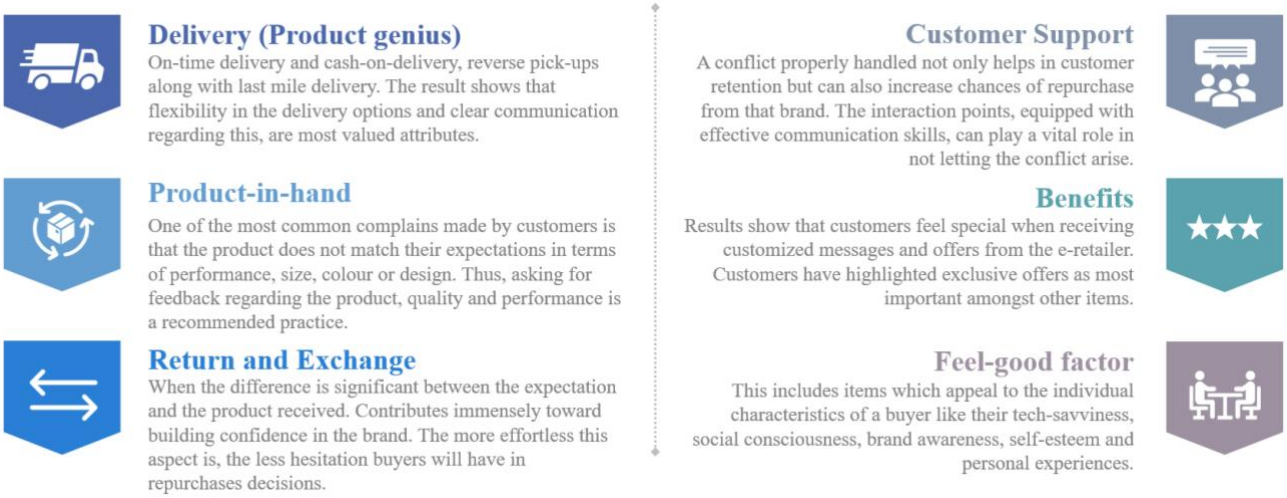


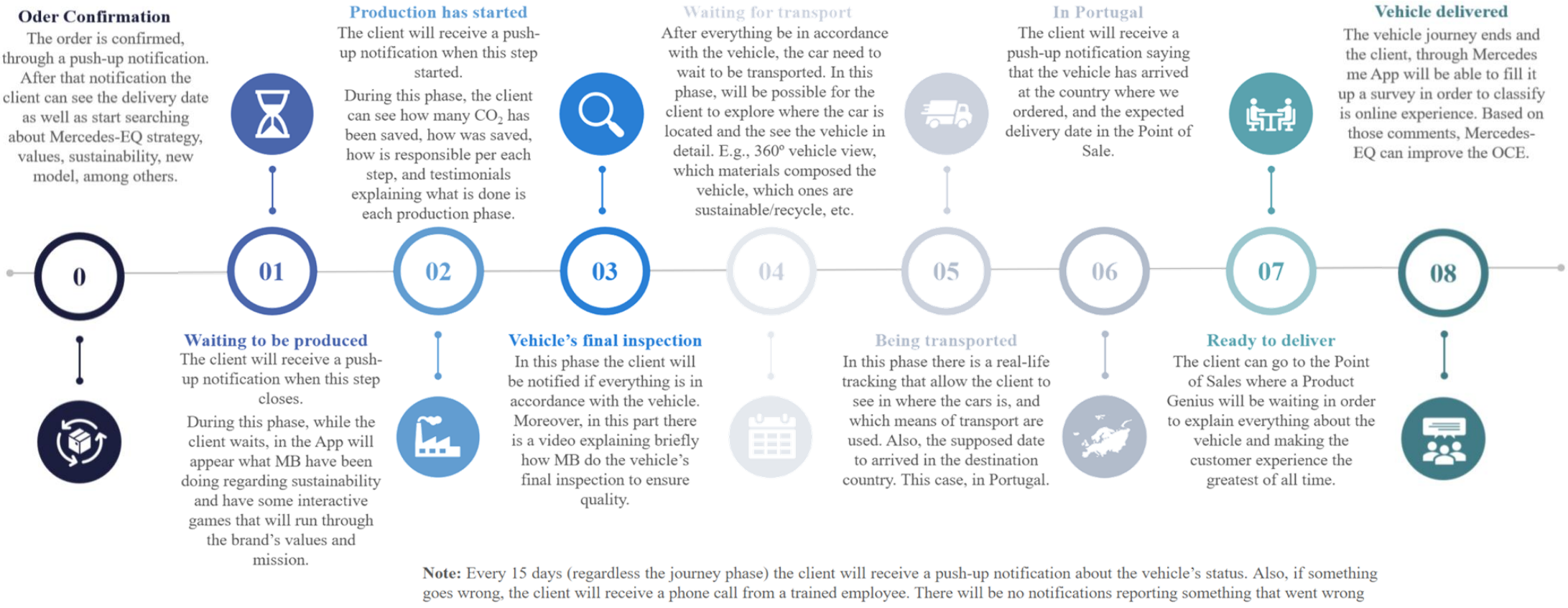
Would this functionality be considered as a key factor when you decide which vehicle to buy?



Appendix 11: Online Customer Experience (OCE) (Rose, Hair e Moira 2011)

Appendix 12: Six Dimensions that enhance OPPCE (Kumar e Anjaly 2017)



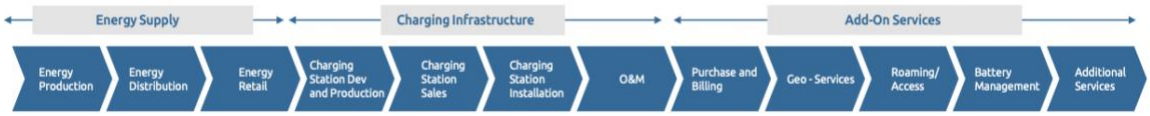


Appendix 13: Customer Journey of the Waiting Time functionality (Own creation)

Appendix (Katharina Sophia Julia Jeczawitz, 43311)

Appendix 1: Framework for Customer Satisfaction, Customer Loyalty and Retention. Adapted from (Johnson 1997)

Appendix 2: The Charging Value Chain (Capgemini 2019)



Appendix 3: Charging Hub Example by Audi AG (Still 2021)

Appendix 4: Analysis on the Current Charging Experience. (Bain& Company, Inc. 2020).

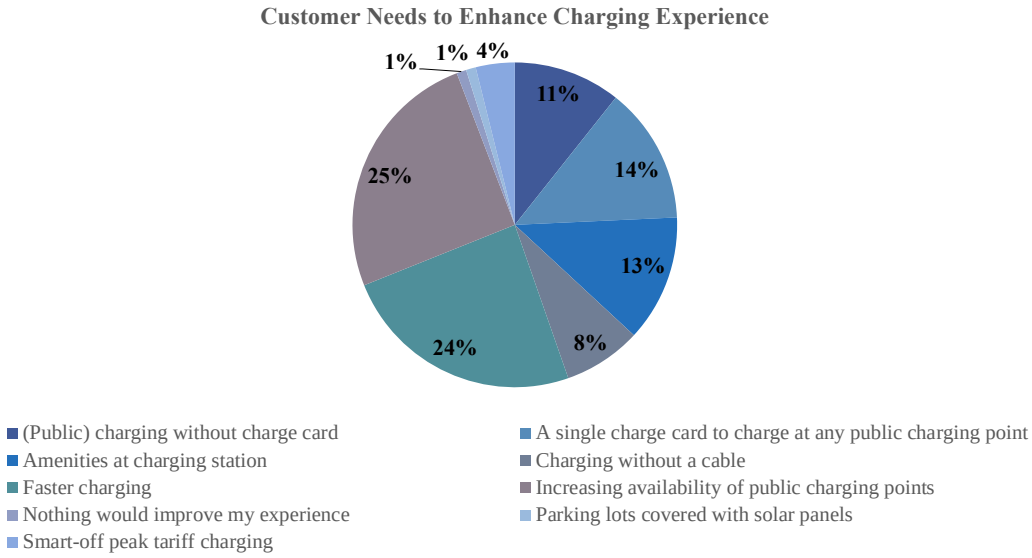
- On a scale from 0-10, how do you rate your current charging experience?*
  - If you selected 0-7, could you explain why you are not fully satisfied with your experience? Choose one or more.

	Detractors (0-6)	Passives (7-8)	Promoters (9-10)	Grand Total
Waiting time until charging is done	**9**	**3**		**12**
Waiting time until person before you is done	**11**	**2**	**2**	**15**

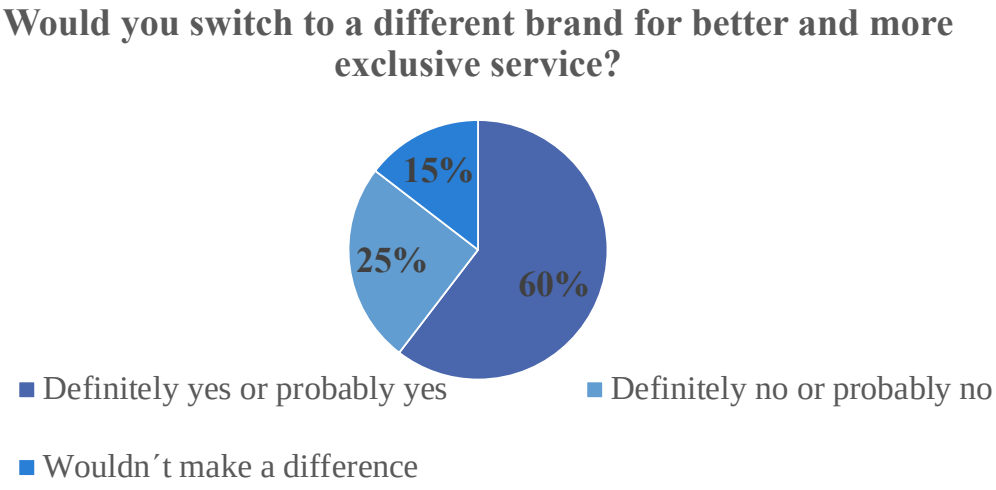
Grand Total	**20**	**5**	**13**	**38**

**The questions were phrased in alignment with the Net Promoter System - a common method to measure customer loyalty, built on the Net Promoter Score (NPS). This system utilizes customer feedback, which helps companies to achieve customer advocacy and growth by monitoring the health of customer relationship through constant learning and development* (Bain& Company, Inc. 2020).

Appendix 5: Customer Needs to Enhance Charging Experience (Survey)



Appendix 6: Switching Behavior to Different Brand (Survey)



Appendix 7: Overview of Type of Chargers (McKinsey & Company 2018)

	Explanation
Alternate Current (AC) Charging	also known as level 1 or 2, is where an in-car inverter converts AC into DC, either charging the battery at level 1 or 2, operating up to approximately 20 kilowatts.
Direct Current (DC) Fast Charging	also known as level 3, converts AC from the grid to DC and can charge the car without an inverter. This type operates at powers from 25 to more than 350 kilowatts (e.g. Ionity GmbH operating 350 kw superchargers / high power chargers)
Wireless Charging	with this type of charging, electromagnetic waves are used to charge the batteries. This type of charging can provide up to 11 kilowatts – similar to level 2 chargers.

Appendix 8: Charging Accessibility (Netherlands Enterprise Agency 2019)

	Explanation
Charge Points accessible to the Public	Provides a 24/7 public access to users
Semi-Public Charging Points	Are accessible to the public, but with restricted public access, e.g. due to parking or opening times. Examples are hotels, service stations, underground parking (workplace charging is categorized as semi-public charging in this paper)

Private Charging Points	Are operated on private sites and connected to private electricity supply.

Appendix 9: Most important Digital Charging Services to increase Customer Experience integrated within Mercedes- EQ (Mercedes-Benz 2021)

	Mercedes-Benz
***Mercedes me* Plug & Charge**	The authentication at a charging station is carried out automatically via the charging cable – no further interaction is needed but plugging in. Payment is made via ***Mercedes me* Charge** to enable a seamless charging experience.
Availability Prognosis	The feature "Popular times for Charging Stations" provides a summarized overview of the capacity utilization rate of charging station locations. This helps customers to choose the right location by giving an idea of the expected occupancy.
Range on Map	With the new NTG7, customers can easily check whether they can reach a certain destination or not and can monitor if there are still charging stations within the current range, otherwise they will get an alert notification.
Programming of Charging Settings – Eco Charging	With the EcoCharge program, the charging performance for electric vehicles is reduced and limited to 80%, mainly to protect the battery and to make charging more energy efficient.
Programming of Charging Settings – Weekly Profile	With the new feature “Weekly Profile”, the customer is able to set single or regular departure times within his daily routine throughout the week.

Appendix 10: Competitive Benchmark (Statista 2021)

	Mercedes-Benz	**Porsche AG**	**Audi AG**	**BMW Group**
Charging Innovations	Potential Premium Charging Sites *(further*	Porsche Charging Hub *(further explanation in text)*	Audi Charging Hub *(further explanation in text)*	The BMW Group is currently implementing workplace charging options to fleet or company car drivers at a large scale.

	explanation in text)			On its own grounds, the company aims to roll out a project with a total of 4,100 charging points in Germany by 2021 – 50% being available to the public (BMW Group 2020).
Ionity Joint Venture	yes	yes	yes	yes
Charging Service	*Mercedes me*	Porsche Charging Service	Audi e-tron Charging Service	BMW Charging
Electric Model	Mercedes-EQ	Porsche Taycan	Audi e-tron GT**	BMW iX3
Charging Speed	The Mercedes-EQA, e.g., has a range of 426 km and a 66.50kW battery. The model charges from 15% to 81% in approximately 30 minutes (240km).	The Porsche Taycan currently takes around 22.5 minutes to charge from 5 to 80 percent if charged at a DC station	The Audi e-tron GT** can be charged up to 270 kW. In particular, charging from 5 to 80 percent takes around 23 minutes.	BMW iX3 can be charged up to 80% within 35 minutes at HPC stations.
Number of available charging points for electric cars in the DACH region by automotive OEM charging service in 2021	55.700	46.840	55.700	55.700

Appendix 11: Excurse of Tesla Inc. (Tesla Inc. 2021)

Within the competitive analysis, Tesla is not considered as a direct competition to the individual OEM players in connection with charging, but rather to Ionity. Tesla is a pioneer in the electric mobility industry and a “booster” of electric transformation (Villa 2021). This gives them a clear competitive advantage in terms of quantity of charging possibilities. While Tesla chargers were exclusively accessible to Tesla customers, the company has started a pilot project in the Netherlands in November 2021, giving third parties access to ten superchargers as of now (Tesla Inc. 2021). Their intensive network of superchargers (25,000 worldwide) and ambitions to increase their presence further, currently positions the company ahead of MB and other premium OEM´s. As the analysis evolves around exclusiveness within the charging experience and compares innovations of premium OEM´s for exclusive luxury, Tesla is not considered as a direct competitor in the respect that it is an established player to increase mass adoption of electric mobility.

Appendix 12: Overview of complete SWOT Analysis

Strengths

- Brand reputation and strong brand value
- Established OEM and player in the automotive industry
- Technological and financial capacities (€40 billion investment into electric industry (2022-2030))
- Highly qualified labor force
- Luxury car brand

Weaknesses

- High R&D, CAPEX and operating costs
- Cannot reach the critical mass, solely targeting premium customer group, too expensive (Villa 2021), (McKinsey & Company 2018)
- Lack of know-how in field of electric charging
- Dependence on established firms with necessary competencies
- Contributes to electric transformation, however not to the same extend as cooperation's and partnerships (e.g. Ionity, Shell), that flourish the existence of a charging infrastructure. Current priority remains the development of a dense charging network (quantity), while second priority remains focus on customer satisfaction

Opportunities

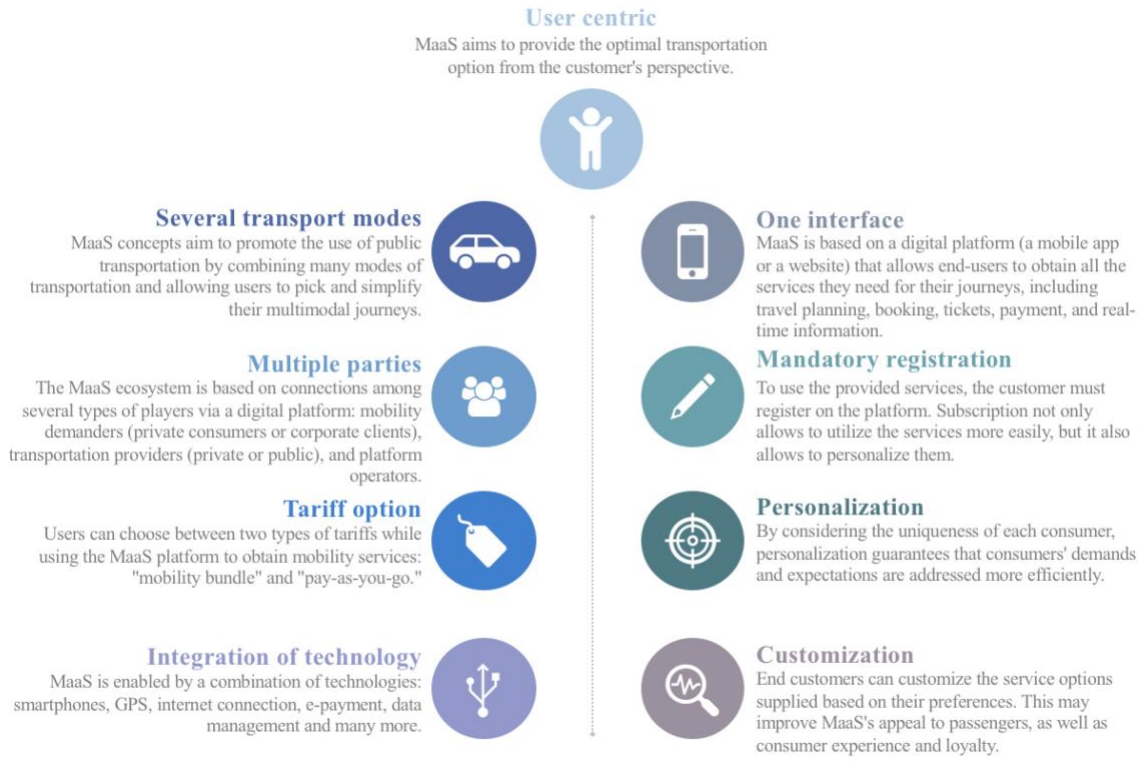
- New business opportunity, beyond vehicle sales
- Competitive advantage
- Fulfilling needs of premium customers, specifically EQ customers: "exclusive customer, exclusive offer" (Viana 2021)
- Increase customer experience by making waiting time more durable and creating seamless charging experience, "convenience is everything" (Viana 2021), specifically for public charging experience for longer-travels
- Increase customer retention, as 60% of customers selected "Yes" or "Probably Yes" whether they would switch to a different brand for better & more exclusive service in the questionnaire (see Appendix 6)
- Complement partnerships without being threat to CPOs (e.g. Ionity), as sufficient demands are there (Teufl 2021), and development of dense infrastructure & charging accessibility is of utmost importance for CX (Krizansky 2021)
- Lucrative marketing initiative to increase brand awareness (Villa 2021) (Teufl 2021)
- Spill-over effect to actual business of selling vehicles
- Increase European and International presence
- EU incentives and political ambitions to become

Threats

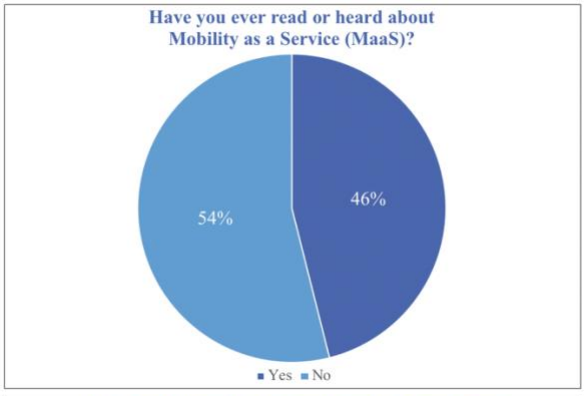
- Other premium OEMs announced exclusive charging hub´s (see Appendix 10)
- Established firms in the market, and increasing number of newcomers
- Technological competition from US and Asia
- Covid-19 and semiconductor crisis
- Quickly evolving innovative technologies (autonomous charging, inductive charging, hydrogen alternatives)
- Standardization regulations (Combined Charging System)

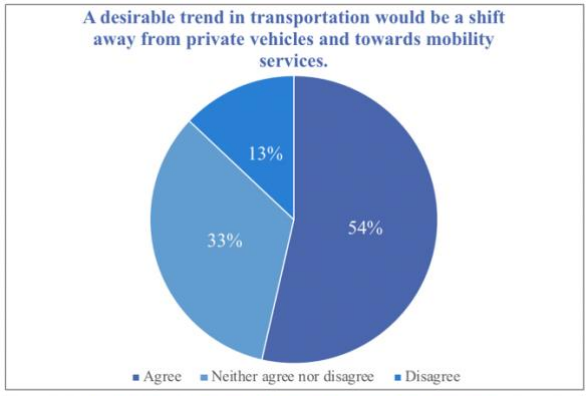
Appendix (Alexandra Scholler Edle von Konty, 44704)

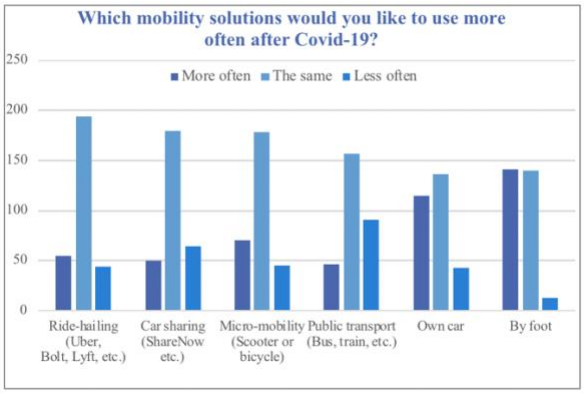
Appendix 1: MaaS' key characteristics (Jittrapirom, et al. 2017)

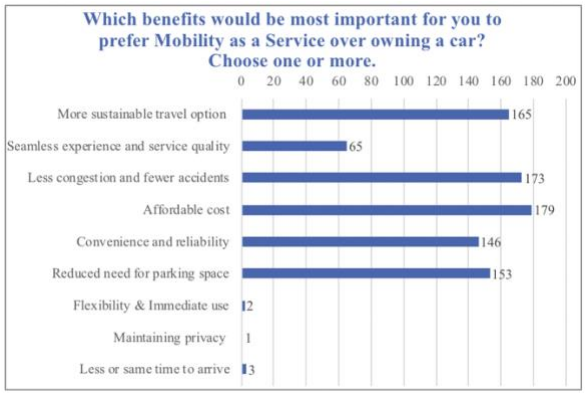


Appendix 2: MaaS (Survey)

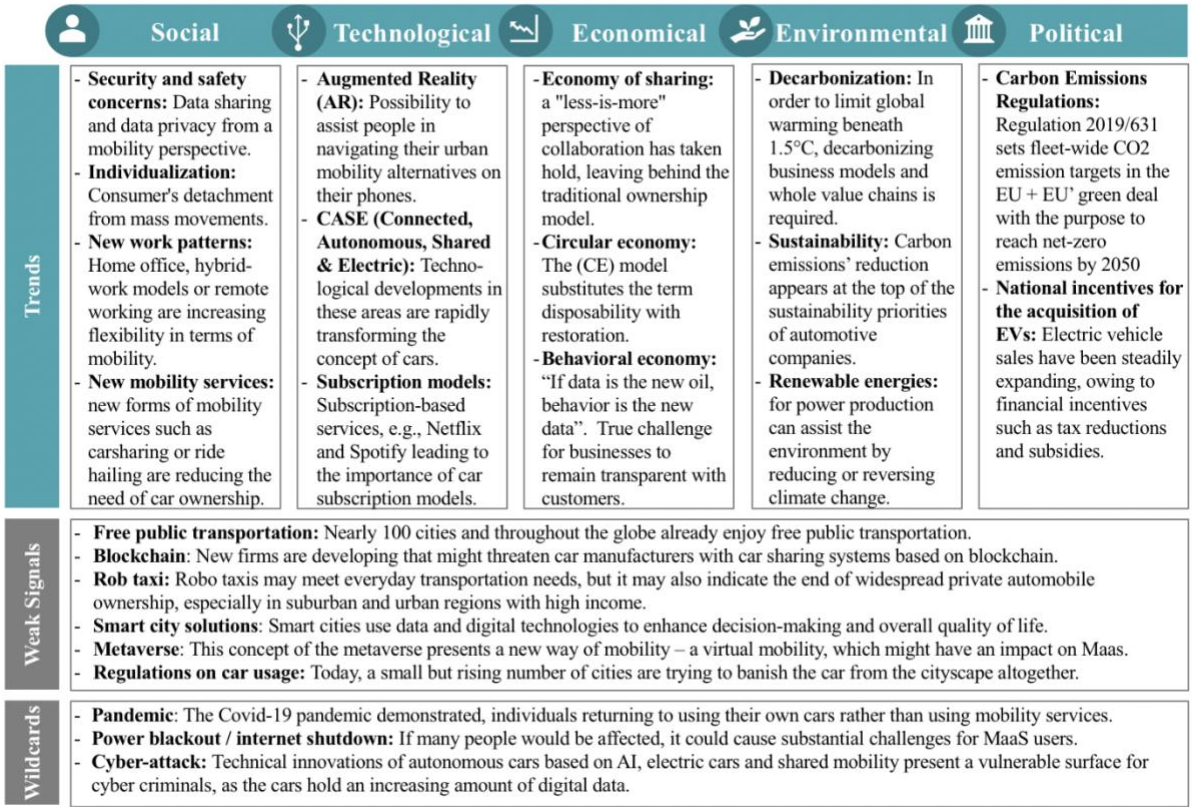








Appendix 3: STEEP Analysis – Trends, Weak signals and Wildcards (zukunftsinstitut 2021, EY 2020, PWC n.d.)



Appendix 4: Uncertainty Survey – Results

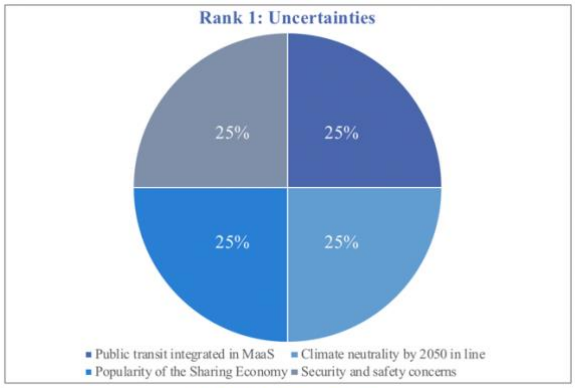
Please rank the top five uncertainties you perceive for MaaS development in cities by 2030.

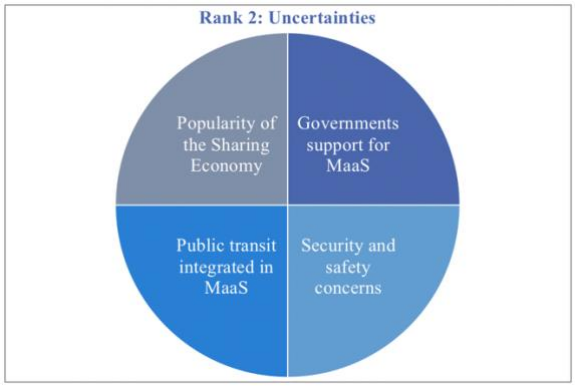
Uncertainties:

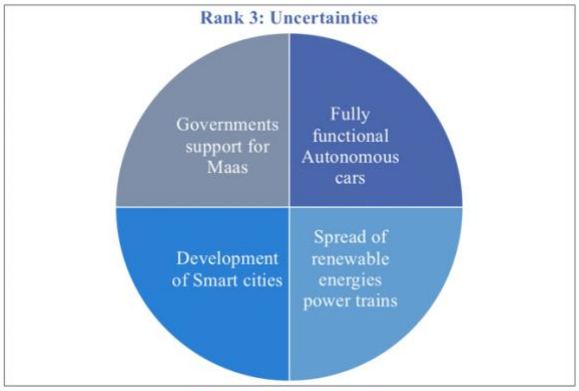
1. New work patterns impact mobility
2. Trend of Individualization remains
3. Security and safety concerns
4. Fully functional Autonomous cars
5. Implementation of VR/AR in everyday life
6. Development of Smart cities
7. Popularity for Subscription Models
8. Popularity of the Sharing Economy
9. Adoption of a Circular Economy
10. Implementation of decarbonization in businesses and value chains
11. Climate neutrality by 2050 inline
12. Spread of renewable energies
13. Public transit integrated into MaaS
14. Regulation on car usage
15. Governments support for Mobility as a service

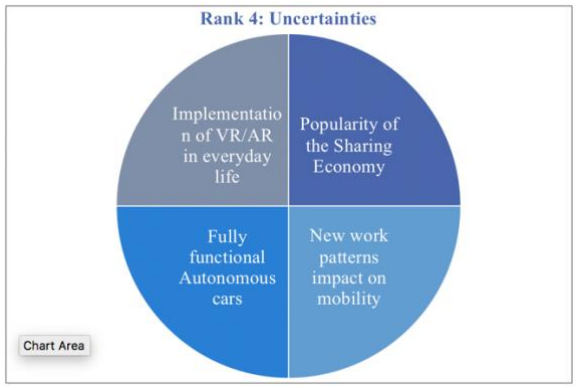
Please rank your selected five uncertainties regarding their potential impact on the development of MaaS in cities by 2030.
High impact – Medium impact – Low impact

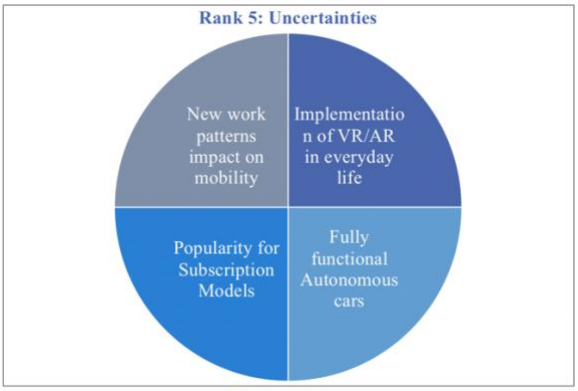
Results:

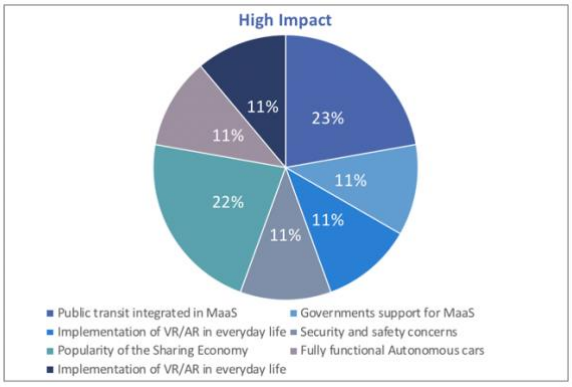


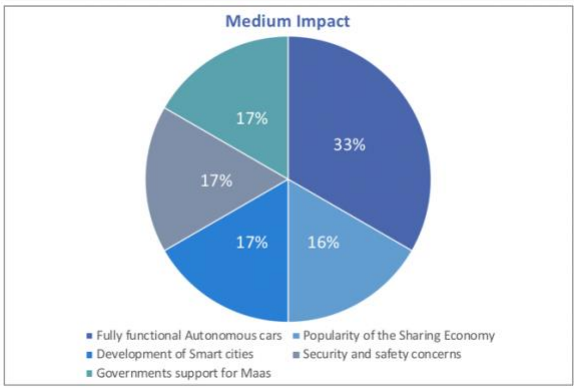


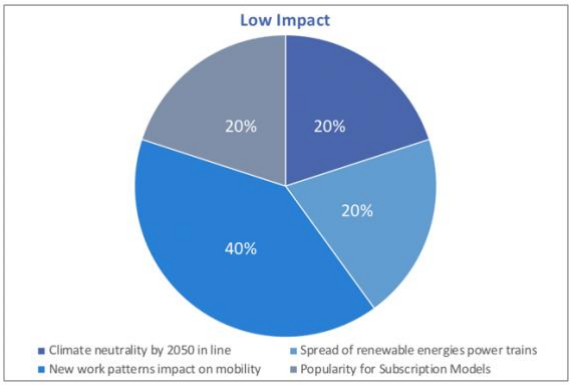




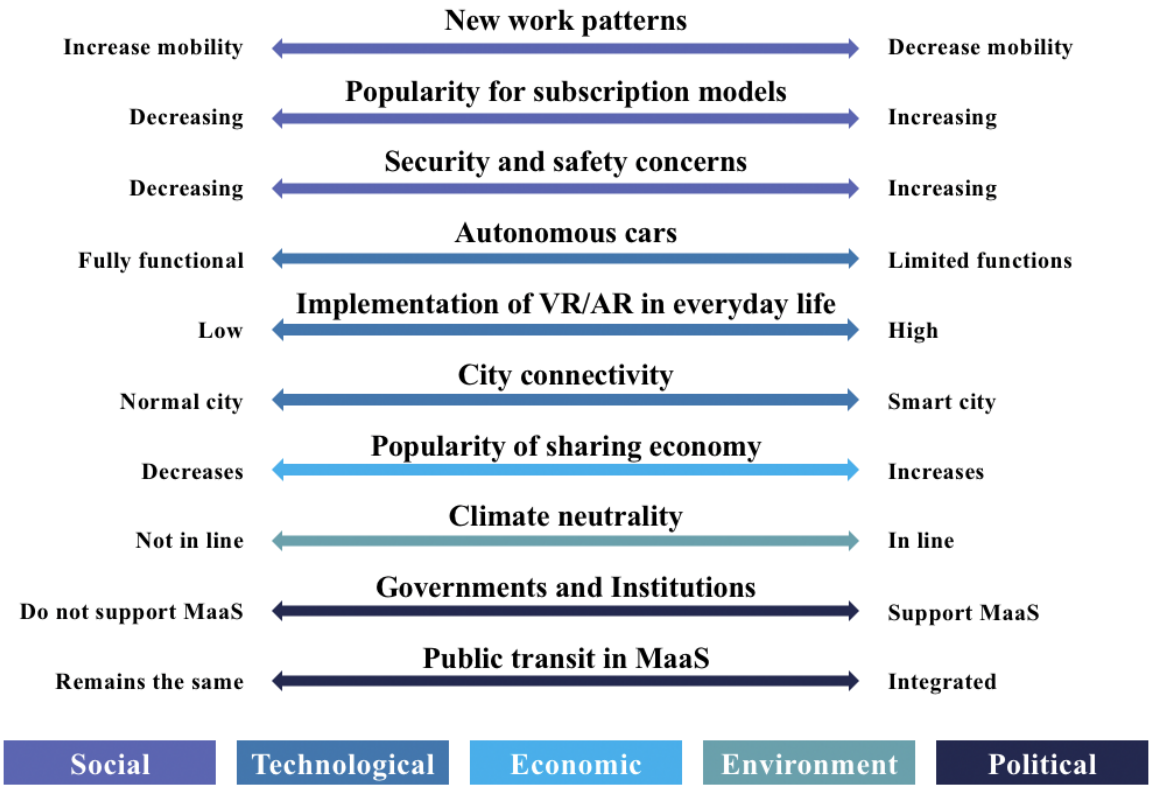






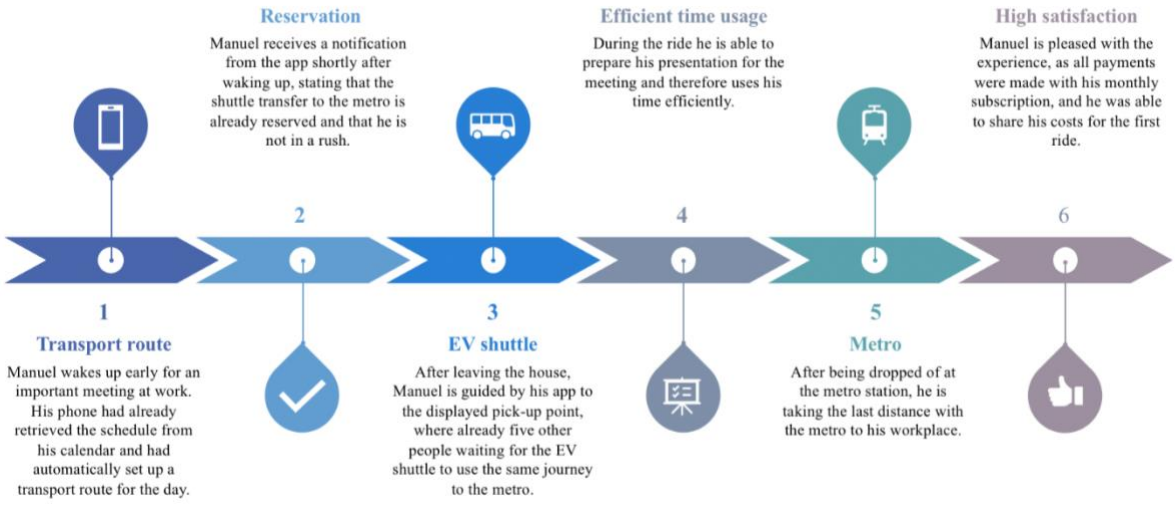


Appendix 5: Ten significant Uncertainties (Own creation)

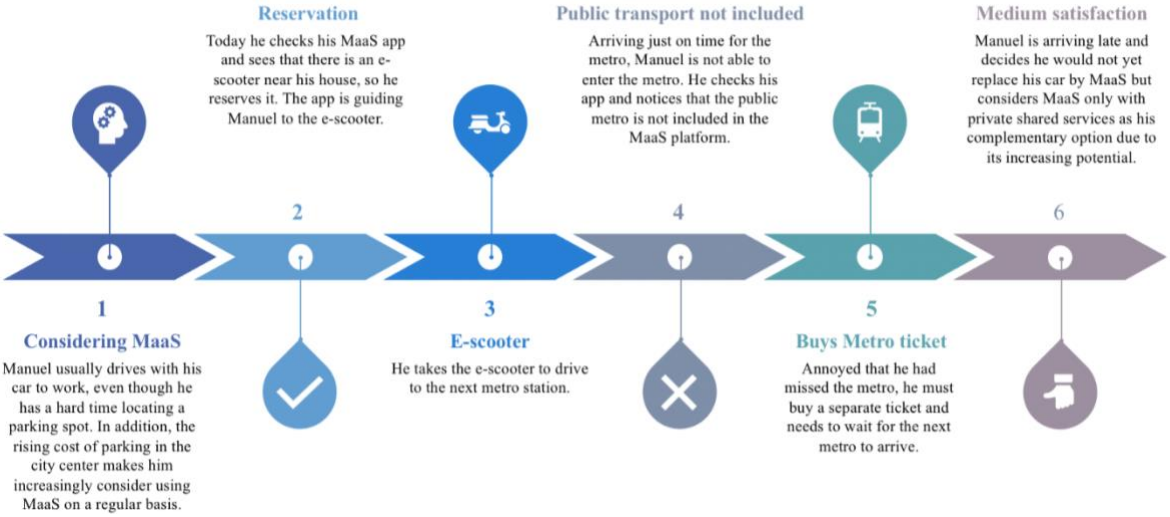


Appendix 6: Customer journey of the four scenarios (Own creation)

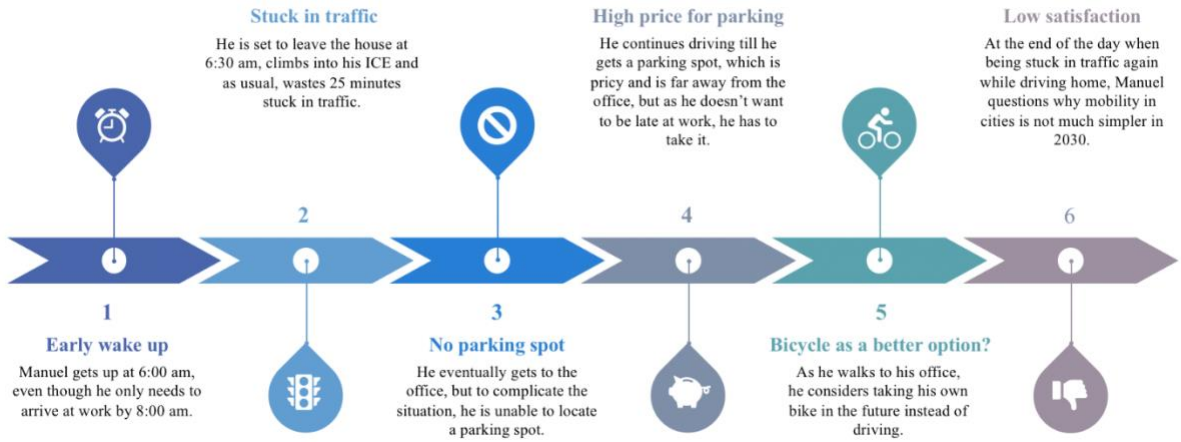
Scenario 1: Seamless Experience



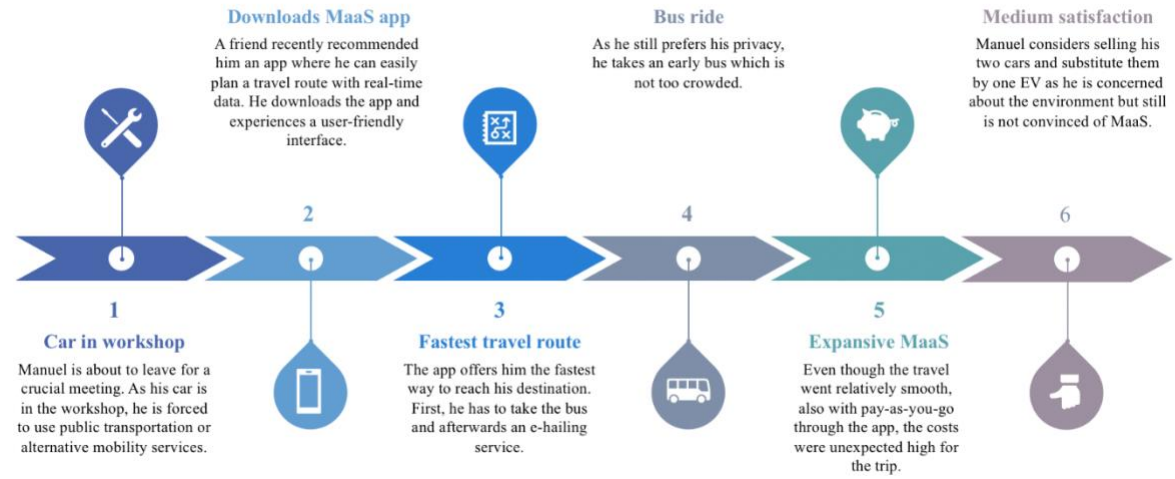
Scenario 2: The uprising of private shared services



Scenario 3: Still stuck in traffic

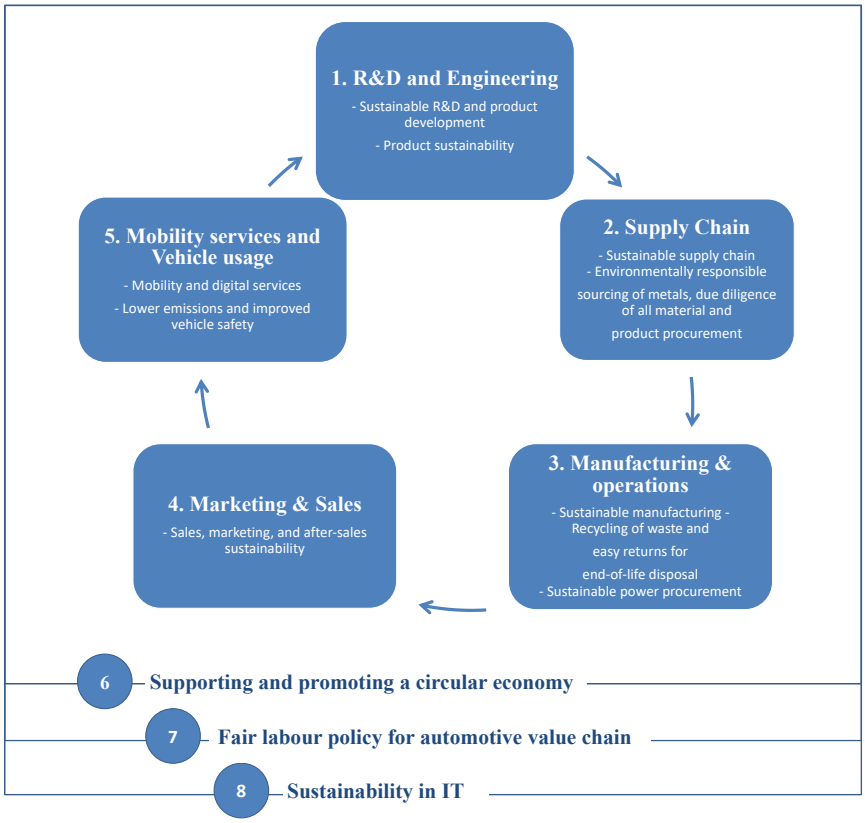


Scenario 4: Disbelieve in freedom of mobility



Appendix (Catarina da Rosa Ferreira, 32169)

Appendix 1: “Sustainability throughout the automotive value-chain” (Winkler, et al. 2020)



Appendix 2: Sustainability across MB value-chain

Areas	**DAIMLER**	
Brands	Mercedes-Benz	Mercedes-EQ
R&D and engineering	**Mercedes-Benz Energy:** "Mercedes-Benz AG subsidiary responsible for the development of innovative energy storage solutions" (Daimler 2021). **FCEVs**: **GLC F-CELL (**fuel-cell vehicle as a plug-in hybrid).	
Supply Chain	**Carbon-Neutral Target Date:** 2039 **2022:** "All **European plants** will be **CO_2-neutral".** "From 2039 at the latest, only **production materials** that have been **produced on a carbon-neutral basis** in all value-creation stages will be allowed through the plant gates of Mercedes-Benz. A supplier declining to sign the Ambition Letter will not be eligible for new supply contracts" (Daimler 2021). **"Standard for Responsible Mining"** of the "Initiative for Responsible Mining Assurance" (IRMA) is a key criterion for supplier decisions and contracts in raw material supply chains. **Workshops with suppliers:** Aim to identify effective CO_2 reduction measures, with a goal to establish CO_2 targets as one key criterion in making supplier decisions and contracts across all major commodities.	**"Factory 56" - The car factory of the future:** CO_2-neutral from the start.
Manufacturing & Operations *(Recycling of waste and easy returns for end-of-life disposal, Sustainable power procurement)*	**Recycling**: "Potential **recycling ratio of 85%.** Recycling of raw materials is included in the strategy" (Daimler 2019). **Logistics: "**In 2020, rail transport in MB transport logistics was converted to a carbon-free energy supply with the help of Deutsche Bahn" (Daimler 2021). **Power-procurement: "**Continuous increase in energy efficiency, use of green power, and realization of a sustainable heat supply. By 2022, factories worldwide will obtain electricity only from renewable sources". **BEVs Production: "**By 2030 50% of car sales will be made up of EVs. Electrifying vans, trucks, and buses is another goal".	**2022:** 8 Mercedes-EQ EVs series will be produced at 7 locations on 3 continents (Daimler 2021). **Power-procurement:** "Factory 56" uses renewable energy.
Mobility services and Vehicle Usage	**Park Now:** "Digital parking service which facilitates ticket and cashless parking" (Park Now 2021). **Share Now:** Joint venture of Daimler AG and BMW offering carsharing services in urban areas in Europe, and North America. **Free Now:** Former "My Taxi". Joint venture Daimler + BMW. Taxi and ride-hailing app. **Reach Now**: MaaS app. **Charge Now**: Charging networks for EVs. (Daimler 2021)	
Sales, marketing, and after-sales sustainability (Partnerships/ Agreements)	**"Transform to Net Zero" initiative: "**Founding member of a climate protection initiative of internationally leading companies established by Microsoft". **Mercedes-Benz Energy and ANDRITZ sign cooperation agreement: "**Agreement to supply modern hybrid energy solutions for the hydropower market based on stationary energy storage systems". **Farasis: "**Long-term partnership with a Chinese company, Farasis Energy (Ganzhou Co.), a Chinese battery cell manufacturer including the acquisition of a stake in the shareholder structure" (Mercedes-Benz 2020)**.** **Mercedes Me Charge**: "An app that enables drivers to conveniently charge their cars at various public charging stations in Europe, wherever possible with energy from renewable sources" (Mercedes-Benz Portugal 2021)**.** **Portugal:** • **EQ Lounge in Nazaré** – "Building 100% sustainable that aims to support surfers and improve the brand image in sustainability-related terms. It uses green energy to supply the space and has implemented an installation on site of a biological treatment station for greywater (water produced by the building) that requires specific treatment" (Mercedes-Benz Portugal 2021). • **GalpElectric:** "The client benefit from a discount on energy for electric mobility electricity, as well as discounts on Evologic fuel with the GalpElectric card" (Mercedes-Benz Portugal 2021). • **EDP: "**MB is an EDP's Electric Mobility partner, which gives advantages for its users in terms of charging at home, outside, and more" (EDP 2021). **Brand Transparency:** • **CDP: "**assesses the environmental impact of Mercedes-Benz's supply chain." • **Public Reports: "**The Group's sustainability report has provided detailed information on this topic every year since 2006" (Daimler 2021). • **Daimler Sustainability Dialogue: "**In November 2020, brought together over 200 representatives from business, science, politics, NGOs, associations, trade unions, and local authorities in the digital space" (Daimler 2021). • **Daimler Sustainability Newsletter:** Monthly updates on the progress in the company's sustainability commitment.	

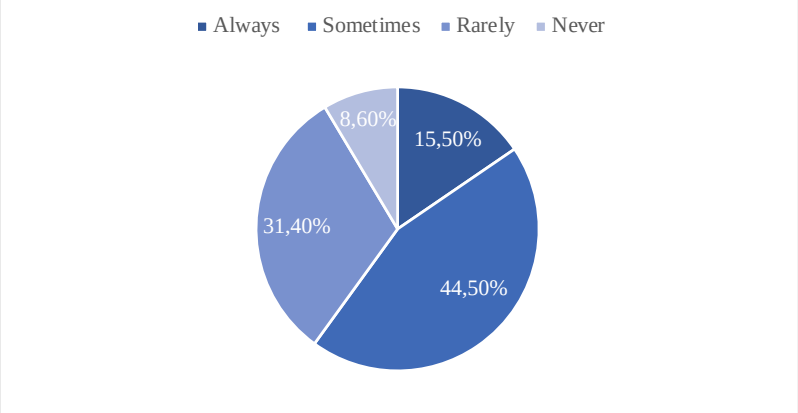
Appendix 3: Sustainability across BMW value-chain

INITIATIVES	BMW
R&D and engineering	**Battery Recycling:** Joint venture to develop a fully sustainable value chain for battery cells. **FCEVs:** iX5 Hydrogen - Earlier this year, it began public road testing around Europe with a focus on developing various electronics systems and model-specific chassis technology.
Supply Chain	**Carbon-Neutral Target Date:** "From 2021 on, the BMW Group's entire production, including all its locations worldwide, will be completely net carbon neutral". "BMW was the first automaker to put information on smelters and the country-of-original of cobalt into the public domain." **Goals achieved:** Decrease of **"**53% CO_2 emissions in the European new vehicle fleet in the period from 1995 to 2020" (BMW 2021). **Goals for 2030 (base year 2019):** "80% reduction of CO_2 emissions per vehicle in production; 40% reduction of CO_2 emissions in vehicle use phase per kilometer driven; 20% reduction of CO_2 emissions in the supply chain" (BMW 2021). **Leipzig plant, Shenyang plant, and Dingolfing plant** with several initiatives towards sustainability.
Manufacturing & Operations *(Recycling of waste and easy returns for end-of-life disposal* *8. Sustainable power procurement)*	**Recycling:** Cooperation with BASF and ALBA on plastic recycling. On average, current vehicles are manufactured using almost **30%** recycled, and reusable materials. With the 'Secondary First' approach, BMW Group plans to successively raise this figure to 50%. Partnership with FSC (Forest Stewardship Council), usage of Kenaf (plant of the hibiscus family with fibers that are used for various commercial applications), natural rubber, Econyl, and aluminum (BMW Portugal 2021). **Power-procurement:** BMW Group production and all locations have been sourced by green power only since 2020. For the production of aluminum (high energy-intensive activity), solar power will be used. **Logistics:** More than 50% of BMW vehicles produced worldwide are transported by rail, avoiding the greater pollution impact of ng truck shipments. **IT sustainability:** "The company's research center at Munich uses the naturally cold temperature of groundwater to cool its computer center, using 90% less electricity than conventional sources." **BEVs Production:** "By 2023, the BMW Group intends to have 25 electrified models on the road. Increase by more than 25% minimum proportion of electrified automobiles to total deliveries. Ten million all-electric vehicles within ten years (BMW 2021), the MINI brand offering exclusively all-electric vehicles from 2030".
Mobility services and Vehicle Usage	**BMW LeaseRad Leasing Program**: "Leasing program with 5,500 bicycle dealers in Germany, supporting any employees who wanted to cycle to work." **Park Now:** "Digital parking service which facilitates ticket and cashless parking app" (Park Now 2021). **Share Now**: "Joint venture of Daimler AG and BMW offering carsharing services in urban areas in Europe, and North America." **Free Now**: Previous "My Taxi". Joint venture Daimler + BMW, Taxi, and ride-hailing app. **Reach Now**: MaaS app. **Charge Now**: Charging networks for EVs (Daimler, 2021).
Sales, marketing, and after-sales sustainability (Partnerships/ Agreements)	**"Cobalt for Development": "**Establish responsible mining practices in the Democratic Republic of Congo" (BMW 2021). **RE:BMW** – Circular economy at the IAA Mobility in Munich (BMW 2021). **BMW eDrive Zone: "**Developed to support emission-free driving in designated low-emission zones or similar. It enables a BMW Plug-in-Hybrid to automatically recognize the environmental zone and automatically change the driving mode to electric, emission-free" (BMW Portugal 2021). **CME and ABB Portugal:** "To provide differentiated services and solutions for intelligent and sustainable charging, for their private and corporate customers. This partnership allows the brand and MINI (sub-brand) customers to have access to an offer of products and services suited to their needs" (BMW Portugal, 2021). **Brand transparency:** • **Podcast:** Episode #053 "Sustainability in every car BMW builds" the hosts go through the sustainable supply chain, the green power, closed material loop, sustainable car models, and peanuts in the automotive production (BMW 2021). • **Public Reports:** The BMW Group Report 2020 includes information about the sustainability strategy of the group.

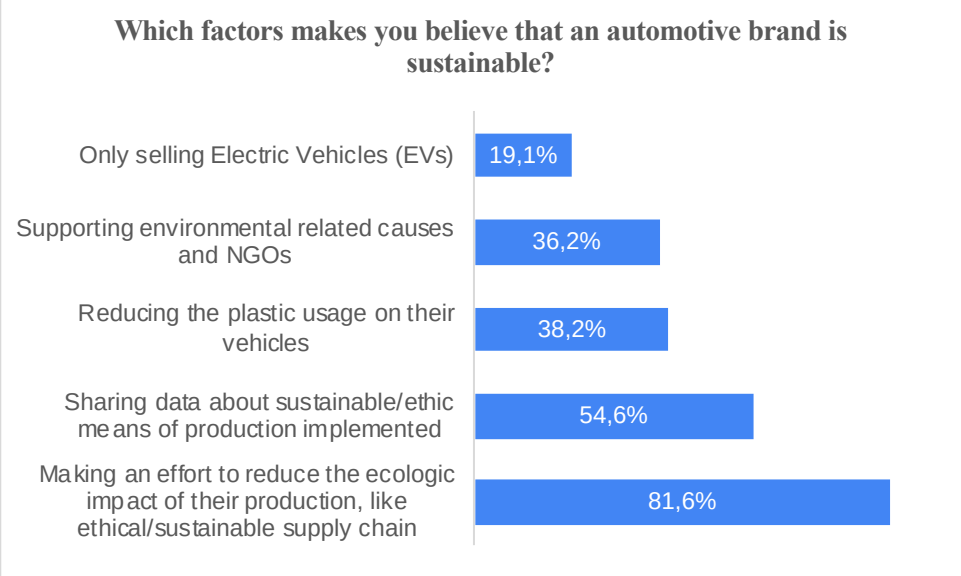
Appendix 4: Sustainability across Tesla value-chain

INITIATIVES	TESLA
R&D and engineering	Continue to improve battery chemistry, cell structure, battery pack structure, and vehicle passive safety to decrease fire risk to as close to zero as possible. **FCEVs**: No production nor interest in research (CNBC 2019).
Supply Chain	Future Tesla factories will set a new standard of water use per vehicle. **Goals:** Tesla's **lack of transparency** regarding its carbon emissions and targets. **Carbon-Neutral Target Date:** No information available.
Manufacturing & Operations *(Recycling of waste and easy returns for end-of-life disposal; Sustainable power procurement)*	**Recycling: "**Battery Packs Will See 92% Reuse of Raw Metals, battery factories have already begun implementing an in-house, closed-loop recycling system that will ensure 100% of Tesla batteries received are recycled." (Tesla 2020) **Power-procurement: "**Tesla cars can convert electricity into power more efficiently than other equivalents EVs." (Tesla 2020)
Electric Vehicles (EVs) Production	The only automotive company that just sells electric vehicles (EVs) (Tesla 2020). Tesla vehicles' all-in emissions per mile are significantly lower than ICE vehicles (Tesla 2020).
Sales, marketing, and after-sales sustainability	**Brand transparency:** • Tesla's lack of transparency regarding its carbon emissions and targets should raise questions about its commitment to a sustainable future. • **Public Reports:** All Tesla's reports are available online, however, they lack SMART goals (Tesla 2020). "Battery production partnerships with Panasonic, South Korea's LG Chem, and China's Contemporary Amperex Technology Co Ltd (CATL) are expected to continue".

Appendix 5: Do you research about sustainable means of production/sustainable supply chain before or after buying a product in the company's channels (website, social media, etc.)?



Appendix 6: Factors to consider an automotive brand sustainable



Appendix 7: Do you consider MB a sustainable brand? By gender

	Gender				
Do you consider Mercedes-Benz a sustainable brand?	Male	Female	Prefer not to answer	Other	Total
Yes	58	26	1	1	86
No	57	43	1	1	102
No Opinion	59	45	1	0	105
Total	174	114	3	2	293

Appendix 8: Do you consider MB a sustainable brand? By gender in %

	Gender				
Do you consider Mercedes-Benz a sustainable brand?	Male	Female	Prefer not to answer	Other	Total
Yes	19,80%	8,87%	0,34%	0,34%	29,35%
No	19,45%	14,68%	0,34%	0,34%	34,81%
No Opinion	20,14%	15,36%	0,34%	0,00%	35,84%
Total	59,39%	38,91%	1,02%	0,68%	100,00%

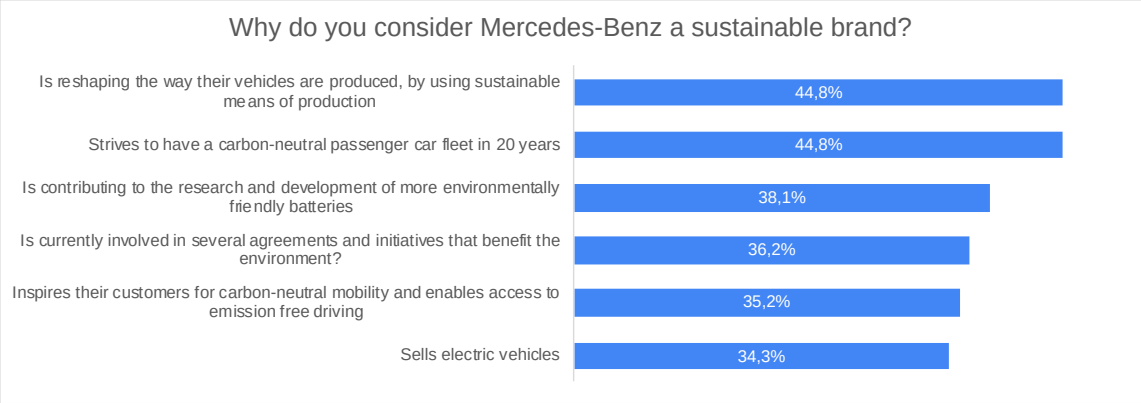
Appendix 9: Do you consider MB a sustainable brand? By age group

	Age							
Do you consider Mercedes-Benz a sustainable brand?	18 or under	18-29	30-39	40-49	50-59	60-69	70-79	Total
Yes	0	37	14	14	19	2	0	86
No	0	81	7	7	4	2	1	102
No opinion	2	67	13	16	5	1	0	104
Total	2	185	34	37	28	5	1	292

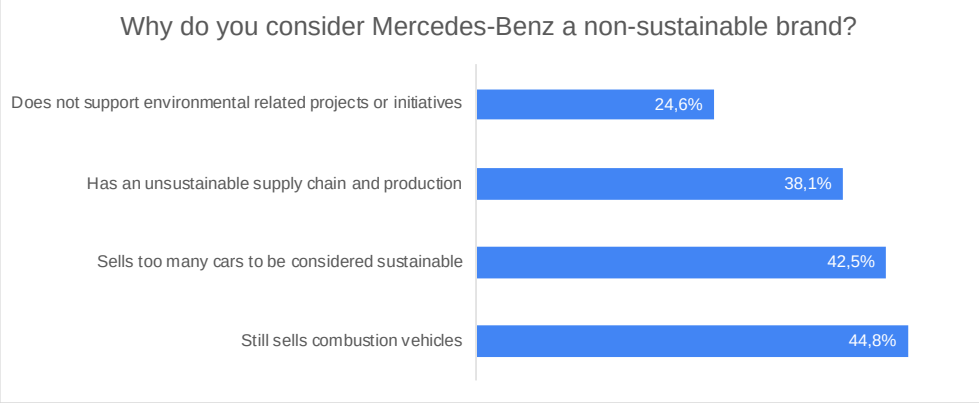
Appendix 10: Do you consider MB a sustainable brand? By age group in %

	Age							
Do you consider Mercedes-Benz a sustainable brand?	18 or under	18-29	30-39	40-49	50-59	60-69	70-79	Total
Yes	0,00%	12,67%	4,79%	4,79%	6,51%	0,68%	0,00%	29,45%
No	0,00%	27,74%	2,40%	2,40%	1,37%	0,68%	0,34%	34,93%
No opinion	0,68%	22,95%	4,45%	5,48%	1,71%	0,34%	0,00%	35,62%
Total	0,68%	63,36%	11,64%	12,67%	9,59%	1,71%	0,34%	100,00%

Appendix 11: Reasons to consider MB a sustainable brand



Appendix 12: Reason to consider MB a non-sustainable brand



Appendix 13: Do you consider Tesla a sustainable brand? By gender

	Gender				
Do you consider Tesla a sustainable brand?	Male	Female	Prefer not to answer	Other	Total
Yes	88	60	0	1	149
No	53	25	0	1	79
No Opinion	33	29	3	0	65
Total	174	114	3	2	293

Appendix 14: Do you consider Tesla a sustainable brand? By gender in %

	Gender				
Do you consider Tesla a sustainable brand?	Male	Female	Prefer not to answer	Other	Total
Yes	30,03%	20,48%	0,00%	0,34%	50,85%
No	18,09%	8,53%	0,00%	0,34%	26,96%
No Opinion	11,26%	9,90%	1,02%	0,00%	22,18%
Total	59,39%	38,91%	1,02%	0,68%	100,00%

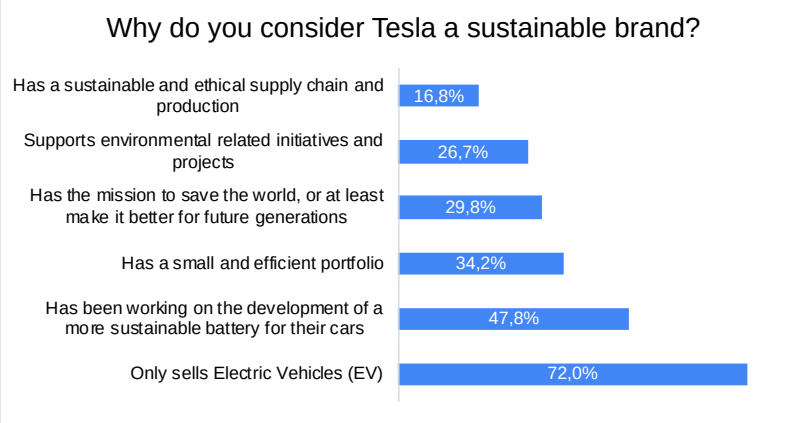
Appendix 15: Do you consider Tesla a sustainable brand? By age group

	Age							
Do you consider Tesla a sustainable brand?	18 or under	18-29	30-39	40-49	50-59	60-69	70-79	Total
Yes	1	105	10	18	12	1	1	148
No	0	52	12	6	6	3	0	79
No opinion	1	28	12	13	10	1	0	65
Total	2	185	34	37	28	5	1	292

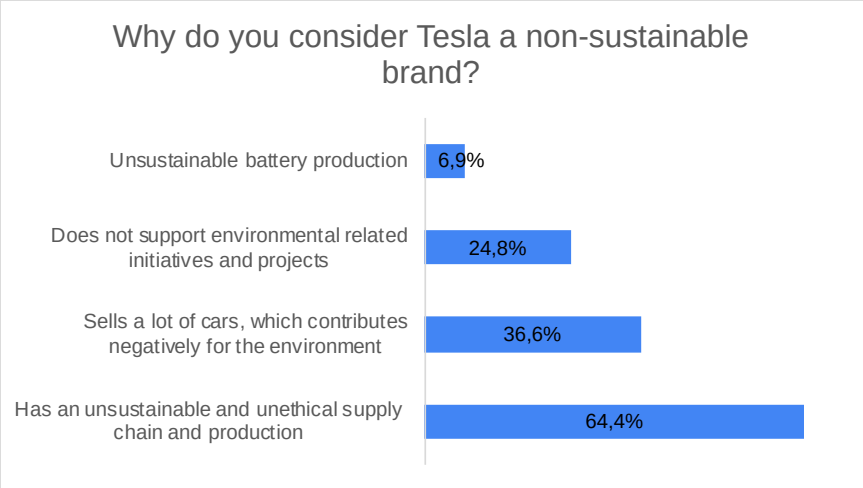
Appendix 16: Do you consider Tesla a sustainable brand? By age group in %

	Age							
Do you consider Tesla a sustainable brand?	18 or under	18-29	30-39	40-49	50-59	60-69	70-79	Total
Yes	0,34%	35,96%	3,42%	6,16%	4,11%	0,34%	0,34%	50,68%
No	0,00%	17,81%	4,11%	2,05%	2,05%	1,03%	0,00%	27,05%
No opinion	0,34%	9,59%	4,11%	4,45%	3,42%	0,34%	0,00%	22,26%
Total	0,68%	63,36%	11,64%	12,67%	9,59%	1,71%	0,34%	100,00%

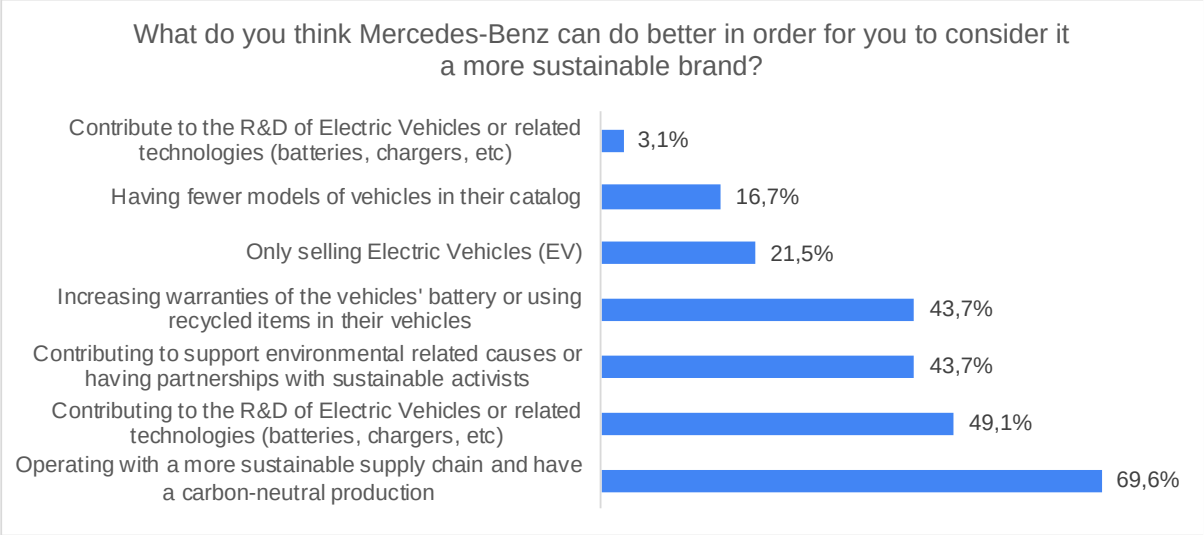
Appendix 17: Reasons to consider Tesla a sustainable brand



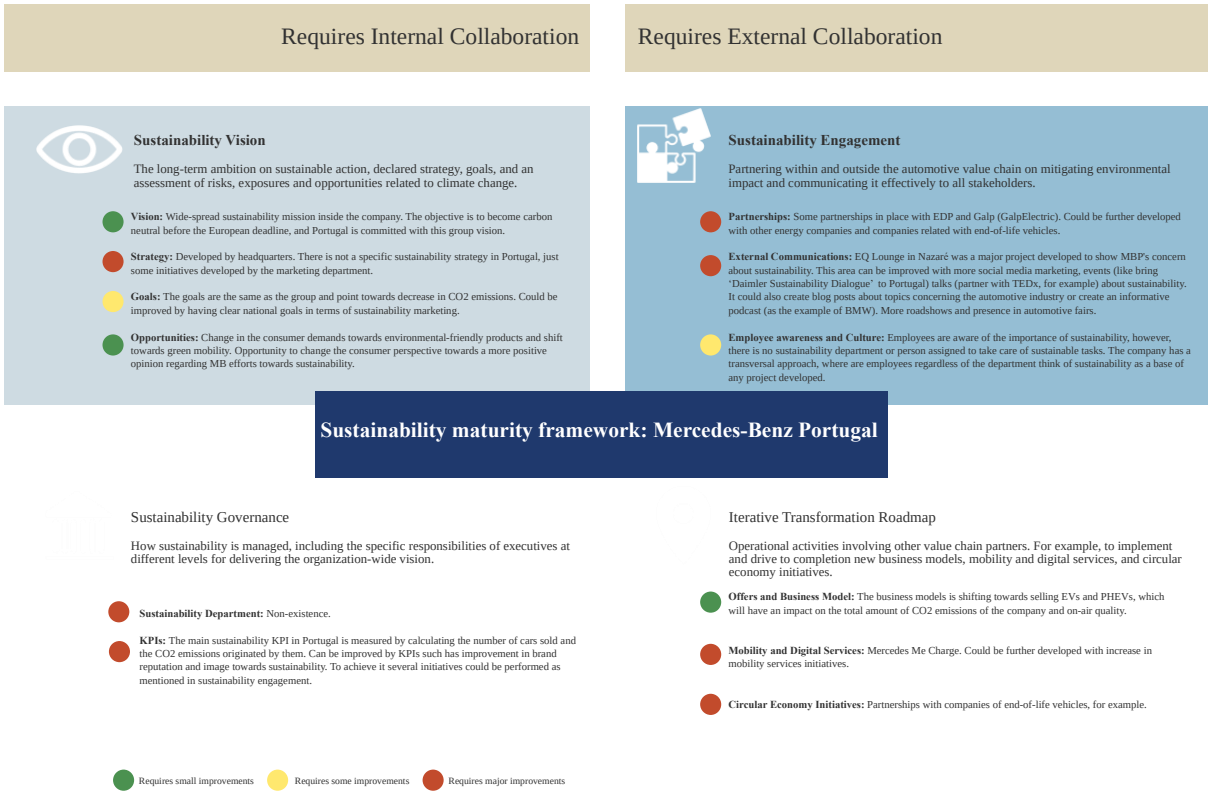
Appendix 18: Reason to consider Tesla a non-sustainable brand



Appendix 19: Areas of improvement in MB sustainability strategy

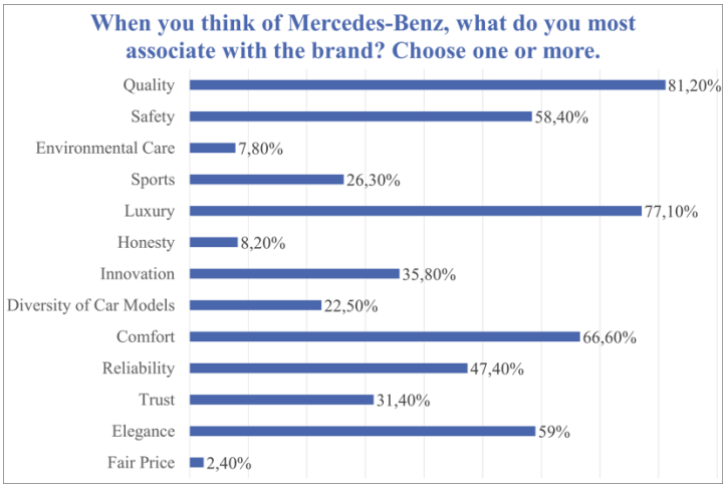


Appendix 20: Sustainability Maturity Framework (Mercedes-Benz Portugal 2021, Mercedes-Benz Portugal 2021, EDP 2021, Daimler 2021)

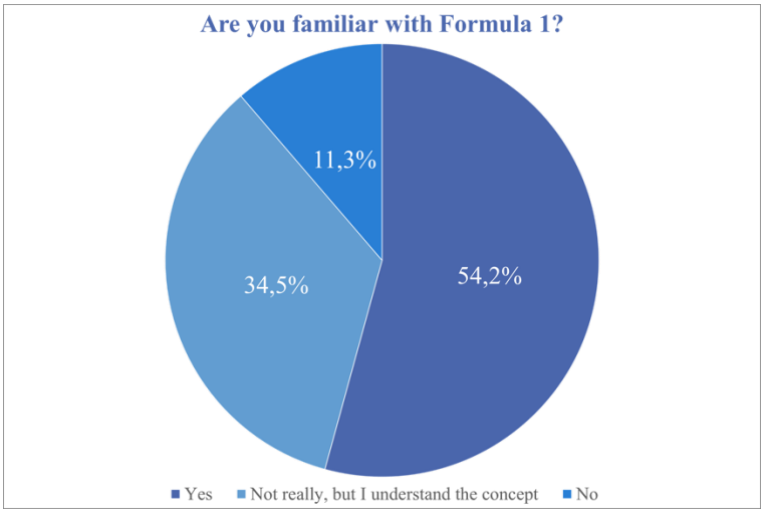


Appendix (André Conde Batista Martins Vedor, 44402)

Appendix 1: Survey Question 1



Appendix 2: Survey Question 2



Appendix 3: Cross-tabulation between Survey Question 2 and Gender

Relationship between Gender and "Are you Familiar with Formula 1?": Out of the following gender, how are the answers distributed?

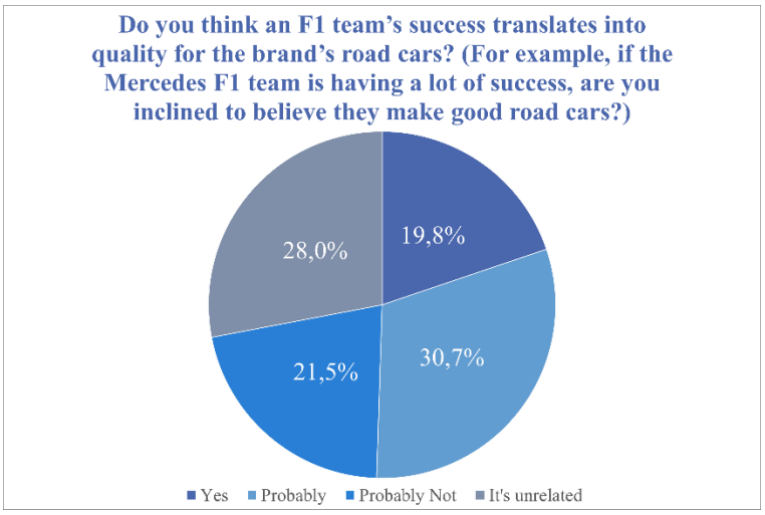
Do you know F1?	Male	Female	Other	Prefer not to Answer	Total
Yes	63,2%	40,4%	50,0%	66,7%	54,3%
Not really, but I understand the concept	28,2%	45,6%	0,0%	0,0%	34,5%
No	8,6%	14,0%	50,0%	33,3%	11,3%
Total	100%	100%	100%	100%	100%

Appendix 4: Cross-tabulation between Survey Question 2 and Age

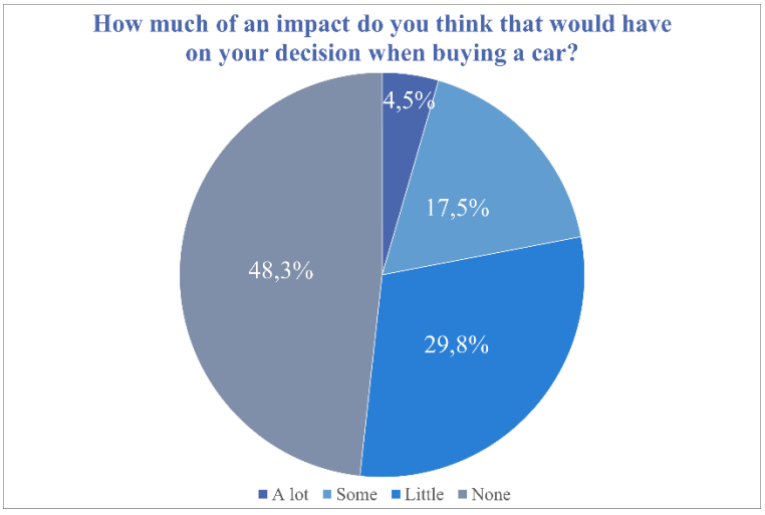
Relationship between Age and “Are you Familiar with Formula 1?”: Out of the following age gaps, how are the answers distributed?

Do you know F1?	18 or under	18-29	30-39	40-49	50-59	60-69	70-79	Total
Yes	0,0%	52,7%	61,8%	54,1%	57,1%	80,0%	0,0%	54,3%
Not really, but I understand the concept	100,0%	38,7%	23,5%	37,8%	17,9%	0,0%	0,0%	34,5%
No	0,0%	8,6%	14,7%	8,1%	25,0%	20,0%	100,0%	11,3%
Total	100%	100%	100%	100%	100%	100%	100%	100%

Appendix 5: Survey Question 3



Appendix 6: Survey Question 4

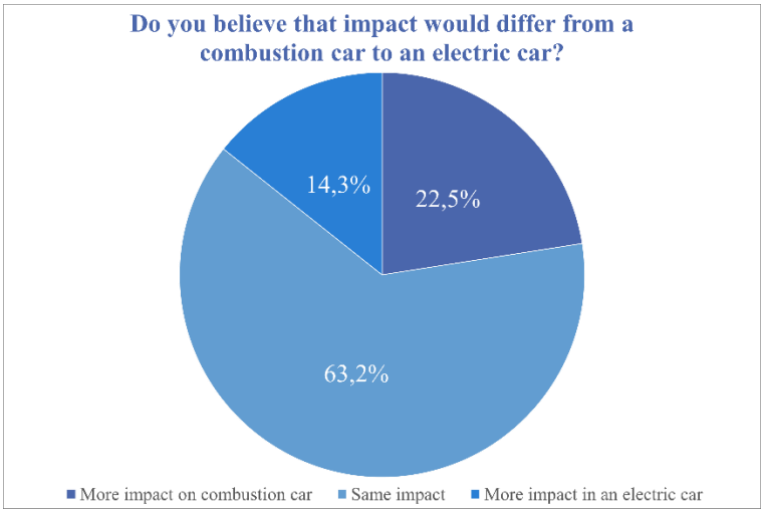


Appendix 7: Cross-tabulation between Survey Questions 3 and 4

Relationship between "*Do you think an F1 team's success translates into quality for the brand's road cars*?" and "*How much of an impact do you think that would have on your decision when buying a car?*": Out of the people that answered "Yes" or "Probably" to the first question, how much of an impact would that have on their decision when buying a car?

Impact/ Quality	Yes	Probably	Probably Not	It's unrelated	Total	Yes + Probably	% Yes + Probably
None	8	27	43	63	141	*35*	*23,8%*
Little	21	37	16	13	87	*58*	*39,5%*
Some	20	22	4	5	51	*42*	*28,6%*
A lot	9	3	0	1	13	*12*	*8,2%*
Total	58	89	82	82	292	*147*	*100%*

Appendix 8: Survey Question 5

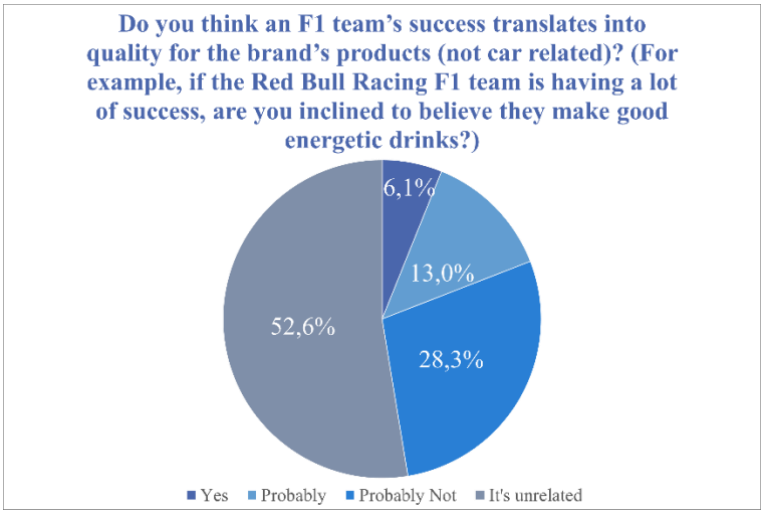


Appendix 9: Cross-tabulation between Survey Questions 4 and 5

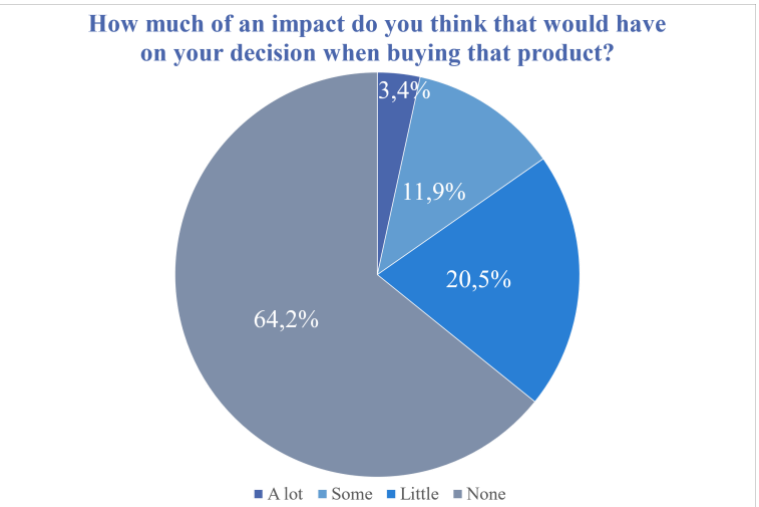
Relationship between "*How much of an impact do you think that would have on your decision when buying a car?*" and "*Do you believe that impact would differ from a combustion car to an electric car?*": Out of the people that answered "Some" or "A lot" to the first question, does that impact differ from a combustion car to an electric car?

Impact/ Quality transmission	None	Little	Some	A lot	Total	Some + A lot	% Some + A lot
More impact on combustion car	24	24	12	6	66	*18*	*28,1%*
Same impact	100	48	31	5	184	*36*	*56,3%*
More impact in an electric car	17	15	8	2	42	*10*	*15,6%*
Total	141	87	51	13	292	*64*	*100%*

Appendix 10: Survey Question 6



Appendix 11: Survey Question 7

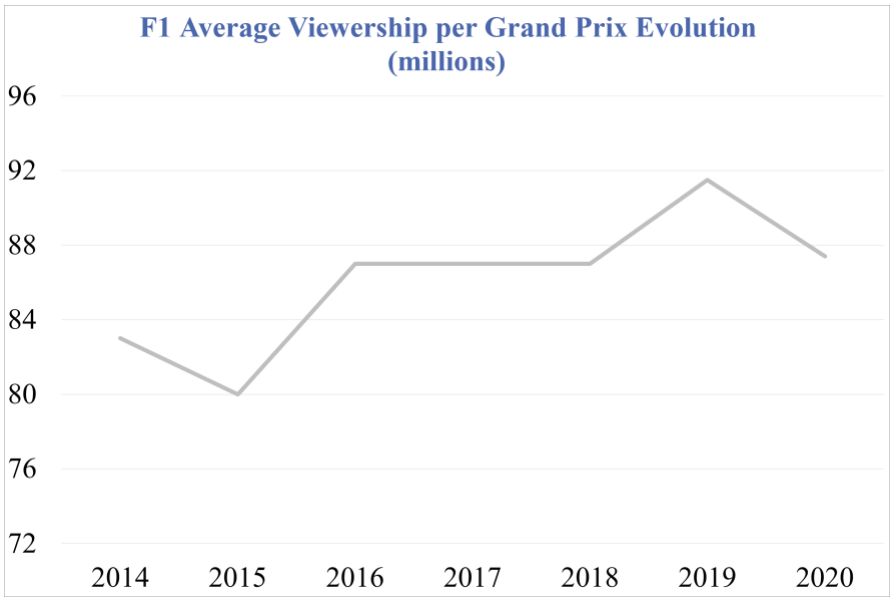


Appendix 12: Cross-tabulation between Survey Questions 6 and 7

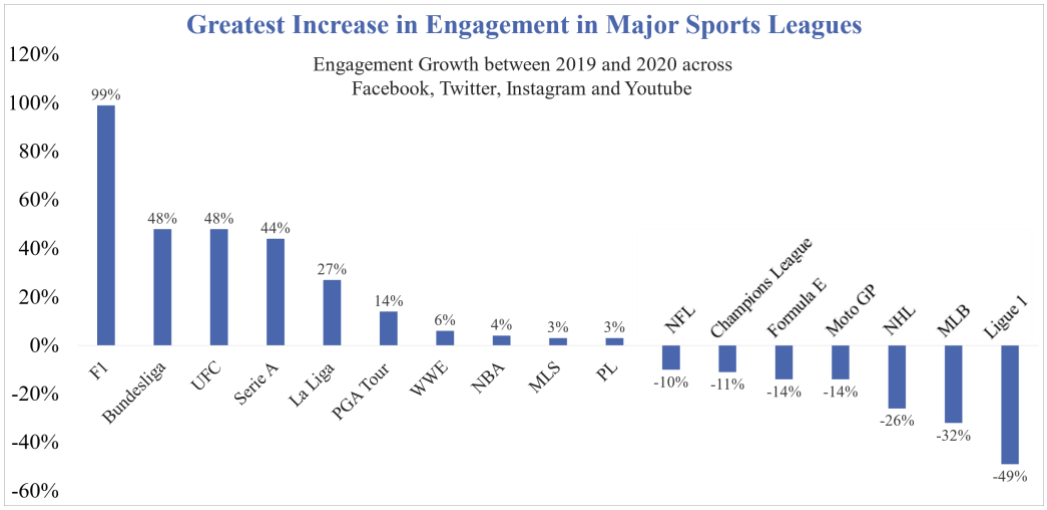
Relationship between "*Do you think an F1 team's success translates into quality for the brand's products (not car related)?*" and "*How much of an impact do you think that would have on your decision when buying that product?*": Out of the people that answered "Yes" or "Probably" to the first question, how much of an impact would that have on their decision when buying that product?

Impact/ Quality transmission	Yes	Probably	Probably Not	It's unrelated	Total	Yes + Probably	% Yes + Probably
None	5	7	48	128	188	*12*	*21,4%*
Little	5	9	26	20	60	*14*	*25,0%*
Some	4	18	7	6	35	*22*	*39,3%*
A lot	4	4	2	0	10	*8*	*14,3%*
Total	18	38	154	154	293	*56*	*100%*

Appendix 13: F1 Average Viewership per Grand Prix (Formula 1 2021)



Appendix 14: Engagement Increase in Major Sports Leagues (Formula 1 2021)



Appendix 15 – SWOT Analysis of F1 in MB (Own creation)

Strengths	**Weaknesses**
• Quality and Luxury associated • Best team in F1 in recent years • Best engine in F1 • F1's advanced production technologies • MB's success translates into perceived quality for road cars	• MB's perceived quality for road cars through success in F1 has limited impact when buying a car • Sportiness brand image not yet well established
Opportunities	**Threats**
• F1 is growing quickly in the USA • Customization is becoming usual in road car brands • F1 might find new sustainable fuel • F1 servers could be used in hospitals, airplanes or cruise ships. • F1's wireless technologies (upload and download speed) can be used in smartphones, smart cities or road cars.	• Possible loss of dominance in 2022 due to new F1 regulations • Possible loss of relevance of F1 in electric era • Leaving Formula E when the electric market is growing quickly

Appendix (Jannik Kessens, 46429)

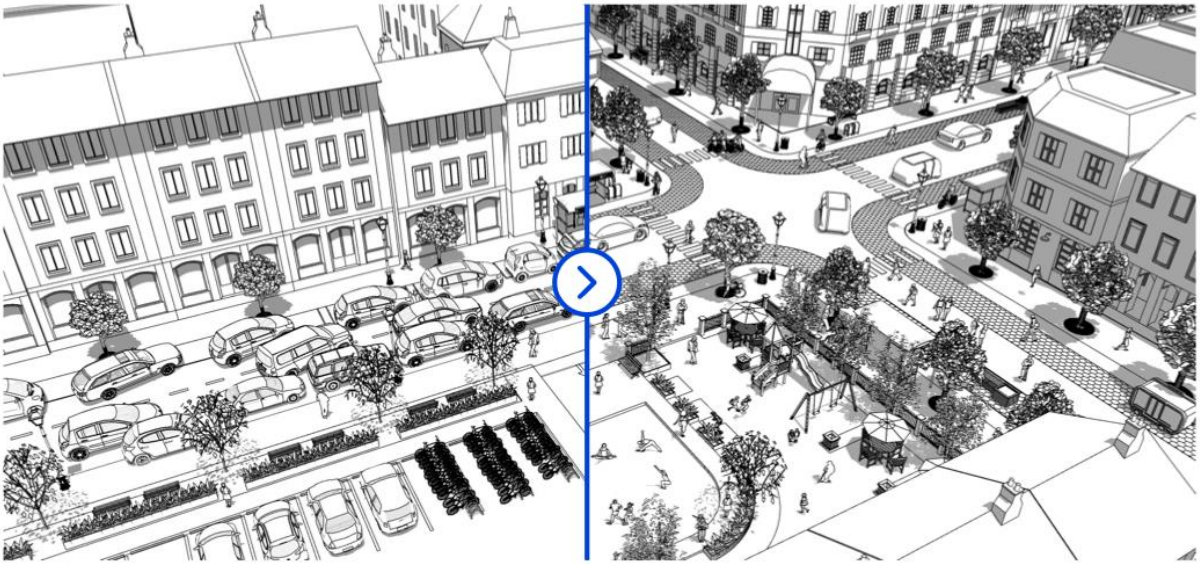
Appendix 1: The city of the future (McKinsey and Company 2021)

Regulation, technology, and consumer behavior will change the mobility landscape

Illustrative change of the city landscape between today and 2030

Today
Cities suffer from emissions, congestion, and safety …

2030
… which is set to change with the arrival of new integrated mobility solutions



Electrification is one of the key enablers for new integrated mobility across vehicle segments, e.g.,

Scooters
Paris recently granted a 2-year contract for the implementation of 5,000 e-scooters

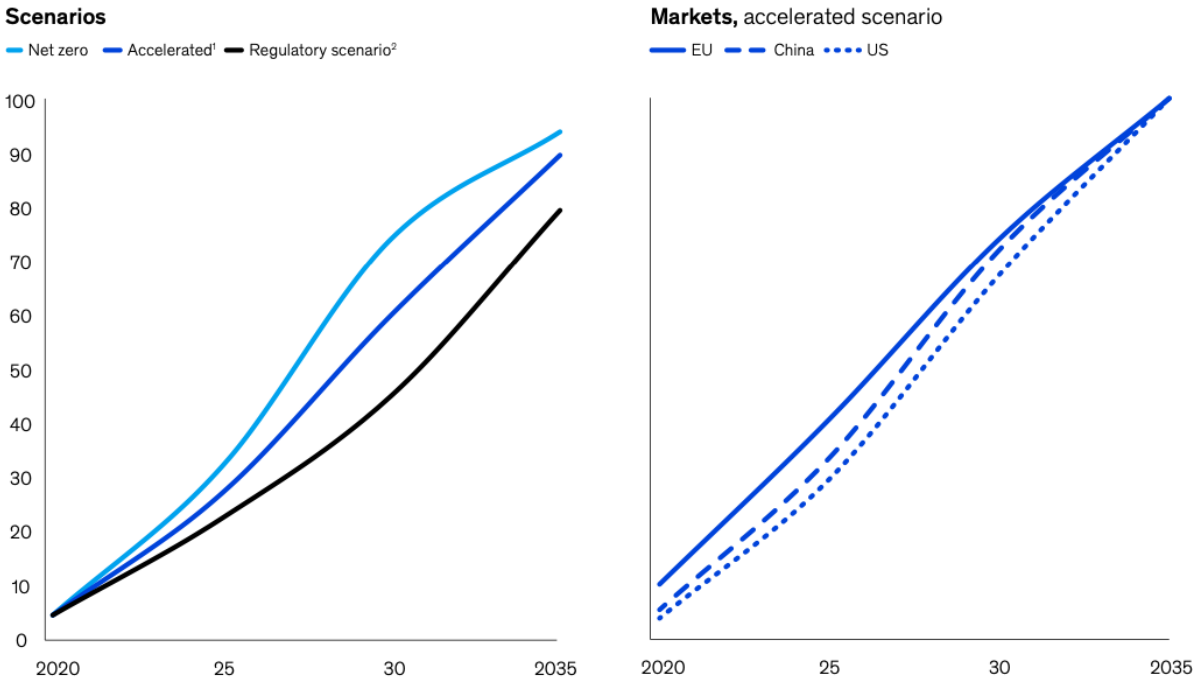
Passenger cars
Oslo reached 66% passenger EV adoption in July 2021

Buses
Shenzhen has already fully electrified its 16,000 unit bus fleet as well as 22,000 taxis

Appendix 2: Development of EV-Sales (McKinsey and Company 2021)

By 2035, the largest automotive markets (the EU, US, and China) will be fully electric

EV (BEV, FCEV, PHEV) sales in percent of new passenger vehicle sales

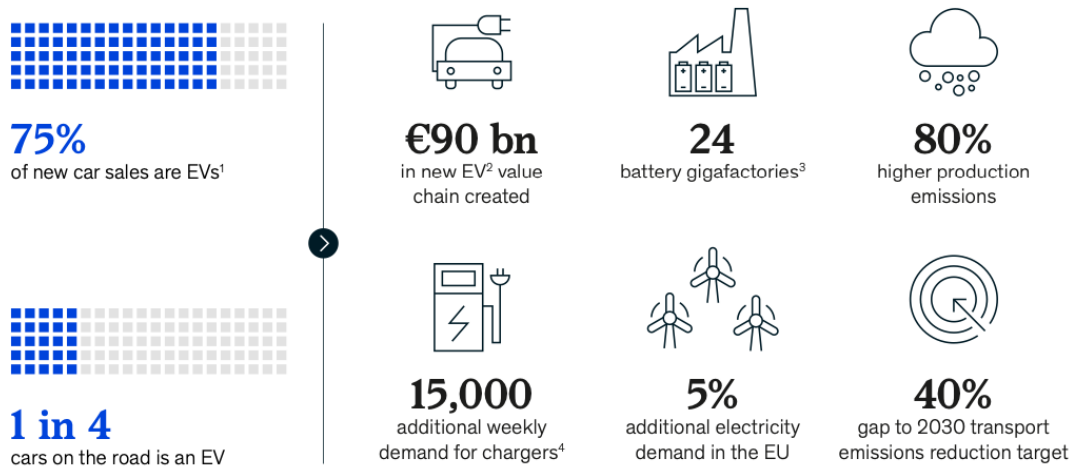


1. Most likely scenario under which consumer adoption will exceed regulatory targets
2. Scenario under which currently expected regulatory targets will be met

Appendix 3: Disruption of the automotive industry (McKinsey and Company 2021)

The e-mobility transformation will disrupt more than the automotive industry

Passenger vehicles, EU+GB+CH+NO, 2030, accelerated scenario



1. EVs include BEVs, PHEVs, FCEVs
2. Includes electric drive, battery packs, power electronics, and thermal management
3. Assumes an average gigafactory with annual capacity of 25 GWh
4. Assumes an ideal EV–charger ratio of 10:1 and refers to public chargers, including chargers in multifamily homes

Appendix 4: Mercedes-Benz Ventures (Mercedes-Benz 2021)

Tech Invest

You have a startup or even a product on the market. Now you want to take the next step and expand internationally and are interested in working with Daimler as a strategic investor?Then look at our offers and find out more about them.

TECHINVEST

Startup Intelligent Center

We actively promote partnerships and collaboration with start-ups.We have established platforms worldwide to scout startups and develop the best and most innovative technologies at eye-level. To this end, we have created a central contact point: the Startup Intelligence Center (SIC). Are you interested in a cooperation or partnership? Get in touch with us!

STARTUP Intelligence Center

STARTUP AUTOBAHN

The innovation platform STARTUP AUTOBAHN, founded by Daimler, helps startups bring new ideas to the streets. Together with other companies, venture capitalists and accelerator operators, we identify and promote innovative technologies and new business models worldwide.

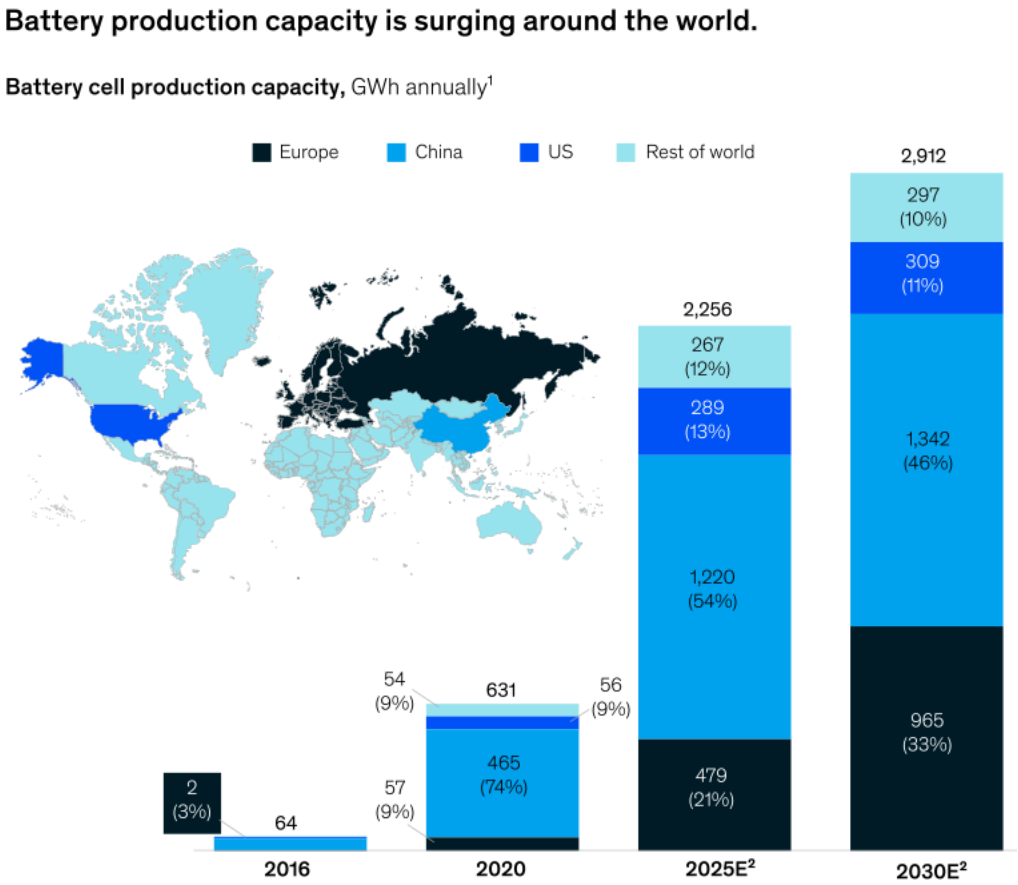
STARTUPAUTOBAHN

Cooperation and Innovation Management

Bringing together what makes Daimler successful. The Cooperation & Innovation Management division within Research & Development initiates strategic partnerships with external companies in order to bring innovation into our vehicles and ecosystems more quickly and efficiently.

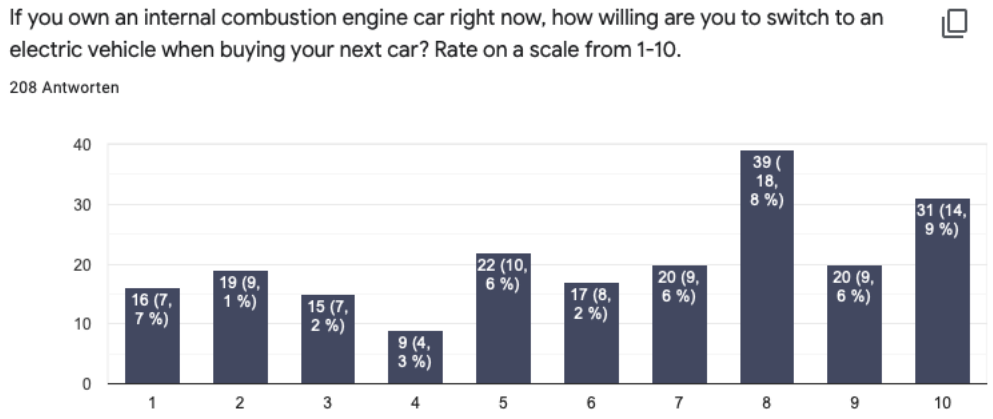
RD/IM
COOPERATE TO INNOVATE

Appendix 5: Battery production capacity (McKinsey and Company 2021)



Source: McKinsey battery supply tracker (June 2021)

Appendix 6: Survey Answer



Appendix 7: Survey Answer

On a scale from 1 to 5: To what extent can you imagine yourself not owning a car in favour of smart mobility solutions such as Mobility as a Service?

293 Antworten