Lisbon School of Economics & Management
Universidade de Lisboa

MASTERS IN

MANAGEMENT AND INDUSTRIAL STRATEGY

MASTER'S FINAL WORK

DISSERTATION

CIRCULAR ECONOMY IN THE AUTOMOTIVE INDUSTRY: AN EMPIRICAL ANALYSIS ON OFFICIAL PORTUGUESE DEALERSHIPS

DIOGO MENDES RAMOS CALAVEIRAS DA COSTA

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Note: Artificial intelligence tools were used to support the structuring of ideas and refinement of academic English, without influencing the analytical content of this study.

ABSTRACT

This study investigates the implementation of circular economy (CE) practices within the automotive industry. More specifically, it analyses how CE principles are implemented and the barriers and enablers of this implementation as perceived by official Portuguese automotive dealerships. To obtain a more complete picture of the role of the circular economy in the automotive context, the study also explores the customer perspective on CE practices, preferences and perceived barriers to CE solutions in the automotive industry. The study adopts a qualitative, exploratory case study approach. The case study focuses on three Volkswagen Group brands: SEAT, CUPRA and Audi. Data were collected through semi-structured interviews with senior sales managers responsible for three of the brands. Moreover, to capture the customer's perspective, the study also applied an online survey to automotive customers to evaluate their preferences and perceived barriers to CE solutions. The findings show that all three brands have implemented circular economy (CE) practices, including leasing, vehicle reuse and reconditioning, albeit with different levels of maturity and visibility. While corporate consumers typically drive demand for circular solutions, individual consumers are more price sensitive.

These findings provide a more holistic view of the adoption of the circular economy in the Portuguese automotive sector, with significant implications for policymakers, industry stakeholders, and researchers.

Keywords: Circular Economy, Circular Economy practices, Automotive Industry, Costumer Perspective, Portuguese Context

RESUMO

Este estudo investiga a implementação de práticas de economia circular (EC) na indústria automóvel. Mais especificamente, analisa a forma como os princípios da EC são implementados e as barreiras e facilitadores desta implementação, tal como são percecionados pelos concessionários oficiais de automóveis portugueses. Para obter uma imagem mais completa do papel da economia circular no contexto automóvel, o estudo também explora a perspetiva do cliente sobre as práticas de EC, as preferências e as barreiras percebidas às soluções de EC na indústria automóvel. O estudo adota uma abordagem qualitativa e exploratória de estudo de caso. O estudo de caso centra-se em três marcas do Grupo Volkswagen: SEAT, CUPRA e Audi. Os dados foram recolhidos através de entrevistas semiestruturadas com gestores de vendas seniores responsáveis por três das marcas. Além disso, para captar a perspetiva do cliente, o estudo também aplicou um inquérito em linha a clientes do sector automóvel para avaliar as suas preferências e os obstáculos que consideravam existir às soluções de EC. Os resultados mostram que as três marcas implementaram práticas de economia circular (EC), incluindo o aluguer, a reutilização e o recondicionamento de veículos, embora com diferentes níveis de maturidade e visibilidade. Enquanto os consumidores empresariais normalmente impulsionam a procura de soluções circulares, os consumidores individuais são mais sensíveis ao preço.

Estas conclusões fornecem uma visão mais holística da adoção da economia circular no sector automóvel português, com implicações significativas para os decisores políticos, as partes interessadas da indústria e a investigação

Palavras-chave: Economia Circular, Práticas de Economia Circular, Indústria Automóvel, Perspetiva do Consumidor, Contexto Português

GLOSSARY

B2B: Business to Business

B2C: Business to Consumer

CE: Circular Economy

EAMA: European Automobile Manufacturers Association

ELV: End of Life Vehicles

EU: European Union

GDP: Gross Domestic Product **SDG**:

Sustainable Development Goals

VAG: Volkswagen Aktiengesellschaft

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CHAPTER 1 – INTRODUCTION

The automotive industry plays a crucial role in industrial activity, employment, and technological development, making it is one of the most important sectors in the global and European economies. According to European Automobile Manufacturers Association (EAMA) the automotive industry represents about 7% of all businesses in European Union (EU) and has a considerable direct and indirect influence on associated manufacturing and services. Nonetheless, this industry is also responsible for one of the largest environmental issues, as it consumes huge quantities of resources like energy, raw materials, and also generates a lot of waste.

The necessity to rethink production and consumption models, has increased in recent years, due to the growing need to address the environmental issues, like climate change, linked to the exhaustion of natural resources and the instability of the raw material markets. Circular economy (CE) offers an alternative paradigm, it promotes the extension of product and material life cycles, prioritizing resource efficiency, waste reduction, and the creation of added value to economic and environmental perspective (Aranda-Usón et al., 2019).

The circular models contrast from the typical linear paradigm of "extract, produce, discard" since it converts waste materials into new resources and extends the usable life of products. In the automotive industry, this manifests itself in practices such as modular design, component reuse, remanufacturing, advanced material recycling, and the development of service-based business models (Bain & Company, 2023; Capgemini, 2023).

In addition to this, the European Community is regarded as strategically important by the European Union (EU) not only for environmental reasons but also for economic and industrial ones. Europe is heavily dependent on China and the Democratic Republic of the Congo for the supply of lithium, cobalt, and nickel, which are essential elements for electrical mobility. Through the recovery of secondary primary materials, the CE allows the reduction of this dependence, fostering greater resilience in supply chains (World Economic Forum, 2024).

The transition towards a CE has become a strategic priority within the European Union's environmental and economic agendas, particularly in high-impact industries such as automotive (European Commission (2020).

Regulators, manufacturers, and consumers all widely acknowledge the importance of the CE to the European automobile industry. In 2023, the European Commission proposed a regulation to strengthen the circularity requirements of vehicles, including mandatory component recycling, the use of recycled materials, and digital traceability (European Commission, 2023b).

For manufacturers, the CE is not just a way to fulfill legal requirements but also a chance to develop new business models and bind customers. Brands like BMW and Porsche have developed strategies for component recall, reconditioning, and reintegration in new models by incorporating circular principles into their vehicles' life cycles (BMW Group, 2024; Porsche Newsroom, 2025).

In Portugal, the automobile sector accounts for about 5% of the GDP (Gross Domestic Product) and remains one of the pillars of the national industry. However, there are significant obstacles to the shift to CE models, such as infrastructure limitations, investment requirements, and the lack of local technological solutions (Moita et al., 2024). At the same time, initiatives for recycling, ELV (end-of-life vehicles) recovery, and collaboration with technical centers to develop circular solutions are starting to emerge.

At an operational level, circularity is also associated to increased operational efficiency, lower operational costs, and risk reduction. Simultaneously, consumers show a growing value for sustainable products, which emphasizes the significance of clearly and transparently communicating these practices (Bain & Company, 2023).

In this context, the study aims to answer the following research questions:

- How are the CE practices been implemented by automotive brands in Portugal?
- How do automotive customers perceive the adoption of CE practices?

The specific objectives of this study are:

- To understand how and which CE practices are been adopted by three specific automotive brands in the Portuguese context;
- To understand key barriers and enablers influencing the implementation of CE practices within these brands;
- To explore the main challenges and opportunities faced by brands in their transition toward CE;
- To investigate consumer perceptions of CE practices in the automotive sector.

To answer the research questions, a qualitative exploratory case study approach was used, and data was collected using semi-structured interviews, online survey, and documentary analysis.

Despite the growing attention in the automotive industry, most studies still focus on technological and economic factors like recycling methods, material efficiency, and innovations in business models (Saidani et al., 2018; Toma & Catană, 2022). Nonetheless, there is still a gap of empirical research that links the internal adoption of circular practices by manufacturers with consumer perceptions and behaviors (Camacho-Otero et al., 2018; Mostaghel & Chirumalla, 2021).

This study aims to address that gap by exploring both organizational strategies and consumer perceptions towards CE initiatives in the Portuguese automotive industry and in three brands of VAG (Volkswagen Aktiengesellschaft) group in specific: Audi, Seat and Cupra. Despite sharing a common corporate structure, these brands adopt different approaches to implementing circular practices. By focusing on the national context, a literature that is still little explored, this research makes it possible to obtain a concrete and situated view of how circularity is being operationalized, communicated and received in Portugal.

In addition, this study seeks to explore the degree of consumer knowledge, perception and behavior towards circular practices in the automotive sector. Understanding how consumers react to initiatives such as component remanufacturing, electric mobility or alternative financing models to common bank financing, is essential to improving their acceptance and integration into company strategies.

By combining qualitative data, obtained through an interview with a sales manager, and quantitative data, collected through a survey applied to Portuguese consumers, this study

provides a multidimensional perspective on the circular economy in the automotive industry. Integrating the internal practices of organizations and the view of the consumer, the study contributes both to the advancement of academic literature and to the definition of more effective strategies by companies and policymakers.

This study is organized into five chapters:

- Chapter 1: Introduction: explains the background, the topic's relevance, the research objectives, and the structure of the work;
- Chapter 2: Literature Review: examines the evolution of the concept, strategies, industry, regulations, barriers and enablers, the Portuguese context and the consumer behaviour;
- Chapter 3: Methodology: explains the type of study, brand comparison, data collection and the interviewee profile;
- Chapter 4: Data Analysis: outlines the empirical results of the interview and the survey;
- Chapter 5: Discussion and Conclusion: summarizes the main results, the discussion, theoretical and pratical contributions, limitations of the study and suggests directions for further research.

CHAPTER 2 - LITERATURE REVIEW

2.1. The evolution of the circular economy concept

Aside from the heavy use of resources and generation of waste, the CE offers an alternative to the linear economic model. Instead of the traditional "extract, produce, discard" logic, the CE supports a restorative system in which materials are kept in circulation for as long as possible to generate economic value and reduce environmental pressure (Geissdoerfer et al., 2017; Kirchherr et al., 2017).

Their high popularity can be attributed in large part to the work of the Ellen MacArthur Foundation (2013), which highlighted the economic benefits of circularity. In CE, the technical and biological cycles of materials are stabilized through reuse, remanufacturing, repair, recycling, and modular design (Ellen MacArthur Foundation, 2013).

CE is not only an ecological evolution, but also a model for economic regeneration. Its roots can be traced back to concepts such as Cradle to Cradle (McDonough & Braungart, 2002) and Performance Economy (Stahel, 2016), which challenge the logic of planned obsolescence. Today, it is increasingly integrated into industrial objectives such as the "Green Deal Europeu" and the Sustainable Development Goals (SDG), particularly SDG 12 and 13, promoting a new paradigm of efficiency and resilience for industrial chains.

2.2. Circular Economy Strategies and Principles

The implementation of CE practices is widely demonstrated by the so-called "Rstrategies," which grew from the initial 3Rs (Reduce, Reuse, and Recycle) to more complete frameworks. Morseletto (2020) and the Ellen MacArthur Foundation (2023) define up to 9 R´s strategies: Refuse, Rethink, Reduce, Reuse, Repair, Refurbish, Remanufacture, Repurpose, and Recycle. These solutions adhere to a value retention hierarchy, with those that maintain product integrity and functionality preceding those that focus simply on material recovery.

2.3 Circular Economy in the Automotive Industry

The automotive industry is accountable for a significant portion of global emissions and the high consumption of critical raw materials. Accordingly, the switch to CE is necessary to improve resource efficiency and lessen environmental impacts. According to Prochatzki et al. (2023), in addition to recycling, a systemic network of supply chain management, business models, and consumer relations is required.

In the automotive business, a subset of these tactics are more widely implemented. As a result, the research focusses on 6 R´s like: Refuse, Reduce, Reuse, Repurpose, Recycle, and Repair. These six strategies represent both the conceptual hierarchy established in academic literature and the operational reality of automobile circularity (Capgemini, 2023; Prochatzki et al., 2023). According to Capgemini (2023), CE implementation in the sector comprises vehicle return programs, leasing, car-sharing, and subscription-based models, all of which contribute to the extension of product life cycles and align with the chosen strategy.

Table I summarizes how these CE strategies are applied in the automobile sector, with actual examples from top companies (Bain & Company, 2023; Capgemini, 2023; Ellen

MacArthur Foundation, 2023; Morseletto, 2020; Prochatzki, Liedtke, & Buhl, 2023)

Table I - Circular Strategies Applied to the Automotive Industry

"R's" principles	**Application in the Automotive Industry**	**Brand Example**
Refuse	Avoid unneeded or unsustainable components in design.	Tesla – Elimination of leather.
Reduce	Reduce material and energy consumption during production.	Volkswagen - Efficient engines.
Reuse	Reusing post-use parts and components	Porsche - Certified component reuse.
Repurpose	Create a new function for used components or materials.	Audi – second-life use of batteries.
Recycle	Recover raw materials from endof-life vehicles (ELVs).	Seat/Cupra – ELV dismantling and material recycling.

Repair	Fix and restore used vehicle parts to extend their lifespan.	Volvo - Increased focus on repair and refurbishment programs to extend the useful life of cars and use recycled materials.

Sources: Based on Audi (2025a, 2025b); Bain & Company (2023); Capgemini (2023); CUPRA (2025); LeafScore (2024); Porsche Newsroom (2024, March 18); Prochatzki et al. (2023); SEAT (2025); Volkswagen Group (2024); Volvo Cars (2021, April 22).

A specific example of CE implementation in the automotive industry is BMW, which integrated circularity principles into the design and manufacturing of vehicles, utilizing recycled materials and strategies designed to recover components once they reach the end of their lifecycle (BMW Group, 2024). Porsche continues to take a similar approach by reusing certified items in post-purchase sales, strengthening the material cycle (Porsche Newsroom, 2025). Audi has adopted exemplary circular practices, such as the Aluminium Closed Loop Project, which reutilizes aluminium waste in new production cycles, reducing energy consumption by up to 95% (Audi, 2025). These actions are part of Audi's global circularity strategy, which is highlighted on their official sustainability website (Audi, 2025b).

To better understand how the CE is integrated into the automotive value chain, the following list outlines examples of CE implementation across a vehicle's life cycle:

- Design: Adjustable, recyclable, removable components;
- Production: Use of recyclable resources, energy efficiency;
- Distribution: Reverse logistics, eco-packaging;
- Use: Leasing, renting, car-sharing, and subscription models;
- End-of-Life: Dismantling, remanufacturing, repurposing.

2.4. European Policies and Regulation

The European Union has been at the forefront of developing public policies to advance the CE. With the aim of reusing ELV materials, the 2023 proposed regulation on ELV indicates that new vehicles must contain at least 25% recycled materials, of which 25% must originate from ELVs (European Commission, 2023b).

Additionally, European Parliament established circularity requirements for autonomous design, such as disassembly, traceability and the use of recycled materials (European Parliament, 2025). These regulatory requirements signify a growing institutional effort to incorporate CE into industrial processes.

European Commission, in March 2020, adopted the CE Action Plan, which is an important component of the European Green Deal, one initiative that aims to reduce the European Union's consumption footprint and double material reuse by 2030 (European Commission, 2020). Regarding the automobile industry, the strategy has three directly important priority axes:

- Sustainable design and resource efficiency: Promotes eco-design products by highlighting recycling, durability, reusability and reparability from the beginning (EEA, 2022).
- Promote the adoption of digital technologies (such as blockchain and IoT) to enhance transparency, efficiency, and circularity in industrial value chains (Yu, Zhang & Li, 2022).
- Right to repair and re-use: The European Commission proposes legal actions to enhance consumers´ rights to repair and re-use products, thereby reducing waste and extending their life cycle (2020).
- Use of secondary raw materials: Establishes objectives for using recycled materials into new goods, especially vehicles, to minimize reliance on crucial and scarces raw resources (Ruet, Wang, & Grebert, 2025).
- Circular Business Models: Encourages the adoption of alternative mobility options like car-sharing, renting or leasing instead of linear consumption models (Khakimova & Park, 2023).
- Extended producer responsibility (EPR): Enhances manufacturers' legal obligations for product disposal, including vehicle collection and recycling (European Commission, 2023a).

The European Commission's 2023 proposal for ELV regulation highlights important objectives like for example, mandatory recycling and integration of digital tracking features during the vehicle's life cycle, with the objective of recovery materials. Firms must align their plans accordingly to ensure compliance and market competitiveness (European Commission, 2023b).

2.5. Barriers and Enablers

Despite these advancements, the circular transition faces many challenges. Kirchherr et al. (2018) identify structural barriers such as cultural resistance, logistic complexity, initial costs, and the lack of unified normative standards. According to Prochatzki et al. (2023), many businesses still lack solid data regarding the life cycle of their products, which makes it challenging to implement circular strategies.

On the other hand, financial and political incentives, the advancement of digital technologies (such as blockchain and the Internet of Things), and the growing engagement of consumers in sustainable practices are enablers mentioned in the literature (Kirchherr et al., 2018). Companies like Volvo and Renault support the recycling and remanufacturing of items as a viable and environmentally friendly business model (Bain & Company, 2023).

2.6. CE Practices in the Portuguese Context

The CE has gained relevance in Portugal's public policies and auto industry, which accounts for about 5% of the country's total income. There are already initiatives to recycle tires, batteries, and ELVs, but their effectiveness depends on the integration of logistical processes, effective triage, and a reward system for reusing items.

In Portugal, both SEAT and CUPRA offer specific programs for collecting and managing used automobiles in compliance with European directives, including clear consumer information on authorized dismantling methods and designated collection places (SEAT, 2025; CUPRA, 2025).

Despite these efforts, Portugal continues to encounter institutional barriers to the widespread application of CE strategies. Moita et al. (2024) found the following key barriers:

- Inadequate logistics infrastructure for recycling, insufficient fiscal incentives for remanufacturing and reuse.
- Poor integration between manufacturers, technical centers, and trash operators.

These obstacles coexist with potential brand-led efforts, such as SEAT and CUPRA's ELV (End-of-Life Vehicle) networks, which demonstrate progress in aligning industrial processes with European Union rules.

According to Moita et al. (2024), the main challenges facing Portugal are the lack of modern infrastructure, the lack of communication between producers and recyclers, and the difficulty reintegrating recycled materials into the production process due to technical and certification limitations.

In addition to qualitative analyses of circular practices, recent statistical data show the level of performance of the Portuguese automotive sector in comparison to European directives. Moita et al. (2024) shows key circularity indicators for critical flows such as ELVs, used tires, oil, and batteries in 2022, with collection and valuation rates above legal targets in most cases.

Portugal exceeded the EU's recycling and valorization targets for end-of-life vehicles (ELVs), used tires, oil, and batteries in 2022. For example, the collection rate of used tires (114.3%) and lubricants (113%) demonstrates a strong capacity for reverse logistics in these segments. Despite positive global indicators, particularly in energy and material valuation, recycling rates for batteries (71.5%) and tires (82.3%) show room for improvement, mostly due to increased electrification of mobility. These data support the qualitative analysis conducted in this study, highlighting that while the national collection system is robust, efficiency in material recycling and reintegration still faces technical and infrastructure challenges (Moita et al., 2024).

2.7. Consumer Behavior

CE is an economic and sustainable focused model that aims to reduce waste and maintains resources for as long as possible (Geissdoerfer et al., 2017). To ensure the success of this model, consumers perception and initiative are crucial, they must be involved in practices such as reusing, repairing, sharing, and recycling products (Camacho-Otero et al., 2018). Recent studies highlight the increasing importance of consumer behavior as a critical factor in the CE (Vidal-Ayuso et al., 2023).

Consumers now have an active role in extending the lifecycle of products and reintegrating them into the value chain, instead of just being a passive agent. Mostaghel and Chirumalla (2021) provide a theoretical model focused on customers in circular business models, where factors like awareness, attitude, and ethical purchasing intentions directly affect the adoption of circular practices. The authors identify personal values, environmental awareness, and perceived costs as determinant factors in consumers' willingness to participate in circular systems, like using reclaimed products or returning useful items.

Santos-Corrada et al. (2023) demonstrate that environmental, ethical considerations, and brand awareness positively affect consumer attitudes, intentions, and ethical purchasing behaviors. The authors also revealed that attitude acts as a mediating factor between awareness´ and effective actions, emphasizing the complexity of the consumer decisionmaking process in a circular environment.

Finnaly, Vidal-Ayuso et al. (2023) emphasizes in their systematic literature review, that consumer behavior in the CE can be analyzed through the stages of purchase, use, re-use, recycle, and upcycle. However, the authors warn of a gap between intention and action, caused by barriers such as lack of trust in the materials, unclear information, or negative perceptions about the quality of circular products. This finding emphasizes the need to include consumers in the value chain and develop and share effective personalized communication strategies.

CHAPTER 3 – METHODOLOGY

3.1. Research Design

This study employs a multi-perspective case study design using a qualitativedominant, mixed-methods case study with an exploratory and descriptive focus, making it appropriate for studying contemporary, changing phenomena such as the CE in the automobile industry (Flick, 2022; Creswell & Poth, 2018). Qualitative research is particularly useful for capturing the complexities of context-specific practices, meanings, and organizational dynamics that are difficult to quantify (Nowell et al., 2017).

The study takes an interpretivist epistemological perspective, recognizing that knowledge is co-constructed through social interaction and influenced by context and subjectivity (Schwartz-Shea and Yanow, 2012). This is congruent with the emphasis on the perspectives of a senior commercial manager actively involved in circular strategy for three different automobile companies.

A single case study design with multiple embedded units of analysis was employed, aligning with recent research on complex organizational contexts (Hyett et al., 2014; Ridder, 2017). The embedded units correspond to the brands SEAT, CUPRA, and Audi, each with different market positioning (entry-level, sporty/innovative, and premium, respectively) but all operating under the same corporate structure (Santogal).

This design enables a comparative analysis of circular strategies across different levels within the same organization, offering contextual richness while maintaining internal coherence (Yin, 2018; Saunders et al., 2023).

An online survey was applied to Portuguese automotive consumers. While the core approach remains qualitative, the inclusion of quantitative survey data allows for a more comprehensive exploration of consumer views of circular mobility.

3.2. Data Collection

This study used a multi-perspectives approach, combining qualitative and quantitative data sources, to improve its analysis of CE practices in the automotive industry. This methodological methodology directly supports the research purpose of understanding CE adoption at both the organizational and consumer levels (via in-depth interviews and a structured survey).

First, a semi-structured interview was performed in person at the Abrunheira unit, on March 12th, 2025, with a manager in charge of commercial responsibilities for the three study brands: SEAT, CUPRA, and AUDI. The interview lasted for about 45 minutes and covered strategic and operational topics related to circular practices. Specifically, the discussion addressed four key themes:

- CE and brand strategy;
- Influence on sales and consumer behavior;

- Influence on the supply chain and after-sales services;
- Future of the CE in the automotive industry.

It was carried out with informed consent and completely transcribed for the latter examination.

The interviewee is the sales director of new and used vehicle of AUDI, SEAT, and CUPRA brands in Portugal, and has been working in the automotive sector for 26 years. Their tasks include client relations (both B2C and B2B), coordination with brand headquarters, post-sale procedures, and engagement with financing partners. This strategic stance gives them a comprehensive and operational view of how CE principles are utilized across various brand categories.

An online survey was developed using the Qualtrics platform, and aims to capture Portuguese consumers' levels of awareness, attitudes, and behavioral intentions towards CE practices in the automotive sector, serving as a complement to the qualitative interviews and allowing to capture different perspectives about the topic.

It was developed using questions based in the circular consumption sustainable product acceptability, and mobility preferences literature (Santos-Corrada et al., 2023).

The survey contained 17 questions organized into four major sections:

(1) Sociodemographic characterization: This portion included four nominal questions about age group, gender, current region of residence, and professional position, which were adapted from similar studies in consumer sustainability research (e.g., Mostaghel and Chirumalla, 2021). Age was measured using categorical brackets (e.g., "Under 25", "25-34"), and area was recorded as an open-ended response to capture geographic variety.

(2) Familiarity and impression of CE concepts: Participants were asked if they had heard of the phrase "circular economy" using a single-choice question with three alternatives ("Yes," "No," and "Not sure") used by Lakatos et al. (2016). Another question assessed how significant they thought the usage of recycled or reused materials in car manufacture was, using a 4-point scale ranging from 1 ("Not important") to 4 ("Very important) (Ruokamo et al., 2022).

(3) Mobility preferences: They were also asked what type of car they would buy today (for example, "Combustion (petrol/diesel)", "Hybrid", and "100% Electric"). Additional questions probed attitudes towards alternative automobile acquisition options such as leasing, renting, monthly-subscription, or bank financing (Polyportis, Mugge, & Magnier, 2022). A multi-response question also questioned which considerations would inspire the interviewee to buy a used or refurbished car rather than a new one (for example, lower price, environmental grounds, warranty) (Polyportis et al., 2022).

(4) The perceived benefits, limitations, and trust factors in circular mobility: This section included multiple-choice questions that asked participants to identify the benefits of CE practices in the automotive industry (e.g., lower environmental impact, lower production costs, greater durability), as well as perceived disadvantages (e.g., lack of trust in recycled parts, higher prices, lack of information) (Polyportis et al., 2022; Ruokamo et al., 2022). One item used a four-point ordinal scale to assess the perceived efficiency of brand communication on CE projects ("Yes, clearly communicated" to "No") based on Lakatos et al. (2016).

In addition, respondents were asked to indicate (a) what would most inspire them to embrace circular mobility solutions such as leasing or reconditioned cars, and (b) what aspects would boost their faith in such solutions (e.g., brand certification, government incentives, user testimonials). A 5-point Likert type scale (1 = "Not motivating"to 5 = "Very motivating") was used for selected questions addressing behavioral intent and motivation, as recommended by Finstad (2010), as this format provides balanced reliability and interpretability for attitudinal assessments in self-administered questionnaires.

To ensure content validity and identify potential flaws with layout or wording, the survey was pre-tested with 10 personal and professional contacts. Minor changes were made based on comments, such as improving the phrasing of items and simplifying instructions to increase completion rates and eliminate ambiguity. A non-probability convenience sampling strategy was utilized, which is suited in exploratory research contexts when the purpose is to identify trends and perceptions rather than statistical generalization (Saunders et al., 2023). The survey was distributed via personal networks, including contacts from academic, work, and social settings, as well as direct distribution through email and messaging platforms. The final sample consists of 167 valid responses.

3.3. Ethics

This study followed ethical principles when collecting data. Participants were informed about the study's objectives before participating, and their participation was voluntary. Data collected will only be used for academic purposes. Anonymity was ensured in both cases, and no information was collected that could directly identify the participants.

CHAPTER 4 - DATA ANALYSIS

4.1. Results from the Semi-structured Interview

The interview was conducted with the sales manager of Audi, SEAT, and CUPRA da Abrunheira.

According to the interviewee, all three brands have already implemented CE practices. Financing and accessibility solutions such as leasing, renting, and subscriptions are widely used particularly by businesses, the primary buyer market in Portugal, as he stated, "the ones who buy the most vehicles are companies and many of them use these financing strategies". The VAG group, to which the brands in question belong, has its own financial structure, making it easier to execute these options. CUPRA, for example, tested flexible leasing and subscription models to promote mobility as a service. Volkswagen Financial Services has expanded solutions to extend the useful life of vehicles through remarketing and used car financing.

The communication of these strategies to clients varies. Financial solutions, such as leasing, are frequently advertised in promotional campaigns focused on selling specific models. The issue of material reutilization and sustainability arises indirectly through advertising campaigns that mention the integration of recycled materials in vehicles, a practice shared by all three brands, but with different marketing approaches.

The interviewee identified regulatory pressure as a key driver for implementing sustainable practices. Brands face penalties for non-compliance, requiring continuous adaptation to environmental goals and European regulations.

Consumers perceived a distinction between individuals and companies. In general, individual clients "end up basing their choices on what's cheapest", said the interviewee, and for consequence electric vehicles are less appealing to this sector due to their higher prices. Companies are increasingly choosing electric or plug-in hybrid vehicles due to financial benefits and reputational concerns. Large companies often choose these motorizations, even if they are not the most cost-effective.

The variety of sustainable offers influences purchasing decisions in a unique way based on brand and target audience. AUDI's customer profile is more resistant to switching to electric vehicles, prioritizing convenience. SEAT, with a strong presence in the business sector, prioritizes hybrid proposals for financial reasons. The CUPRA, on the other hand, attracts a more receptive audience to electric mobility, aligning with an image of innovation and sustainability.

The interviewee confirmed that renting and leasing options are increasingly popular, particularly for electric vehicles, like the interviewee said, "this option of leasing is increasingly being used to buy electric vehicles because the buyer always has doubts and fears about what the future will bring.", there is still not enough past data to analyze what the second-hand market for these vehicles will be, these options end up being safer for consumers.

There were no significant changes in concession operations involving suppliers or concessionaires. Importers are primarily responsible for managing parts and vehicles. In factories, it may be necessary to replace suppliers who did not follow the transition, despite the fact that many circular practices involve the same suppliers, with a focus on material reutilization.

Regarding the after-sales impact, like the interviewee said, "The brands are still adapting, even for the sustainability of the business, an electric car has much less maintenance than a combustion car". Electric vehicles necessitate service adaptations, including staff training and cost structure review. Working on electric vehicles requires more specialized skills, have less maintenance to do, which is a financial problem for the company and has a higher cost for both parts, he explained "formation costs have also had to increase... mechanics have had to be adapted... which also means a different cost in

terms of the hourly labor rate, which is also higher than that of a conventional combustion vehicle".

Vehicle end-of-life plans have been confirmed, allowing for the reuse of parts and components in the construction of new vehicles to reduce waste. Selling used, seminew, and service vehicles is an essential strategy for brands, supported by CE principles. However, brands have expressed concern about the financial impact of transitioning from new to used vehicles, which may affect their resale value.

The CE is viewed as a determining factor for the future of the automotive industry. The interviewee believes that brands cannot deviate from European guidelines without endangers their financial and reputational position. However, the interviewee highlighted that "the fastest phase has already passed". He mentioned the postponement of some European goals and suggested that evolution should occur gradually, taking into account consumers' adaptability. Several barriers have been identified, including limited purchasing power, a scarcity of charging infrastructure, and high costs for charging outside of the domestic environment.

Strategic differences between the brands were also discussed. Audi continues to offer a diverse range of vehicles, including combustion, plug-in hybrids, and electric vehicles, differentiating itself through the reuse of components, which is possible due to their high quality. SEAT focusses on combustion engines, with only one plug-in hybrid model, while CUPRA invests heavily in electrification, with a large portion of their lineup comprised of hybrid or fully electric vehicles, they invest in circular practices by using recycled materials into their vehicles The interviewee also mentioned that CUPRA separated from SEAT to better align with the group's strategy focused on electric motorizations.

Finally, he mentioned the VAG group's investment in the MOON brand, which provides electric charging stations, a complementary business aimed at facilitating energy transition.

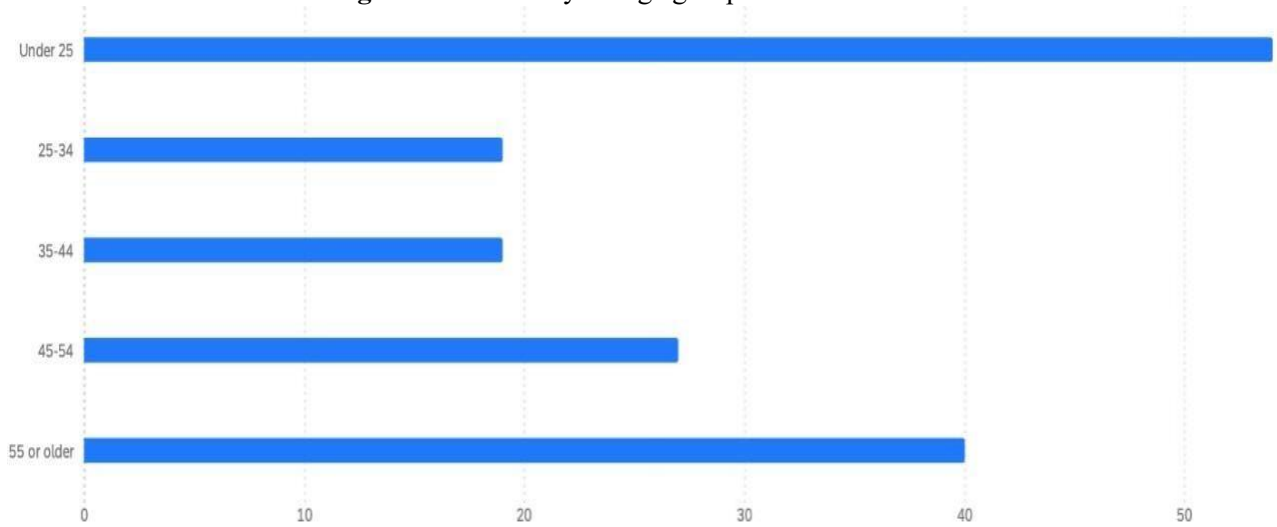
To summarize the differences between these 3 brands, Annex C demonstrates a clear perspective of the strategy of each brand.

4.2. Survey Data

4.2.1. Respondent Characterization

The survey found that most of participants are from Lisbon, with ages ranging from “under 25” with 56 answers to “55 or older" with 43 answers, gender distribution is balanced, and the majority are employed.

Figure 1 – What is your age group?

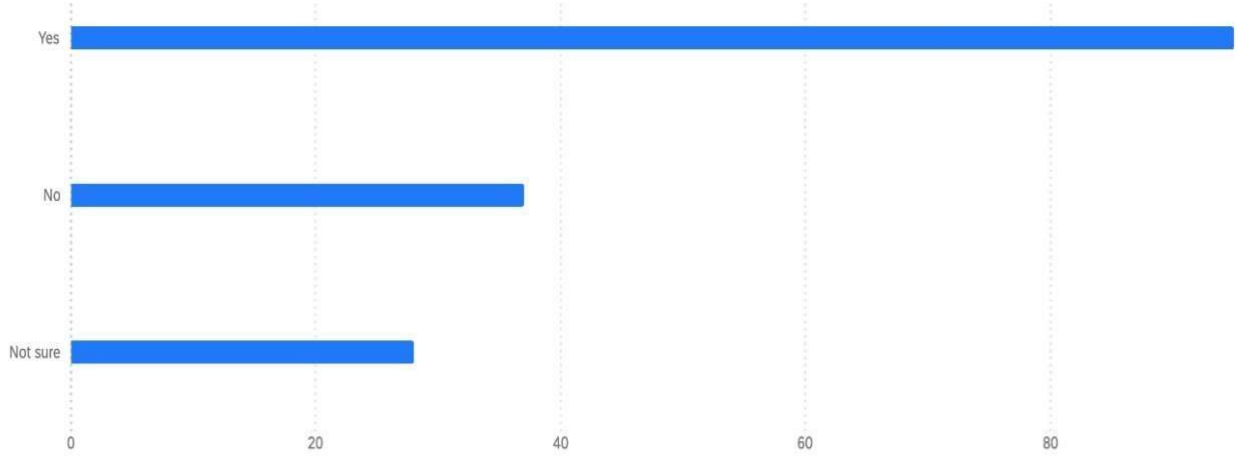


4.2.2. Awareness and Attitudes about Circular Economy

4.2.2.1 Consumer Familiarity with the Concept of CE

Most respondents say they know what the term circular economy means (59% of the respondents), but there is still a significant number of customers who are unfamiliar with the term.

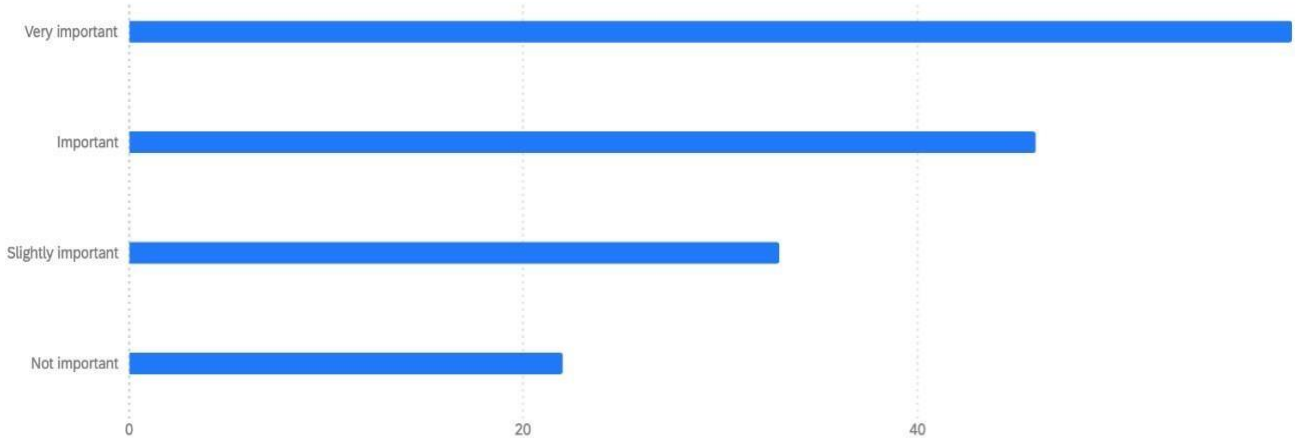
Figure 2 – Have you heard of the term “circular economy”?



4.2.2.2 The Importance of Using Recycled Materials in Automotive Manufacturing

Most respondents consider the use of recycled materials in automotive manufacturing important or very important (65% of the respondents), which demonstrates a positive attitude towards sustainability.

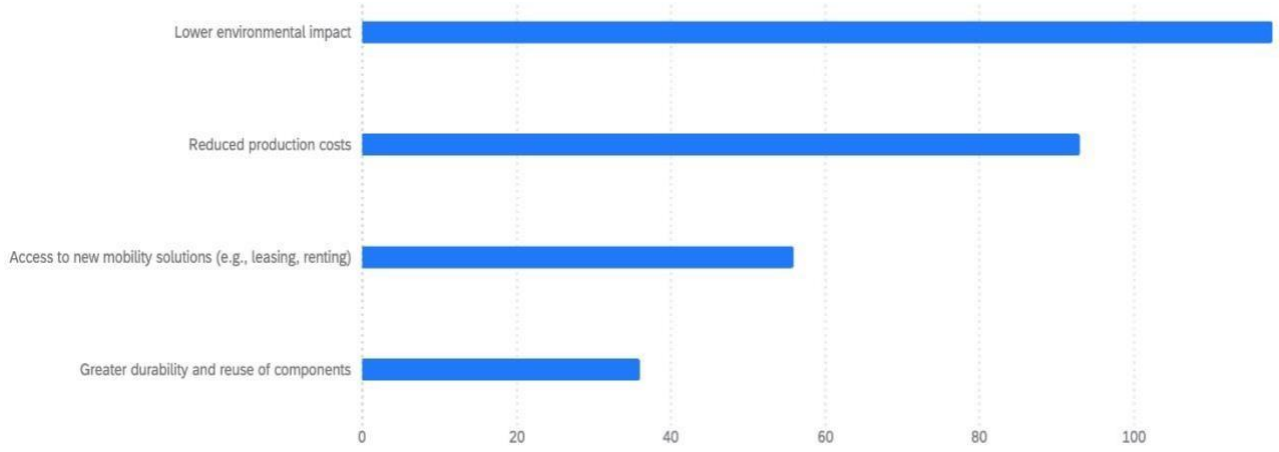
Figure 3 - How important do you think it is for vehicles to be produced using recycled or reused materials?



4.2.2.3 Advantages Associated with CE in Automotive Industry

Consumers associate a lower environmental impact (120 answers) and reduced production costs (94 answers) as the main advantages associated with CE.

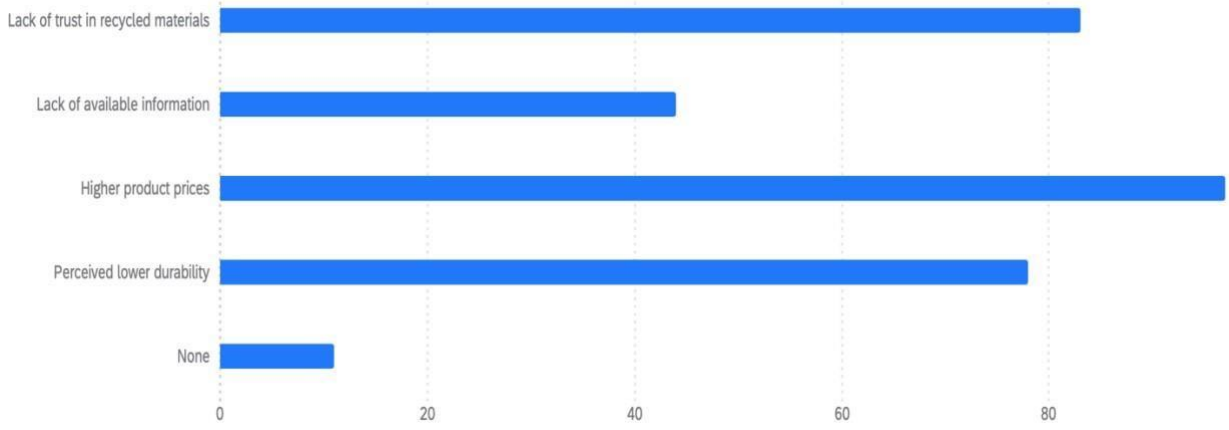
Figure 4 – What advantages do you associate with circular economy practices in the automotive sector?



4.2.2.4. Disadvantages Associated with CE in Automotive Industry

The perception of higher prices (97 answers), lack of trust in recycled materials (44 responses) and perceived lower durability (78 answers) are among the main disadvantages associated with the circular economy (CE) in the automotive industry.

Figure 5 – What disadvantages do you associate with circular practices in the automotive sector?

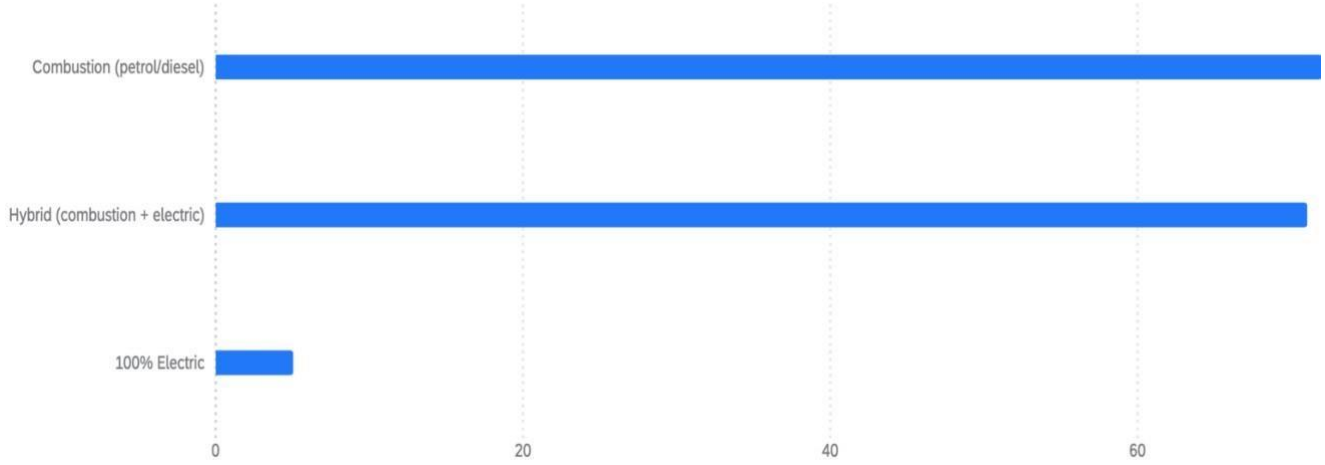


4.2.3 Mobility Preferences and Acquisition Models

4.2.3.1 Preferential Motorization

Combustible vehicles continue to be the preferred mode of transportation (72 answers), by the minimum margin, hybrids are gaining popularity (71 answers), and 100% electric vehicles have a low adoption rate (5 answers).

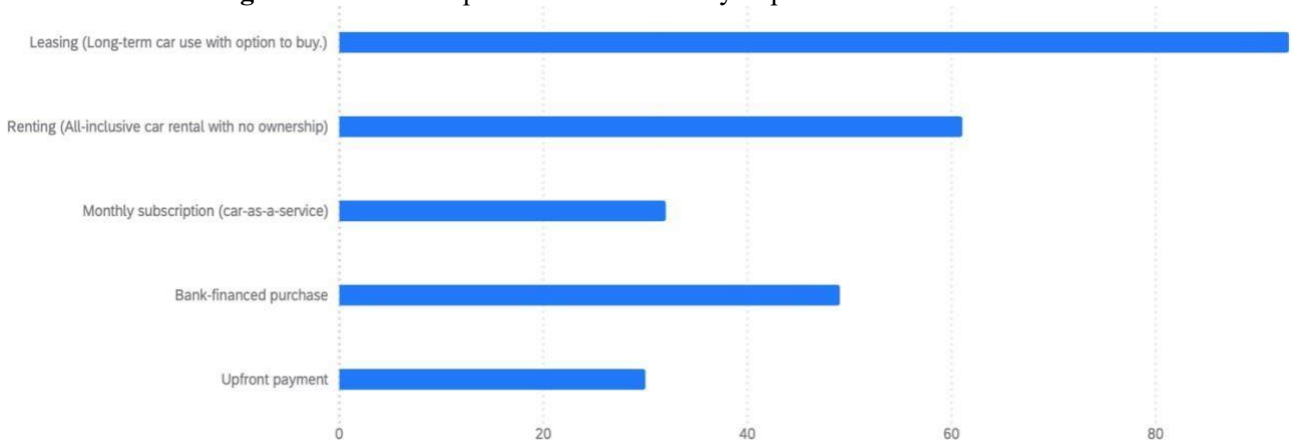
Figure 6 - If you were to acquire a car today, which type would you choose?



4.2.3.2 Acquisition Models

Leasing is the preferred mode of acquisition (93 answers), followed by renting (61 answers) and bank financed purchase (49 answers) , monthly subscription is still not widely adopted (32 answers) and the less preferable method, upfront payment with 30 responses.

Figure 7 - Which acquisitions methods do you prefer?

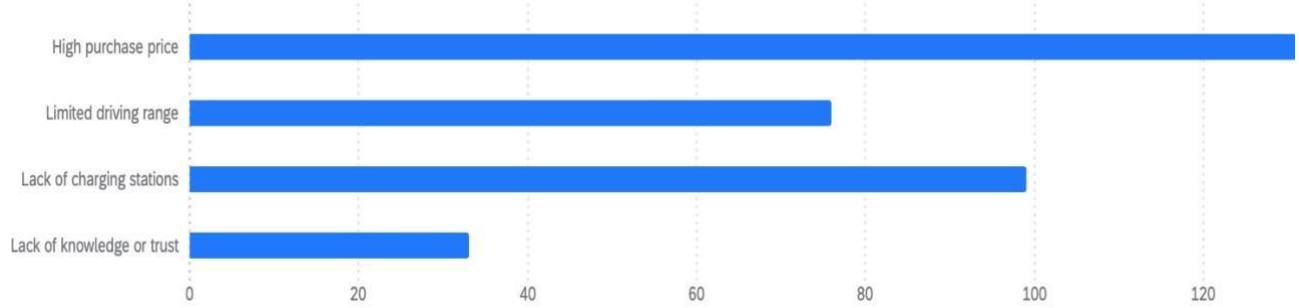


4.2.4. Barriers, Enablers and Strategic Perceptions

4.2.4.1 Barriers to adopt electric vehicles

The high purchase price (131 answers), lack of infrastructures (99 answers), and limited driving range (76 answers) are the main barriers for consumers to adopt electric vehicles.

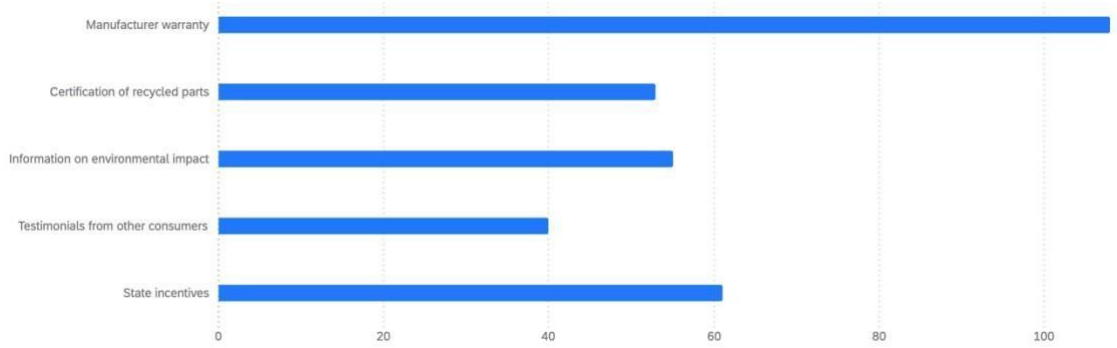
Figure 8 – What do you consider the main obstacle(s) to adopt electric or hybrid vehicles?



4.2.4.2 Enablers to boost trust in circular products

Manufacturer warranties (108 answers) and state incentives (61answers) are the main enablers of trust in circular products.

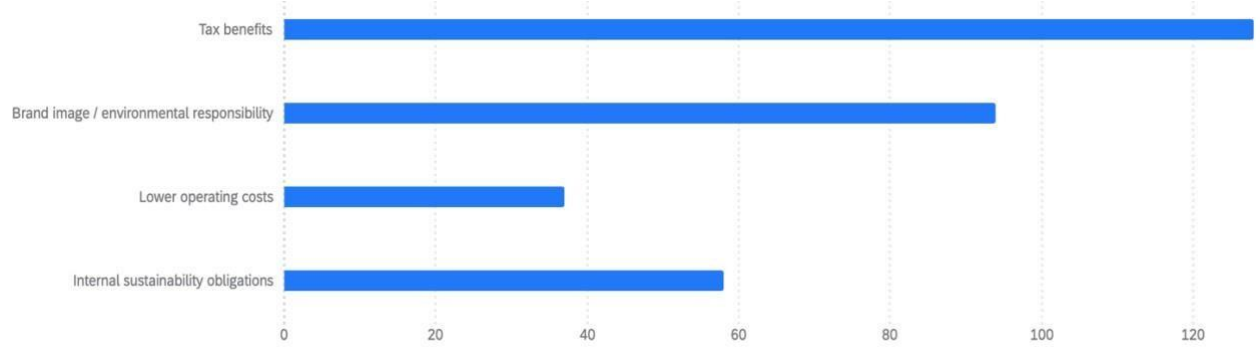
Figure 9 - Which of the following would increase your trust in circular mobility solutions the most?



4.2.4.3 Reasons for Companies use Electric and Hybrid Vehicles more Frequently than Individuals

Consumers believe that companies use electric and hybrid vehicles more frequently due to tax benefits (128 answers) that individuals do not have and to maintain a positive image with their target audience.

Figure 10 - In your opinion, why do companies adopt hybrid and electric vehicles more in comparison to private individuals?



The presented results serve as the foundation for critical discussion and theoretical reflection in the upcoming chapter.

CHAPTER 5 – DISCUSSION AND CONCLUSION

5.1. Summary of the Main Results

The main goal of this research was to understand how Volkswagen Group brands SEAT, CUPRA, and AUDI adopt CE practices in Portugal and how consumers perceive these practices. A qualitative exploratory case study approach was used, along with semistructured interviews with a senior manager and a customer survey, to collect data. These two sources of data allow us to capture two perspectives: organizational and consumer. The results show that the CE effectively integrates the commercial and operational strategies of the brands under consideration. Financing solutions such as leasing, renting, and subscriptions are heavily promoted, particularly among business clients, and help extend vehicle life cycles. There is a growing adoption of practices such as component reuse, modular design, and the use of recycled materials in automotive production, although these actions are not always well communicated to consumers. Valorizing used, semi-new, and service vehicles is a viable strategy to increase product circularity and reach new market segments.

The interview also revealed a clear distinction between the behaviors of corporate and individual consumers. While businesses are more reluctant to use electric or hybrid vehicles due to financial, reputational and strategic considerations, individual consumers continue to prioritize price, suggesting a lower willingness to adopt sustainable solutions. This divergence is also confirmed by survey data, which shows that although sustainability is valued, choices are predominantly based on final product cost.

5.2. Discussion

The data analysis shows strong alignment with the main concepts explored in the literature review. The literature recognizes CE as a regenerative paradigm that requires a

systematic transformation of the entire value chain of the automobile industry (Geissdoerfer et al., 2017; Prochatzki et al., 2023).

Moreover, the interviewee highlights the importance of European regulation as the key driver for transition, aligning with authors like Kirchherr et al. (2018) and recent European Commission proposals on ELV (European Commission, 2023b). Brands are under constant pressure to satisfy environmental objectives and agendas, and if they don't, there will face financial and reputational consequences. This forces them to adopt sustainable practices, even if there is no direct return or clear consumer perception.

Communication with customers is another critical factor to take into account. According to Khakimova and Park (2023), many circular initiatives developed by brands are not properly communicated, limiting their capacity to engage with more audience. The survey data shows that while most respondents recognize the need of recycling materials, many are unaware of the specific practices used by brands.

Research by Mostaghel e Chirumalla show that intentions to adopt sustainable practices do not always translate into concrete actions due to factors such as lack of confidence, lack of information, and perception of high costs. This trend is also evident in the data collected in this study: although there is an overall positive attitude towards sustainability, most consumers still prefer internal combustion vehicles and have doubts about the quality and reliability of reconditioned products.

Finally, the study highlights structural and contextual barriers that impede the implementation of CE practices in Portugal, like for example unfavorable taxation of used vehicles, lack of transportation infrastructure, and low environmental literacy are barriers that must be addressed by both businesses and regulatory bodies. Circularity relies not only on technological innovations, but also on institutional reforms, consumer involvement, and more effective communication strategies.

5.3. Theoretical Implications

From a theoretical point of view this research contributes to the literature on CE by providing an empirical perspective on the Portuguese automotive industry, which is still underexplored. This study, which combines qualitative and quantitative data from three

different brands, confirms that the transition to circularity is influenced by organizational, technological

Theoretically, an integrated approach that considers both internal company challenges and consumer behaviors is valuable. By connecting business practices with user perceptions, we may understand circularity as a dynamic process influenced by regulations, consumer culture, technological innovation, and market structures.

This contribution broadens the theoretical scope of CE adoption models, highlighting the importance of communication and consumer trust as critical elements for the success of sustainable practices.

5.4. Practical Implications

The findings suggest several practical implications. Manufacturers and distributors must improve communication of circularity practices by clearly integrating them into marketing campaigns and customer contact points. The lack of visibility for sustainable practices limits their value and might undermine customer loyalty. Investing in continuous employee training, in both technical and commercial aspects, is essential for addressing challenges associated with electrification and changing business models.

Brands could consider expanding mobility models based on usage, like renting or monthly subscription programs for example, and customize them for various types of consumer profiles.

Policymakers should review the percentage of tax in semi used, used and electric vehicles to make them more appealing to individual consumers, and not only for businesses, in the case of the electric vehicles. Reinforce incentives for reusing, repairing, and recycling vehicles, in addition to expanding the electric vehicle charging infrastructure, particularly in residential areas. Implementing circularity criteria in public competitions and urban mobility programs can promote the adoption of sustainable practices.

5.5. Research limitations

As with any exploratory research, this study has limitations that should be acknowledged. The survey sample is not representative and was selected for convenience. The findings do not allow for statistical generalizations, but rather a qualitative analysis of trends and perceptions. The interview, while comprehensive and covering three distinct brands, is based on the perspective of a single manager, limiting the range of organizational perspectives.

This study focusses mainly on the Portuguese scenario, where factors like as purchasing power, fiscal policies, and technological infrastructure have a significant impact on the adoption of circular practices. The specificities make it difficult to generalize the results to other countries or continents with different realities.

5.6. Suggestions for Future Research

Given the limitations mentioned, future research could improve the empirical base by conducting interviews with representatives from other car brands such as, Ferrari, Stellantis Group, Mercedes-Benz or Renault allowing for a more rigorous interorganizational comparison. It is also important to do comparative studies with other European countries to understand how institutional context, culture and regulations influences circular strategies.

Another promising research line is a quantitative analysis of the influence of CE on business profitability, vehicle residual value, and operational cost reduction.

Finally, further studies that focus only on consumer behavior, using representative samples can provide more in depth understanding of the motivations, barriers, and confidence factors associated with the adoption of circular solutions in the automotive industry.

REFERENCES

Aranda-Usón, A., Portillo-Tarragona, P., Scarpellini, S., & Llena-Macarulla, F. (2019). The progressive adoption of a circular economy by businesses for cleaner production: An approach from a regional study in Spain. Journal of Cleaner Production, 247, 119648. https://doi.org/10.1016/j.jclepro.2019.119648

Audi. (2025a, April 7). Economia circular: Audi garante fornecimento estratégico e eficiente de matérias-primas recicladas. Audi Portugal. Retrieved May 17, 2025, https://www.audi.pt/stories/economia-circular-audi-garantefornecimentoestrategico-e-eficiente-de-materias-primas-recicladas

Audi. (2025b). Circular economy – Environmental resources. Audi AG. Retrieved May 29, 2025, https://www.audi.com/en/sustainability/environmentresources/circulareconomy/

Bain & Company. (2023, July 6). Reuse, remanufacturing, recycling, and robocabs: Circularity in the automotive industry.,https://www.bain.com/insights/reuseremanufacturing-recycling-and-robocabscircularity-in-the-automotive-industry/

BMW Group. (2024). Circular economy at BMW Group. Retrieved March 17, 2025, https://www.bmwgroup.com/en/sustainability/circular-economy.html

Camacho-Otero, J., Boks, C., & Pettersen, I. N. (2018). Consumption in the circular economy: A literature review. Sustainability, 10(8), 2758. https://doi.org/10.3390/su10082758

Capgemini. (2023, August 14). Circular economy in automotive: The sustainable key to a profitable future. Retrieved March 7, 2025, https://www.capgemini.com/gben/insights/expert-perspectives/circular-economy-inautomotive-the-sustainable-key-toa-profitable-future/

Catană, Ș. A., Toma, S. G., & Grădinaru, C. (2022). Circular economy applied to the automotive industry. Ovidius University Annals, Economic Sciences Series, 22(1), 516–522. https://doi.org/10.61801/OUAESS.2022.1.70

Creswell, J. W., & Poth, C. N. (2018). Qualitative Inquiry and Research Design: Choosing Among Five Approaches (4th ed.). SAGE.

CUPRA. (2021). Sustainability and SEAQUAL® YARN: Innovation in the CUPRA Born. Retrieved March 17, 2025, https://www.cupraofficial.com/brand/sustainability/cupra-seaqual-ocean-cleaninnovative-design

CUPRA. (2025). Veículos em fim de vida. CUPRA Portugal. Retrieved March 17, 2025, https://www.cupraofficial.pt/o-seu-cupra/apoio-tecnico/veiculos-em-fim-de-vida

de Jesus, A., & Mendonça, S. (2018). Lost in transition? Drivers and barriers in the ecoinnovation road to the circular economy. Ecological Economics, 145, 75–89. https://doi.org/10.1016/j.ecolecon.2017.08.001

EEA – European Environment Agency. (2022). Transport and environment report 2021: Decarbonising road transport.

Ellen MacArthur Foundation. (2013). Towards the circular economy: Economic and business rationale for an accelerated transition.

Ellen MacArthur Foundation. (2023). The 9Rs Framework.https://static1.squarespace.com/static/646bdeebc453335e43aa9930/t/6498fef2acb81561df78d4b0/1687748343402/9Rs.pdf

European Commission. (2020, March 11) Circular Economy Action Plan – For a cleaner and more competitive Europe. Retrieved March 3, 2025 https://eurlex.europa.eu/legalcontent/EN/TXT/?uri=CELEX:52020DC0098

European Commission. (2023a). End-of-life vehicles: Revision of EU rules. Retrieved March 12, 2025, https://environment.ec.europa.eu/topics/waste-and-recycling/endlifevehicles_en

European Commission. (2023b, July 13). Proposal for a Regulation ... on circularity requirements for vehicle design and on the management of end-of-life vehicles. Retrieved March 12, 2025, https://eurlex.europa.eu/legalcontent/EN/TXT/?uri=CELEX:52023PC0451 European Parliament. (2025). Circularity requirements for vehicle design and management of end-of vehicles. Retrieved May 21, 2025 https://www.europarl.europa.eu/thinktank/en/document/EPRS_BRI(2023)754627

Finstad, K. (2010). Response interpolation and scale sensitivity: Evidence against 5-point scales. Journal of Usability Studies, 5(3), 104–110. https://uxpajournal.org/responseinterpolation-and-scale-sensitivityevidence-against-5-point-scales/

Flick, U. (2015). *Introducing research methodology: A beginner's guide to doing a research project*. Sage.

Fonseca, L. M., Domingues, J. P., Pereira, M. T., Martins, F. F., & Zimon, D. (2018). Assessment of Circular Economy within Portuguese Organizations. Sustainability, 10(7), 2521. https://doi.org/10.3390/su10072521

Geissdoerfer, M., Savaget, P., Bocken, N. M. P., & Hultink, E. J. (2017). The circular economy – A new sustainability paradigm? Journal of Cleaner Production, 143, 757– 768. https://doi.org/10.1016/j.jclepro.2016.12.048

Hyett, N., Kenny, A., & Dickson-Swift, V. (2014). Methodology or method? A critical review of qualitative case study reports. Qualitative Health Research, 24(9), 1177–1187.https://doi.org/10.3402/qhw.v9.23606

Khakimova, S. N., & Park, Y. W. (2023). Circular economy in automobile industry: Literature analysis. Management Review: An International Journal, 18(1), 83–113.https://doi.org/10.55819/mrij.2023.18.1.83

Kirchherr, J., Piscicelli, L., Bour, R., Kostense-Smit, E., Muller, J., Huibrechtse-Truijens, A., & Hekkert, M. (2018). Barriers to the circular economy: Evidence from the European Union (EU). Ecological Economics, 150, 264–272.https://doi.org/10.1016/j.ecolecon.2018.04.028

Kirchherr, J., Reike, D., & Hekkert, M. (2017). Conceptualizing the circular economy: An analysis of 114 definitions. Resources, Conservation and Recycling, 127, 221–232.https://doi.org/10.1016/j.resconrec.2017.09.005

Maldonado-Guzmán, G., Garza-Reyes, J.A. and Pinzón-Castro, Y. (2021), "Ecoinnovation and the circular economy in the automotive industry", Benchmarking: An International Journal, Vol. 28 No. 2, pp. 621-635. https://doi.org/10.1108/BIJ-06-20200317

McDonough, W., & Braungart, M. (2002). Cradle to Cradle: Remaking the Way We Make Things. North Point Press. https://doi.org/10.1017/S1466046609990494

Moita, A., Lopes, J. C., & Mendes, J. Z. (2024). Circular economy and sustainability: The case of the automotive industry in Portugal. Innovation and Green Development, 3, 100177. https://doi.org/10.1016/j.igd.2024.100177

Morseletto, P. (2020). Targets for a circular economy. Resources, Conservation and Recycling, 153, 104553. https://doi.org/10.1016/j.resconrec.2019.104553

Mostaghel, R., & Chirumalla, K. (2021). Role of customers in circular business models. Journal of Business Research, 127, 35–44. https://doi.org/10.1016/j.jbusres.2020.12.053

Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic analysis: Striving to meet the trustworthiness criteria. International Journal of Qualitative Methods, 16(1). https://doi.org/10.1177/1609406917733847

Porsche Newsroom. (2024, December 18). "Taking responsibility – for products and resources": Circular Economy at Porsche Retrieved May 19, 2025, 2025,https://newsroom.porsche.com/en/2024/sustainability/porscheperspectives-on-sustainability-jonathan-hoerz-circular-economy-38211.html

Porsche Newsroom. (2025, April 10). Circular economy: How Porsche reconditions defective vehicle components. Retrieved May 19, 2025 https://newsroom.porsche.com/en/2025/sustainability/porsche-remanufacturing-circulareconomy-vehicle-components-39167.html

Prochatzki, G., Mayer, R., Haenel, J., Schmidt, A., Götze, U., Ulber, M., Fischer, A., & Arnold, M. G. (2023). A critical review of the current state of circular economy in the automotive sector. Journal of Cleaner Production, 425, 138787. https://doi.org/10.1016/j.jclepro.2023.138787

Ridder, H. G. (2017). The theory contribution of case study research designs. Business Research, 10(2), 281–305. https://doi.org/10.1007/s40685-017-0045-z

Ruet, J., Wang, X., & Grebert, J. (2025). Transforming the automotive industry with the circular economy model. HAL Archives Ouvertes. https://hal.science/hal-04865087

Santos-Corrada, M. D. L. M., Méndez-Tejeda, R., Flecha-Ortiz, J. A., & Lopez, E. (2023). An analysis of sustainable consumption practices through the role of the consumer behavior in the circular economy. Journal of Consumer Behaviour, 23(1), 229–242. https://doi.org/10.1002/cb.2183

Saunders, M., Lewis, P., & Thornhill, A. (2023). Research Methods for Business Students (9th ed.). Pearson Education.

Schwartz-Shea, P., & Yanow, D. (2012). Interpretive Research Design: Concepts and Processes (2nd ed.). Routledge.

SEAT. (2024, March 6). SEAT S.A. to install 39,000 new solar panels to triple its own renewable energy production. Retrieved March 25, 2025, https://www.seat.co.uk/aboutseat/news-events/corporate/seat-sa-to-install-39000-newsolar-panels

SEAT. (2025). Veículos em fim de vida. SEAT Portugal. Retrieved March 25, 2025, https://www.seat.pt/pos-venda/seat-service/veiculos-em-fim-de-vida

Stahel, W. R. (2016). The circular economy. Nature News, 531(7595), 435–438. http://doi.org/0.1038/531435a

Toma, S. G., & Catană, Ş. (2022). Circular economy in the European automotive industry: A review. Procedia Environmental Science, Engineering and Management, 9(3), 739–748. http://doi/org/0.61801/OUAESS.2022.1.70

Vidal-Ayuso, F., Akhmedova, A., & Jaca, C. (2023). The circular economy and consumer behaviour: Literature review and research directions. Journal of Cleaner Production, 418,

137824. https://doi.org/10.1016/j.jclepro.2023.137824

Volkswagen Group (2024). Research and development – Sustainable value enhancement.

In Annual Report 2023. Retrieved May 2 , 2025 https://annualreport2023.volkswagengroup.com/group-management-report/sustainablevalue-enhancement/research-anddevelopment.html

Volvo Cars. (2021, April 21). Volvo Cars to lower CO_2 emissions and save billions in circular business aim.Media.Volvocars.com. https://www.media.volvocars.com/global/en-gb/media/pressreleases/280872/volvo-cars-to-lower-co2-emissions-and-save-billionsincircular-business-aim

World Economic Forum. (2024, March 22). Automotive industry circularity: How the EU, China and the US are revving up sustainability. Retrieved March 10, 2025, https://www.weforum.org/stories/2024/03/automotive-industry-circularity/

ANNEXES

ANNEX A – INTERVIEW GUIDE

1. Informações Gerais do Entrevistado

- 1.1 Nome – Anónimo
- 1.2 Cargo/Função – Sales Manager
- 1.3 Marca automóvel representada - Audi; Seat; Cupra;
- 1.4 Tempo de experiência no setor automóvel - 26 anos - 1.5 Principais mercados onde atua - Portugal

2. Economia Circular e Estratégia da Marca

- 2.1 A marca que representa já adota práticas de economia circular? Se sim, quais?
- 2.2 Como a adoção dessas práticas é comunicada aos clientes e concessionários?
- 2.3 O que levou a marca a adotar estas medidas?

3. Impacto nas Vendas e no Comportamento do Consumidor

- 3.1 Os consumidores demonstram interesse por veículos e serviços alinhados à EC? O que mais valorizam?

- 3.2 Como a oferta de veículos sustentáveis influência a decisão de compra?

- 3.3 A economia circular impactou os modelos de venda?

4. Impacto na Cadeia de Abastecimento e Pós-Venda

- 4.1 A introdução de práticas circulares alterou a relação da marca com fornecedores?

- 4.2 Como funciona o serviço de pós-venda e acompanhamento dos clientes destes novos veículos?

- 4.3 Como a marca lida com o fim de vida dos veículos e a reciclagem de peças?

- 4.4 A venda de veículos usados, de serviço ou seminovos faz parte da estratégia da marca?

5. Futuro da Economia Circular na Indústria Automóvel

- 5.1 Acredita que a EC será determinante no futuro das vendas?

- 5.2 Como imagina que as práticas circulares irão evoluir nos próximos anos e o que pode acelerar a adoção da economia circular no setor?

- 5.3 Dentro das marcas que representa sente que existe diferenças na estratégia para o futuro no que toca à transição para veículos elétricos ou até um diferente tipo investimento em práticas ecológicas?

ANNEX B – INTERVIEW TRANSCRIPTION

The interview covered the three brands separately, and the answers were then organized by unit of analysis (brand) for the purposes of the research.

Entrevistador - A marca que representa já adota práticas de economia circular? Se sim, quais? (por exemplo: reutilização de materiais, reciclagem, leasing de veículos, etc.)

Entrevistado - Sim, ambas as 3 marcas adotam. No caso das facilidades de compra e pagamento é fundamental no mercado automóvel praticar todas essas formas de financiamento e subscrições para se chegar mais facilmente ao cliente. Em Portugal quem mais compra veículos são as empresas e muitas delas recorrem a estas estratégias de financiamento. O leasing já e utilizado há muito tempo, e no caso do grupo VAG o próprio tem mesmo uma financeira própria. A Cupra lançou testespiloto com leasing flexível e modelos de subscrição, promovendo a mobilidade como serviço *(Mobility-as-a-Service)* e falando da VW, como grupo VAG que fazemos parte, a *Volkswagen Financial Services* está a expandir serviços que prolongam a vida útil de veículos através de *leasing, renting e remarketing* de veículos usados.

Já na questão da reutilização de materiais sim claro que essas práticas já são adotadas há alguns anos e cada vez mais estão a ser utilizadas em diferentes componentes dos próprios automóveis e das suas linhas de produção. São utilizadas praticas como a Reutilização e Remanufatura de Componentes, A Volkswagen Group Components opera centros de desmontagem e remanufatura na Alemanha, segunda vida de baterias, as marcas do grupo estão a adaptar módulos de veículos para serem mais facilmente substituíveis (ex: módulos eletrónicos, baterias)

Entrevistador - Como a adoção dessas práticas é comunicada aos clientes e concessionários?

Entrevistado - No caso do *Leasing* este é muitas vezes comunicado através de recorrentes campanhas que a marca faz para aumentar as vendas de determinados modelos.

Na parte da reutilização de materiais e da reciclagem a comunicação ocorre também através de publicidade mas não de forma direta e só focada nesse tema, acontece sim muitas vezes através da publicidade de certos veículos onde é referida essa utilização de materiais reciclados na produção dos automóveis, e isto é transversal às 3 marcas que represento (Audi, Seat e Cupra) cada uma com a sua estratégia de marketing mas ambas realizam campanhas com a referencia ao *leasing* e ambas utilizam também as suas publicidades para aproveitarem para fazerem referência à tal utilização de materiais reciclados.

Entrevistador - O que levou a marca a adotar estas medidas? (ex.: pressão de mercado, medidas governamentais, reputação)

Entrevistado - A evolução foi muito rápida, e as marcas tem de acompanhar essas medidas e regulamentações pois as multas são muito pesadas e um grupo como o grupo VAG se não cumprir com essas medidas pode ver o seu negócio destruído tanto a níveis financeiros como reputacionais. Há, portanto, uma constante pressão muito grande sobre as marcas para cumprirem medidas, normas e agendas.

Entrevistador - Os consumidores demonstram interesse por veículos e serviços alinhados à economia circular? O que mais valorizam (ex.: sustentabilidade, durabilidade, custobenefício)?

Entrevistado - Para responder a esta questão temos de dividir os consumidores em dois grupos, os particulares e as empresas. No caso dos particulares estes na sua grande maioria não demonstram grande preocupação com a sustentabilidade e acabam por basear as suas escolhas no que é mais barato dentro da gama que estão à a procura, por exemplo tanto na Audi como na Seat como na Cupra, onde o perfil de cliente particular não é o mesmo para as 3 marcas, um cliente particular que esteja interessado num produto de uma destas marcas, em que nesse produto tem varias opções de combustível, o consumidor particular acaba quase sempre por escolher motorizações a combustão pois apresentam um preço final bastante mais baixo em comparação com as propostas elétricas, e este como nem sempre tem grande poder económica realiza a escolha para o produto mais em conta, pois mesmo o que iria poupar em combustível caso optasse por uma proposta elétrica, na grande maioria das vezes não iria justificar a diferença de preço final entre as duas propostas pois os particulares não tem as dedução nos chamados "produtos verdes "

No caso das empresas, a compra acaba muitas vezes por recair sobre as propostas elétricas. No caso de empresas mais pequenas fazem as contas ao custo total do automóvel (custos de manutenção e fiscalidade), antes da tributação autónoma fazia se as contas diretas a uma prestação por exemplo, agora desde que apareceu a tributação autónoma e a dedução de IVA, faz se bastantes mais contas para se perceber qual será a oferta com menor custo para a empresa. Já as empresas com maior dimensão, há muitas delas em que a eletrificação e os híbridos plug-in ainda não é o ideal, mas por uma questão de imagem e reputação fazem a transição para esse tipo de motorizações, em termos de custas acaba

por lhes ficar um pouco mais caro, mas para cumprir com normas internas e pela questão da reputação acabam por integrar esse mercado eletrificado.

Entrevistador - Como a oferta de veículos sustentáveis (ex.: elétricos, híbridos, recicláveis) influencia a decisão de compra?

Entrevistado - Tudo uma questão de custos e imagem, onde neste momento no grupo VAG, 85% das vendas de veículos elétricos são comprados por empresas, e a tendência é para aumentar e não diminuir. Dentro as 3 marcas que represento, que são marcas de gamas diferentes, na Audi acaba por ser uma gama alta, a Seat uma gama media e a Cupra tem todo o tipo de clientes também por ser uma marca relativamente nova.

Sinto que na decisão de compra é mais difícil converter um cliente Audi a propostas eletrificadas, um pouco pela questão de que procuram facilitismo e não querem perder tempo com carregamentos. No caso da Seat em que o principal cliente são empresas sentimos que muitas vezes as propostas híbridas são adquiridas por eles por questões fiscais e no caso da Cupra como é uma marca que desde que investe bastante na eletrificação acaba por ter clientes que já estão familiarizados com o tema e que gostam da ideia do elétrico e do produto em si.

Entrevistador - A economia circular impactou os modelos de venda? Ex.: maior interesse por *leasing* e subscrição em vez de compra tradicional.

Entrevistado - A marca enquanto vendedora, tenta sempre tudo para conseguir facilitar o cliente na aquisição de veículos e muitas vezes como já referido aposta em facilidades de pagamento e subscrições como os *rentings, leasing* etc. Para este caso especifico dos elétricos, sim esta questão dos *renting*, que é cada vez mais usado para compras de veículos elétricos porque existe sempre por parte do comprador a duvida e o receio do que será o futuro, porque tudo isto é muito recente ainda, enquanto no caso de um veiculo a gasolina por exemplo, o comprador consegue ter uma ideia de quanto valerá o seu veiculo daqui a "x" anos, pois existem no mercado secundário esses veículos à venda, em muitos casos nos veículos elétricos ainda não passaram, esses anos suficientes para sabermos quanto valerá certo modelo, portanto a marca encoraja os compradores que tem este receio a optarem pelo *renting* como segurança de ao final do período acordado entregarem o veiculo de volta e não terem preocupações futuras com o valor do automóvel nessa altura.

As próprias financeiras, é um problema que temos em mãos, pois não sabemos como vai ser daqui em diante, porque há uma grande e constante evolução do produto. Por exemplo há 2 anos atras um veículo elétrico que realizasse 400km de autonomia era dos melhores e hoje passado 2 anos temos propostas de veículos a fazerem já o dobro dessa autonomia.

Entrevistador - A introdução de práticas circulares alterou a relação da marca com fornecedores e concessionários? Existiram novos desafios com a logística e abastecimento de peças e veículos?

Entrevistado - Para as fábricas em si, pode ter acontecido que alguns fornecedores não tenham conseguido acompanhar a mudança rápida, mas em grande parte dos casos como se trata de veículos diferentes os fornecedores acabam também por ser diferentes e no caso da reciclagem de matérias os fornecedores mantém-se os mesmos, simplesmente existe uma reutilização de materiais. Para nós (concessionários), não existiu praticamente alterações, 90% do que nos vendemos compramos aos nossos importadores que são eles que tratam dos veículos, peças e todos os produtos relacionados com o automóvel.

Entrevistador - Como funciona o serviço de pós-venda e acompanhamento dos clientes destes novos veículos?

Entrevistado - As marcas ainda se estão a adaptar, até para a sustentabilidade do negocio, um carro elétrico tem muito menos manutenção do que um carro a combustão, e com isso, com o crescimento e a transição cada vez maior para veículos elétricos, cada vez serão precisos menos mecânicos, Os encargos de formação também tiveram que aumentar pois foi preciso adaptar os mecânicos a estes novos serviços específicos dos veículos elétricos, o que acaba por trazer um custo diferente também no que toca ao preço da hora de mão de obra de um veiculo elétrico, que acaba por também ser mais elevada do que de um veiculo convencional a combustão.

Entrevistador - Como a marca lida com o fim de vida dos veículos e a reciclagem de peças? Existe um programa estruturado?

Entrevistado - Existe tal como foi referido anteriormente, um plano a seguir e a cumprir pelas marcas, onde cada vez mais se reutilizam de certos peças e componentes de veículos que chegaram ao fim de vida, para construção e montagem de novos veículos, portanto cada vez menos existe desperdício tanto a nível de peças como de maquinaria de

montagem pois os veículos na sua construção já são construídos sabendo que no seu fim de vida certas peças irão integrar veículos novos.

Entrevistador - A venda de veículos usados, de serviço ou seminovos faz parte da estratégia da marca? Se sim, de quais, e qual a aceitação do mercado?

Entrevistado - Sim sempre fez e cada vez mais faz pelos motivos referidos na questão anterior também, com o objetivo de redução de desperdício. Ao nível dos *rentings* as nossas marcas estão sim bastante preocupadas, porque devido às deduções fiscais, e como a grande parte dos clientes desse tipo de carros são empresas, um carro ao passar para o regime de bens usados, não tem o mesmo valor que se tivesse no regime de bens novos com os Ivas discriminados etc., aquilo que é deduzido à cabeça vai penalizar depois na retoma do veículo.

Entrevistador - Acredita que a economia circular será um fator determinante no futuro das vendas de automóveis?

Entrevistado - Sim, sem dúvida, tem de ser, aquilo que temos hoje em dia no mercado e o que se vende, se mudar qualquer coisa nestas diretivas aquilo que vale hoje amanhã pode já não valer e isso seria um prejuízo enorme para as marcas voltarem atras ou alterarem drasticamente o seu rumo.

Entrevistador - Como imagina que as práticas circulares irão evoluir nos próximos anos no setor automóvel, e o que pode acelerar a adoção da economia circular no setor (ex.: incentivos governamentais, evolução tecnológica, novas exigências do mercado)?

Entrevistado - Achamos que isto não vai acelerar assim tao rápido, a parte mais rápida já passou, até porque muitas datas que tínhamos em agendas para cumprir foram adiadas, o mercado tem que evoluir naturalmente e não só por pressões de mercado, e como se percebeu que não é possível atingir certas metas em tao pouco espaço de tempo e isso para a Audi, Seat e Cupra, e para o grupo VAG no fundo, isso acaba por ser uma boa noticias pois quanto mais brusca for a transição mais difícil será para as marcas porque nem todos os clientes se adaptam com a mesma velocidade e alguns são mais recetivos à mudança do que outros portanto este regime em que nos encontramos atualmente acaba por ser bom para ambos, clientes e marca.

Na minha opinião a evolução rápida tem vantagens e desvantagens, mas a grande desvantagem que ainda pesa muito para o cliente é que não sabemos como é que vai ser no futuro o resultado desta evolução.

Outra razão para a qual a evolução está a abrandar um pouco o seu ritmo é porque são necessárias outras nuances, nas quais as marcas não tem influencia direta, como o poder de compra dos consumidores, a rede de abastecimento de postos de carregamento que ainda não é suficientemente extensa para que todos possamos ter veículos eletrificados, os custos dos carregamentos que ainda são muito elevados se não forem efetuados em tomadas domesticas e o facto de também muitas pessoas não terem acesso a tomadas domesticas junto dos seus automóveis. As empresas acabam por ter infraestruturas próprias para carregar os carros da frota da empresa enquanto nem todos os particulares tem essa facilidade.

Os clientes não têm grandes exigências, eles são pressionados como as marcas pelos incentivos governamentais. As marcas têm uma diferença para os clientes, neste caso o mercado evolui, não pelos incentivos porque o mercado em si não tem incentivos, as fabricas não tem incentivos significativos, mas tem as multas, acaba por não ser tanto pelos incentivos, mas sim pelas penalizações.

Entrevistador - Das marcas que representa (Seat, Cupra e Audi) sente que existe entre elas uma diferente estratégia para o futuro no que toca à transição para veículos elétricos ou até um diferente tipo investimento em práticas ecológicas?

Entrevistado - Ambas estão preocupadas em cumprir as agendas e metas internas, existe sim uma diferença na maneira como o fazem e nas propostas que apresentam, por exemplo no caso da Audi, apresentamos propostas a diesel, a gasolina, híbridas *plug-in* e 100% elétricas, temos uma transição para as tais práticas circulares que menciona, diria não tanto como na Cupra que está mais focada nesse aspeto, pelo menos na componente das motorizações, mas mais do que a Seat, isto pelo número de propostas sustentáveis a nível de motorizações que apresenta, diria que o seu elemento de diferenciação é a reutilização de materiais devido à qualidade dos mesmos. No caso da Seat e da Cupra, já agora não sei se sabe mas a Cupra separou se da Seat por estratégia do grupo e agora tem a sua própria marca, a Seat até ao momento mantém a sua gama a combustão, sem qualquer proposta 100% elétrica e apenas 1 modelo com possibilidade de motorização híbrida *plug-in*, a marca acaba por apostar em práticas circulares através dos materiais sustentáveis que

utiliza no fabrico do automóvel, enquanto a sua antiga divisão desportiva, a Cupra, que agora se tornou uma marca independente da Seat, esta aposta sim fortemente na eletrificação mantendo apenas com motorizações a combustão 2 dos seus modelos, ficando com o resto da gama toda abrangida por veículos híbridos *plug-in* e 100% elétricos. Isto refletido em vendas, no mercado nacional, a Seat é a que mais vende pois também é a que apresenta propostas mais económicas.

A estratégia é sempre ditada pela sede da marca, e esta é estruturada consoante os mercados, no caso do mercado europeu, a estratégia tem que ter sempre como finalidade cumprir com as metas e agendas definidas pela União Europeia, e essas propostas e estratégias são pensadas como referi consoante o mercado, e Portugal, no mercado europeu pesa muito pouco e tem também um regime fiscal bastante especifico, o que depois não facilita o cumprimento em certos escalões o que torna um veiculo que deveria ter um preço competitivo, a ter um preço pouco competitivo com o que o mesmo oferece, portanto em termos de estratégia e de investimento, estas são definidas pelas marcas a nível europeu e com foco nos países que mais vendem, portanto no nosso mercado acabamos por ter que nos adaptar ao que é consumido nos grandes europeus e adotar as suas estratégias.

Não é que seja crucial para o negócio neste momento, mas por estratégia o grupo VAG investiu agora há poucos anos numa marca chamada "*MOON*" que realiza a comercialização de postos de carregamento de veículos elétricos, como negócio complementar, para assim também facilitar esta transição.

ANNEX C - COMPARISON OF CIRCULAR STRATEGIES (SEAT; CUPRA; AUDI)

Brand	Circular Solution	Implementation Level	Notes

Seat	Recycled materials	Medium	Use recycled raw materials to incorporate in their new vehicles
Audi	High quality materials for future component reutilization (ELV)	Medium-High	Invest in high quality components for reuse them in new vehicles
Cupra	Electric motorizations	High	Most portion of motorization is electric or hybrid

Source: Own elaboration based on brand documentation and interview data (Audi, 2025a; CUPRA, 2021; CUPRA, 2025; SEAT, 2025).

ANNEX D – FINAL VERSION OF THE SURVEY

Português

Survey about Circular Economy in the Automotive Industry

Caro(a) inquirido(a).
O meu nome e Diogo Mendes Ramos Calaveiras da Costa e sou aluno do mestrado em Gestão e Estratégia Industrial no ISEG, Universidade de Lisboa.

Estou a desenvolver uma dissertação de mestrado sobre a Economia Circular na Indústria Automóvel. É neste âmbito que pretendo, através de um breve questionário, compreender o nível de familiarização e adoção de práticas de economia circular.

O tempo médio de resposta é de 5 minutos.

Os dados recolhidos são anónimos e confidenciais e destinam-se exclusivamente para os fins acima mencionados.

Agradeço desde já a participação que é indispensável para a conclusão do estudo.

Para qualquer questão relacionada com o estudo contactar: diogo.calaveiras@aln.iseg.ulisboa.pt

Li a informação acima descrita, com a qual concordo, e estou consciente de que a minha participação é voluntária e que posso interromper a qualquer momento.

Português

What is your age group?

- Under 25
- 25-34
- 35-44
- 45-54
- 55 or older

What is your gender?

- Male
- Female
- Prefer not to say

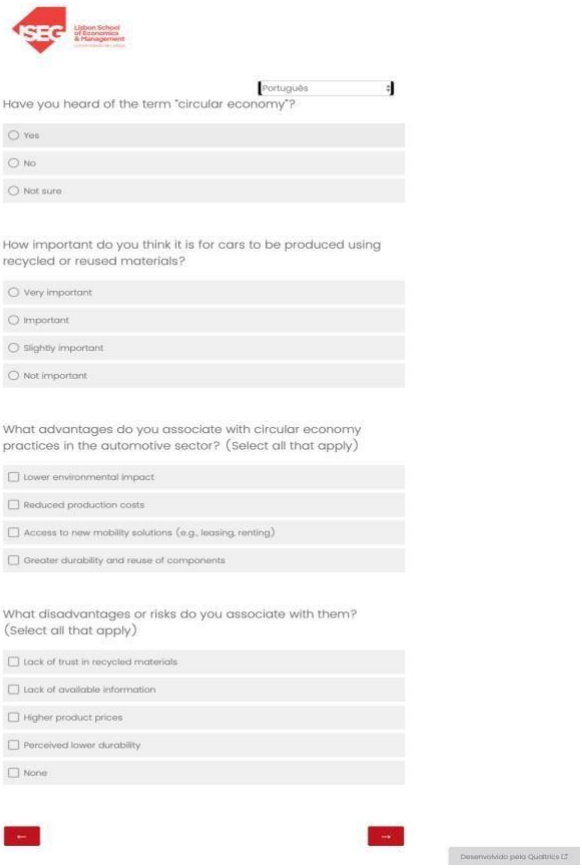
In which region (district) do you live?

What is your current professional status?

- Student
- Working student
- Employee
- Self-employed
- Unemployed
- Retired

What type of engine does your current vehicle(s) have?

- Combustion (petrol/diesel)
- Hybrid (combustion + electric)
- 100% Electric



Português

Have you heard of the term "circular economy"?

- Yes
- No
- Not sure

How important do you think it is for cars to be produced using recycled or reused materials?

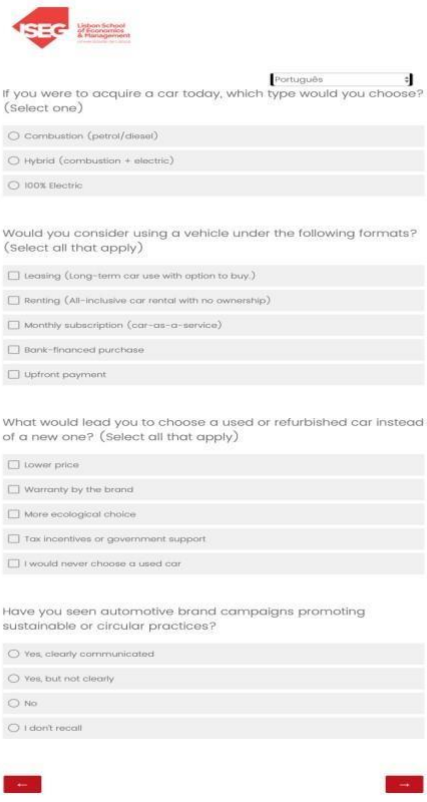
- Very important
- Important
- Slightly important
- Not important

What advantages do you associate with circular economy practices in the automotive sector? (Select all that apply)

- Lower environmental impact
- Reduced production costs
- Access to new mobility solutions (e.g., leasing, renting)
- Greater durability and reuse of components

What disadvantages or risks do you associate with them? (Select all that apply)

- Lack of trust in recycled materials
- Lack of available information
- Higher product prices
- Perceived lower durability
- None



Português

If you were to acquire a car today, which type would you choose? (Select one)

- Combustion (petrol/diesel)
- Hybrid (combustion + electric)
- 100% Electric

Would you consider using a vehicle under the following formats? (Select all that apply)

- Leasing (Long-term car use with option to buy.)
- Renting (All-inclusive car rental with no ownership)
- Monthly subscription (car-as-a-service)
- Bank-financed purchase
- Upfront payment

What would lead you to choose a used or refurbished car instead of a new one? (Select all that apply)

- Lower price
- Warranty by the brand
- More ecological choice
- Tax incentives or government support
- I would never choose a used car

Have you seen automotive brand campaigns promoting sustainable or circular practices?

- Yes, clearly communicated
- Yes, but not clearly
- No
- I don't recall

Português

What would most encourage you to adopt circular mobility solutions (e.g., leasing, refurbished cars)? (Rate from 1 "Not motivating" to 5 "Very motivating")

	1- Not motivating	2 - Slightly motivating	3 - Neutral	4 - Motivating	5 - Very motivating
Price reduction	○	○	○	○	○
Tax incentives	○	○	○	○	○
Transparent information	○	○	○	○	○
Quality guarantee	○	○	○	○	○
Environmental values	○	○	○	○	○

Which of the following would increase your trust in circular mobility solutions the most? (Select all that apply)

- ☐ Manufacturer warranty
- ☐ Certification of recycled parts
- ☐ Information on environmental impact
- ☐ Testimonials from other consumers
- ☐ State incentives

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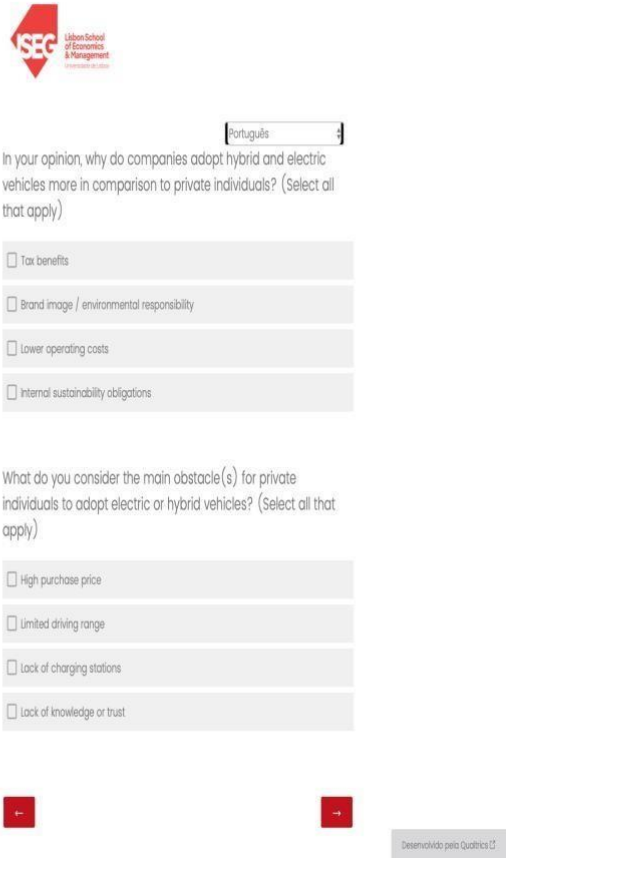

Português

In your opinion, why do companies adopt hybrid and electric vehicles more in comparison to private individuals? (Select all that apply)

- ☐ Tax benefits
- ☐ Brand image / environmental responsibility
- ☐ Lower operating costs
- ☐ Internal sustainability obligations

What do you consider the main obstacle(s) for private individuals to adopt electric or hybrid vehicles? (Select all that apply)

- ☐ High purchase price
- ☐ Limited driving range
- ☐ Lack of charging stations
- ☐ Lack of knowledge or trust

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