Shared Autonomous Vehicles in an Urban Area

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Abstract

Through the research conducted by De Carneiro et al. (2023) and Pereira et al. (2023), 35 concepts were found as crucial for the implementation of Shared Autonomous Vehicles in an urban area. This thesis aims to validate the importance of these concepts. To do so, a survey was sent out to top-tier managers, from twelve countries, and renowned companies, with high levels of decision-making, to better understand their managing orientation and, ultimately, to validate the concepts.

Findings show that the concept “Sanitary Test with QR Code” is rejected, which is fairly understandable given that it was introduced to the reference model during the pandemic crisis of Covid-19 and isn’t relevant anymore. As for the other 34 concepts, 10 of them left the respondents divided and were only partially supported, while the remaining 24 concepts were consensually approved as indispensable for the implementation of this service in an urban area.

Keywords: Shared Autonomous Vehicles, Urban Area, Decision-Making, Managers, Disruptive Innovation, Sustainable Technologies

Abstrato

Através da investigação conduzida por De Carneiro et al. (2023) e Pereira et al. (2023), 35 conceitos foram encontrados como cruciais para a implementação de Veículos Autónomos Partilhados numa área urbana. Esta tese tem como objetivo validar a importância destes conceitos. Para tal, foi enviado um inquérito a gestores de topo, de doze países, de empresas de renome, com elevados níveis de decisão, para melhor compreender a sua orientação de gestão e, em última análise, validar os conceitos.

Os resultados mostram que o conceito "Teste Sanitário com QR Code" é rejeitado, o que é bastante compreensível, uma vez que foi introduzido no modelo de referência durante a crise pandémica da Covid-19 e já não é relevante. Quanto aos outros 34 conceitos, 10 deles deixaram os inquiridos divididos e foram apenas parcialmente aprovados, enquanto os restantes 24 conceitos foram consensualmente aprovados como indispensáveis para a implementação deste serviço numa área urbana.

Palavras-chaves: Veículos Autónomos Partilhados, Área Urbana, Tomada de Decisão, Gestores, Inovação Disruptiva, Tecnologias Sustentáveis

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Table of Contents

Abstract 2

Acknowledgments 3

List of Tables 6

Table of Figures 6

1. Introduction 7

2. Literature Review 9

2.1 Disruptive Innovation 9

2.2 Decision-making 10

2.2.1 Challenges and barriers related to decision-making 11

2.2.2 Criteria organizations should consider when making decisions 12

2.2.3 Managing uncertainty and risk in a decision-making process 13

2.2.4 Entrepreneurial orientation 14

2.3 Sustainable technologies 16

2.3.1 Sustainable mobility 16

2.4 Autonomous Vehicles 17

2.5 SAV (Shared Autonomous Vehicle) 18

2.5.1 The benefits of a SAV 18

2.5.2 The economic benefits of a SAV service 19

2.6 SAV in an urban area 21

2.6.1 The impacts and challenges of SAV in an urban area 21

2.6.2 The benefits of shared autonomous vehicles (SAVs) in urban areas 23

2.6.3 Implementing shared autonomous vehicles (SAVs) in urban areas 23

3. Methodology 26

3.1 Research Method and Approach 26

3.1.1 Data Collection and Sampling 28

3.2 Survey 28

3.2.1 Variable's description 29

4. Analysis and Results 31

4.1 Data preparation **31**

4.1.1 Sample characterization 31

4.2 Variable Testing **33**

4.2.1 Decision-making 34

4.2.2 Validation of the 35 concepts 36

5. Conclusion **41**

5.1 Discussion **41**

5.2 Theoretical Implications **43**

5.3 Managerial Implications **44**

5.4 Limitations **44**

5.5 Future Research **45**

6. Appendix **46**

7. References: **50**

List of Tables

Table 1 - 35 concepts identified 25
Table 2 - 40 variables 31
Table 3 - Levels of decision-making 32
Table 4 - Respondents' industry 32
Table 5 - Respondents' position in the company 33
Table 6 - Descriptives 1st block of questions 34
Table 7 - One-Sample T-Test 1st block of questions 35
Table 8 – Categorization of the means intervals 37
Table 9 - Descriptives of the 2nd block of questions 37
Table 10 - Summary of the results 2nd block of questions 38
Table 11 - One-Sample T-Test 2nd block of questions 39

Table of Figures

Figure 1 - Responses obtained in survey 31

1. Introduction

The automotive industry has been the subject of much attention regarding the need to adopt more sustainable paths of innovation (Pinkse et al., 2014). The challenge they face, however, is making low-emission vehicles (LEVs), which are potentially disruptive, systemic, and socially embedded technologies, attractive to mainstream customers (Pinkse et al., 2014).

In recent years, there has been a growing focus on reducing dependence on fossil fuels and transitioning towards sustainable innovation (Pinkse et al., 2014). The automotive industry has been a key player in this regard, with low-emission vehicles such as electric, hybrid, and fuel-cell vehicles being explored as alternatives to the traditional internal combustion engine (Bakker et al., 2012; Van Bree et al., 2010).

The autonomous vehicle market is projected to reach $2.161 billion by 2030 (Abhay & Sonia, 2022). Autonomous driving technologies have emerged as a key area of interest for the automotive industry, as they promise to revolutionize the way we commute and travel. According to research made by McKinsey, autonomous driving has the possibility to create huge value for the automotive industry, generating hundreds of billions of dollars by 2030 (Deichmann et al. 2023).

Kyriakidis et al. (2015) conducted a study with 5000 respondents from 109 countries and revealed that 69% of respondents predicted that between now and 2050, fully autonomous driving will have a 50% market share (Kyriakidis et al., 2015).

While some companies may have their own motivations for investing in sustainable technologies, the question remains as to how they can attract mainstream customers to adopt these potentially disruptive innovations (Christensen, 1997).
Thus, this research aims to validate the 35 fundamental concepts identified in the research conducted by De Carneiro et al. (2023) and Pereira et al. (2023), as the key factors necessary to implement a Shared Autonomous Vehicle service in an urban area.

RQ: What are the key factors necessary to implement Shared Autonomous Vehicles in an urban area?

This topic is highly relevant both academically and managerially. With the advancements in technology, autonomous driving is becoming more prevalent in the automotive industry, and understanding the concepts necessary to take into consideration when implementing Shared Autonomous Vehicles in an urban area is critical to the future of mobility. The results of this study will provide valuable insights to academia by contributing to the body of knowledge on decision-making and technology adoption. From a managerial perspective, the study's findings can inform marketing strategies, provide key insights on how to integrate new mobility services in urban environments, and help understand which concepts to look out for in companies developing autonomous driving technologies and the electric car industry. Moreover, this topic also highlights the need to investigate the implications of autonomous driving for the future of mobility and the electric car industry, which can help inform decision-making processes at both the academic and managerial levels.

The methodology used for this dissertation employs primary research. The primary data involves the use of literature review and an online survey to gather data from 122 participants.

The population under study are top-tier decision makers from various industries, with no restrictions on age, gender, or nationality. This population was selected because they are the target audience for validating 35 concepts identified found in the literature review. The online survey method was selected as it provides a cost-effective and efficient way of collecting data from a large sample size, allowing for a robust analysis of the data.

Overall, the proposed methodology is appropriate for the area of study, as it allows for a comprehensive analysis of the research question formulated, while also being grounded in the methodological choices of past studies that have investigated similar phenomena.

2. Literature Review

2.1 Disruptive Innovation

Disruptive innovation is a process involving the introduction of new technologies or innovations that disrupt an existing market or industry, leading to the creation of a new market or value network and displacing established market leaders, products, and alliances (Nagy et al., 2016; Si & Chen, 2020). It encompasses two main types: new market innovations, which generate demand for a novel technology, and low-end innovations, offering characteristics akin to existing technologies but at a significantly lower cost (Nagy et al., 2016; Si & Chen, 2020). This innovative process is marked by the initial inferiority of technologies, products, or services in attributes valued by mainstream consumers. However, these innovations can successfully attract and satisfy consumers in low-end or new markets by providing advantages in performance attributes like affordability, simplicity, or convenience, which mainstream markets may overlook. Disruptive innovation also includes innovations that disrupt the established trajectory of performance improvement within an industry or redefine the meaning of performance. (Nagy et al., 2016; Si & Chen, 2020)

Before disruptive innovations can have a transformative effect and disrupt the market, they must first mature and reach sufficient scale. In the early stages, they are vulnerable to competition from within and outside, and therefore require some form of protection (Pinkse et al., 2014). In the case of products and services related to energy and mobility, infrastructure, rules, norms, and regulations play a crucial role in shaping their ability to attract mainstream customers (Yu and Hang, 2010).

Disruptive innovation, which changes the basis of competition by altering performance metrics, poses a significant managerial challenge. In particular, attracting mainstream customers during the early stages of technology development is a key concern (Christensen, 1997). At the initial stage, these innovations tend to be attractive only to small market segments composed of more forward-looking customers (Pinkse et al., 2014).

However, product innovation alone may not be enough to bring about a transition, as vehicle technology is closely intertwined with other factors such as fueling infrastructure, customer usage, and regulations (van Bree et al., 2010).

2.2 Decision-making

The concept of decision-making covers the process of selecting a course of action from several alternatives, playing a crucial role in human cognition and behavior across personal and professional contexts (Grünig & Kühn, 2009). The importance of thought processes and rational decision-making procedures in achieving optimal decisions is underscored, framing decision-making as a systematic procedure involving rules for obtaining and analyzing information to resolve specific decision problems (Grünig & Kühn, 2009). This approach outlines essential sub-tasks, including problem discovery and analysis, development and evaluation of options, specification of overall consequences, and the decision-making itself (Grünig & Kühn, 2009).

Decision-making is further defined as an integral organizational process impacting all levels, from individuals to groups and the organization as a whole, closely associated with problem-solving and organizational group processes (Akdere, 2011). The complexity of decision-making is emphasized by authors who argue that leaders must understand the contextual complexity and be adaptable in their approach (Snowden & Boone, 2007). Another perspective defines decision-making as the mental process leading to the actual decision (Dragsted, 2012).

In a managerial context, decision-making is positioned as the essence of management, involving the identification and resolution of problems and opportunities crucial for a company's success (López-Cabrales & Bornay-Barrachina, 2019). A broader perspective depicts decision-making as a process ranging from mundane daily decisions to profound choices, drawing from interdisciplinary fields such as economics, mathematics, philosophy, psychology, and statistics (Speekenbrink & Shanks, 2013). Additionally, decision-making in business is portrayed as a critical process that employs analytical methods to analyze data sets and uncover valuable information, aiming to equip individuals with practical decision-making tools applicable in their business careers (Albright et al., 2010).

2.2.1 Challenges and barriers related to decision-making

The intricate nature of decision problems, coupled with the uncertainty of future developments and the involvement of multiple divisions or departments within an organization, presents formidable challenges for decision-makers (Grünig & Kühn, 2009). Edwards (1954) underscores the hurdles posed by incomplete information, infinite sensitivity, and the distinction between uncertainty and risk in decision-making (Edwards, 1954). Kordeš (2009) adds layers to this complexity, highlighting the impact of cultural and social conditioning, the unique, subjective nature of decision-making experiences, and the challenges associated with perception (Kordeš, 2009).

The acknowledgment of subjective values in goal choice adds complexity to decision-making, necessitating the alignment of individual perspectives and priorities within the decision-making process (Grünig & Kühn, 2009). Edwards (1954) delves into the challenge of subjective scales and utility, challenging the assumption of transitivity in choices. Mellers et al. (1998) contribute insights into the impact of justifiability on decision errors, the influence of anticipated emotions on decision-making, and the phenomenon of commitment to sunk costs (Mellers et al., 1998).

Limitations in cognitive and emotional processing, errors, and biases in decision-making, along with the need for behavioral assumptions in the marketplace, emerge as significant challenges (Mellers et al., 1998).

The interdisciplinary nature of decision-making research, incorporates perspectives from artificial intelligence and neuroscience, indicating diverse interpretations of decision-making processes (Kordeš, 2009).

The unique and subjective nature of decision-making experiences pose methodological challenges for traditional scientific approaches, which often aim to eliminate anything unrepeatable, specific, or subjective from the phenomenon (Kordeš, 2009).

These challenges collectively underscore the multifaceted and intricate nature of decision-making, requiring attention to cognitive, emotional, subjective, and interdisciplinary factors throughout the decision-making process (Grünig & Kühn, 2009; Edwards, 1954; Kordeš, 2009; Mellers et al., 1998).

2.2.2 Criteria organizations should consider when making decisions

Organizations are advised to consider a variety of criteria and factors when making decisions, as highlighted by several articles. These encompass information gathering and extensive analysis, with a focus on crucial information during the decision-making process (Hashem, 2018). Decision-makers are encouraged to utilize techniques such as attending training courses, conducting feasibility studies, and using consultants to enhance decision-making (Hashem, 2018).

Organizations should assess risk perceptions, behavioral assumptions, and emotional influences, such as anticipated regret, to make well-rounded decisions (Mellers et al., 1998). Due to real-world violations of rational choice theory, incorporating behavioral assumptions is essential in decision-making (Mellers et al., 1998). Accountability to others and the need for justifications can impact decision errors and biases, and organizations should be aware of the phenomenon of commitment to sunk costs, which can lead to decision lock-ins and compromised self-interests (Mellers et al., 1998).

Decision criteria should represent organizational goals or a part thereof, with clarity in evaluation criteria ensuring a precise understanding of how decision options are judged (Grünig & Kühn, 2009). Independence of criteria is necessary to prevent double counting of effects and consider cause-effect relationships between criteria (Grünig & Kühn, 2009).

Factors contributing to decision clarity include authenticity, responsibility, vision, and courage (Papamichail & Rajaram, 2007). Building a trust culture among decision actors through risk tolerance, adjustment level, relative power, security, alignment of interests, capability, predictability, and communication is essential (Papamichail & Rajaram, 2007). A structured approach involves well-defined procedures, decision structures, and structured debates, exemplified by the RAPID Approach (Papamichail & Rajaram, 2007). Data analysis, considering management structures, leadership, seeking/sharing information, and effective collective decision-making, is vital (Papamichail & Rajaram, 2007). Evaluation involves defining criteria, compromising under time pressure, exploring contingencies, and evaluating alternatives with reference to the present and future (Papamichail & Rajaram, 2007).

These considerations emphasize the importance of a holistic approach, incorporating diverse factors ranging from information processing and risk assessment to organizational goals, clarity, and trust-building in the decision-making process.

2.2.3 Managing uncertainty and risk in a decision-making process

Edwards (1954) assesses the distinction between uncertainty and risk, explaining that uncertainty arises when probabilities cannot be assigned to outcomes, while risk involves situations where probabilities are assignable. The author analysis the expected utility theory, suggesting that rational decision-making involves maximizing expected utility. Moreover, the research conducted by Edwards (1954) stresses the importance of developing subjective probability and utility scales for evaluating potential outcomes and risks.

In another perspective, attention shifts to the subjective and non-rational facets of decision-making (Kordeš, 2009). The author delves into unsymbolized thinking and non-rational impulses, proposing that traditional rational models may not fully capture individuals' experiences of uncertainty and risk (Kordeš, 2009). Cultural and social conditioning are introduced as influential factors shaping decision-making experiences. The discourse extends to decision-making strategies, emphasizing the dynamic and non-linear nature of decision processes (Kordeš, 2009).

Strategic decision-making tools and techniques take center stage in a different angle (Hashem, 2018). The research conducted by Hashem (2018) accentuates their role in transforming valuable data into actionable decisions, especially in large and complex firms. These tools contribute to risk reduction, prioritization, and effective communication within organizations (Hashem, 2018). The structured approach they provide proves crucial in managing uncertainty and risk, facilitating the evaluation of different business portfolios (Hashem, 2018).

Decision-makers are urged to weigh pros and cons, considering factors like success rates, suitability, and flexibility (Papamichail & Rajaram, 2007). Decision rules and the need for clarity, authenticity, and courage are highlighted, emphasizing their role in navigating uncertainty and risk (Papamichail & Rajaram, 2007). Trust-building among decision actors emerges as a crucial foundation for productive relationships (Papamichail & Rajaram, 2007). Challenges posed by limited cognitive capabilities, resource constraints, and complex problems are acknowledged (Elbanna, 2006).

2.2.4 Entrepreneurial orientation

Entrepreneurial orientation refers to a strategic organizational posture that emphasizes innovation, risk-taking, proactiveness, autonomy, and competitive aggressiveness. It is a widely accepted firm-level construct in the literature on entrepreneurship and has been shown to have a positive impact on firm performance and growth (Wales et al, 2013). It also allows for a separate understanding of key entrepreneurial actors and how they influence the behavioral proclivity of the entire firm (Wales et al, 2013).

Highly innovative entrepreneurs tend to witness positive outcomes in terms of new technologies, products, services, or processes, aligning with the futurity dimension of entrepreneurial orientation focused on long-term competitive positioning (Tan, 2008). This emphasis on innovation is crucial for both established companies and startups, as it aligns with the concept of innovativeness, a key dimension of entrepreneurial orientation (Tan, 2008). Sustainable entrepreneurship underscores the role of innovation in creating products, services, and business models contributing to sustainable development. Innovations enable companies to differentiate themselves, enhance efficiency, reduce costs, and open new markets (Kuckertz & Wagner, 2010). Measuring innovation involves assessing a company's investment in research and development and its ability to introduce novel products or services. Alignment between a company's innovation strategy and overall business strategy is essential for effectiveness (Venkataraman, 1989).

The entrepreneurial orientation dimension of risk-taking indicates a willingness to commit resources to projects with substantial risks and returns (Tan, 2008). The calculated risks undertaken in pursuit of opportunities can lead to significant returns, especially in sustainable entrepreneurship where such investments may involve innovative projects contributing to environmental and social sustainability (Kuckertz & Wagner, 2010). Embracing high-risk, high-return investments positions companies as industry leaders and innovators, strengthening their competitive advantage (Kuckertz & Wagner, 2010). The broader concept of "entrepreneurial orientation" emphasizes risk-taking, innovation, and proactiveness as integral components guiding a company's strategic decision-making, further reinforcing the prioritization of high-risk, high-return investments (Venkataraman, 1989).

The entrepreneurial orientation concept of futurity measures a firm's inclination toward long-term competitive positioning instead of immediate gains (Tan, 2008). Furthermore, the dimension of "market orientation" underscores the importance of understanding and meeting customer needs to achieve sustained profitability (Venkataraman, 1989). This strategic orientation involves customer satisfaction, market research, and a focus on long-term perspectives in decision-making, with market orientation measured through a company's investment in market research and its adaptability to changing customer needs (Venkataraman, 1989).

Companies prioritize sustainability even if it means accepting less profit or facing challenges, aligning with the concept of sustainable entrepreneurship. This approach, contrary to traditional models focused on short-term financial gains, embraces the "triple bottom line" by considering economic, social, and environmental factors (Kuckertz & Wagner, 2010). Acknowledging that sustainable practices may entail initial costs or challenges, this strategic decision reflects a commitment to long-term sustainability and responsible business conduct. Companies choosing to accept lower immediate profits anticipate long-term benefits, including enhanced reputation, strengthened stakeholder relationships, and resilience in response to evolving market expectations (Kuckertz & Wagner, 2010). Despite the challenges, prioritizing sustainability can result in competitive advantages, improved brand perception, and enduring value creation for companies (Kuckertz & Wagner, 2010).

Proactiveness involves actively pursuing and anticipating opportunities to gain a competitive edge, with a focus on swift decision-making and the approval of new projects without a multi-stage process (Tan, 2008). Additionally, a flexibility orientation allows companies to adapt quickly to changing market conditions, respond rapidly to strategic opportunities, and make decisions without being hindered by lengthy approval processes. This emphasis on speed and adaptability enables companies to capitalize on emerging opportunities and respond promptly to competitive threats (Venkataraman, 1989). In essence, these companies approve new projects with a "blanket" approval approach rather than a "stage-by-stage" basis, demonstrating a commitment to agile decision-making (Tan, 2008).

Proactivity aligns with the entrepreneurial mindset, emphasizing the pursuit and anticipation of opportunities for gaining a competitive edge (Tan, 2008). In the context of sustainable entrepreneurship, companies may proactively embrace opportunities aligning with sustainable practices, underscoring their commitment even in the face of uncertainty (Kuckertz & Wagner, 2010). The "proactiveness orientation" underscores a company's readiness to take risks and pursue opportunities, particularly in innovation, by investing in new products, services, or technologies, even when immediate payoffs are uncertain. This proactive stance enables companies to stay ahead of the competition and position themselves for long-term success (Venkataraman, 1989).

2.3 Sustainable technologies

Sustainable technologies are those that help to reach sustainability targets. These technologies are designed to prevent or reduce environmental damage, improve resource efficiency, and promote sustainable development (Rennings, 2000).

Firms engage in sustainable technologies for a variety of reasons, including environmental regulation, instrumental motivations, and green values (Dangelico & Pujari, 2010; Rennings, 2000; Sarasini & Jacob, 2014). Research has shown that sustainable innovation can provide a competitive advantage (Blanco et al., 2013; Chen et al., 2006; Cramer, 2000).

2.3.1 Sustainable mobility

Sustainable mobility is the pursuit of meeting societal access needs while minimizing environmental harm and preserving natural resources for future generations. It requires a fundamental reconsideration of personal mobility due to the ecological unsustainability of the automobile as the dominant mode of transportation. Achieving sustainable mobility involves advocating for environmentally friendly, socially inclusive, and economically viable transportation modes, necessitating changes in infrastructure, land use, technology, and societal institutions. (Høyer, 1999; Vergragt & Brown, 2007)

Sustainable mobility has been a major concern for the automotive industry, with climate change, increasing regulation, and environmental demands from consumers driving the need for more fuel-efficient and environmentally friendly vehicles (Kolk & Levy, 2004). The future of automobile companies depends on their ability to develop safer forms of mobility that are kinder to the environment (Zadek, 2004).

Despite the industry's efforts to develop lower-emission vehicles, a significant mobility transition has not yet taken place (Bakker et al., 2012; Bohnsack et al., 2015; Oltra & Saint Jean, 2009; Pinkse et al., 2014; Van Bree et al., 2010).

The value proposition, which is the promise of value to customers, has been extensively studied in the field of marketing (Payne & Frow, 2014). Car sharing is considered the most innovative approach for mobility services, as it complements EVs' superior characteristics of reduced maintenance costs, which leads to improved cost-effectiveness with increased utilization cost (Bohnsack & Pinkse, 2017).

2.4 Autonomous Vehicles

Autonomous vehicles, also known as self-driving, driverless, or robotic cars, are vehicles equipped with advanced driver assistance systems (ADAS) that utilize technologies such as radar, lidar, GPS, and computer vision to observe their surroundings. These vehicles operate without direct human input, and their autonomy is categorized into different levels, ranging from complete driver control to complete automation without any driver involvement. The primary goals of autonomous vehicles include reducing accidents, improving mobility for individuals with disabilities and the elderly, minimizing emissions, and optimizing infrastructure usage. According to the National Highway Traffic Safety Administration (NHTSA), autonomous vehicles are defined as those capable of performing at least one critical safety control function without human input, encompassing various levels of automation, from assisting drivers to entirely replacing human control. (Davidson & Spinoulas, 2015; Van Brummelen et al., 2018; Rahman & Thill, 2023)

2.5 SAV (Shared Autonomous Vehicle)

Shared Autonomous Vehicle (SAV) is a self-driving vehicle designed for shared use by multiple passengers (Dia & Javanshour, 2017 and Fagnant & Kockelman, 2015). SAVs can be hailed using smartphone apps and are typically part of on-demand mobility services, operated either by transportation network companies (TNCs) or private individuals. They aim to reduce traffic congestion by sharing rides among passengers, ultimately contributing to more efficient urban transportation.

Regarding the importance of SAVs, they have the potential to revolutionize urban transportation by enhancing efficiency, affordability, and sustainability (Narayanan et al., 2020). SAVs can reduce congestion, enhance road safety, and offer greater mobility access, especially for those without private vehicles. Additionally, they can help reduce greenhouse gas emissions, but their deployment raises important governance, equity, and privacy concerns that must be addressed.

As for the nature of Shared Autonomous Vehicles, both Fraedrich et al. (2019) and Greenblatt & Shaheen (2015) emphasize that SAVs are autonomous vehicles capable of driving passengers without human intervention. They are designed for shared use, similar to car-sharing services, and can be hailed on-demand. These vehicles utilize various sensors, cameras, and computer algorithms to navigate traffic, aiming to reduce the number of cars on the road, improve traffic flow, and enhance urban transportation efficiency.

2.5.1 The benefits of a SAV

Alazzawi et al. (2018) and Fagnant & Kockelman (2015) state that Shared Autonomous Vehicles (SAVs) offer several potential benefits in urban areas:

- Traffic Congestion Reduction: SAVs can significantly reduce traffic congestion by optimizing routes, facilitating ridesharing, and decreasing the number of vehicles on city streets.
- Air Quality Improvement: The deployment of SAVs can lead to improved air quality in urban areas by reducing the overall number of vehicles and potentially utilizing electric or low-emission vehicles.

- Enhanced Accessibility: SAVs provide a more inclusive transportation option, benefiting individuals who cannot drive, such as the elderly or those with disabilities, and promoting a more equitable urban society.
- Cost Savings: SAVs offer cost savings as users pay only for the time they actively use the vehicle, reducing the financial burden associated with personal vehicle ownership.
- Safety Improvement: SAVs have the potential to enhance road safety by reducing accidents attributed to human error through advanced safety features and precise driving.
- Increased Productivity: Passengers can utilize travel time more efficiently in SAVs for work-related tasks, leisure activities, or relaxation due to the removal of the need for driving.

Regarding the ownership model's impact, it can affect the cost, availability, and accessibility of SAV services (Narayanan et al., 2020). Fleet-owned systems may offer lower costs but potentially limited availability, whereas fractionally owned systems may provide greater accessibility but at potentially higher costs.

Becker & Axhausen (2017) highlights that autonomous vehicles can offer increased safety, reduced traffic congestion, improved productivity and services, and greater accessibility for those who cannot or do not want to drive themselves for travelers.

SAVs can be designed to meet the needs of different types of travelers, such as commuters, tourists, and people with disabilities, by prioritizing efficiency, entertainment, accessibility, and inclusivity (Chen et al., 2016 and Clements & Kockelman, 2017). Additionally, the deployment of SAVs can have a significant impact in transportation patterns and infrastructure needs by enhancing mobility, reducing congestion, improving safety, and potentially requiring new regulations and infrastructure developments.

2.5.2 The economic benefits of a SAV service

The reviewed literature highlights various potential benefits and impacts of deploying Shared Autonomous Vehicle (SAV) services, considering different dimensions of urban life and the economy.

- Economic Benefits: The deployment of SAV services can lead to increased efficiency and productivity for passengers during their commutes. Cost savings are another significant advantage, as SAVs can reduce transportation costs for individuals and society by optimizing ridesharing and decreasing the need for extensive parking infrastructure. The introduction of SAVs might also result in job creation within urban areas, particularly in vehicle maintenance, software development, and customer service sectors. Additionally, SAVs can stimulate increased economic activity by providing convenient and efficient transportation options, benefiting both businesses and individuals (Narayanan et al., 2020).
- Social and Economic Impacts: The introduction of SAVs can raise concerns about job displacement in industries like taxi and truck driving. However, they can also enhance productivity and economic growth by enabling passengers to use their travel time efficiently. SAVs can improve accessibility, benefiting those who cannot drive, like the elderly or individuals with disabilities, potentially reducing social isolation. Moreover, the potential reduction in traffic congestion due to SAVs optimizing routes can positively influence air quality and overall well-being (Alazzawi et al., 2018).
- Economic Impact: SAVs can increase productivity by allowing passengers to use commuting time more efficiently and reduce transportation costs for individuals by eliminating the need for car ownership. They can also enhance transportation system efficiency by potentially reducing traffic congestion. However, there are concerns about job displacement in industries like taxi driving and potential inequality in SAV system implementation. Cost concerns and industry disruption are also factors to consider (Clements & Kockelman, 2017).
- Environmental Benefits: The implementation of SAVs in urban areas can significantly reduce greenhouse gas emissions by promoting ridesharing and using electric or low-emission vehicles. This can contribute to improved urban air quality and reduced respiratory illnesses and cardiovascular diseases. SAVs can also alleviate traffic congestion, further enhancing air quality, and reduce the need for urban parking spaces, potentially repurposing land for more beneficial uses (Dia & Javanshour, 2017).

2.6 SAV in an urban area

Shared Autonomous Vehicles (SAVs) in urban areas are autonomous, self-driving vehicles designed for transporting people and goods without human intervention. Operating within a shared mobility system, these vehicles can be utilized by multiple users for transportation needs in urban environments. SAVs present the potential to offer convenient and efficient transportation options, potentially diminishing the necessity for personal vehicle ownership and contributing to the overall enhancement of urban mobility. The emphasis is on understanding the essential elements of the ecosystem required to support SAV deployment, attracting potential investors, and assessing public acceptance as a solution to urban transportation challenges (Pereira et al., 2023; De Sousa Carneiro et al., 2023).

2.6.1 The impacts and challenges of SAV in an urban area

The implementation of Shared Autonomous Vehicles (SAVs) in urban areas is a multifaceted endeavor that necessitates careful consideration of various challenges and complexities. Firstly, the development of SAV infrastructure is a critical requirement, involving substantial investments in charging stations, communication networks, and dedicated lanes tailored to SAVs' unique operational needs. This infrastructure development is essential to ensure the safe and efficient operation of SAVs within urban environments (Fagnant & Kockelman, 2015).

Secondly, the regulatory landscape for SAVs is intricate and varies across different jurisdictions (Fagnant & Kockelman, 2015 & Greenblatt & Shaheen, 2015). Issues such as licensing, insurance, and liability must be addressed comprehensively to establish a robust regulatory framework that prioritizes safety and reliability while fostering innovation and industry competition. Collaborative efforts between government entities and industry stakeholders are crucial in this regard (Fagnant & Kockelman, 2015).

Public perception and acceptance represent pivotal factors in the successful integration of SAVs into urban transportation systems. Building trust in SAV safety, reliability, and benefits is essential, while addressing concerns related to privacy, security, and job displacement is equally important. Comprehensive public education campaigns are necessary to convey the advantages of SAVs and dispel common misconceptions (Fagnant & Kockelman, 2015 & Greenblatt & Shaheen, 2015).

The authors also state that equity is another significant concern that must be addressed proactively. Efforts should be made to ensure that SAVs remain accessible to all members of the community, regardless of income or geographical location. Strategies to prevent the exacerbation of existing urban transportation inequalities are imperative (Fagnant & Kockelman, 2015 & Greenblatt & Shaheen, 2015).

SAVs face technical challenges, particularly in the development and maintenance of the advanced technology required for their safe and efficient operation. This technology encompasses sensors, cameras, and autonomous driving systems. Research and development efforts in collaboration with technology companies are essential to overcome these technical hurdles (Greenblatt & Shaheen, 2015).

There is also an impact of SAVs on various transportation modes, such as public transit, walking, and biking. SAVs have the potential to complement public transit by offering first- and last-mile connectivity and filling transportation gaps in underserved areas. However, they may also influence traffic congestion and transportation choices, necessitating comprehensive planning and regulatory adjustments (Greenblatt & Shaheen, 2015).

Urban planning and policy adjustments are vital to prepare for the widespread adoption of SAVs. Infrastructure development, zoning regulations, parking requirements, and transportation planning must align with the evolving transportation landscape. Policymakers and urban planners should engage in proactive research to understand the impacts of SAVs comprehensively (Fagnant & Kockelman, 2015; Greenblatt & Shaheen, 2015).

The successful integration of SAVs into urban environments requires a holistic and collaborative approach that addresses challenges related to infrastructure, regulation, public perception, equity, technology, transportation impacts, urban planning, and user considerations (Greenblatt & Shaheen, 2015). Fagnant & Kockelman (2015) add to this by stating that policymakers, urban planners, industry stakeholders, and the public must work together to navigate these complexities and leverage the transformative potential of SAVs in urban transportation systems (Fagnant & Kockelman, 2015).

2.6.2 The benefits of shared autonomous vehicles (SAVs) in urban areas

Shared Autonomous Vehicles (SAVs) in urban areas offer various benefits, encompassing potential enhancements in road safety, energy savings, and traffic efficiency. These vehicles have the capability to decrease the number of vehicles on the road, thereby reducing CO2 emissions and liberating land used for parking. SAVs provide convenient transportation options, potentially diminishing the necessity for personal vehicle ownership and alleviating traffic congestion. Positive customer experiences with autonomous shuttles have been noted in research, and additional incentives, such as customer perks, can further encourage the adoption of driverless cars. Furthermore, SAVs contribute to reducing traffic congestion, improving mobility, promoting environmental sustainability, optimizing land use efficiency, and providing cost-effective transportation solutions for urban residents, positioning them as a potential solution to broader urban transportation challenges (Pereira et al., 2023; De Sousa Carneiro et al., 2023).

2.6.3 Implementing shared autonomous vehicles (SAVs) in urban areas

The successful implementation of Shared Autonomous Vehicles (SAVs) in urban areas requires careful consideration of various factors. A regulatory environment supporting the deployment of SAVs is critical, encompassing safety, insurance, and liability regulations. Adequate physical infrastructure, including roads and charging stations, is essential for SAV operations. Gaining customer confidence through safety, convenience, and affordability, along with offering customer perks, is crucial for encouraging SAV adoption. Incorporating carpooling and carsharing concepts, depending on market demand, is vital to reduce vehicles on the road and provide affordable transportation options. The use of V2X technology is also critical for enhancing road safety, energy savings, and traffic efficiency. The multifaceted implementation involves infrastructure development, clear regulations, public acceptance through education and outreach, integration with public transit systems, and sustainable business models considering pricing, ownership, and partnerships. Ensuring safety and security through robust cybersecurity measures, emergency response protocols, and ongoing monitoring and evaluation is paramount for the success of SAV services in urban areas (Pereira et al., 2023; De Sousa Carneiro et al., 2023).

In their research, Pereira et al. (2023) employed a systematic literature review and topic modeling to identify 29 concepts forming the basis of a reference model for the shared autonomous mobility ecosystem in urban areas. This model aimed to offer a conceptual framework for decision-making in the context of autonomous mobility (Pereira et al., 2023). The authors subsequently validated this reference model by comparing it with real-world scenarios in Phoenix, Arizona. Through this validation, they identified weaknesses, strengths, and opportunities for improvement, resulting in the incorporation of four new concepts: client interface, customer feedback, mapping, and customer perks (Pereira et al., 2023).

Furthermore, during the validation process in Beijing, De Sousa Carneiro et al. (2023) identified additional concepts to augment the reference model established by Pereira et al. (2023). These concepts included a QR code-generating app for customer health verification and the incorporation of Remote Driving Service. These additions were derived from the comparison with the real situation in Beijing and were deemed valuable for enhancing the reference model for the deployment of Shared Autonomous Vehicles (SAVs) in urban areas (De Sousa Carneiro et al., 2023).

In total, Pereira et al. (2023) initially introduced 29 concepts in their reference model, subsequently incorporating four more based on the Phoenix study. De Sousa Carneiro et al. (2023) then added two further concepts during their validation process in Beijing. Consequently, the combined efforts of both research teams resulted in a comprehensive reference model consisting of 35 concepts for shared autonomous mobility in urban areas. The continuous acknowledgment of the need for validation and refinement underscores the dynamic nature of the field. Both research teams recommend conducting field experiments to further validate these concepts, emphasizing the importance of empirical testing in enhancing the robustness and applicability of the reference model (Pereira et al., 2023; De Sousa Carneiro et al., 2023).

Based on the research done by De Carneiro et al. (2023) and Pereira et al. (2023), the following 35 concepts were identified as crucial when implementing Shared Autonomous Vehicles in an urban area (Pereira et al., 2023; De Sousa Carneiro et al., 2023):

Automakers	Firms	Remote Driving Service
Autonomy	Fleet	Researcher
Car	Fraud	Ridesharing
Car-pool	Insurance	Security
Carsharing	IT Support Infrastructure	Telecom
Client	Mapping	Traffic
Client interface	Metropolitan	V2X (Vehicle-to-Everything)
Customer perks	Mobility	Vehicle AI platform
Customer's feedback	Norms	Vehicle detection
Data	Physical Infrastructure	Vehicle protocols
e-Mobility	Privacy	WI-FI
Fare	QR Code with sanitary test	

Table 1 - 35 concepts identified

3. Methodology

3.1 Research Method and Approach

This thesis follows a quantitative approach, by employing a “Survey” that is used often to describe a method of gathering information from a sample of individuals, in order to learn something about the larger population from which the sample has been drawn (Ferber et al., 1980; Scheuren, 2004).

Surveys come in many different forms and have a wide variety of purposes, but they do have certain characteristics in common. Unlike a census, they gather information from only a small sample of people. In a bona fide survey, the sample is not selected haphazardly or only from persons who volunteer to participate. It is scientifically chosen so that each individual in the population has a known chance of selection. In this way, the results can be reliably projected to the larger public. Information is collected by means of standardized questions so that every individual surveyed respond to exactly the same question. The survey's intent is not to describe the particular individuals who by chance are part of the sample, but to obtain a statistical profile of the population. Individual respondents are never identified, and the survey's results are presented in the form of summaries, such as statistical tables and charts. The sample size required for a survey will depend on the reliability needed which, in turn, depends on how the results will be used. Consequently, there is no simple rule for sample size that can be used for all surveys (Ferber, 1980).

Surveys are a very traditional way of conducting research. They are particularly useful for non-experimental descriptive designs that seek to describe reality. So, for instance, a survey approach may be used to establish the prevalence or incidence of a particular condition. Likewise, the survey approach is frequently used to collect information on attitudes and behavior. Some issues are best addressed by classical experimental design where participants are randomized to either an intervention group or a control group. In the real world it is not always a very practical design. There may be good reasons, either ethical or practical, why participants cannot be randomly assigned to a particular intervention. It may also be impossible to identify a control group. Control over the randomization process can also be difficult to achieve (Mathers et al., 1998).

Surveys have internal and external validity, are efficient, can cover geographically spread samples, may have ethical advantages and are flexible. On the other hand, surveys are dependent upon the chosen sampling frame, are not so good at explaining why people think or act as they do and specifically interview surveys are only as good as the interviewers asking the questions (Mathers et al., 1998).

A questionnaire consists of standardized questions that operationalize the measurement constructs. The goal is to present a uniform stimulus to respondents so that their responses are comparable. Research showing that small changes in question wording or order can substantially affect responses has reinforced the assumption that questions must be asked exactly as worded, and in the same order, to produce comparable data. Respondents do not necessarily respond to the literal meaning of a question, but rather to what they infer to be its intended meaning (Martin, 2006).

Nowadays, surveys might be web-based. Online data collection carries the potential of accessing a large and geographically distributed population, along with being time and cost efficient for the researcher. Web-based surveys provide researchers with unique opportunities for collecting data through the Internet. They can be particularly useful for collecting preliminary data and for pretesting research design and question comprehension (Lefever et al., 2007)

There are many software programs to consider while performing surveys, where the Statistical Product and Service Solutions (SPSS) is a popular choice. SPSS is a fairly user-friendly statistics software program that is windows-drive and offers users a point-and-click way to generate output. This program offers some advanced features, which allow the user to tackle more sophisticated statistical techniques. Users may also choose to utilize the syntax editor to write ´code´ to target specific analysis as opposed to the point-and-click method of generating the output (Mills, 2003).

Based on the research previously shown, an online based survey for collecting primary data was conducted to validate the variables identified. The platform used for his purpose was Qualtrics, a web-based survey platform that provides tools for building and distributing surveys, analyzing responses, and generating reports, that offers a user-friendly interface and a wide range of features for creating and conducting surveys (Molnar, 2019).

3.1.1 Data Collection and Sampling

The sampling method used for this study was Convenience Sampling, which is a non-random sampling method where participants are selected based on their easy availability and accessibility to the researcher (Emerson, 2015).

The population under analysis were top-tier decision-makers (C-Level executives, managers, directors, etc.), from various industries, age, and nationalities. The survey was sent to personal and not personal contacts via social media (LinkedIn), to ensure that the targeted population was reached.

3.2 Survey

The survey was divided into 3 blocks. The first block included questions about decision-making, which integrated innovativeness, proactiveness, risk taking and futurity, and economic tradeoffs (DiVito & Bohnsack, 2017). Even though this block of questions isn't relevant for the main focus of this study, which is the validation of the 35 concepts previously identified, it is still relevant to include in the questionnaire to better understand the respondents' managing orientation.

Participants were asked to express their level of agreement with each statement, by using a rating scale ranging from 1 (strongly disagree) to 7 (strongly agree). The first set of questions were about the company's tendency for innovation, exploring the search for new opportunities and the introduction of new products to the market. Simultaneously, the survey investigated the emphasis placed on strategic investments pitched towards securing a competitive advantage.

Moving forward, the survey delved into the agility of strategic decision-making processes. Respondents were asked to assess the organization's responsiveness to opportunities, the degree to which new projects receive approval without a multistage process, and the willingness to act on opportunities regardless of the uncertainty surrounding the outcomes. Risk, investigating the organization's approach to high-risk, high-return strategic decisions, and whether long-term profitability takes precedence over short-term gains, were also variables studied in this research.

Furthermore, the survey explored the company's forward-thinking approach, evaluating how much the future is considered in strategic decision-making. The tension between sustainability and profitability was also explored, touching upon challenges related to maintaining sustainability while maximizing financial returns. This included the willingness to accept lower profits in favor of offering more sustainable products (appendix 1).

On the second block of questions, participants were asked to rate their level of agreement with each of the 35 concepts identified (Pereira et al., 2023; De Sousa Carneiro et al., 2023), on a scale from 1 (strongly disagree) to 7 (strongly agree) (appendix 2).

The third block of questions assessed the demographic data, to ensure that the data was balanced and that the participants corresponded to the standards proposed by the study (appendix 3).

The participants were forced to respond to all items, to avoid lose observations.

3.2.1 Variable's description

3.2.1.1 Innovativeness

The first variable was Innovativeness and was measured by three-item with a 7-point Likert scale, adapted from DiVito & Bohnsack (2017), *We always look for new opportunities and introduce new products to the market; Investments that will provide us with a competitive advantage are emphasized; When making strategic decisions we respond to opportunities quickly.*

3.2.1.2 Pro-Activeness

The second variable was Pro-Activeness and was measured by two-item with a 7-point Likert scale, adapted from DiVito & Bohnsack (2017), *New projects are approved without an approval process of various stages; We always strive to improve our position in the market and simultaneously challenge our competitors.*

3.2.1.3 Risk orientation

The third variable was Risk orientation and was measured by two-item with a 7-point Likert scale, adapted from DiVito & Bohnsack (2017), *We act on opportunities regardless the uncertainty of the outcome; The strategic decisions we make with a focus on investment include high risk and high return.*

3.2.1.4 Future orientation

The forth variable was Future orientation and was measured by two-item with a 7-point Likert scale, adapted from DiVito & Bohnsack (2017), *Long term profitability gains precedence over short term profitability; We think about the future when making strategic decisions.*

3.2.1.5 Sustainability decision tradeoffs - Economic

The fifth variable was Sustainability decision tradeoffs – Economic and was measured by two-item with a 7-point Likert scale, adapted from DiVito & Bohnsack (2017), *We often face the challenge of being less sustainable but make more money; We would accept less profit rather than offer less sustainable products.*

3.2.1.6 Concepts

The other variables are the 35 concepts identified in the work done by De Carneiro et al. (2023) and Pereira et al. (2023), measured by one-item with a 7-point Likert scale: *Automakers; Autonomy; Car; Car-pool; Carsharing; Client; Client interface; Customer perks; Customer's feedback; Data; e-Mobility; Fare; Firms; Fleet; Fraud; Insurance; IT Support Infrastructure; Mapping; Metropolitan; Mobility; Norms; Physical; Infrastructure; Privacy; QR Code with sanitary test; Remote Driving Service; Researcher; Ridesharing; Security; Telecom; Traffic; V2X (Vehicle-to-Everything); Vehicle AI platform; Vehicle detection hardware; Vehicle protocols; WI-FI.*

In summary, the 40 variables (5 about decision making and 35 concepts) evaluated are:

Variables							
1	Innovativeness	11	Client	21	Insurance	31	Researcher
2	Pro-Activeness	12	Client interface	22	IT Support Infrastructure	32	Ridesharing
3	Risk orientation	13	Customer perks	23	Mapping	33	Security
4	Future orientation	14	Customer's feedback	24	Metropolitan	34	Telecom
5	Sustainability decision tradeoffs - Economic	15	Data	25	Mobility	35	Traffic
6	Automakers	16	e-Mobility	26	Norms	36	V2X (Vehicle-to-Everything)
7	Autonomy	17	Fare	27	Physical Infrastructure	37	Vehicle AI platform
8	Car	18	Firms	28	Privacy	38	Vehicle detection hardware
9	Car-pool	19	Fleet	29	QR Code with sanitary test	39	Vehicle protocols
10	Carsharing	20	Fraud	30	Remote Driving Service	40	WI-FI

Table 2 - 40 variables

4. Analysis and Results

4.1 Data preparation

The survey was answered by 122 respondents, but 34 didn't finish the study, leaving us with 88 valid responses. The difficulty of obtaining responses was due to the fact that the survey was only sent to top-tier managers. With this in mind, 88 valid responses are a very significant sample and to the best of my knowledge the obtained sample is valid and strong enough to proceed with the statistical analyses.

4.1.1 Sample characterization

Among the valid participants, 87,5% were male and 86,3% had an age gap comprehended between 41 and 60 years. Regarding the nationality of the participants, 68,2% were Portuguese. A total of 12 nationalities are comprehended in this study.

From the 88 valid participants, 87,5% are in top 3 levels of decision making on a scale from 1 (lowest) to 7 (highest). For the sake of this study, only respondents who have a level of decision making equal to 5, 6 and 7 (on a Likert Scale of 1 (lowest) to 7 (highest)), will be considered. The following diagram simplifies the responses obtained:

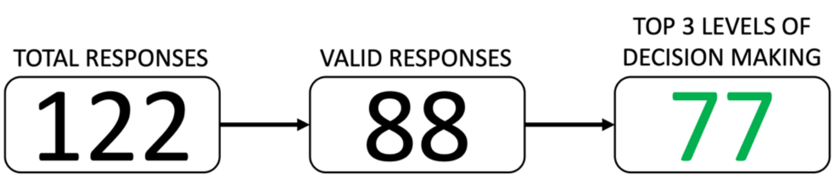

Figure 1 - Responses obtained in survey

The following table shows the frequency of the level of decision-making of the respondents:

LEVEL OF DECISION-MAKING	Frequency	Frequency %
5	24	31,2%
6	36	46,8%
7	17	22,1%
Grand Total	**77**	**100%**

Table 3 - Levels of decision-making

The respondents were also questioned about the industry they work in. From the 77 responses considered for this study, 33,8% worked in the Automotive industry, 33,8% worked in the Banking / Finance industry and 15,6% work in the mobility industry. The following table shows the frequency of the industries where the respondents work at:

Industry	Frequency	Frequency %
Automotive	26	33,8%
Banking / finance	26	33,8%
Consulting	1	1,3%
Insurance	5	6,5%
Law	3	3,9%
Mobility	12	15,6%
Political	1	1,3%
Research	3	3,9%
Grand Total	**77**	**100,0%**

Table 4 - Respondents' industry

In addition to their level of decision making and industry, the participants were also asked about their position in the company. Since this was an open-answer question, we got several types of answers (Appendix 4). For the sake of this study, we aggregated the positions into 3 categories:

- C-Level (top management)
- Directors
- Middle managers

C-level executives, also known as C-suite executives, are high-ranking executives within an organization who typically hold titles beginning with the letter "C," such as CEO (Chief Executive Officer), COO (Chief Operating Officer), CFO (Chief Financial Officer), CMO

(Chief Marketing Officer), and CIO (Chief Information Officer). These individuals are part of the top leadership team and are responsible for making strategic decisions that impact the organization as a whole (Francis, 2011).

Directors are individuals who are appointed or elected to serve on the board of directors of a company. The board of directors is responsible for overseeing the company's overall management and strategic direction. Directors have fiduciary duties to act in the best interests of the company and its shareholders. They are involved in making high-level decisions, setting company policies, and providing guidance to the executive management team (Francis, 2011).

A middle manager is an individual within an organization who holds a management position and is typically responsible for overseeing a team or department within the company (Francis, 2011).

From the 77 responses considered for this study, 51,9% are C-Level executives, 44,2% are Directors and 3,9% are Middle Managers. The following table shows the frequency of the positions of the respondents:

Position	Frequency	Frequency %
C-Level	40	51,9%
Director	34	44,2%
Middle Manager	3	3,9%
Grand Total	**77**	**100%**

Table 5 - Respondents' position in the company

4.2 Variable Testing

To test the variables 1 to 7, Descriptive Statistics and the One-Sample T-Test were employed as analytical tools to assess the significance of respondents' agreement with specific statements related to companies' strategic decision-making processes in the context of implementing Shared Autonomous Vehicle services in urban areas, as well as the validation of the 35 concepts identified before. Descriptive Statistics were utilized to compute the mean and standard deviation, offering a concise summary of the central tendency and variability in participants' responses. The One-Sample T-Test was then applied to compare the obtained mean with a theoretical value, specifically 4 on a 1-7 Likert scale, which represents neutral agreement. This statistical approach enables an exploration of whether companies, as indicated by survey respondents, exhibit a noteworthy inclination toward the specific aspects outlined in the research hypotheses, and if the respondents validate the concepts or not. The use of the One-Sample T-Test facilitates an objective assessment of whether the observed means significantly deviate from neutrality, providing a robust foundation for drawing conclusions.

4.2.1 Decision-making

Even though the main objective of this study is to validate the 35 concepts identified before, it is still worth conducting a descriptive analysis on the questions regarding decision-making, to better understand the path that companies are choosing.

4.2.1.1 Descriptive analysis

The following table shows a summary of the descriptive analysis conducted for the first block of questions:

Variable	Question	N	Minimum	Maximum	Mean	Std Deviation
1	We always look for new opportunities and introduce new products to the market	77	3	7	6,01	0,993
1	Investments that will provide us with a competitive advantage are emphasized	77	4	7	6,08	0,807
1	When making strategic decisions we respond to opportunities quickly	77	1	7	5,18	1,325
2	We always strive to improve our position in the market and simultaneously challenge our competitors	77	3	7	5,65	0,984
2	New projects are approved without an approval process of various stages	77	1	7	3,49	2,162
3	The strategic decisions we make with a focus on investment include high risk and high return	77	2	7	3,95	1,564
3	We act on opportunities regardless the uncertainty of the outcome	77	1	7	4,16	1,631
4	Long term profitability gains precedence over short term profitability	77	1	7	4,95	1,486
4	We think about the future when making strategic decisions	77	2	7	6,19	0,932
5	We often face the challenge of being less sustainable but make more money	77	1	7	3,91	1,549
5	We would accept less profit rather than offer less sustainable products	77	1	7	4,40	1,388

Table 6 - Descriptives 1st block of questions

Variable 1: The three related questions collectively indicate a high mean (6.01, 6.08, 5.18) reflecting a generally positive attitude toward innovativeness. The standard deviations (0.993, 0.807, 1.325) are below 2, suggesting a good level of agreement. Therefore, Variable 1 demonstrates a high level of innovativeness with a consistent and well-agreed upon perspective.

Variable 2: The mean values (5.65 and 3.49) suggest a moderate attitude toward pro-activeness, while the standard deviation (0.984 and 2.162) indicates some variability. The second question's high standard deviation suggests diverse opinions on project approval processes. This implies a moderate level of pro-activeness with notable variations in perspectives.

Variable 3: For the first question, the mean is 3.95 with a standard deviation of 1.564, indicating a moderate level of risk orientation. The second question shows a mean of 4.16 with a standard deviation of 1.631, reinforcing the moderate risk orientation. There is variability, but it is within a moderate range, reflecting a balanced attitude toward risk.

Variable 4: Both related questions show moderate to high standard deviations (1.549 and 1.388), indicating variability in attitudes toward sustainability. The means (3.91 and 4.40) suggest a willingness to face sustainability challenges but also a diversity of perspectives. Therefore, while the 4th variable seems to be true, the variability highlights differing attitudes toward the balance between profit and sustainability.

Variable 5: Both questions exhibit means (3.91 and 4.40) suggesting a moderate stance on economic sustainability tradeoffs. The standard deviations (1.549 and 1.388) are moderate, indicating some variability. Therefore, Variable 5 shows a willingness to face sustainability challenges with a diversity of perspectives, highlighting differing attitudes toward the balance between profit and sustainability.

4.2.1.2 One-Sample T-Test

The following table shows a summary of the One-Sample T-Test conducted for the first block of questions:

		t (Test Value = 0)	df	Significance		Mean Difference	95% Confidence Interval of the Difference	
Variable	Questions			One-Sided p	Two-Sided p		Lower	Upper
1	We always look for new opportunities and introduce new products to the market	53.119	76	<.001	<.001	6.013	5.79	6.24
1	Investments that will provide us with a competitive advantage are emphasized	66.064	76	<.001	<.001	6.078	5.89	6.26
1	When making strategic decisions we respond to opportunities quickly	34.314	76	<.001	<.001	5.182	4.88	5.48
2	We always strive to improve our position in the market and simultaneously challenge our competitors	50.398	76	<.001	<.001	5.649	5.43	5.87
2	New projects are approved without an approval process of various stages	14.179	76	<.001	<.001	3.494	3.00	3.98
3	The strategic decisions we make with a focus on investment include high risk and high return	22.158	76	<.001	<.001	3.948	3.59	4.30
3	We act on opportunities regardless the uncertainty of the outcome	22.361	76	<.001	<.001	4.156	3.79	4.53
4	Long term profitability gains precedence over short term profitability	29.221	76	<.001	<.001	4.948	4.61	5.29
4	We think about the future when making strategic decisions	58.298	76	<.001	<.001	6.195	5.98	6.41
5	We often face the challenge of being less sustainable but make more money	22.144	76	<.001	<.001	3.909	3.56	4.26
5	We would accept less profit rather than offer less sustainable products	27.824	76	<.001	<.001	4.403	4.09	4.72

Table 7 - One-Sample T-Test 1st block of questions

Variable 1: The t-value of 53.119 for questions related to innovativeness suggests a highly significant positive shift. The mean difference of 6.013, along with a narrow 95% confidence interval (5.79, 6.24), indicates a strong organizational emphasis on seeking new opportunities and introducing innovative products.

Variable 2: A t-value of 14.179 and a mean difference of 3.494 for questions related to pro-activeness imply a significant positive shift. The 95% confidence interval (3.00, 3.98) supports this, suggesting a clear tendency for organizations to approve new projects without an extensive approval process.

Variable 3: The t-value of 22.158 and a mean difference of 3.948 indicate a significant inclination toward high-risk decisions related to investments. The 95% confidence interval (3.59, 4.30) supports this, reflecting a pronounced organizational orientation toward embracing higher-risk strategies.

Variable 4: With a t-value of 58.298 and a mean difference of 6.195, organizations show a highly significant positive change toward considering the future in strategic decisions. The 95% confidence interval (5.98, 6.41) reinforces a strong future-oriented mindset.

Variable 5: The t-value of 22.144 and a mean difference of 3.909 indicate a significant positive shift toward facing sustainability challenges even if it means making less money. The 95% confidence interval (3.56, 4.26) suggests a moderate to high level of confidence in this shift.

4.2.2 Validation of the 35 concepts

4.2.2.1 Descriptive analysis

To facilitate the analysis, it was decided to categorize the variables into four distinct groups - Strongly Supported (>6), Supported (5.5 – 6), Partially Supported (5 – 5.5), and Not Supported (0 – 5) - based on the Likert Scale used (1-7), showing that means above 6 are most relevant ones. The following tables summarizes the process:

Category	Mean Range	Interpretation
Strongly Supported	> 6	Concepts with a mean score higher than 6, indicating robust consensus.
Supported	5.5 - 6	Concepts with mean scores between 5.5 and 6, signifying substantial agreement.
Partially Supported	5 - 5.5	Concepts with mean scores between 5 and 5.5, showing agreement with some diversity in perspectives.
Not Supported	0 - 5	Concepts with mean scores between 0 and 5, suggesting a lack of consensus or lower agreement.

Table 8 – Categorization of the means intervals

The following table shows a summary of the descriptive analysis conducted for the second block of questions, using the categorization explained above for easier comprehension:

Variables	Concept	N	Minimum	Maximum	Mean	Std. Deviation	Result
6	Automakers	77	1	7	5,61	1,309	Supported
7	Autonomy	77	2	7	5,96	1,069	Supported
8	Car	77	2	7	5,66	1,231	Supported
9	Car-pool	77	3	7	5,79	1,092	Supported
10	Carsharing	77	1	7	5,44	1,419	Partially supported
11	Client	77	2	7	5,49	1,314	Partially supported
12	Client interface	77	4	7	6,06	0,848	Strongly supported
13	Customer perks	77	2	7	5,36	1,256	Partially supported
14	Customer's feedback	77	2	7	6,00	1,039	Strongly supported
15	Data	77	3	7	6,23	0,985	Strongly supported
16	e-Mobility	77	3	7	6,03	0,903	Strongly supported
17	Fare	77	1	7	5,66	1,083	Supported
18	Firms	77	2	7	5,30	1,171	Partially supported
19	Fleet	77	1	7	5,52	1,199	Supported
20	Fraud	77	1	7	5,30	1,514	Partially supported
21	Insurance	77	1	7	6,13	1,128	Strongly supported
22	IT Support Infrastructure	77	4	7	6,43	0,715	Strongly supported
23	Mapping	77	2	7	5,90	1,242	Supported
24	Metropolitan	77	2	7	5,47	1,252	Partially supported
25	Mobility	77	4	7	6,23	0,776	Strongly supported
26	Norms	77	4	7	5,81	1,026	Supported
27	Physical Infrastructure	77	2	7	5,83	1,056	Supported
28	Privacy	77	2	7	5,78	1,284	Supported
29	QR Code with sanitary test	77	1	7	4,60	1,575	Not supported
30	Remote Driving Service	77	1	7	5,25	1,549	Partially supported
31	Researcher	77	1	7	5,18	1,275	Partially supported
32	Ridesharing	77	2	7	5,14	1,364	Partially supported
33	Security	77	4	7	6,40	0,831	Strongly supported
34	Telecom	77	2	7	5,73	1,242	Supported
35	Traffic	77	2	7	5,78	1,177	Supported
36	V2X (Vehicle-to-Everything)	77	2	7	5,48	1,294	Partially supported
37	Vehicle AI platform	77	3	7	5,92	1,085	Supported
38	Vehicle detection hardware	77	1	7	6,38	0,946	Strongly supported
39	Vehicle protocols	77	2	7	5,87	1,043	Supported
40	WI-FI	77	1	7	5,68	1,352	Supported

Table 9 - Descriptives of the 2nd block of questions

Variables 12, 14, 15, 16, 21, 22, 25, 33 and 38 have a mean higher than 6 and a low standard deviation (lower than 1), meaning that respondents strongly support the relevance of these concepts in the implementation of Shared Autonomous Vehicle Services in Urban Areas.

Variables 6, 7, 8, 9, 17, 19, 23, 26, 27, 28, 34, 35, 39 and 40 have a mean between 5.5 and 6, and a moderate standard deviation (between 1 and 2), meaning that respondents support the relevance of these concepts in the implementation of Shared Autonomous Vehicle Services in Urban Areas.

Variables 10, 11, 13, 18, 20, 24, 30, 31, 32 and 36 have a mean between 5 and 5.5, while also presenting a moderate standard deviation (between 1 and 2), which shows that respondents don't have a strong opinion regarding these concepts being critical in the implementation of Shared Autonomous Vehicle Services in Urban Areas.

When it comes to variable 29, it presents a low mean (lower than 5) with a moderate standard deviation of 1.575, indicating that respondents don't find this concept relevant in the implementation of Shared Autonomous Vehicle Services in Urban Areas.

In summary:

Results	Not supported	Partially supported	Supported	Strongly supported	TOTAL
N	1	10	15	9	35

Table 10 - Summary of the results 2nd block of questions

4.2.2.2 One-Sample T-Test

The following table shows a summary of the One-Sample T-Test conducted for the second block of questions:

		t (Test Value = 0)	df	Significance		Mean Difference	95% Confidence Interval of the Difference	
Hypotheses	Concepts			One-Sided p	Two-Sided p		Lower	Upper
H7	Automakers	37,597	76	<,001	<,001	5,610	5,31	5,91
H8	Autonomy	48,922	76	<,001	<,001	5,961	5,72	6,20
H9	Car	40,354	76	<,001	<,001	5,662	5,38	5,94
H10	Car-pool	46,532	76	<,001	<,001	5,792	5,54	6,04
H11	Carsharing	33,655	76	<,001	<,001	5,442	5,12	5,76
H12	Client	36,682	76	<,001	<,001	5,494	5,20	5,79
H13	Client interface	62,746	76	<,001	<,001	6,065	5,87	6,26
H14	Customer perks	37,484	76	<,001	<,001	5,364	5,08	5,65
H15	Customer's feedback	50,687	76	<,001	<,001	6,000	5,76	6,24
H16	Data	55,513	76	<,001	<,001	6,234	6,01	6,46
H17	e-Mobility	58,569	76	<,001	<,001	6,026	5,82	6,23
H18	Fare	45,858	76	<,001	<,001	5,662	5,42	5,91
H19	Firms	39,722	76	<,001	<,001	5,299	5,03	5,56
H20	Fleet	40,402	76	<,001	<,001	5,519	5,25	5,79
H21	Fraud	30,717	76	<,001	<,001	5,299	4,96	5,64
H22	Insurance	47,686	76	<,001	<,001	6,130	5,87	6,39
H23	IT Support Infrastructure	78,892	76	<,001	<,001	6,429	6,27	6,59
H24	Mapping	41,669	76	<,001	<,001	5,896	5,61	6,18
H25	Metropolitan	38,314	76	<,001	<,001	5,468	5,18	5,75
H26	Mobility	70,470	76	<,001	<,001	6,234	6,06	6,41
H27	Norms	49,626	76	<,001	<,001	5,805	5,57	6,04
H28	Physical Infrastructure	48,439	76	<,001	<,001	5,831	5,59	6,07
H29	Privacy	39,504	76	<,001	<,001	5,779	5,49	6,07
H30	QR Code with sanitary test	25,615	76	<,001	<,001	4,597	4,24	4,95
H31	Remote Driving Service	29,726	76	<,001	<,001	5,247	4,90	5,60
H32	Researcher	35,676	76	<,001	<,001	5,182	4,89	5,47
H33	Ridesharing	33,082	76	<,001	<,001	5,143	4,83	5,45
H34	Security	67,585	76	<,001	<,001	6,403	6,21	6,59
H35	Telecom	40,458	76	<,001	<,001	5,727	5,45	6,01
H36	Traffic	43,094	76	<,001	<,001	5,779	5,51	6,05
H37	V2X (Vehicle-to-Everything)	37,170	76	<,001	<,001	5,481	5,19	5,77
H38	Vehicle AI platform	47,878	76	<,001	<,001	5,922	5,68	6,17
H39	Vehicle detection Hardware	59,121	76	<,001	<,001	6,377	6,16	6,59
H40	Vehicle protocols	49,379	76	<,001	<,001	5,870	5,63	6,11
H41	WI-FI	36,840	76	<,001	<,001	5,675	5,37	5,98

Table 11 - One-Sample T-Test 2nd block of questions

The initial analysis of the descriptive statistics provided insights into the central tendency and variability of responses for each concept. The subsequent one-sample t-test served as a statistical validation, supporting the initial analysis by confirming the level of support for each variable. The combination of both analyses enhances the robustness of the findings, offering a more comprehensive understanding of the respondents' attitudes and perceptions related to Shared Autonomous Vehicle Services in Urban Areas. In this case, the one-sample t-test corroborated and reinforced the conclusions drawn from the descriptive statistics, providing a more robust basis for the support levels of each variable.

The high t-values observed in the one-sample t-test signify a significant deviation of the sample mean from the variables' population mean, providing strong statistical evidence in favor of the variables. The very low one-sided p-values, often below the conventional significance level of 0.05, further indicate the supporting of the acceptance of the variables. Additionally, the positive mean differences signify a consensus among respondents in favor of the concepts being tested. The narrow confidence intervals around the mean difference, ranging from 5.37

to 5.98, give confidence to the precision of the estimation. Collectively, these statistical indicators contribute to the robustness of the findings, reaffirming the support levels derived from the descriptive statistics and underscoring the reliability of the conclusions drawn from the survey data.

In summary, the strong support for these variables indicates a consensus among the survey participants regarding the critical factors that contribute to the success of Shared Autonomous Vehicle Services. The positive mean differences, along with the narrow confidence intervals and very low p-values, reinforce the robustness of these findings. This alignment in opinions and the high level of support across all concepts suggest a unified perspective among the respondents on the essential components and considerations that need to be considered by companies, cities, and governments when implementing Shared Autonomous Vehicle Services in Urban Areas.

4.2.2.3 Conclusion about the 35 concepts

The initial analysis of descriptive statistics revealed valuable insights into respondents' attitudes and perceptions regarding Shared Autonomous Vehicle Services in Urban Areas. This examination provided a clear understanding of the tendency and variability associated with each concept. Subsequently, the one-sample t-test served as a statistical validation, affirming and reinforcing the initial analysis by confirming the level of support for each variable. This dual-method approach not only deepened the comprehension of respondents' perspectives but also enhanced the robustness of the findings. Together, these analyses offer a comprehensive evaluation of the relevance of various concepts, providing a solid foundation for understanding the factors crucial to the successful implementation of Shared Autonomous Vehicle Services in Urban Areas.

5. Conclusion

5.1 Discussion

The goal of this study was to determine "**What are the key factors necessary to implement Shared Autonomous Vehicles in an urban area?"** by conducting an online survey.

Its purpose was to validate the concepts identified in the research done by De Carneiro et al. (2023) and Pereira et al. (2023). The authors developed a reference model and used a systematic literature review and topic modeling approach to identify 29 concepts (Pereira et al., 2023). Later, in a study conducted by Pereira et al. (2023), the reference model is validated by comparing it with a real-world situation in Phoenix, Arizona and 4 other concepts were identified (Pereira et al., 2023). Additionally, the researchers identified 2 more concepts during the validation process in Beijing (De Sousa Carneiro et al., 2023), making it a total of 35 concepts.

Regarding the research question, the findings suggest that 9 of the concepts are strongly validated and 15 others are validated, making it a total of 24 concepts that the respondents agree that are crucial for the implementation of a Shared Autonomous Vehicles service in an urban area. The concept that wasn't validated is "QR Code with a sanitary test", which makes sense that it's not validated and reinforces the validity of this study. The research conducted by De Carneiro et al. (2023) and Pereira et al. (2023) identified this concept as crucial in the pandemic phase of Covid-19, making it a priority at the time, but not anymore, as proven by this study. Therefore, it should be excluded from the model developed by the authors.

The 10 concepts that were partially supported are, in my opinion, the ones worth diving deeper into, as they are subject to interpretation and require further analysis.

Starting with the concepts "Carsharing" and "Ridesharing", it may seem that the respondents were skeptical into giving them more relevance due to the fact that people often have a "car ownership" mentality, and we are still slowly walking towards a shared mobility state of mind, so the concept of sharing such a personal item may take some time to be accepted. It is recommended that the researchers conduct further analysis into these concepts.

Regarding the concept “Client”, it is odd that respondents don’t find it highly relevant, as such a service wouldn’t be doable if there were no clients. It is suggested that the authors dig deeper into the motives of why Decision-Makers don’t find this concept relevant.
When it comes to the concept “Customer Perks”, it seems essential to recognize the importance of customer satisfaction and the role it plays in the success of shared autonomous vehicle services. Despite the partial support, it is advisable for stakeholders to delve deeper into understanding the specific customer perks that would have the most significant impact on user satisfaction and, consequently, the success of the service.

The concept “Firms” may have been subject to misinterpretation, as it may have not been clear that it refers to the infrastructure behind the SAVs and companies that implement this service, as it was intended, but rather how it could benefit firms as clients. It is worth analyzing it further and try to clarify this concept.

The concept “Fraud” had a positive agreement amongst the respondents but a considerable diversity in perspectives. It may be beneficial for stakeholders to enhance fraud prevention strategies and thus gaining confidence among the SAV service users.

When it comes to “Metropolitan”, this concept may be valid in a further stage of the implementation, as the initial stage focuses more in an urban area, which may be the reason for the discordance in the respondents perspectives.

The “Remote Driving Service” concept, similarly to the concept “Firms”, may have been misinterpreted, as this is a futuristic technology of the car driving itself to the nearest help point in case of a malfunction during the ride. Since this isn’t a service that exists nowadays, it may be subject to some holdbacks in its utility and practicality.

When it comes to the concept “Researcher”, the respondents may have a more practical perception and don’t interpret this asset as absolutely necessary. Further investigation into the perceived value and impact of research in the context of shared autonomous vehicles could provide valuable insights. Collaborative efforts between researchers and decision-makers can ensure that research activities align with the practical needs and expectations of stakeholders, fostering a mutually beneficial relationship.

Lastly, the concept “V2X (Vehicle-to-Everything)” is understandably questioned, as this is a technology from the future being assessed in the present. This concept suggests a seamless interaction between the vehicle grid and the surrounding infrastructures, such as traffic lights, public services and even the user’s homes. Although it is only partially supported by the respondents, it seems like a valid concept to keep in the model.

5.2 Theoretical Implications

This thesis contributes to existing literature in two main areas: decision-making and implementing a SAV service in urban areas. Given the very specific target population of this study, it represents significant relevance to the areas analyzed.

This research contributes significantly to the theoretical understanding of decision-making within organizations, particularly in the context of implementing shared autonomous vehicle services in urban areas. The key contributions include providing deep insights into how companies prioritize innovation, navigate high-risk investments, emphasize long-term profitability, handle sustainability considerations, exhibit organizational agility, and approach proactive decision-making. The recognition of diversity and variability among organizations in these aspects enriches the broader theoretical landscape, offering valuable insights for both academic research and practical implications for decision-makers operating in this evolving domain.

Regarding the validation of the 35 concepts, this study highly contributes to the research done by De Carneiro et al. (2023) and Pereira et al. (2023), as it ultimately evaluates the concepts found by using a valid sample population with relevant experience in its industry. The study not only confirms but also refines and extends the theoretical foundations established by previous research.

Furthermore, the insights into the partially supported concepts highlight the complexity and diversity inherent in decision-making processes related to shared autonomous mobility. This complexity challenges existing assumptions and invites the researchers to delve deeper into understanding the factors influencing decision-makers' perspectives on concepts such as carsharing, client relevance, customer perks, firms' involvement, and fraud prevention.

The study's emphasis on the diversity of opinions within the sample population adds a layer of richness to the theoretical discussion, recognizing that decision-making in shared autonomous vehicles is not a one-size-fits-all scenario. Future research endeavors can explore the contextual and organizational factors, as well as industry-specific considerations that contribute to the varied perspectives observed in the study.

5.3 Managerial Implications

This thesis offers practical guidance for decision-makers involved in implementing shared autonomous vehicle services in urban areas. Key managerial contributions include insights into fostering innovation, tailoring risk management and investment strategies. These contributions provide actionable recommendations for managers to align their decision-making processes with the challenges of shared autonomous mobility, ultimately enhancing the success and sustainability of their services.

From the concepts validation standpoint, this research offers practical insights into the implementation of a SAV service in urban areas, with emphasis on which concepts are worth paying more attention to and which ones can be discarded. By incorporating these insights, managers can refine strategies, fostering user acceptance, and ultimately ensuring the success and sustainability of shared autonomous vehicle services in urban environments.

5.4 Limitations

The survey used in this research was sent only to top-tier decision makers, which made it challenging to obtain a larger sample. Given the busy nature of the respondents, one of the downsides presented was the dropout percentage (almost 30%). This higher likelihood of incomplete surveys may be due to the absence of an interviewer to encourage respondents (Heiervang & Goodman, 2011). Furthermore, when conducting online surveys, there’s the disadvantage of the low attention of participants (Reips, 2000). In addition, online surveys may attract respondents with biases, as they are completed only by literate individuals with internet access who are interested in the survey topic. This can lead to skewed survey findings, as individuals with certain biases may be overrepresented in the sample (Andrade, 2020).

5.5 Future Research

This study opens the possibilities of further and deeper analysis of the concepts gathered by De Carneiro et al. (2023) and Pereira et al. (2023). Different research methods can be applied, such as interviews and focus groups, to better understand the motives and reasons for the choices made regarding the validation of the concepts, specifically the ones classified as "partially supported".

6. Appendix

Appendix 1 – First block of questions from the survey

Please rate your level of agreement with the following statements, on a scale from 1 (strongly disagree) to 7 (strongly agree). In the company where I work at...

	Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (6)	Strongly agree (7)
We always look for new opportunities and introduce new products to the market	○	○	○	○	○	○	○
Investments that will provide us with a competitive advantage are emphasized	○	○	○	○	○	○	○
When making strategic decisions we respond to opportunities quickly	○	○	○	○	○	○	○
New projects are approved without an approval process of various stages	○	○	○	○	○	○	○
We always strive to improve our position in the market and simultaneously challenge our competitors	○	○	○	○	○	○	○
We act on opportunities regardless the uncertainty of the outcome	○	○	○	○	○	○	○
The strategic decisions we make with a focus on investment include high risk and high return	○	○	○	○	○	○	○
Long term profitability gains precedence over short term profitability	○	○	○	○	○	○	○
We think about the future when making strategic decisions	○	○	○	○	○	○	○
We often face the challenge of being less sustainable but make more money	○	○	○	○	○	○	○
We would accept less profit rather than offer less sustainable products	○	○	○	○	○	○	○

Appendix 2 – Second block of questions from the survey

Please rate your level of agreement with the following concepts, on a scale from 1 (strongly disagree) to 7 (strongly agree).

When implementing a Shared Autonomous Vehicle Service in an Urban Area, I think that this concept is relevant

	Strongly disagree (1)	Disagree (2)	Somewhat disagree (3)	Neither agree nor disagree (4)	Somewhat agree (5)	Agree (6)	Strongly agree (7)
Automakers	○	○	○	○	○	○	○
Car	○	○	○	○	○	○	○
Autonomy	○	○	○	○	○	○	○
Vehicle detection and positioning hardware	○	○	○	○	○	○	○
Car-pool	○	○	○	○	○	○	○
Carsharing	○	○	○	○	○	○	○
Ridesharing	○	○	○	○	○	○	○
Client	○	○	○	○	○	○	○
IT Support Infrastructure	○	○	○	○	○	○	○
V2X (Vehicle-to-Everything)	○	○	○	○	○	○	○
Data	○	○	○	○	○	○	○
e-Mobility	○	○	○	○	○	○	○
Fare	○	○	○	○	○	○	○
Firms	○	○	○	○	○	○	○
Fleet	○	○	○	○	○	○	○
Fraud	○	○	○	○	○	○	○
Physical Infrastructure	○	○	○	○	○	○	○
Insurance	○	○	○	○	○	○	○
Metropolitan	○	○	○	○	○	○	○
Norms	○	○	○	○	○	○	○
Researcher	○	○	○	○	○	○	○
Privacy	○	○	○	○	○	○	○
Vehicle protocols	○	○	○	○	○	○	○
Security	○	○	○	○	○	○	○
Telecom	○	○	○	○	○	○	○
Traffic	○	○	○	○	○	○	○
Mobility	○	○	○	○	○	○	○
Vehicle AI platform	○	○	○	○	○	○	○
WI-FI	○	○	○	○	○	○	○
Client interface	○	○	○	○	○	○	○
Customer's feedback	○	○	○	○	○	○	○
Mapping	○	○	○	○	○	○	○
Customer perks	○	○	○	○	○	○	○
Remote Driving Service	○	○	○	○	○	○	○
QR Code with sanitary test	○	○	○	○	○	○	○

Appendix 3 – Third block of questions from the survey (demographics)

What is your gender?

- Male
- Female
- Other

How old are you?

- 18 - 30
- 31 - 40
- 41 - 50
- 51 - 60
- + 60

What is your nationality?

On a scale of 1 (lowest) to 7 (highest), what is your level of decision making in your company?

	1 (lowest)	2	3	4	5	6	7 (highest)
Level of decision making	○	○	○	○	○	○	○

In what industry do you work at?

- Automotive
- Banking / finance
- Insurance
- Law
- Mobility
- Infrastructures
- Political
- Research
- Other

What is your position in your company?

Appendix 4 – Initial positions of the respondents.

Position	Frequency	Frequency %
ARAC	1	1,3%
Branch Manager	1	1,3%
Branch Manager FO	1	1,3%
C-Level	19	24,7%
Chief Digital Officer	1	1,3%
Country Manager	2	2,6%
Digital Transformation and New Business Development Manager	1	1,3%
Director	13	16,9%
Equity Partner	1	1,3%
Fleet Sales Director	1	1,3%
FO	1	1,3%
Head of Fleet	1	1,3%
Head of Legal and Compliance	1	1,3%
Manager	3	3,9%
Managing Director	10	13,0%
Marketing Director	4	5,2%
Mayor	1	1,3%
New Mobility & Connected Services	1	1,3%
Partner	3	3,9%
PhD Candidate	1	1,3%
Regional Manager	1	1,3%
Sales Director	2	2,6%
Sales Manager	2	2,6%
Secretário Geral	1	1,3%
Senior Head of Department	1	1,3%
Senior Manager	1	1,3%
Unit head	1	1,3%
Vice President	1	1,3%
Grand Total	**77**	**100%**

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