Shared Mobility:
The Role of Green Perceptions and Psychological Preferences in E-carsharing Adoption

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Abstract

Title: The Role of Green Perceptions and Psychological Preferences in E-carsharing Adoption

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The growing awareness of environmental issues can be linked to the demand for green transport innovations. E-carsharing embodies an evolution in sustainable mobility innovations that is on a path of exponential growth. Business-to-consumer (B2C) providers are strategically integrating carsharing with electric vehicles (EVs) and positioning themselves as pioneers of environmentally conscious driving behaviors. Consumer behavior studies have highlighted the importance of green perceptions and psychological preferences in the adoption of sustainable innovations. The purpose of this paper is to identify how users and non-users of e-carsharing perceive the greenness of this service and how psychological preferences affect the adoption of e-carsharing. The goal is to determine which factors significantly influence the adoption of e-carsharing. The paper also analyzes the relationship between environmental consciousness, one of the psychological preferences, and the green perceptions of e-carsharing. An online questionnaire was used to survey e-carsharing users and non-users from the ten German cities with the highest density of car sharing services. Results revealed that users perceive the e-carsharing service as greener. In terms of psychological preferences, users show a greater inclination toward tech-savviness, have a higher propensity to adopt a Variety-Seeking Lifestyle (VSL), and use shared goods, but they are less environmentally conscious compared to non-users. This research validates that the factors significantly influencing the adoption of e-carsharing are green perceptions, VSL, and environmental consciousness. Additionally, the results indicate that environmental consciousness is not directly related to green perceptions. The theoretical and managerial implications of these results are discussed.

Keywords: Shared Mobility, Electric Vehicles, Carsharing, Sustainability**,** Lifestyle, Innovation, Adoption, Consumer Behavior

Sumário

Título: O Papel das Percepções Verdes e das Preferências Psicológicas na Adoção do E-carsharing

Autor: Hannah Zabel

A crescente consciência sobre questões ambientais pode ser associada à procura por inovações de transporte sustentável. O e-carsharing é uma inovação de mobilidade sustentável em crescimento exponencial. Os fornecedores de destes serviços estão a integrar estrategicamente o e-carsharing com veículos elétricos e a posicionarem-se como pioneiros em comportamentos ambientalmente conscientes. Alguns estudos têm destacado a importância das percepções verdes e das preferências psicológicas na adoção de inovações sustentáveis. O objetivo deste artigo é identificar de que forma utilizadores e não utilizadores de e-carsharing percepcionam a sustentabilidade desse serviço e como as preferências psicológicas afetam a adoção do e-carsharing. Pretende-se determinar que factores influenciam a adoção do e-carsharing. O artigo também analisa a relação entre a consciência ambiental e as percepções verdes do e-carsharing. Recorreu-se a um questionário online para investigar o comportamento de utilizadores e não utilizadores de e-carsharing das dez cidades alemãs com maior densidade destes serviços. Os resultados revelaram que os utilizadores percepcionam o serviço de e-carsharing como mais sustentável. Em termos de preferências psicológicas, os utilizadores mostram maior inclinação para a tecnologia, têm maior propensão a adotar um Estilo de Vida Variado (VSL) e utilizam bens partilhados, mas são menos conscientes ambientalmente em comparação com os não utilizadores. Esta investigação permite validar que os fatores que influenciam a adoção do e-carsharing são as percepções verdes, VSL e consciência ambiental. Além disso, os resultados indicam que a consciência ambiental não está diretamente relacionada com as percepções verdes. As implicações teóricas e para a gestão destes resultados são discutidas.

Palavras-chave: Mobilidade Partilhada, Veículos Eléctricos, Carsharing, Sustentabilidade, Estilo de Vida, Inovação, Adoção, Comportamento do Consumidor

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List of Abbreviations

AFV	Alternative fuel vehicle
BEV	Battery electric vehicle
B2B	Business-to-business
B2C	Business-to-consumer
EV	Electric vehicle
FCHEV	Fuel cell hybrid electric vehicle
HEV	Hybrid electric vehicle
NGO	Non-governmental organisation
PHEV	Hybrid electric vehicle
REEV	Range extended electric vehicle

1. Introduction

"Sharing rides and vehicles while not sacrificing freedom or comfort is, for me, the basic idea for sustainable, future-oriented transportation." - Co-Founder & COO MILES, Alexander Eitner (2023)

The increasing awareness of environmental concerns has driven a demand for innovative solutions in sustainable transportation. In urban areas, the emergence of innovative mobility services has significantly transformed the landscape of transportation offerings. The shift is being propelled by the efforts of automotive manufactures, service providers, Non-Governmental Organisations (NGOs), and policymakers worldwide, who are actively working to develop a wide range of transformative services to reduce environmental impact of transportation (Flores & Jansson, 2021). Among these transformative services, shared mobility has emerged as a compelling alternative to traditional transportation modes (Nicole DuPuis et al., 2019). Shared mobility services and offers aim to fundamentally change the traditional concept of individual vehicle ownership and personal mobility by allowing people to use transport on demand rather than owning a private vehicle. These services range from carsharing to bike sharing and electric scooter rental, ride-sharing, taxis, and on-demand ride services like ride-hailing.

Notably, the global carsharing market has experienced remarkable growth and is projected to increase from USD 1.92 billion in 2022 to USD 6.2 billion by 2030 (IMARC Group, 2023). Carsharing organizations in the Business-to-Consumer (B2C) sector are increasingly focusing on integrating electric vehicles (EVs) and strategically positioning themselves as advocates for eco-friendly driving behaviors. They aim to establish their brands as symbols of sustainability, capitalizing on consumers' heightened awareness of the environmental impact of products (MILES Mobility GmbH, 2023). This demonstrates a pivotal shift towards more sustainable mobility practices.

This growing emphasis on sustainable mobility practices aligns with research showing that consumer choices are increasingly influenced by environmental considerations (Jansson, Marell, & Nordlund, 2011; Paparoidamis & Tran, 2019). Understanding green perceptions is vital in assessing how consumers view the environmental benefits of products, reflecting how individuals perceive sustainable offerings (Heidenreich et al., 2017; Noppers et al., 2015).

From a user perspective, alternative fuels like EVs would only lead to smaller changes in vehicle handling, while shared mobility implies greater changes in daily mobility behaviors, resulting in a more profound disruption of established habits (Burghard & Dütschke, 2019). The psychological preferences of individuals who are open to disrupting their habits in favor of carsharing should be captured, as research on the psychological aspects of carsharing has shed light on how different attitudes and lifestyles affect carsharing usage patterns (Aguilera-García et al. 2022). This highlights the importance of conducting an investigation to explore the role of green perceptions as well as psychological preferences regarding lifestyles and attitudes in e-carsharing adoption.

Therefore, the main objective of this research is to investigate the green perceptions and psychological preferences that influence the adoption of e-carsharing. Specifically, the study aims to a) assess and compare the differences in green perceptions and psychological preferences between users and non-users of e-carsharing and b) determine which of these factors influence the adoption of e-carsharing. Additionally, c) it aims to explore the relationship between green perceptions and environmental consciousness, one of the psychological preferences variables. This is particularly important as previous research has shown that environmentally friendly behaviors can reduce the adoption of carsharing (Aguilera-García et al. 2022). Some consumers may not readily recognize the environmental benefits associated with e-carsharing, potentially constraining its diffusion among consumers.

The research is relevant to all stakeholders involved in sustainable transport planning and their efforts to reduce CO_2 emissions in the transport sector. The findings are particularly relevant for e-carsharing providers to optimise their services and marketing strategies.

In chapter two, the theoretical framework around e-carsharing as part of shared mobility, the influence of green perceptions as well as psychological preferences of lifestyles and attitudes will be provided, leading towards the hypotheses of this research. In chapter three, the methodology used to perform conduct this study will be depicted. In chapter four, the results of data analysis and the test of the hypotheses will be presented. Chapter five presents and discusses the main findings, deriving theoretical and managerial implications. Limitations and recommendations for future research will be mentioned in chapter six. The study finishes with a conclusion.

2. Theoretical Background

This chapter provides a framework for the current research in the field of e-carsharing as a part of shared mobility, combined with relevant findings on green perceptions of sustainable innovations and psychological preferences of lifestyles and attitudes. This theoretical background leads us to the development of our research hypotheses that constitute the framework for the quantitative study that follows.

2.1 Shared Mobility

In response to growing economic and environmental pressures, the development of efficient mechanisms to capitalise on unused capacity is on the rise (Gansterer et al., Hartl, & Tzur, 2022). In urban areas, the emergence of innovative mobility services has significantly transformed the landscape of transportation offerings (Flores & Jansson, 2021). Among these transformative services, shared mobility has emerged as a compelling alternative to traditional transportation modes (Nicole DuPuis et al., 2019).

Shared mobility encompasses a wide range of transportation services and offerings aimed at fundamentally transforming the traditional concept of individual vehicle ownership and personal mobility. These services range from carsharing to bike sharing and electric scooter rental, ridesharing, taxis, and on-demand ride services like ride-hailing. Additionally, alternative transportation services such as "paratransit" and shuttle services, as well as private transportation services like "micro-transit" services using vans and minibuses, fall under this multifaceted category (Susan Shaheen et al., Adam Cohen, & Ismail Zohdy, 2016).

The basic principle of shared mobility is to allow people to use transport on demand rather than owning a private vehicle. This approach has the potential to deliver several significant benefits. It helps to reduce traffic congestion, minimize the need for additional transport infrastructure, lowering CO_2 emissions and reduce the environmental impact compared to traditional private car ownership. In addition, shared mobility allows for the flexible use of transport over a wide range of distances and provides different levels of flexibility (Susan Shaheen, et al., Nelson Chan, Apaar Bansal, & Adam Cohen, 2015). The provision of these shared mobility services is typically organised through digital platforms that facilitate the efficient exchange of goods or services (Gansterer et al., 2022). These developments shed light on the changing landscape of mobility and highlight how traditional vehicle manufacturers in the automotive industry are seeking to reposition themselves in this emerging sector.

2.1.1 Automotive Industry

One of the most exciting developments in shared mobility involves the automobility industry. In the automobility industry, traditional car manufacturers are increasingly trying to position themselves as mobility service providers. This means that they not only sell cars, but also offer services that make it easier for people to get around in cities and regions without having to own a car. This development has brought the automobility industry itself to the brink of major change (Osztovits et al., 2015).

Automobility was once hailed as a great promise for humanity, offering enhanced mobility opportunities at an affordable cost, especially in industrialized nations. The car has played a significant role in these societies, becoming deeply rooted in a framework of technical infrastructures and lifestyles that prioritize automobility (Urry, 2004).

However, conventional vehicles, which rely on fossil fuels, have played an important role in exacerbating many of the wicked problems we face today, including climate change, air pollution, and resource depletion. The term 'wicked problem', first proposed by Rittel and Webber (Rittel & Webber, 1973) refers to highly complex, unpredictable problems that interact with other problems, involve stakeholder conflicts, and usually need to be managed rather than solved. Consequently, there is a growing interest among policymakers, researchers, and industry leaders in exploring alternative transportation solutions. In particular, alternative fuel vehicles (AFVs) such as battery electric vehicles (BEVs), coupled with shared mobility options, are emerging as drivers of transformation within our transport system (Bergman, Schwanen, & Sovacool, 2017). However, in order to be considered valid alternatives, new mobility options should not only be sustainable but also flexible enough to meet dynamic customer needs (Brendel, Lichtenberg, Brauer, Nastjuk, & Kolbe, 2018). This research is primarily concerned with enhancing an understanding of the user perspective in this evolving landscape. Specifically, we will look into the business model of BEV-based carsharing, as a key component of the dynamics, impacts, and implications of shared mobility.

2.1.1.1 Electric Vehicles

Electromobility has a profound impact on the economy, the environment and our daily lives. It is a revolution on our roads, driven by electric motors and powered by the grid. This alternative form of vehicle power opens up a wide range of possibilities for environmentally friendly mobility independent of fossil fuels. Electromobility covers a wide range of vehicle types, including BEVs, range extended electric vehicles (REEVs), plug-in hybrid electric vehicles (PHEVs), hybrid electric vehicles (HEVs) and fuel cell hybrid electric vehicles (FCHEVs). Vehicles that can be driven solely by an electric motor are BEVs, REEVs and FCHEVs (Bundesministerium für Wirtschaft und Energie, 2018).

This study primarily focuses on BEVs due to their prominence among available and upcoming models (Elektromobilitätsgesetz, 2018). Furthermore, car-sharing providers are notably incorporating BEVs into their offerings (MILES Mobility GmbH, 2023). BEVs operate exclusively on electric power, driven solely by electric motors. They are a key solution to reducing harmful emissions and helping to fight climate change. From the extraction and processing of raw materials to the production and use of the vehicles, to recycling, BEVs are changing the way we get around and making a significant contribution to reducing the negative environmental impact of road transport (Henning Wallentowitz & Arndt Freialdenhoven, 2011). Prior, research found out that individuals' knowledge of environmental issues and their familiarity with pro-environmental behaviors initiate the process of EVA acceptance (Wang et al., 2018).

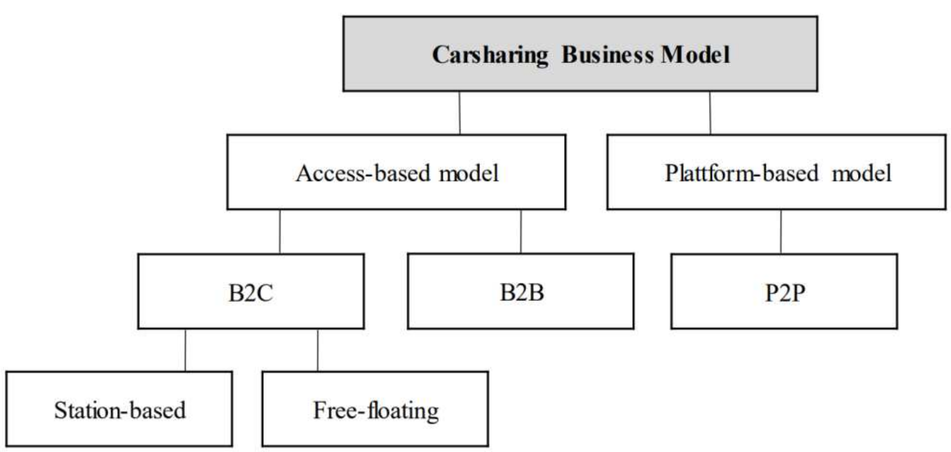
However, there are still many reservations among car drivers that have slowed down the adoption. Experts have identified several factors to explain the hesitant acceptance of electric mobility (Christoph Willing, Tobias Brandt, & Dirk Neumann, 2016). Firstly, the high costs of EV batteries require significantly higher initial investments in electric vehicles (Tobias Brandt, Stefan Feuerriegel, & Dirk Neumann, 2013). Secondly, cognitive biases can still lead people to prefer conventional gasoline-powered combustion vehicles, often perceived as more attractive and sportier. Lastly, most people are genuinely concerned that the maximum range on a full charge is insufficient. While this range anxiety is generally exaggerated (Franke & Krems, 2013), it is often fueled by real challenges that EV owners face, such as long charging times or the absence of public charging points. At the same time, several studies suggest that, in terms of user-friendliness, EVs are not significantly inferior, and driver concerns are unfounded (Franke, Neumann, Bühler, Cocron, & Krems, 2012).

Therefore, sharing mobility can serve as a crucial channel to further introduce EV technology to the market and facilitate a faster rate of acceptance. Due to the absence of significant capital expenditures for carsharing users, the sharing mechanism makes it easier for people to engage with the technology and overcome biases. Ultimately, individuals who are less inclined to purchase a BEV but are curious to test it in a shared setting can assess more quickly whether their reservations are justified (Brendel et al., 2018; Christoph Willing et al., 2016). BEVs can be a successful, environmentally friendly addition to future mobility options, especially in combination with carsharing services (Bruglieri, Colorni, & Luè, 2014; Huo, Wu, Li, Zheng, & Yu, 2020). For simplicity, moving forward, only the term EV is used to refer to BEVs.

2.1.1.2 Carsharing Business Model

A business model describes how a business creates and captures value, articulating the value proposition, resources, and associated costs and revenue mechanisms (Teece, 2010). Among carsharing services providers, business models vary widely from access-based services such as business-to-consumer (B2C) and business-to-business (B2B) models and cooperatives to platform-based peer-to-peer (P2P) models.

Figure 1: Carsharing Business Model



Source: Elaborated by the author.

The majority of carsharing business models fall into the category of access-based services (Bardhi & Eckhardt, 2012), which allow customers to access a product for a specified period in return for an access payment while the service provider maintains legal ownership (Schaefers, Wittkowski, Benoit (née Moeller), & Ferraro, 2016). Access-based services are considered suitable for convenience-seeking customers who do not care about the value of ownership and favor monetary savings (Hazée, Delcourt, & Van Vaerenbergh, 2017).

In the context of this research, the primary focus lies on B2C carsharing models and the utilization patterns associated with short trips, encompassing both free-floating and station-based carsharing. B2C carsharing represents the most prevalent and extensively studied category. In B2C carsharing, an entity possesses vehicles and offers them to private individuals for short-term rentals (Münzel, Boon, Frenken, & Vaskelainen, 2018). Moreover, in addition to independent service providers, automobile manufacturers have ventured into B2C carsharing to explore new market opportunities (Perboli, Ferrero, Musso, & Vesco, 2018). As the owner or lessee of the vehicles, the service provider is responsible for ensuring proper maintenance of the vehicles and facilitating rental transactions (Wilhelms, Henkel, & Falk, 2017). B2C carsharing typically employs a usage-based pricing model, wherein members pay the service provider based on minutes or hours of usage, or a daily rate contingent on the distance traveled. A diverse range of membership options is often available, including pay-per-use or monthly subscriptions, catering to customers' expected levels of usage (Bocken, Jonca, Södergren, & Palm, 2020). Furthermore, B2C carsharing services may encompass both one-way trips or round-trip options, where vehicles are returned to the initial pickup location following use (Le Vine, Lee-Gosselin, Sivakumar, & Polak, 2014).

Notably, the membership structure in B2C carsharing extends to the choice between station-based and free-floating models. Station-based users must return the vehicle to a designated station within a specified area, whereas free-floating models afford the flexibility to leave the vehicle at any location within the designated service area (Shaheen, Chan, & Micheaux, 2015).The choice between free-floating and station-based options often hinges on trip length and purpose, with station-based carsharing favored for situations where a vehicle is the most efficient mode of transportation, while the free-floating alternative is preferred for irregular trips and offers time-saving advantages over alternatives such as public transport (Becker, Ciari, & Axhausen, 2018).

Carsharing providers are also doing their part to protect the environment by including BEVs in their fleets. These efforts are aimed at increasing the level of electrification and thus enabling more sustainable mobility. For example, the car-sharing provider Miles has set itself the goal of becoming emissions-neutral by 2026, in particular through the increased use of BEVs (MILES Mobility GmbH, 2023). The use of BEVs has the potential to increase acceptance of EVs and address concerns by providing positive driving experiences (Rauh, Franke, & Krems, 2015).

Therefore, carsharing as flexible short-distance transport can complement conventional transport modes by linking individual mobility with existing public transport options to form a coherent intermodal mobility chain (Willing et al., 2017). Additionally, short-term rental of BEVs in urban areas is a viable strategy to promote mass adoption of BEVs (Brendel et al., 2018; Rauh et al., 2015; Willing, Brandt, & Neumann, 2017). This makes carsharing a valuable element of our future mobility (Brendel et al., 2018; Christoph Willing et al., 2016).

2.3 Green Perceptions

Research has consistently shown that environmental attributes have a significant impact on the adoption of sustainable innovations, reflecting how individuals perceive the benefits of environmentally friendly products and services (Noppers et al., 2014). For instance, the absence of harmful emissions while driving an EV is one such environmental attribute (Figure 2). Consumers who recognize and value these environmental attributes tend to embrace sustainable behaviors and enjoy the consumption of eco-friendly products (Tezer & Bodur, 2020).

According to Jansson et al. (2011), individuals who adopt sustainable innovations are more likely to perceive and appreciate the green attributes of the products they adopt, in contrast to non-adopters. This finding holds particular relevance in the context of carsharing, as carsharing organizations strategically position themselves as advocates for eco-friendly driving practices. They aim to establish their brands as symbols of sustainability, capitalizing on consumers' heightened awareness of the environmental impact of their product choices (MILES Mobility GmbH, 2023). Furthermore, multiple studies have consistently shown that more positive evaluations of the environmental attributes of sustainable innovations enhance the likelihood of their adoption (Korcaj, Hahnel, & Spada, 2015; Noppers, Keizer, Bolderdijk, & Steg, 2014). A study by Peters and Dütschke (2014) even found that certain environmental attributes, such as environmental consequences, received more favorable evaluations from actual users and those with a higher propensity to adopt EVs, as compared to less committed groups. However, it is important to note that this study did not specifically consider BEVs in conjunction with shared mobility options. Consequently, we propose that green perceptions of carsharing are linked with consumers' decisions to use this mode of transportation.

Hypothesis H1a: There are significant differences between the group of e-carsharing users and non-users regarding green perceptions.

Hypothesis H2a: Green perceptions of e-carsharing will influence e-carsharing adoption.

In summary, prior research indicates a strong connection between environmental attributes and the adoption of sustainable innovations (Noppers et al., 2014). However, the role of environmental considerations in carsharing adoption appears multifaceted, with some studies suggesting that sustainability may not always be the primary driver for carsharing users (Hartl, Sabitzer, Hofmann, & Penz, 2018). Additionally, some consumers may not readily recognize the environmental benefits associated with e-carsharing, potentially constraining its diffusion among consumers. Understanding these complexities and potential contradictions is essential for a comprehensive understanding of consumer behavior in the context of sustainable transportation. However, it is as well important to understand how people's psychological preferences regarding lifestyle and attitudes influence their willingness to adopt the transformative aspects of shared mobility.

Figure 2: Items of Green Perceptions

Green Perception
Reducing Air Pollution
Addressing Environmental Pollution
Combating Climate Change
Preserving Natural Resources

Source: Noppers et al., 2015, adapted

2.4 Psychological Preferences

From a user perspective, alternative fuels like EVs would only lead to smaller changes in vehicle handling, while shared mobility implies greater changes in daily mobility behaviors, resulting in a more profound disruption of established habits (Burghard & Dütschke, 2019). To comprehensively capture the psychological preferences of individuals who are open to disrupting their habits in favor of carsharing, we turn our attention to latent psychological variables. As suggested by Kim et al. (2017) and Hjorteset and Böcker (2020), these latent variables offer insights into the multifaceted aspects of psychological and behavioral factors, such as lifestyles and attitudes, that may impact the adoption of e-carsharing.

Five latent constructs capturing different psychological and behavioral aspects of individuals that may impact carsharing usage were adopted from Aguilera-García et al. (2022) as a framework for exploring these dimensions. These behaviors include the propensity to adopt a variety-seeking lifestyle (VSL), tech-savviness, propensity to use shared goods, the intrinsic preference for driving and environmental consciousness.

Figure 3: Latent Variable Construct of Psychological Preferences

Lifestyle Attitudes
Variety-seeking-lifestyle (Lifestyle)
Tech-savviness (Technology)
Propensity to use shared goods (Sharing)
Preference for driving (Driving)
Environmental consciousness (Environment)

Source: Aguilera-García et al., 2022*, adapted*

(1) **Propensity to adopt a Variety-Seeking Lifestyle (VSL):** This latent variable, which was modified from Schwartz et al., (2001), includes several indicators that reflect an individual's affinity for a varied lifestyle filled with new experiences, a willingness to take risks, and a tendency for trying out new goods or services. This concept has been used in earlier studies in the field of shared mobility (Alemi, Circella, Handy, & Mokhtarian, 2018; Gomez et al. 2021; Lavieri & Bhat, 2019). The adoption of the VSL concept seems justified, in light of the fact that carsharing is a popular mobility option in urban areas and individuals who are

more likely to follow a VSL may have a higher e-carsharing adoption rate because they are more open-minded and willing to try the new mobility services. Hence, we hypothesize:

Hypothesis 1b: There are significant differences between the group of e-carsharing users and non-users regarding VSL attitudes.

Hypothesis 2b: VSL attitudes will influence e-carsharing adoption.

(2) **Tech-savviness:** An individual's ability and regular usage of social media and mobile applications for regular tasks, which indicate their digital competence, are assessed using a set of indicators. In earlier studies on the use of new urban transportation modes this latent variable has been a key component (Acheampong & Siiba, 2020; Aguilera-García et al. 2022; Guillermo Velázquez Romera, 2019). Given that carsharing is a cutting-edge type of technology-driven mobility, its inclusion is justified. Familiarity with new technologies, especially mobile apps and internet services, is essential for using e-carsharing, as vehicles can only be booked via app. Therefore, we hypothesize:

Hypothesis 1c: There are significant differences between the group of e-carsharing users and non-users regarding tech-savviness.

Hypothesis 2c: Tech-savviness will influence e-carsharing adoption.

(3) **Propensity to use shared goods:** This latent construct includes a number of indicators that assess a person's propensity to use shared goods and services, such as carsharing, as well as their willingness to buy used goods. As a result, this hidden variable also captures people's concerns about privacy. The adoption of shared mobility choices, including carsharing, has been shown to be influenced by both privacy sensitivity and sharing preference (Lavieri and Bhat, 2019; Gomez et al., 2021).

Hypothesis 1d: There are significant differences between the group of e-carsharing users and non-users regarding the propensity to use shared goods.

Hypothesis 2d: Propensity to use shared goods will influence e-carsharing adoption.

(4) **Intrinsic preference for driving:** To determine a person's level of pleasure or preference for driving a car, a set of indicators is used. According to Kim et al. (Kim et al., 2017), earlier research has also used this latent component. Given that people's opinions toward driving a car could potentially affect their willingness to accept carsharing as a mode of transportation, the inclusion of this construct seems reasonable.

Hypothesis 1e: There are significant differences between the group of e-carsharing users and non-users regarding intrinsic preference for driving.

Hypothesis 2e: Intrinsic preference for driving will influence e-carsharing adoption.

(5) **Environmental Consciousness:** Pro-environmental attitudes are measured using a number of variables, such as opinions of sustainable modes of transport, home recycling habits, and preferences for ecologically friendly goods and services. According to the existing literature (e.g., Acheampong & Siiba, 2020; Hjorteset & Böcker, 2020; Jin et al., 2020; Mattia et al., 2019),this latent variable has the potential to have a considerable impact on the adoption of carsharing. A decrease in the use of private vehicles and an increase in the choice for eco-friendly modes of transportation are both possible outcomes of pro-environmental behavior.

Hypothesis 1f: There are significant differences between the group of e-carsharing users and non-users regarding environmental consciousness.

Hypothesis 2f: Environmental consciousness will influence e-carsharing adoption.

Prior research indicates a strong connection between environmental attributes and the adoption of sustainable innovations (Jansson, 2011; Paparoidamis & Tran, 2019). However, the role of environmental considerations in carsharing adoption appears multifaceted, with some studies suggesting that sustainability may not always be the primary driver for carsharing users (Hartl et al., 2018) and that environmentally friendly behaviors can reduce the adoption of carsharing (Aguilera-García et al. 2022). Therefore, it is of interest if environmental consciousness can influence the green perceptions of carsharing.

Hypothesis 3: Environmental consciousness is positively related to the green perceptions of e-carsharing.

Together, these latent variables Aguilera-García et al. (2022) provide a framework for exploring the interplay between psychological preferences and the adoption of e-carsharing. Furthermore, it can be investigated whether there is an interplay between the latent variable of environmental consciousness and green perceptions of carsharing, because understanding the relationship between these factors can provide valuable insights into the adoption and promotion of sustainable transportation practices.

3. Methodology

After the theoretical foundation has been laid in the previous chapter, this chapter is dedicated to empirical research. It describes the methodological procedures we followed to try to address our research questions and to test the hypotheses defined in the previous section and here summarized in Table 1.

Table 1: Research Questions and Hypotheses

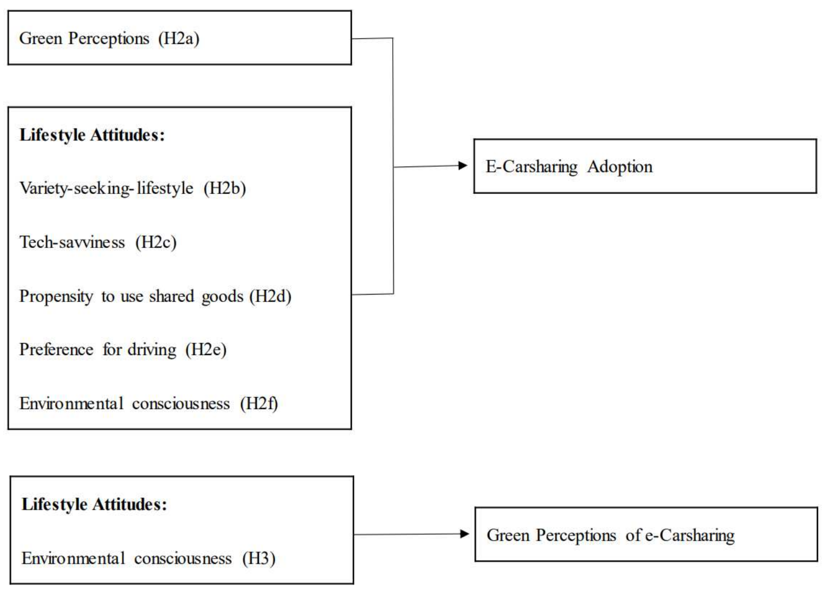
Research Question	Hypothesis
1: Do green perceptions and psychological preferences differ between users and non-users of e-carsharing?	1a: There are significant differences between the group of e-carsharing users and non-users regarding green perceptions.
	1b: There are significant differences between the group of e-carsharing users and non-users regarding VSL attitudes.
	1c: There are significant differences between the group of e-carsharing users and non-users regarding tech-savviness.
	1d: There are significant differences between the group of e-carsharing users and non-users regarding the propensity to use shared goods.
	1e: There are significant differences between the group of e-carsharing users and non-users regarding intrinsic preference for driving.
	1f: There are significant differences between the group of e-carsharing users and non-users regarding environmental consciousness.
2: Are green perceptions and psychological preferences positive related to the adoption of e-carsharing?	2a: Green perceptions will influence e-carsharing adoption.
	2b: VSL attitudes will influence e-carsharing adoption.
	2c: Tech-savviness will influence e-carsharing adoption.
	2d: Propensity to use shared goods will influence e-carsharing adoption.
	2e: Intrinsic preference for driving will influence e-carsharing adoption.
	2f: Environmental consciousness will influence e-carsharing adoption.

3: Is there a relationship between green perceptions of e-carsharing and environmental consciousness?	3: Environmental consciousness will influence e-carsharing adoption.

3.1 Model Definition and Measurement

Aiming to contribute to the understanding of adoption of shared mobility services, such as e-carsharing, this investigation analyses the green perceptions and psychological preferences regarding lifestyles and attitudes of users and non-users. To represent the formulated hypotheses, the following model was designed:

Figure 4: Proposed Conceptual Model



Source: Elaborated by the author.

The model above illustrates green perceptions defined by Noppers et al.'s (2014), as well as the variables of latent psychological preferences of lifestyles and attitudes defined by Aguilera-García et al. (2022), such as VSL, tech-savviness, propensity to use shared goods, preference for driving and environmental consciousness, as they are considered of importance in the literature regarding carsharing adoption.

E-carsharing adoption in this context means that individuals have already used e-carsharing. In research on adoption of innovations, the problem is often that questions are asked to consumers in terms of intention to adopt rather than actual adoption (Flores & Jansson, 2021). The strength of these studies is that consumers with different intentions can be compared, but the weakness is that intentions do not necessarily lead to actual adoption. To address this weakness, in this study we focus on actual usage so that a comparison can be made between users and non-users. In the next point we present the research design of the online study. This is followed by an explanation of the data collection procedures and the measurement instruments used, as well as a description of the methods for data analysis.

3.2 Research Design

The research design defines the methodological approach to a scientific investigation and is thus a central component of the methodological procedure. There are various clues that can classify a research design, but there is no single model. Döring and Bortz provide a classification option based on nine criteria (Döring & Bortz, 2016, 182). The selection was reduced to six criteria, as only these are considered relevant for this work. Table 2 provides an overview of the criteria and selected variants.

Table 2: Criteria of the Research Design

Criteria of the research design	Selected variants
Scientific approach	Quantitative study
Insight objective	Applied scientific study
Object	Original study
Data basis	Primary analysis
Epistemological interest	Explanatory study
Number of test objectives	Group study

As part of defining the research design, assigning the study to a scientific theoretical framework was a fundamental criterion. To address the topic, a research question with an associated hypothesis was formulated. To test the research hypotheses derived from theory, a quantitative research approach was chosen (Döring & Bortz, 2016, 184). This approach involved structured data collection based on a sample of respondents. The goal of the study focused on contributing to solving practical business problems using scientific methods and theories. It was an applied scientific research approach (Döring & Bortz, 2016, 185). The research design was developed individually within this work, and no previously conducted research was repeated. Therefore, it was an original study (Döring & Bortz, 2016, 186). Since there were no usable data available yet, a primary analysis was conducted. Primary analysis involves the evaluation of data collected for the first time. The study's knowledge interest was explanatory, as a set of hypotheses derived from theory were tested for their validity. This research approach primarily examined the relationships between variables (Döring & Bortz, 2016, 192). Practical insights could be gained, and there was maximum relevance to reality (Döring & Bortz, 2016, 205). In this work, the investigation was conducted as a group study, as a sample of objects from the population was examined and evaluated in summary (Döring & Bortz, 2016, 184).

3.3 Data Collection Techniques and Sample Definition

The quantitative study was conducted through the form of an audience polling. This was carried out using an online questionnaire to reach a high number of participants in a short period (Reinders, Ditton, Gräsel, & Gniewosz, 2015). The online survey was conducted using the Qualtrics tool. In this study, a complete standardization was used to analyze the green perceptions and psychological preferences of users and non-users of e-carsharing (Flick, 2019). The online survey took place from 31.10.2023 to 12.11.2023. The survey questionnaire was shared on social networks such as WhatsApp and Facebook.

The target population consisted of individuals with a Class B driver's license who came from one of the Top Ten cities in the Carsharing City Ranking. Hence, the selection of participants was based on two control characteristics. First, possession of a Class B driver's license was required to have the authorization to independently access e-carsharing services. Second, the respondents had to come from one of the following ten cities: Karlsruhe, Munich, Berlin, Hamburg, Freiburg, Tübingen, Cologne, Heidelberg, Frankfurt am Main, or Darmstadt. As for the selection of the research locations, the Top Ten cities from the Carsharing City Ranking (Appendix A) were chosen because they had the densest car-sharing coverage (Bundesverband Carsharing e.V. (bcs), 2022). The two demographic control characteristics were prerequisites for participating in the survey. Due to time and financial limitations of this work, it was assumed that even a small sample of participants was sufficient for this theory-testing study (exploratory study) to provide relevant insights for practice (Döring & Bortz, 2016, 297). For the specific size of the sample, reference was made to Sparkman et al. (1979), who emphasize that the absolute minimum size should obey the minimum proportion of five to ten respondents for each question.

3.4 Questionnaire Design

To facilitate data analysis and obtain statistical indicators, a fully structured questionnaire was created. The questionnaire consisted of closed questions or statements, where respondents could provide pre-defined response options (Döring & Bortz, 2016, 405). The structure of the questionnaire was divided into six sections, following the approach of Döring and Bortz (2016). The questionnaire's structure is presented in Table 3.

Table 3: Elements of Questionnaire

Section	Subject
[1]	Questionnaire Title & Questionnaire Instructions
[2]	Control Characteristics
[3]	Segmentation into Users and Non-users
[4]	Green Perceptions Questions
[5]	Psychological Preferences of Lifestyles and Attitudes
[6]	Demographic Information
[7]	Goodbye

The questionnaire title "Adoption of E-Carsharing" provided information about the topic and was intended to motivate participation. The instructions (Appendix B) explained the purpose and conditions of the survey to the participants, emphasizing the voluntary nature of participation and the assurance of anonymity. The questions were divided into five sections. The **first** section inquired about the two control characteristics. If participants did not possess a Class B driver's license and/or did not come from one of the ten specified cities, they were automatically redirected to a page that concluded their participation in the survey. This ensured that the participants matched the research target population. In the **second** part, participants were asked whether they had used e-carsharing (station-based or free-floating), which allowed segmentation into two groups, (a) e-carsharing users and (b) non-e-carsharing users. The **third** part focused on the participants' green perceptions of e-carsharing. The measures of green perceptions influencing the use and non-use of e-carsharing were derived from Noppers et al. (2015) concerning the relationship between environmental attributes and the adoption of electric cars. The **fourth** part of the survey was used to identify the psychological preferences regarding lifestyles and attitudes of participants. The variables of psychological preferences were defined and adapted from the study by Aguilera-García et al. (2022) regarding behavioral factors influencing the adoption and frequency of carsharing. For the individual items in the Lifestyle Attitudes and Green Perceptions sections (Table 4), multiple response options were provided in the form of 5-point Likert scales, allowing participants to express their agreement or disagreement with statements. The fourth section also incorporated an attention-check question to assess whether respondents were focusing on the questions. This ensured that participants were attentive, contributing to the collection of high-quality data. Answers from inattentive respondents were excluded during the analysis. In the **fifth** section of questions, more specific demographic information was collected, including (a) gender, (b) age, (c) education, (d) employment status, and (e) monthly net income. The end of the questionnaire served as the conclusion. The complete questionnaire can be found in Appendix B. In the next chapter, the methodology for data analysis is described.

Table 4: Questionnaire's Measurement Items

Variable	Item	Source
	[Q1] Have you ever used electric carsharing?	-
	[Q2] Please indicate how often you have used electric carsharing in the past year.	-
Green Perceptions	[Q3] Renting and using electric carsharing in general would help to reduce the environmental problems caused by car traffic.	(Noppers et al., 2015)
	[Q4] Renting and using electric carsharing in general would reduce the climate problems caused by traffic.	
	[Q5] Renting and using electric carsharing in general would help reduce air pollution caused by traffic in residential areas.	
	[Q6] Renting and using electric carsharing in general would reduce society's dependence on fossil oils.	
Lifestyle	[Q7] I think it is important to have all kinds of experiences and I am always trying new things.	(Aguilera-García et al., 2022)
	[Q8] I love to try new products before anyone else.	
	[Q9] Looking for adventures and taking risks is important to me.	
	[Q10] I regularly use sharing economy apps or websites: Airbnb, Wallapop, Couchsurfing, etc.	
Technology	[Q11] I frequently use online social media (e.g., Facebook, Twitter, Instagram, or Snapchat).	
	[Q12] I regularly use internet services or mobile applications to facilitate my daily life: banking services, online purchases, GPS navigation, email, etc.	

	[Q13] Learning how to use new smartphone apps and testing them is easy for me.	
Environment	[Q14] When choosing my transportation mode, I try to be environmentally friendly.	
	[Q15] I recycle at home.	
	[Q16] Generally, I am willing to pay more for a product that is more environmentally friendly.	
Sharing	[Q17] I am willing to purchase second-hand products.	
	[Q18] I am willing to use/put on objects that have been used by many people before me.	
	[Q19] I feel comfortable traveling with strangers.	
	[Q20] I am willing to share a ride with strangers if it reduces my costs.	
Driving	[Q21] I like driving.	
	[Q22] I prefer driving in my own vehicle even if I waste time looking for parking.	
	[Q23] I don't mind using a mode of transport which doesn't allow me to take advantage of the time: reading, studying, working, using my mobile, watching movies, etc.	
	[Q24] I usually feel calm and relaxed, even when driving in heavy traffic/jams.	
	[Q25] Gender	-
	[Q26] Age	-
	[Q27] Education	-
	[Q28] Employment status	-
	[Q29] Income	-

4. Data Analysis

This chapter presents a detailed analysis of the data collected through the online survey, aiming to reach relevant conclusions regarding the research questions of this study.

4.1 Sample Characterization

The present investigation was based on a sample of 211 individuals with a Class B driver's license and residence in one of the ten specified cities in Germany. A total of 151 participants' answers were valid, as only these passed the attention-check question in section four. Regarding the size of the sample, Sparkman et al. (1979) emphasize that the absolute minimum size should obey the minimum proportion of five to ten respondents for each question, which means that for 29 questions, the minimum sample size would be 145 responses to the questionnaire. As a total of 151 valid responses were obtained, the sample thus slightly exceeds the recommended minimum size.

4.1.1 Socio-demographic Characterization by Use of E-Carsharing

The distribution of the socio-demographic characteristics of the participants by use of electric car sharing in the past is presented in table 5. In terms of socio-demographic characteristics, the results show that among the participants who never used electric carsharing (Non-adopters; N=68) the largest percentages concerns females (58,8%), participants between 18 and 24 years (38,2%), participants with bachelor's degree (48,5%), participants that work in full time (57,4%) and participants with a household income per year less than 25,000€ (29,4%). Among the participants who already used electric carsharing (Adopters; N=83), the results show that the largest percentages concerns males (51,8%), participants between 25 and 34 years (41,0%), participants with bachelor's degree (59,0%), participants that work in full time (55,4%) and participants with a household income per year of 50,000 to 99,999€€ (37,3%).

Table 5: Distribution of Socio-demographic Characteristics by Use of E-carsharing

(N=151)

Charateristic/category	Ever use of electric carsharing				Total	
	No (N=68)		Yes (N=83)		(N=151)	
	n	%	n	%	n	%
Gender						
Male	28	*41,2*	43	***51,8***	71	*47,0*
Female	40	***58,8***	39	*47,0*	79	*52,3*
Prefer not to say	0	*0,0*	1	*1,2*	1	*0,7*
Age group						
18-24 years	26	***38,2***	22	*26,5*	48	*31,8*
25-34 years	13	*19,1*[a]	34	***41,0***[a]	47	*31,1*
35-44 years	9	*13,2*	14	*16,9*	23	*15,2*
45-54 years	10	*14,7*	12	*14,5*	22	*14,6*
55-64 years	10	*14,7*[b]	1	*1,2*[b]	11	*7,3*
Education level						
High school diploma	13	*19,1*	9	*10,8*	22	*14,6*
Trade school	10	*14,7*	5	*6,0*	15	*9,9*
Bachelor's degree	33	***48,5***	49	***59,0***	82	*54,3*
Master's degree	11	*16,2*	19	*22,9*	30	*19,9*
Doctorate or professional degree	1	*1,5*	1	*1,2*	2	*1,3*
Employment status						
Working full-time	39	***57,4***	46	***55,4***	85	*56,3*
Working part-time	12	*17,6*	12	*14,5*	24	*15,9*
Unemployed and looking for work	1	*1,5*	1	*1,2*	2	*1,3*
Homemaker or stay-at-home parent	1	*1,5*	1	*1,2*	2	*1,3*
Student	12	*17,6*	23	*27,7*	35	*23,2*
Retired	1	*1,5*	0	*0,0*	1	*0,7*
Other	2	*2,9*	0	*0,0*	2	*1,3*
Household income per year						
Less than 25,000€	20	***29,4***	18	*21,7*	38	*25,2*
25,000 - 49,999€	17	*25,0*	18	*21,7*	35	*23,2*
50,000 - 99,999€	15	*22,1*[c]	31	***37,3***[c]	46	*30,5*
100,000 - 199,999€	10	*14,7*	14	*16,9*	24	*15,9*
Prefer not to say	6	*8,8*	2	*2,4*	8	*5,3*

abc. Each subscript letter denotes a subset of "*Ever used electric carsharing*" categories whose column proportions in a category of a socio-demographic variable differ significantly from each other at the 0,05 level.

To compare differences in proportions between two groups, a z-test for proportions was used with p-values adjusted using the Bonferroni method. When proportions within a category of a variable are significantly different at a 0.05 level of significance, SPSS indicates this with letters in the percentage table.

Regarding age group and household income per year, there are significant differences in the proportions presented between the two groups. The results show that the proportion of participants with 25 to 34 years is significantly superior among those who already used electric car sharing (41,0%) than among those who never used electric car sharing (19,1%). The proportion of participants with 55 to 64 years is significantly superior among those who never used electric car sharing (14,7%) than among those who already used electric car sharing. For the other age groups categories, the proportions are not significantly different.

In the same sense, the proportion of participants with a household income per year of 50,000€ to 99,999€ is significantly superior among those who already used electric car sharing (37,3%) than among those who never used electric car sharing (22,1%). For the other household income categories the proportions are not significantly different.

There are no significant variations in the proportions presented among participants regarding gender, education level, and employment status between individuals who have never utilized electric car sharing and those who already have, in any of the characteristic categories.

4.2 Reliability and Internal Consistency

The aim of this point is to validate the constructs that represent the characteristics of psychological preferences – VSL, tech-savviness, environmental consciousness, propensity to use shared goods and preference for driving – as well as green perceptions. Therefore, in order to analyse the reliability of data, the **Cronbach Alpha test** and the **Item-total correlation** of each variable were used to analyse the internal consistency of the scale.

This part is related to the validity and reliability of the constructs used, that is, we intend to verify each of the six constructs obtained, each from 3 to 4 items, can be represented by a score (average of items) that will present this construct. We followed the indications of Hair et. Al (2009), which suggest an analysis of internal consistency. Therefore, for each of the constructs will be analysed its reliability that is the measurement of the degree of consistency in the multiple measures of a variable, through the analysis of its internal consistency. The principle underlying the internal consistency of a given factor is that its individual items measure the same construct and thus are highly interrelated (Jum C. Nunnally, 1978).

The type of diagnostic measure to be considered is the reliability coefficient, which affects the consistency of the scale as a whole. The most commonly used measure is Cronbach's alpha (Cronbach, 1951; Jum C. Nunnally, 1978). The most consensual minimum limit measure is 0.60 as shown in Table 6 (Hair Jr. & Page, 2015).

Table 6: Cronbach's Alpha Reference Values

Alpha Coefficient Range	Strength of Association
<0.6	Poor
0.6 to < 0.7	Moderate
0.7 to < 0.8	Good
0.8 to < 0.9	Very Good
0.9	Excellent

Source: Hair Jr. & Page, 2015

Corrected item to total correlation is a discrimination index, that shows the correlation between the item and the scale score without the item in reference. By Loiacono et al. (2002), items with correcteditem to total correlation above 0.40 indicate very good discrimination index and by Cristobal et al. (2007) if above 0.30. All the items kept in the final constructs have a good discrimination index, showing corrected item to total correlation values above 0,376.

In table 7 is presented the internal consistency of the 6 constructs of the study and also the corrected item-total correlation of each item and Cronbach's Alpha value if the item was deleted from the construct.

Table 7: Constructs Internal Consistency

(N=151)

Constructs and correspondent items	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Cronbach's Alpha
Q7. Green Perceptions (4 items)			**0,869**
Renting and using electric carsharing in general would:			
... help to reduce the environmental problems caused by traffic.	0,761	0,818	
... reduce the climate problems caused by traffic.	0,743	0,824	
... help reduce air pollution caused by traffic in residential areas.	0,697	0,842	
... reduce society's dependence on fossil oils.	0,688	0,847	
Q8. Lifestyle (4 items)			**0,688**
I think it is important to have all kinds of experiences and I am always trying new things.	0,516	0,608	
I love to try new products before anyone else.	0,526	0,586	
Looking for adventures and taking risks is important to me.	0,485	0,615	
I regularly use sharing economy apps or websites (Airbnb, Couchsurfing, etc.).	0,387	0,681	
Q12.Technology (3 items)			**0,730**
I frequently use online social media (e.g., Facebook, Twitter, TikTok,Instagram, or Snapchat etc.).	0,512	0,698	
I regularly use internet services or mobile applications to facilitate my daily life (banking services, online purchases, GPS navigation, email, etc.).	0,624	0,572	
Learning how to use new smartphone apps and testing them is easy for me.	0,535	0,666	
Q13.Environment (3 items)			**0,738**
When choosing my transportation mode, I try to be environmentally friendly.	0,631	0,569	
I recycle at home.	0,433	0,800	
Generally, I am willing to pay more for a product that is more environmentally friendly.	0,638	0,565	
Q14.Sharing (4 items)			**0,690**

I am willing to purchase second-hand products.	,445	,644	
I am willing to use/put on objects that have been used by many people before me.	,576	,562	
I feel comfortable traveling with strangers.	,378	,683	
I am willing to share a ride with strangers if it reduces my costs.	,504	,605	
Q15.Driving (4 items)			0,594
I am comfortable using a transportation method where I can't do other things (reading, studying, working, using my mobile, watching movies, etc.).	,207	,627	
Q15.Driving (3 items)			**0,627**
I like driving.	,493	,439	
I prefer driving in my own vehicle even if I waste time looking for parking.	,376	,523	
I usually feel calm and relaxed, even when driving in heavy traffic/jams.	,445	,463	

The results show that the construct **Green Perceptions** (α=0,869) presents a very good internal consistency, **Technology** (α=0,730) a good one and **Lifestyle** (α=0,688) and **Sharing** (α=0,690) a moderate internal consistency.

The construct **Environment** (α=0,738) presents a moderate internal consistency, but if the item "*I recycle at home"* is eliminated, the internal consistency increases to 0,800. However, if doing that the construct would be measured by only 2 items. Since the value of the corrected Item-Total Correlation of the item is 0,433, indicating a very good discrimination index, it was decided to keep all the 3 items and accept a moderate internal consistency for the construct.

The construct **Driving** (α=0,594) presents a poor internal consistency, but the elimination of the item "*I am comfortable using a transportation method where I can't do other things (reading, studying, working, using my mobile, watching movies, etc.)"* increases the internal consistency to 0,627. Since this item presents a very low discrimination index (Corrected Item-Total Correlation=0,207), it was decided to eliminate it from the construct and measure Driving only with the remaining 3 items.

4.3 Normality and T-Test of Constructs

This chapter focuses on evaluating construct normality and conducting one-sample t-tests to validate the average tendencies observed among participants for specific constructs.

To ensure that parametric tests such as the t-test are appropriate for a sample, it was first checked whether the constructs are normally distributed. Due to the sample size of more than 50 cases, the Kolmogorov-Smirnov test was used. A value below 0.05 would have suggested non-normality. However, considering the large sample size (>30 cases) and the skewness and kurtosis falling within acceptable limits (|Sk|<3 and |Ku|<7), the assumption of approximate normality for the distributions was made, justifying the use of parametric statistics (table 8).

Table 8: Normality distribution of the constructs

	Tests of Normality				
	Kolmogorov-Smirnov[a]				
	Statistic	df	Sig.	Skewness	Kurtosis
Green perceptions	0,172	151	<0,001	-0,710	0,164
Lifestyle	0,119	151	<0,001	-0,160	-0,176
Technology	0,131	151	<0,001	-0,871	0,888
Environment	0,099	151	0,001	-0,196	-0,120
Sharing	0,114	151	<0,001	-0,312	-0,167
Driving	0,144	151	<0,001	-0,396	-0,265

a. Lilliefors Significance Correction

After assessing the normality of the constructs, one-sample t-tests were conducted. The focus was on determining whether participants, on average, tended to agree or disagree with these constructs. A p-value below 0.05 indicated a significant deviation from the neutral point and provided insights into participants' inclinations regarding the constructs.

Table 9 presents the descriptive statistics of the constructs and the one-sample t-test, confirming the average tendency of the participants. The participants showed a median ranging from 3.50 to 3.75 across different constructs, except for technology, where they reached 4.33. Concerning the average results, they generally ranged between 3.42 for 'sharing' and 3.60 for 'driving', with technology scoring the highest at an average of 4.19.

Table 9: Constructs Descriptive Statistic and One-sample T-test

Construct	Min.-Máx	Median	Mean	Std. Deviation	$t_{(150)}$ (value 3)	P (one-sided)
Green perceptions	1,00 - 5,00	3,75	3,49	0,879	6,873[a]	<0,001
Lifestyle	1,50 - 5,00	3,50	3,48	0,696	8,540[a]	<0,001
Technology	1,67 - 5,00	4,33	4,19	0,682	3,343[b]	<0,001
Environment	1,00 - 5,00	3,67	3,58	0,802	8,866[a]	<0,001
Sharing	1,25 - 5,00	3,50	3,42	0,725	7,072[a]	<0,001
Driving	1,33 - 5,00	3,67	3,60	0,778	9,452[a]	<0,001

1.*Strongly Disagree* 3.*Neutral* 5. *Strongly Agree* *a. Tested value 3* *a. Tested value 4*

The results of the one-sample t-tests suggested that, on average, participants scored significantly above 3, the midpoint of the scale. This indicates that they tend to have a green perception of e-carsharing (M=3.49; SD=0.879; t(150)=6.873; p<0.001), a tendency towards a variety-seeking lifestyle (M=3.48; SD=0.696; t(150)=8.540; p<0.001), a pronounced inclination towards tech-savviness (M=4.19; SD=0.682; t(150)=3.343; p<0.001), an environmental consciousness (M=3.58; SD=0.802; t(150)=8.866; p<0.001), a propensity to use shared goods (M=3.42; SD=0.725; t(150)=7.072; p<0.001), and a preference for driving (M=3.60; SD=0.778; t(150)=9.452; p<0.001).

Since all p-values are < 0.001, the statistical conclusions indicate that, on average, participants scored higher than 3, placing them in the agreement zone. They tend to agree with the constructs, with the strongest agreement observed in the case of technology.

4.4 Differences between Adopters and Non-Adopters of E-Carsharing

The two-sample parametric t-test was conducted to assess the difference in means between users and non-users of e-carsharing, with the dependent variables measured on a scale.

This comparison was made considering the results of the Levene test, which indicated variance homogeneity for most of the constructs, except for green perceptions. The distinction in homogeneity of variance determined the choice of the t-test used. The Welch correction was used for the construct with non-homogeneous variances, while the t-test assuming equal variances was used for the other constructs, thus ensuring appropriate statistical analysis for accurate results.

On table 4, the descriptive statistics of the constructs by user and non-user of e-car sharing are presented alongside the corresponding difference test. In terms of green perception of e-carsharing, variety-seeking lifestyle, technology savviness, propensity to use shared goods, and preference for driving, the mean scores of users of e-car sharing are higher than non-users. Conversely, in relation to the environment, the mean score of non-users of e-car sharing is higher than that of users.

Table 10: T-Test between Adopters and Non-adopters of E-carsharing

	E-carsharing					
	Non-Adopters (N=68)		**Adopters** (N=83)			
Constructs	**Mean**	**Std. Deviation**	**Mean**	**Std. Deviation**	**t**	**p**
Green perceptions	3,27	*0,917*	**3,67**	*0,807*	-2,858	0,002
Lifestyle	3,19	*0,647*	**3,73**	*0,641*	-5,113	<0,001
Technology	4,05	*0,716*	**4,29**	*0,636*	-2,172	0,016
Environment	**3,73**	*0,781*	3,46	*0,803*	2,064	0,020
Sharing	3,28	*0,761*	**3,53**	*0,677*	-2,198	0,015
Driving	3,55	*0,854*	**3,64**	*0,712*	-0,703	0,242

p. one-side p-value

Regarding green perceptions, users of e-car sharing (M=3.67; SD=0.807) exhibited a significantly higher green perception of E-Carsharing than non-users (M=3.27; SD=0.917) (t(134.77)= -2.858; p=0.002). Since the p-value is less than 0.025 for the variable green perceptions, hypothesis 1a is confirmed. We can say with 95% confidence that there are significant differences between the group of e-carsharing users and non-users regarding green perceptions.

Regarding lifestyle, users of e-car sharing (M=3.73; SD=0.641) revealed a significantly higher variety-seeking lifestyle than non-users (M=3.19; SD=0.647) (t(149)= -5.113; p<0.001). Since the p-value is less than 0.025 for the variable lifestyle, hypothesis 1b is confirmed. We can say with 95% confidence that there are significant differences between the group of e-carsharing users and non-users regarding VSL attitudes.

In terms of technology, users of e-car sharing (M=4.29; SD=0.636) demonstrated a significantly higher technology savviness than non-users (M=4.05; SD=0.716) (t(149)= -2.172; p=0.016). Since the p-value is less than 0.025 for the variable technology, hypothesis 1c is confirmed. We can say with 95% confidence that there are significant differences between the group of e-carsharing users and non-users regarding tech-savviness.

Concerning sharing, again users of e-carsharing (M=3.53; SD=0.677) exhibited a significantly higher propensity to use shared goods than non-users (M=3.28; SD=0.761) (t(149)= -2.198; p=0.015). Since the p-value is less than 0.025 for the variable sharing, hypothesis 1d is confirmed. We can say with 95% confidence that there are significant differences between the group of e-carsharing users and non-users regarding the propensity to use shared goods.

Regarding driving, there are no significant differences in the preference for driving between non-users of e-car sharing (M=3.55; SD=0.854) and users (M=3.64; SD=0.712) (t(149)= -0.703; p=0.242). Since the p-value is more than 0.025 for the variable driving, hypothesis 1e is not confirmed. We can say with 95% confidence that there are no significant differences between the group of e-carsharing users and non-users regarding intrinsic preference for driving.

Finally, regarding environmental consciousness, non-users of e-carsharing (M=3.73; SD=0.781) demonstrated a significantly higher environmental consciousness than users (M=3.46; SD=0.803) (t(149)= 2.064; p=0.020). Since the p-value is less than 0.025 for the variable environmental consciousness, hypothesis 1f is confirmed. We can say with 95% confidence that there are significant differences between the group of e-carsharing users and non-users regarding environmental consciousness.

4.5 Correlations

It is important for the simple regression and for the Logistic Regression, to validate that there is no multicollinearity between the 5 constructs as predictors.

As presented in table 11, there are **significant positive** correlations with moderate intensity between Green perceptions and Technology (r=0,399), Lifestyle and Technology (r=0,455) and Lifestyle and Sharing (r=0,414) and of low intensity between Environment and Sharing (r=0,375) and between Green perceptions and Lifestyle (r=0,295).

Between Green perceptions and Sharing (r=0,168) and Technology and Sharing (r=0,193) there are very low significant positive correlations.

Regarding the relation between Environment and Driving, it is a low negative significant correlation (r=-0,249) indicating that the higher the Environmental consciousness the less the Preference for driving. The other constructs. have also a negative correlation with Preference for driving, but not statistically significant (p>0,05).

Green perception, Lifestyle and Technology have also no significant correlations with environment consciousness (p>0,05).

Table 11: Correlation between Constructs

	Lifestyle	Technology	Environment	Sharing	Driving
Green perceptions	$0,295^{***}$	$0,399^{***}$	$-0,023^{ns}$	$0,168^{*}$	$-0,062^{ns}$
Lifestyle		$0,455^{***}$	$0,097^{ns}$	$0,414^{***}$	$-0,021^{ns}$
Technology			$0,105^{ns}$	$0,193^{*}$	$-0,060^{ns}$
Environment				$0,375^{***}$	$-0,249^{**}$
Sharing					$-0,155^{ns}$

n.s. non-significant * significant for p-value <0,05 ** significant for p-value <0,01 *** significant for p-value <0,001

4.6 Logistic Regression

A logistic regression was performed to assess the effects of the predictors Green perceptions, and the psychological preferences regarding Lifestyle, Technology, Sharing, Driving and Environment on e-carsharing adoption. Prior to the procedure, four multivariate outliers cases were removed (ID 37, 46, 90 and 107), following the criteria of standardized residuals higher than |2| (Appendix F). The Logistic regression analysis was then carried out with a sample of 147 cases.

4.6.1 Significance of the Regression Model

To check whether the regression model is significant overall, a chi-square test was performed (referred to in SPSS as the "omnibus tests of model coefficients"). This tests whether the model makes an overall explanatory contribution. Table 12 shows that the model as a whole is significant (Chi-square(5) = 55.950, $p < .001$). For this reason, the analysis can be continued. If the model were not significant, the analysis would not be continued.

Table 12: Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	50,950	6	<,001
	Block	50,950	6	<,001
	Model	50,950	6	<,001

4.6.2 Significance of the Regression Coefficients

It was examined whether the regression coefficients (Betas) are also significant. For each of the regression coefficients, a Wald test was conducted.

Figure 6 shows that the z-tests for the regression coefficients of *Green Perceptions* (Wald(1) = 4.034, $p = 0.045$), *Lifestyle* (Wald(1) = 17.445, $p < .001$) and *Environment* (Wald(1) = 10.264, $p < .001$) are significant. The significant coefficients of the independent variables mean that their regression coefficients are not 0, indicating that these variables have a significant impact on *e-carsharing adoption*.

As the influence of the variables is interpreted through the Odds Ratios (Exp(B)), their significance is also checked: if the confidence interval of Exp(B) does not include the value 1, a significant influence is assumed. This holds true for all examined independent variables.

For *Green Perceptions* and *Lifestyle*, the value of Exp(B) > 1, and for Environment, Exp(B) < 1. Therefore, it follows that the probability of e-carsharing adoption increases 1,66 times per increase of 1 unit of the green perception (*OR=1,661; 95%CI [1,012 ; 2,727]*), it increases 5,42 times per increase of 1 unit of the variety-seeking-lifestyle (*OR=5,421; 95%CI [2,452 ; 11,983]) and* it decreases 0,36 times per increase of 1 unit of the environmental consciousness (*OR=0,368; 95%CI [0,200 ; 0,678]*).

Table 13: Variables in the Equation

								95% C.I.for EXP (B)	
		B	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**	**Lower**	**Upper**
Step 1[a]	Green perceptions	,508	,253	4,034	1	,045	1,661	1,012	2,727
	Lifestyle	1,690	,405	17,445	1	<,001	5,421	2,452	11,983
	Technology	,023	,340	,004	1	,947	1,023	,526	1,990
	Environment	-1,000	,312	10,264	1	,001	,368	,200	,678
	Sharing	,463	,336	1,894	1	,169	1,588	,822	3,069
	Driving	-,306	,281	1,183	1	,277	,736	,424	1,278
	Constant	-4,269	2,189	3,805	1	,051	,014		

a. Variable(s) entered on step 1: Green perception, Lifestyle, Technology, Environment, Sharing, Driving.

4.6.3 Quality of Model

In assessing model fit within logistic regression, analogies to the R^2 of linear regression are used. There are many different pseudo- R^2 measures - two of which are implemented in SPSS: the Cox and Snell R^2 and the Nagelkerke R^2. The Nagelkerke R^2 standardizes the Cox and Snell R^2, allowing it to take values exclusively between 0 and 1. The higher the R^2 value, the better the fit between the model and the data. In the present example, the Nagelkerke R^2, as can be observed in Figure 7, is 0.392, explaining 39.2% of the variance of e-carsharing adoption.

Table 14: Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	150,865[a]	,293	,392

a. Estimation terminated at iteration number 5 because parameter estimated changes by less than ,001.

4.6.4 Prediction of Probability for observed Values

The logistic regression function calculates probabilities that the dependent variable assumes the value 1. These probabilities vary between 0 and 1. SPSS uses the probability of 50.0% (0.500, see footnote in Figure 8) as a cut-off value to determine whether y = 0 or y = 1 is predicted. From a predicted probability of 0.500, it is therefore predicted that e-car sharing adoption = 1. If the probability is lower, non-e-carsharing adoption = 0 is predicted. If the proportions for y = 0 or y = 1 are the same, a cut-off value of 0.500 can be selected, otherwise it corresponds to the proportion of cases y = 1 and can be read from the classification table in the initial block.

Overall, 72.1% of people were classified by the model according to their actual response. Of those people who used e-car sharing, only 60 out of a total of 82 (22 + 60) e-car sharing adopters were correctly predicted. This corresponds to 73.2% correct predictions. Of those people who have never used e-car sharing, 46 out of a total of 65 (46 + 19) were correctly predicted. This corresponds to 70.8% correct predictions (Table 15).

Table 15: Classification Table

Observed			Predicted: Ever used electric carsharing – Non-user	Predicted: Ever used electric carsharing – User	Percentage Correct
Step 1	Ever used electric carsharing	Non-user	46	19	70,8
		User	22	60	73,2
	Overall Percentage				72,1

a. The cut value is ,500

4.6.5 Summary of Logistic Regression Findings

In summary, the logistic regression model was statistically significant (*X2 (6, N=147)=50,950, p<0,001),* explaining 39,2% of the variance of e-carsharing adoption (Nagelkerke R^2=0,392). The model, classify correctly 72,1% of the cases. Three of the predictors were associated with e-carsharing adoption, namely **green perceptions** (*B=0,508; Wald(1)=4,034; p=0,045*), **variety-seeking-lifestyle** (*B=1,690; Wald(1)=17,445; p<0,001*) and **environmental consciousness** (*B=-1,000; Wald(1)=10,264; p=0,001*). E-carsharing adoption is more likely to occur when green perceptions increases and variety-seeking-lifestyle increases. It is less likely to occur when environmental consciousness increases. In magnitude, the probability of e-carsharing adoption increases 1,66 times per increase of 1 unit of the green perceptions (*OR=1,661; 95%CI [1,012 ; 2,727]*), increases 5,42 times per increase of 1 unit of the variety-seeking-lifestyle (*OR=5,421; 95%CI [2,452 ; 11,983]) and* decreases 0,36 times per increase of 1 unit of the environmental consciousness (*OR=0,368; 95%CI [0,200 ; 0,678]).*

Tech-savviness, Propensity to use shared goods and Preference for driving presented no association with e-carsharing adoption (p>0,05).

4.7 Simple Regression Analysis

A simple regression analysis was used to analyse the relationship between two interval-scaled variables. The independent variable represents the "predictor variable" and the dependent variable represents the "criterion variable". The criterion variable represents green perceptions, while the predictor variable represents environmental awareness. The aim of this analysis is to determine the extent to which environmental awareness influences the green perceptions of e-car sharing.

A 5-point Likert scale was used in the survey items to evaluate both variables. Participants could indicate how much they agreed with statements using the Likert scale, which assigned numerical values to their answers (5 being strongly agree, 4 being agree, 3 being neutral, 2 being disagree, and 1 being strongly disagree). Greater positive agreement with the statements regarding green perceptions and environmental consciousness is indicated by higher means values.

As presented in section 4.5- correlations, there was no significant correlation between environmental consciousness and green perceptions of e-carsharing (r=-0,023). Consequently, the simple regression model performed, of the predictor environmental consciousness over the criterion variable green perceptions, explains 0,1% of the green perceptions of e-carsharing (R2=0,001) and it is not significant or valid (F(1, 149)=0,080; p=0,778). Accordingly, the regression coefficient of environmental consciousness is not significant (B=-0,025; t=-0,282; p=0,778) leading to the conclusion that environmental consciousness has no effect on green perceptions of e-carsharing. In this way, hypothesis 3 is neither confirmed in terms of significance nor in terms of the direction of the influence. Therefore, environmental consciousness is not positively related to the green perceptions of e-carsharing.

Table 16: Simple Regression Model

Predictor	**B**	**Std. Error**	**t**	**p**
Constant	3,582	0,329	10,878	<0,001
Environmental consciousness	-0,025	0,090	-0,282	0,778

$F_{(1, 149)}$=0,080; p=0,778; R^2=0,001 Dependent variable: green perceptions

4.8 Hypotheses Validation and Final Model

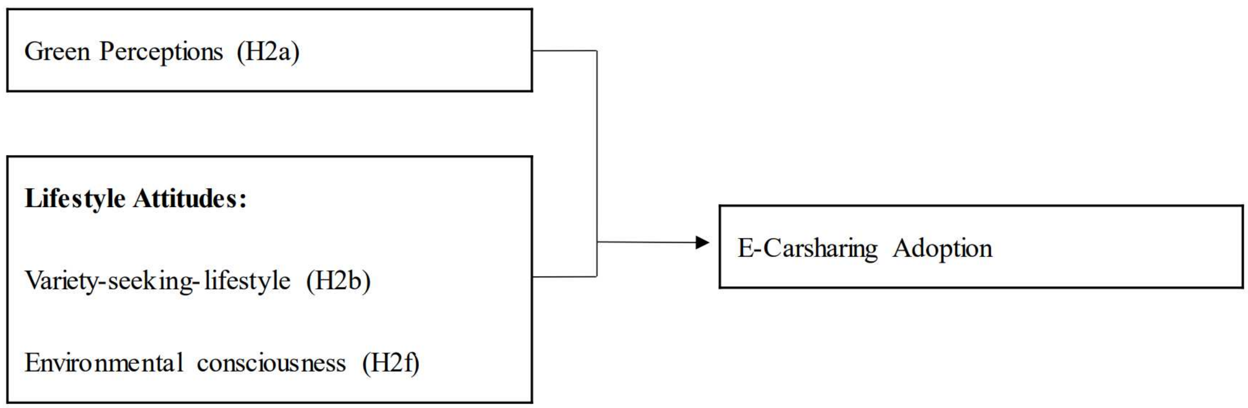
After the validation of the model, we present the results regarding the validation of each of the previously defined hypotheses.

Table 17: Hypotheses and Results

Hypotheses	Results
1a: There are significant differences between the group of e-carsharing users and non-users regarding green perceptions.	Confirmed
1b: There are significant differences between the group of e-carsharing users and non-users regarding VSL attitudes.	Confirmed
1c: There are significant differences between the group of e-carsharing users and non-users regarding tech-savviness.	Confirmed
1d: There are significant differences between the group of e-carsharing users and non-users regarding the propensity to use shared goods.	Confirmed
1e: There are significant differences between the group of e-carsharing users and non-users regarding intrinsic preference for driving.	Not Confirmed
1f: There are significant differences between the group of e-carsharing users and non-users regarding environmental consciousness.	Confirmed
2a: Green perceptions will influence e-carsharing adoption.	Confirmed
2b: VSL attitudes will influence e-carsharing adoption.	Confirmed
2c: Tech-savviness will influence e-carsharing adoption.	Not Confirmed
2d: Propensity to use shared goods will influence e-carsharing adoption.	Not Confirmed
2e: Intrinsic preference for driving will influence e-carsharing adoption.	Not Confirmed
2f: Environmental consciousness will influence e-carsharing adoption.	Confirmed
3: Environmental consciousness will influence e-carsharing adoption.	Not Confirmed

In this way, the final model is presented below:

Figure 5: Final Model



Source: Elaborated by the author.

5. Main Findings and Discussion

The aim of this study was to find out which factors explain the adoption of e-car sharing and to identify possible differences between users and non-users in green perceptions and psychological preferences. Environmental awareness has developed significantly in recent years and sustainable transport solutions have become an essential part of the transport services landscape. Therefore, all stakeholders involved in sustainable transport planning are trying to understand what the relevant factors are for the adoption of this new type of mobility. In this way, e-carsharing providers can better recognize the interests of their customers and meet their needs and expectations by adapting the way they place their service and ultimately their own business models.

It was found out, that adopters of e-carsharing have a significant higher tendency to a variety seeking lifestyle. They love to try new products before anyone else, it is important for them to look for adventures and take risks and they regularly use sharing economy websites and apps. Lifestyle was shown to be a positive influence factor, being the variable with the greatest influence on the e-carsharing adoption. That aligns with the findings of Aguilera-García et al. (2022) in their study on behavioral factors impacting the adoption and frequency of carsharing use in two European cities, indicating that individuals with a high variety-seeking lifestyle tend to have greater familiarity with carsharing services. This emphasises a deeper connection between the aspiration for new experiences and the willingness to use innovative means of transport. Shared mobility leads to a change in daily mobility behaviour and challenges established routines. The results suggest that e-car sharing, as part of shared mobility, encourages a more adaptable lifestyle that values new experiences and diversity. E-carsharing participants tend to have a varied lifestyle and seem to be more open to disrupting their established habits in favour of a flexible approach that values novelty and variety of experiences.

It was found out, that adopters of e-carsharing have significant greener perceptions of this service. The higher green perceptions towards e-carsharing of adopters aligns with the research of Paparoidamis & Tran (2019) showing that consumer choices are increasingly influenced by environmental considerations. People who perceive this shared mobility service as a sustainable offering tend to adopt. Non-adopters do not recognize the environmental benefits associated with e-carsharing, which may prevent them from using the service. This fits to a study by Peters and Dütschke (2014) who found out that certain environmental attributes, such as environmental consequences, received more favorable evaluations from actual users and those with a higher propensity to adopt EVs, as compared to less committed groups. Additionally, it fits to the findings from Jansson et al. (2011), who found out that individuals who adopt sustainable innovations are more likely to perceive and appreciate the green attributes of the products they adopt, in contrast to non-adopters. Additionally, green perception was the second factor considered as a positive influencer of the adoption of e-carsharing. This is in line with multiple studies, which have consistently shown that more positive evaluations of the environmental attributes of sustainable innovations enhance the likelihood of their adoption (Korcaj et al., 2015; Noppers et al., 2014).

While green perception is positively related to adoption, the third influencing factor, environmental consciousness, is negatively related to the use of e-carsharing. The more environmentally aware a person is, the less likely they are to use e-carsharing. The role of environmental considerations in carsharing adoption appears multifaceted in current research, with some studies suggesting that environmentally friendly behaviors can reduce the adoption of (Aguilera-García, Gomez, Velázquez, et al., 2022), which is supported by the present study. This is contrary to previous findings, such as those of Englis and Philipps (2013), who found out that people who are concerned about the environment and its preservation are more likely to accept innovations, and to the study by Velazquez Romera (2019), which showed that environmental concerns do not seem to have a significant effect on the adoption of smart mobility options. Comparing users and non-users, the mean value of environmental consciousness is also higher among non-users of e-car sharing than among users. One possible explanation for this discrepancy could be that, although non-adopters are generally more environmentally aware, they may not recognize the environmental benefits associated with e-carsharing, which limits their acceptance and use of this service. These individuals may tend to avoid the car in daily life, including e-carsharing options, and instead choose public transport, cycling or walking to reduce their carbon footprint. Concerns about the entire life cycle of electric cars, including raw material extraction, production, and battery disposal, may also contribute to their reluctance. In addition, their preference for local lifestyles, such as living close to their workplace or choosing places that are easily accessible on foot or by bike, can influence their choices. Overall, these factors could explain why non-adopters, despite being more environmentally conscious overall, do not use e-carsharing. At the same time, it may explain why they perceive e-car sharing to be less green, as they indicated a lower level of agreement, even though there is no significant correlation between environmental awareness and green perceptions.

VSL, green perceptions and environmental consciousness are the only significantly factors related to the use of e-carsharing. Nevertheless, significant differences in other factors between users and non-users were discovered.

Tech-savviness and the propensity to use shared goods are significant higher for adopters than non-adopters. The higher importance of tech affinity and sharing among e-carsharing users compared to non-users indicates a potential influence on their adoption decisions. The technology variable, including frequent use of social media, regular use of online services, and ease of learning and using new smartphone apps, indicate a comfort and familiarity with digital platforms. This familiarity could facilitate the transition to e-carsharing platforms as they often utilize similar digital interfaces for booking and management. Similarly, the increased propensity for sharing goods among adopters, such as a willingness to use previously used objects, feeling comfortable with unfamiliar travel companions, and openness to cost-saving ride options, reflects an inherent comfort with shared experiences. E-carsharing as a shared mobility concept could attract individuals who are more likely to engage in such collaborative behaviors. Ultimately, these predispositions to use technology and the propensity to share may fit well with the principles of e-carsharing, where digital interaction and a shared mobility ethos are integral components. However, neither of these factors are significant drivers of e-carsharing adoption, they merely show a higher level of approval among users, which may be related to the reasons mentioned above. That does not align with the findings of Aguilera-García et al. (2022) indicating that individuals with a high sharing propensity tend to have greater familiarity with carsharing services and that **tech-savvy** individuals have a higher intention to adopt carsharing (Acheampong & Siiba, 2020).

The lack of significant differences in preference for driving between users and non-users and the lack of being a significant driver of e-carsharing adoption suggests that the preference for driving does not appear to strongly influence the decision to use e-carsharing. That does not align with the findings of Aguilera-García et al. (2022) indicating that individuals with a preference for driving tend to have greater familiarity with carsharing services. Instead, other factors such as lifestyle, perception of green aspects and environmental consciousness play a more important role in the adoption of e-carsharing services in this study. This suggests that the motivation for using e-carsharing goes beyond individual driving preferences and encompasses a broader range of considerations.

In summary, this research proved that there are statistically significant differences between adopters and non-adopters of e-carsharing regarding green perceptions, propensity to adopt a VSL, tech-savviness, environmental consciousness and propensity to use shared goods. In particular, this research validated that the factors influencing the adoption of e-carsharing significantly are green perceptions, propensity to adopt a VSL and environmental consciousness.

5.1 Theoretical Implications

Theoretically, this research contributes to the literature by confirming the significance of Lifestyle and Green Perceptions in the use of sustainable innovations. Furthermore, we added understanding to the importance of distinguishing between green perceptions and environmental consciousness, as these two factors can influence the adoption of sustainable innovations in different directions. Green perceptions have a positive influence on adoption, while environmental consciousness has a negative impact on adoption. Although the results regarding the impact of environmental consciousness conflict with many previous studies, we provided an argument to emphasize the significance of more detailed approaches when it comes to studies in sustainable innovations.

This paper also furthers existing knowledge regarding the role of Lifestyle preferences by the adoption of shared mobility options. We provided a strong argument that, to motivate people to behave pro-environmentally by using more sustainable mobility options such as e-carsharing, it must fit their Lifestyle preferences. Therefore, it underlines the relevance of the detailed investigation of lifestyle preferences when it comes to studies on the adoption of mobility options. There needs to be more research into how new mobility options can best fit into the lifestyles of target groups to be easily integrated into their lives, as it was identified as an influencing factor.

This study calls for future research efforts to look deeper into the complex dynamics between lifestyle preferences, environmental awareness and perceptions of sustainability to gain insights for the development and implementation of sustainable mobility services. Overall, these theoretical implications emphasise the multifaceted nature of the factors shaping the adoption of sustainable innovations and challenge researchers and practitioners to take a more nuanced approach to a comprehensive understanding of consumer behavior in the field of sustainable transport.

5.2 Managerial Implications

After discussing the results of the e-carsharing survey data analysis, it is equally relevant to link these results, obtained by the demand side, that is, what the consumer demands are and what they consider to be important factors, with the supply side, understanding how and what e-carsharing services, in general, can do to correspond to those expectations.

Certainly, aligning the e-carsharing business model with consumer demands, especially focusing on greener positioning, can significantly boost adoption rates. The emphasis should be on leveraging the strong influence of green perceptions while targeting environmentally conscious individuals who are not currently using e-carsharing. This strategy involves educating and engaging this demographic about the green benefits to encourage their adoption.

Additionally, recognizing the significance of a variety-seeking lifestyle as a driver, marketing efforts should amplify this aspect. Highlighting the diversity, novelty, and adventurous aspects of e-carsharing can attract individuals inclined towards new experiences.

However, it's crucial to acknowledge the segment of users who don't necessarily seek novelty or have a variety-seeking lifestyle. To cater to their needs and make e-carsharing appealing, there's a necessity to introduce new offerings tailored to their preferences. Creating specialized services that focus on stability, predictability, and reliability could entice this group to embrace e-carsharing.

Therefore, to enhance e-carsharing adoption, providers should optimize their services and marketing strategies by implementing the ideas illustrated in Table 19.

Table 18: Idea and Implementation

Idea	Implementation
Strengthen Green Positioning	• Communicate the environmental benefits extensively through marketing and educational campaigns. • Highlight how e-carsharing contributes to reducing carbon footprint, air pollution, and resource conservation.
Target environmental consciousness	• Develop specific campaigns targeting environmentally conscious individuals. • Showcase the positive environmental impact of e-carsharing and its alignment with sustainable practices.
Amplify Variety-Seeking Lifestyle in Marketing	• Tailor marketing strategies to emphasize the diversity, novelty, and adventurous nature of e-carsharing. • Highlight the freedom, flexibility, and new experiences that come with using e-carsharing services.
Create Tailored Offerings for different User Preferences	• Introduce specialized packages or service tiers catering to stability-focused individuals. • Offer reliable and predictable e-carsharing options appealing to those who seek familiarity and consistency.

By incorporating these strategies, e-carsharing providers can bridge the gap between consumer preferences and service offerings, ultimately driving higher adoption rates. This aligns with the objective of providing a comprehensive and inclusive e-carsharing service that caters to a diverse range of user preferences and lifestyles to reduce CO2 emissions in the transport sector.

6. Limitations and Further Research

A few limitations of the current paper are relevant for further research to address. First, we did not have a sample that is representative of the population as it is non-probabilistic, meaning that not every unit in the population has an equal chance of being included in the sample. The questionnaire was largely distributed through the author's personal network, which consists mainly of people with similar characteristics. Second, was not assessed the intention to adopt as we just focused on the actual adoption. Having included the measurement of Adoption Intention would have contributed to a more comprehensive comparison between consumers with different intentions, specially within the group of non-users.

In this paper, we also did not focus on the city comparison, thereby not including a discussion regarding similarities and differences between the users and non-users of these ten cities. By focusing on these ten cities, the implications might be more relevant for cities or counties that share similar characteristics and should be corroborated by empirical studies in other cities. Nevertheless, the results and implications presented can serve as initial input for understanding consumer behaviors and a guide for future research. One possibility for further research is to apply psychological preferences and green perceptions to e-carsharing in other cities using a longitudinal approach. As research has only been conducted in ten German cities using one survey, studies in additional cities of different countries using multiple surveys at different points over a period could provide more insight into the drivers for adoption and the evolution of these drivers.

Furthermore, no distinction was made in this study between free-floating and station-based models. A distinction and the addition of the remaining carsharing business models and other forms of sustainable transport innovations such as shared e-bikes and e-scooters could corroborate the findings of this study.

Moreover, no distinction was made between the providers. Finally, it is suggested to analyse the segmentation of psychological preferences of users and non-users and their impact on acceptance as well as the influence of individual e-carsharing brands on user perceptions. As more and more e-carsharing providers emerge and use branding as a marketing strategy, it will be interesting to see in the future how consumers perceive the differences between brands in terms of eco-friendliness.

7. Conclusion

E-carsharing is an innovative mobility solution that offers flexibility and convenience in accessing vehicles on demand and provides users with a sustainable alternative to traditional car ownership. The current thesis reveals that individuals with higher green perceptions, propensity to adopt a VSL and environmental consciousness tend to adopt this service. For individuals to share journeys and vehicles without sacrificing freedom and comfort and thus contribute to sustainable, future-oriented transport, future initiatives by providers should focus on strengthening green positioning and adapting services to different lifestyles to further incentivise adoption and meet evolving consumer demands. In parallel to the practical implications, the academic implications derived from this research show a clear demand for a deeper understanding of consumer behavior in the context of sustainable transport. They argue for a more nuanced and holistic approach and challenge researchers to explore the complex interplay of psychological factors and sustainability perceptions in order to gain a comprehensive understanding of adoption patterns. The study emphasises the need to deepen the complex relationships between lifestyle preferences, environmental consciousness and green perceptions in order to gain insights for the development of sustainable mobility services. Considering these implications will lead the scientific community to a deeper understanding of the acceptance of sustainable innovations and point the way for future scientific research.

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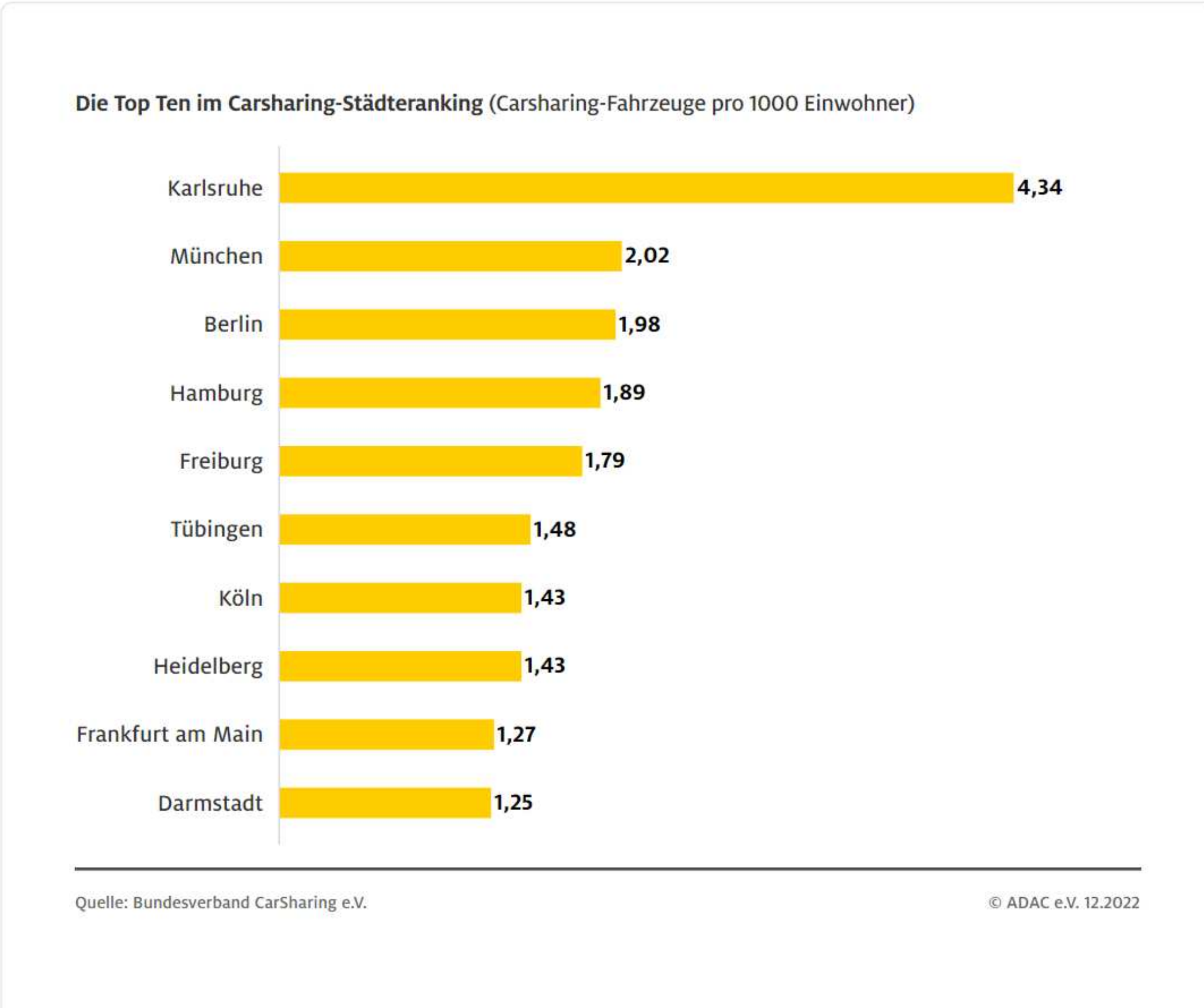
Appendices

Appendix A: The Top Ten in the Carsharing City Ranking



Appendix B: Qualtrics Survey

Start of Block: Introduction

Hello and thank you for participating in this survey!

This online survey is conducted as part of my Master's thesis in Consumer Adoption of Product Innovation at Católica Lisbon SBE. The survey aims to assess individuals' attitudes and behaviors regarding electric carsharing.

Your participation is very important to me and entirely voluntary, and all the data collected will be kept strictly private and anonymous. This survey will take approximately 3 minutes to complete. If you are willing to provide your insights, please consent in the next step.

Thank you for being part of this survey. Let's get started!

Do you consent to participate in this study?

○ I consent (1)

○ I do not consent (2)

Skip To: End of Survey If Do you consent to participate in this study? = I do not consent

End of Block: Introduction

Start of Block: Control Characteristics

Do you have a Class B driver's license?

○ No (1)

○ Yes (2)

Skip To: End of Survey If Do you have a Class B driver's license? = No

Page Break

Do you live in one of these cities?

- Berlin (1)
- Cologne (2)
- Darmstadt (3)
- Frankfurt am Main (4)
- Freiburg (5)
- Hamburg (6)
- Heidelberg (7)
- Karlsruhe (8)
- Munich (9)
- Tübingen (10)
- None of the above (11)

Skip To: End of Survey If Do you live in one of these cities? = None of the above

End of Block: Control Characteristics

Start of Block: Segmentation

In this survey, we're interested in your experience with electric carsharing. Carsharing involves service providers who own vehicles and offer them for short-term rentals to individuals (e.g. SHARE NOW, MILES and Sixt Share). Some cars need to be returned to specific places in certain areas (station-based), while others can be left anywhere within a certain zone (free-floating). Carsharing providers often have electric cars available for this service.

Page Break

Have you ever used electric carsharing?

○ No (1)

○ Yes (2)

Skip To: End of Block If Have you ever used electric carsharing? = No

Page Break

Please indicate how often you have used electric carsharing in the past year.

○ Never (1)

○ Rarely (1-2 times) (2)

○ Occasionally (3-5 times) (3)

○ Regularly (6-10 times) (4)

○ Frequently (more than 10 times) (5)

End of Block: Segmentation

Start of Block: Green Perception

Please rate your agreement with the following statements regarding the environmental and societal impact of renting and using electric carsharing. For each statement, indicate your level of agreement on a scale from 'Strongly Disagree' to 'Strongly Agree.'

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
Renting and using electric carsharing in general would help to reduce the environmental problems caused by traffic. (1)	○	○	○	○	○
Renting and using electric carsharing in general would reduce the climate problems caused by traffic. (2)	○	○	○	○	○
Renting and using electric carsharing in general would help reduce air pollution caused by traffic in residential areas. (3)	○	○	○	○	○
Renting and using electric carsharing in general would reduce society's dependence on fossil oils. (4)	○	○	○	○	○

End of Block: Green Perception

Start of Block: Lifestyle Attitudes

Please rate your agreement with the following statements related to different aspects of your lifestyle and preferences. For each statement, indicate your level of agreement on a scale from 'Strongly Disagree' to 'Strongly Agree.'

Lifestyle

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
I think it is important to have all kinds of experiences and I am always trying new things. (1)	○	○	○	○	○
I love to try new products before anyone else. (2)	○	○	○	○	○
Looking for adventures and taking risks is important to me. (3)	○	○	○	○	○
I regularly use sharing economy apps or websites (Airbnb, Couchsurfing, etc.). (4)	○	○	○	○	○

Page Break

Technology

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
I frequently use online social media (e.g., Facebook, Twitter, TikTok,Instagram, or Snapchat etc.). (1)	○	○	○	○	○
I regularly use internet services or mobile applications to facilitate my daily life (banking services, online purchases, GPS navigation, email, etc.). (2)	○	○	○	○	○
I never used a smartphone. (3)	○	○	○	○	○
Learning how to use new smartphone apps and testing them is easy for me. (4)	○	○	○	○	○

Page Break

Environment

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
When choosing my transportation mode, I try to be environmentally friendly. (1)	○	○	○	○	○
I recycle at home. (2)	○	○	○	○	○
Generally, I am willing to pay more for a product that is more environmentally friendly. (3)	○	○	○	○	○

Page Break

Sharing

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
I am willing to purchase second-hand products. (1)	○	○	○	○	○
I am willing to use/put on objects that have been used by many people before me. (2)	○	○	○	○	○
I feel comfortable traveling with strangers. (3)	○	○	○	○	○
I am willing to share a ride with strangers if it reduces my costs. (4)	○	○	○	○	○

Page Break

Driving

	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
I like driving. (1)	○	○	○	○	○
I prefer driving in my own vehicle even if I waste time looking for parking. (2)	○	○	○	○	○
I am comfortable using a transportation method where I can't do other things (reading, studying, working, using my mobile, watching movies, etc.). (3)	○	○	○	○	○
I usually feel calm and relaxed, even when driving in heavy traffic/jams. (4)	○	○	○	○	○

End of Block: Psychological Preferences

Start of Block: Demographics

How would you describe yourself?

○ Male (1)

○ Female (2)

○ Non-binary / third gender (3)

○ Prefer not to say (4)

How old are you?

- Under 18 (1)
- 18-24 years old (2)
- 25-34 years old (3)
- 35-44 years old (4)
- 45-54 years old (5)
- 55-64 years old (6)
- 65+ years old (7)

What is the highest level of education you have completed?

- No formal education (1)
- High school diploma (2)
- Trade school (3)
- Bachelor's degree (4)
- Master's degree (5)
- Doctorate or professional degree (6)

What best describes your employment status over the last three months?

- ◯ Working full-time (1)
- ◯ Working part-time (2)
- ◯ Unemployed and looking for work (3)
- ◯ A homemaker or stay-at-home parent (4)
- ◯ Student (5)
- ◯ Retired (6)
- ◯ Other (7)

What was your total household income before taxes during the past 12 months in Euros?

- ◯ Less than 25,000 Euros per year (1)
- ◯ 25,000 - 49,999 Euros per year (2)
- ◯ 50,000 - 99,999 Euros per year (3)
- ◯ 100,000 - 199,999 Euros per year (4)
- ◯ More than 200,000 Euros per year (5)
- ◯ Prefer not to say (6)

End of Block: Demographics

Appendix C: Cross-tabulation of Demographic Characteristics

Cross-tabulation of demographic characteristics is used to explore and analyse potential associations or relationships between different variables. Cross-tabulations and the associated chi-square tests are used for different combinations. The chi-square test is used in this context to test whether there is a statistically significant association between the analysed variables. It makes it possible to assess whether the observed differences between the groups are greater than what would be expected by chance or sampling deviations. Thus, the test helps to determine whether the observed association between the characteristics is actually significant or could be due to random variation.

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
How would you describe yourself? * Have you ever used electric carsharing?	151	100,0%	0	0,0%	151	100,0%
How old are you? * Have you ever used electric carsharing?	151	100,0%	0	0,0%	151	100,0%
What is the highest level of education you have completed? * Have you ever used electric carsharing?	151	100,0%	0	0,0%	151	100,0%
What best describes your employment status over the last three months? * Have you ever used electric carsharing?	151	100,0%	0	0,0%	151	100,0%
What was your total household income before taxes during the past 12 months in Euros? * Have you ever used electric carsharing?	151	100,0%	0	0,0%	151	100,0%

Q25_gender How would you describe yourself? * Q1_Carsharing Have you ever used electric carsharing?

Crosstab

			Have you ever used electric carsharing?		Total
			No	Yes	
How would you describe yourself?	Male	Count	28_a	43_a	71
		% within Have you ever used electric carsharing?	41,2%	51,8%	47,0%
	Female	Count	40_a	39_a	79
		% within Have you ever used electric carsharing?	58,8%	47,0%	52,3%

			No	Yes	Total
	Prefer not to say	Count	0_a	1_a	1
		% within Have you ever used electric carsharing?	0,0%	1,2%	0,7%
Total		Count	68	83	151
		% within Have you ever used electric carsharing?	100,0%	100,0%	100,0%

Each subscript letter denotes a subset of Have you ever used electric carsharing? categories whose column proportions do not differ significantly from each other at the ,05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	2,718[a]	2	,257	,218		
Likelihood Ratio	3,099	2	,212	,218		
Fisher-Freeman-Halton Exact Test	2,642			,218		
Linear-by-Linear Association	,872[b]	1	,350	,366	,217	,078
N of Valid Cases	151					

a. 2 cells (33,3%) have expected count less than 5. The minimum expected count is ,45.

b. The standardized statistic is -,934.

Q26_Age How old are you? * Q1_Carsharing Have you ever used electric carsharing?

Crosstab

			Have you ever used electric carsharing?		
			No	Yes	Total
How old are you?	18-24 years old	Count	26_a	22_a	48
		% within Have you ever used electric carsharing?	38,2%	26,5%	31,8%
	25-34 years old	Count	13_a	34_b	47
		% within Have you ever used electric carsharing?	19,1%	41,0%	31,1%
	35-44 years old	Count	9_a	14_a	23
		% within Have you ever used electric carsharing?	13,2%	16,9%	15,2%
	45-54 years old	Count	10_a	12_a	22
		% within Have you ever used electric carsharing?	14,7%	14,5%	14,6%
	55-64 years old	Count	10_a	1_b	11
		% within Have you ever used electric carsharing?	14,7%	1,2%	7,3%

Total	Count	68	83	151
	% within Have you ever used electric carsharing?	100,0%	100,0%	100,0%

Each subscript letter denotes a subset of Have you ever used electric carsharing? categories whose column proportions do not differ significantly from each other at the ,05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	17,027[a]	4	,002	,001		
Likelihood Ratio	18,389	4	,001	,001		
Fisher-Freeman-Halton Exact Test	17,277			,001		
Linear-by-Linear Association	1,535[b]	1	,215	,221	,121	,024
N of Valid Cases	151					

a. 1 cells (10,0%) have expected count less than 5. The minimum expected count is 4,95.

b. The standardized statistic is -1,239.

Q27_Education What is the highest level of education you have completed? * Q1_Carsharing Have you ever used electric carsharing?

Crosstab

			Have you ever used electric carsharing?		Total
			No	Yes	
What is the highest level of education you have completed?	High school diploma	Count	13_a	9_a	22
		% within Have you ever used electric carsharing?	19,1%	10,8%	14,6%
	Trade school	Count	10_a	5_a	15
		% within Have you ever used electric carsharing?	14,7%	6,0%	9,9%
	Bachelor's degree	Count	33_a	49_a	82
		% within Have you ever used electric carsharing?	48,5%	59,0%	54,3%
	Master's degree	Count	11_a	19_a	30
		% within Have you ever used electric carsharing?	16,2%	22,9%	19,9%
	Doctorate or professional degree	Count	1_a	1_a	2
		% within Have you ever used electric carsharing?	1,5%	1,2%	1,3%
Total		Count	68	83	151
		% within Have you ever used electric carsharing?	100,0%	100,0%	100,0%

Each subscript letter denotes a subset of Have you ever used electric carsharing? categories whose column proportions do not differ significantly from each other at the ,05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	6,221[a]	4	,183	,174		
Likelihood Ratio	6,239	4	,182	,221		
Fisher-Freeman-Halton Exact Test	6,350			,149		
Linear-by-Linear Association	4,043[b]	1	,044	,049	,027	,009
N of Valid Cases	151					

a. 2 cells (20,0%) have expected count less than 5. The minimum expected count is ,90.

b. The standardized statistic is 2,011.

Q28_Employment status What best describes your employment status over the last three months? * Q1_Carsharing Have you ever used electric carsharing?

Crosstab

			Have you ever used electric carsharing? No	Have you ever used electric carsharing? Yes	Total
What best describes your employment status over the last three months?	Working full-time	Count	39_a	46_a	85
		% within Have you ever used electric carsharing?	57,4%	55,4%	56,3%
	Working part-time	Count	12_a	12_a	24
		% within Have you ever used electric carsharing?	17,6%	14,5%	15,9%
	Unemployed and looking for work	Count	1_a	1_a	2
		% within Have you ever used electric carsharing?	1,5%	1,2%	1,3%
	A homemaker or stay-at-home parent	Count	1_a	1_a	2
		% within Have you ever used electric carsharing?	1,5%	1,2%	1,3%
	Student	Count	12_a	23_a	35
		% within Have you ever used electric carsharing?	17,6%	27,7%	23,2%
	Retired	Count	1_a	0_a	1
		% within Have you ever used electric carsharing?	1,5%	0,0%	0,7%
	Other	Count	2_a	0_a	2
		% within Have you ever used electric carsharing?	2,9%	0,0%	1,3%
Total		Count	68	83	151

% within Have you ever used electric carsharing?	100,0%	100,0%	100,0%

Each subscript letter denotes a subset of Have you ever used electric carsharing? categories whose column proportions do not differ significantly from each other at the ,05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	5,599[a]	6	,470	,531		
Likelihood Ratio	6,760	6	,344	,591		
Fisher-Freeman-Halton Exact Test	5,645			,459		
Linear-by-Linear Association	,139[b]	1	,709	,712	,373	,035
N of Valid Cases	151					

a. 8 cells (57,1%) have expected count less than 5. The minimum expected count is ,45.

b. The standardized statistic is ,373.

Q29_Income What was your total household income before taxes during the past 12 months in Euros? * Q1_Carsharing Have you ever used electric carsharing?

Crosstab

			Have you ever used electric carsharing? No	Yes	Total
What was your total household income before taxes during the past 12 months in Euros?	Less than 25,000 Euros per year	Count	20_a	18_a	38
		% within Have you ever used electric carsharing?	29,4%	21,7%	25,2%
	25,000 - 49,999 Euros per year	Count	17_a	18_a	35
		% within Have you ever used electric carsharing?	25,0%	21,7%	23,2%
	50,000 - 99,999 Euros per year	Count	15_a	31_b	46
		% within Have you ever used electric carsharing?	22,1%	37,3%	30,5%
	100,000 - 199,999 Euros per year	Count	10_a	14_a	24
		% within Have you ever used electric carsharing?	14,7%	16,9%	15,9%
	Prefer not to say	Count	6_a	2_a	8
		% within Have you ever used electric carsharing?	8,8%	2,4%	5,3%
Total		Count	68	83	151
		% within Have you ever used electric carsharing?	100,0%	100,0%	100,0%

Each subscript letter denotes a subset of Have you ever used electric carsharing? categories whose column proportions do not differ significantly from each other at the ,05 level.

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	6,944[a]	4	,139	,141		
Likelihood Ratio	7,087	4	,131	,143		
Fisher-Freeman-Halton Exact Test	6,837			,142		
Linear-by-Linear Association	,006[b]	1	,937	,950	,494	,049
N of Valid Cases	151					

a. 2 cells (20,0%) have expected count less than 5. The minimum expected count is 3,60.

b. The standardized statistic is ,079.

Appendix D: Normality Descriptives Output

Checking the normal distribution of the constructs makes it possible to determine whether the data follow a normal distribution, which is important in order to apply appropriate statistical tests. Since a normal distribution is present, one-sample t-tests can be used to validate whether the average trends observed among participants for certain constructs deviate significantly from a specified value.

Statistics

	N		Mean	Median	Std. Deviation	Minimum	Maximum
	Valid	Missing					
Green perception	151	0	3,49	3,75	,879	1,00	5,00
Lifestyle	151	0	3,48	3,50	,696	1,50	5,00
Technology	151	0	4,19	4,33	,682	1,67	5,00
Environment	151	0	3,58	3,67	,802	1,00	5,00
Sharing	151	0	3,42	3,50	,725	1,25	5,00
Driving	151	0	3,60	3,67	,778	1,33	5,00

Descriptives

			Statistic	Std. Error
Green perception	Mean		3,4917	,07154
	95% Confidence Interval for Mean	Lower Bound	3,3504	
		Upper Bound	3,6331	
	5% Trimmed Mean		3,5231	
	Median		3,7500	
	Variance		,773	
	Std. Deviation		,87912	
	Minimum		1,00	
	Maximum		5,00	
	Range		4,00	
	Interquartile Range		1,00	
	Skewness		-,710	,197
	Kurtosis		,164	,392
Lifestyle	Mean		3,4834	,05661
	95% Confidence Interval for Mean	Lower Bound	3,3716	
		Upper Bound	3,5953	
	5% Trimmed Mean		3,4881	
	Median		3,5000	
	Variance		,484	
	Std. Deviation		,69562	
	Minimum		1,50	
	Maximum		5,00	
	Range		3,50	
	Interquartile Range		1,00	
	Skewness		-,160	,197
	Kurtosis		-,176	,392
Technology	Mean		4,1854	,05547
		Lower Bound	4,0758	

	95% Confidence Interval for Mean	Upper Bound	4,2950	
	5% Trimmed Mean		4,2355	
	Median		4,3333	
	Variance		,465	
	Std. Deviation		,68165	
	Minimum		1,67	
	Maximum		5,00	
	Range		3,33	
	Interquartile Range		1,00	
	Skewness		-,871	,197
	Kurtosis		,888	,392
Environment	Mean		3,5784	,06523
	95% Confidence Interval for Mean	Lower Bound	3,4495	
		Upper Bound	3,7073	
	5% Trimmed Mean		3,5931	
	Median		3,6667	
	Variance		,643	
	Std. Deviation		,80157	
	Minimum		1,00	
	Maximum		5,00	
	Range		4,00	
	Interquartile Range		1,00	
	Skewness		-,196	,197
	Kurtosis		-,120	,392
Sharing	Mean		3,4172	,05900
	95% Confidence Interval for Mean	Lower Bound	3,3006	
		Upper Bound	3,5338	
	5% Trimmed Mean		3,4329	
	Median		3,5000	
	Variance		,526	
	Std. Deviation		,72498	
	Minimum		1,25	
	Maximum		5,00	
	Range		3,75	
	Interquartile Range		1,00	
	Skewness		-,312	,197
	Kurtosis		-,167	,392
Driving	Mean		3,5982	,06329
	95% Confidence Interval for Mean	Lower Bound	3,4732	
		Upper Bound	3,7233	
	5% Trimmed Mean		3,6165	
	Median		3,6667	
	Variance		,605	
	Std. Deviation		,77776	
	Minimum		1,33	
	Maximum		5,00	
	Range		3,67	
	Interquartile Range		1,00	
	Skewness		-,396	,197
	Kurtosis		-,265	,392

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Green perception	,172	151	<,001	,935	151	<,001
Lifestyle	,119	151	<,001	,983	151	,053
Technology	,131	151	<,001	,913	151	<,001
Environment	,099	151	,001	,971	151	,003
Sharing	,114	151	<,001	,979	151	,019
Driving	,144	151	<,001	,966	151	<,001

a. Lilliefors Significance Correction

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Green perception	151	3,4917	,87912	,07154
Lifestyle	151	3,4834	,69562	,05661
Technology	151	4,1854	,68165	,05547
Environment	151	3,5784	,80157	,06523
Sharing	151	3,4172	,72498	,05900
Driving	151	3,5982	,77776	,06329

One-Sample Test

	Test Value = 3						
			Significance			95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Mean Difference	Lower	Upper
Green perception	6,873	150	<,001	<,001	,49172	,3504	,6331
Lifestyle	8,540	150	<,001	<,001	,48344	,3716	,5953
Technology	21,370	150	<,001	<,001	1,18543	1,0758	1,2950
Environment	8,866	150	<,001	<,001	,57837	,4495	,7073
Sharing	7,072	150	<,001	<,001	,41722	,3006	,5338
Driving	9,452	150	<,001	<,001	,59823	,4732	,7233

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
Technology	151	4,1854	,68165	,05547

One-Sample Test

	Test Value = 4

	t	df	Significance		Mean Difference	95% Confidence Interval of the Difference	
			One-Sided p	Two-Sided p		Lower	Upper
Technology	3,343	150	<,001	,001	,18543	,0758	,2950

Appendix E: T-Test between Adopters and Non-adopters

An independent T-test between adopters and non-adopters is used to investigate whether there is a significant difference in the mean values of the variables analysed between these two groups. This test is used when the data for each group was collected independently and allows comparison of the means between the groups. A test of normal distribution is used before the T-test to ensure that the data for each group follows a normal distribution. This is a prerequisite for the independent T-test to ensure its validity. If the data are normally distributed, the T-test can be used more reliably to determine whether the mean values differ significantly between the groups.

Group Statistics

	Have you ever used electric carsharing?	N	Mean	Std. Deviation	Std. Error Mean
Green perception	No	68	3,27	,917	,11115
	Yes	83	3,67	,807	,08863
Lifestyle	No	68	3,19	,647	,07846
	Yes	83	3,73	,641	,07037
Technology	No	68	4,05	,716	,08684
	Yes	83	4,29	,636	,06984
Environment	No	68	3,73	,781	,09472
	Yes	83	3,46	,803	,08810
Sharing	No	68	3,28	,761	,09224
	Yes	83	3,53	,677	,07432
Driving	No	68	3,55	,854	,10353
	Yes	83	3,64	,712	,07818

Tests of Normality

	Have you ever used electric carsharing?	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Green perception	No	,156	68	<,001	,938	68	,002
	Yes	,176	83	<,001	,916	83	<,001
Lifestyle	No	,107	68	,053	,975	68	,185
	Yes	,129	83	,002	,968	83	,038
Technology	No	,118	68	,020	,931	68	,001
	Yes	,155	83	<,001	,883	83	<,001
Environment	No	,119	68	,019	,951	68	,009
	Yes	,133	83	<,001	,966	83	,029
Sharing	No	,131	68	,006	,977	68	,241
	Yes	,128	83	,002	,976	83	,130
Driving	No	,158	68	<,001	,957	68	,019
	Yes	,130	83	,001	,969	83	,040

a. Lilliefors Significance Correction

Descriptives

	Have you ever used electric carsharing?			Statistic	Std. Error
Green perception	No	Mean		3,2684	,11115
		95% Confidence Interval for Mean	Lower Bound	3,0465	
			Upper Bound	3,4902	
		5% Trimmed Mean		3,2819	
		Median		3,5000	
		Variance		,840	
		Std. Deviation		,91659	
		Minimum		1,50	
		Maximum		5,00	
		Range		3,50	
		Interquartile Range		1,50	
		Skewness		-,435	,291
		Kurtosis		-,723	,574
	Yes	Mean		3,6747	,08863
		95% Confidence Interval for Mean	Lower Bound	3,4984	
			Upper Bound	3,8510	
		5% Trimmed Mean		3,7209	
		Median		3,7500	
		Variance		,652	
		Std. Deviation		,80749	
		Minimum		1,00	
		Maximum		5,00	
		Range		4,00	
		Interquartile Range		,75	
		Skewness		-,974	,264
		Kurtosis		1,699	,523
Lifestyle	No	Mean		3,1875	,07846
		95% Confidence Interval for Mean	Lower Bound	3,0309	
			Upper Bound	3,3441	
		5% Trimmed Mean		3,1920	
		Median		3,2500	
		Variance		,419	
		Std. Deviation		,64700	
		Minimum		1,50	
		Maximum		5,00	
		Range		3,50	
		Interquartile Range		1,00	
		Skewness		-,136	,291
		Kurtosis		,406	,574
	Yes	Mean		3,7259	,07037
		95% Confidence Interval for Mean	Lower Bound	3,5859	
			Upper Bound	3,8659	
		5% Trimmed Mean		3,7299	
		Median		3,7500	
		Variance		,411	
		Std. Deviation		,64109	
		Minimum		2,25	

		Maximum		5,00	
		Range		2,75	
		Interquartile Range		1,00	
		Skewness		-,219	,264
		Kurtosis		-,510	,523
Technology	No	Mean		4,0539	,08684
		95% Confidence Interval for Mean	Lower Bound	3,8806	
			Upper Bound	4,2273	
		5% Trimmed Mean		4,0948	
		Median		4,0000	
		Variance		,513	
		Std. Deviation		,71610	
		Minimum		2,00	
		Maximum		5,00	
		Range		3,00	
		Interquartile Range		1,00	
		Skewness		-,551	,291
		Kurtosis		,107	,574
	Yes	Mean		4,2932	,06984
		95% Confidence Interval for Mean	Lower Bound	4,1542	
			Upper Bound	4,4321	
		5% Trimmed Mean		4,3436	
		Median		4,3333	
		Variance		,405	
		Std. Deviation		,63630	
		Minimum		1,67	
		Maximum		5,00	
		Range		3,33	
		Interquartile Range		,67	
		Skewness		-1,203	,264
		Kurtosis		2,365	,523
Environment	No	Mean		3,7255	,09472
		95% Confidence Interval for Mean	Lower Bound	3,5364	
			Upper Bound	3,9146	
		5% Trimmed Mean		3,7320	
		Median		3,6667	
		Variance		,610	
		Std. Deviation		,78108	
		Minimum		2,33	
		Maximum		5,00	
		Range		2,67	
		Interquartile Range		1,33	
		Skewness		,018	,291
		Kurtosis		-,922	,574
	Yes	Mean		3,4578	,08810
		95% Confidence Interval for Mean	Lower Bound	3,2826	
			Upper Bound	3,6331	
		5% Trimmed Mean		3,4672	
		Median		3,6667	
		Variance		,644	
		Std. Deviation		,80262	
		Minimum		1,00	
		Maximum		5,00	

		Range		4,00	
		Interquartile Range		1,00	
		Skewness		-,351	,264
		Kurtosis		,274	,523
Sharing	No	Mean		3,2757	,09224
		95% Confidence Interval for Mean	Lower Bound	3,0916	
			Upper Bound	3,4599	
		5% Trimmed Mean		3,2949	
		Median		3,2500	
		Variance		,579	
		Std. Deviation		,76067	
		Minimum		1,25	
		Maximum		5,00	
		Range		3,75	
		Interquartile Range		1,00	
		Skewness		-,268	,291
		Kurtosis		-,067	,574
	Yes	Mean		3,5331	,07432
		95% Confidence Interval for Mean	Lower Bound	3,3853	
			Upper Bound	3,6810	
		5% Trimmed Mean		3,5435	
		Median		3,5000	
		Variance		,458	
		Std. Deviation		,67712	
		Minimum		1,75	
		Maximum		5,00	
		Range		3,25	
		Interquartile Range		1,00	
		Skewness		-,261	,264
		Kurtosis		-,420	,523
Driving	No	Mean		3,5490	,10353
		95% Confidence Interval for Mean	Lower Bound	3,3424	
			Upper Bound	3,7557	
		5% Trimmed Mean		3,5784	
		Median		3,6667	
		Variance		,729	
		Std. Deviation		,85376	
		Minimum		1,33	
		Maximum		5,00	
		Range		3,67	
		Interquartile Range		1,25	
		Skewness		-,483	,291
		Kurtosis		-,427	,574
	Yes	Mean		3,6386	,07818
		95% Confidence Interval for Mean	Lower Bound	3,4830	
			Upper Bound	3,7941	
		5% Trimmed Mean		3,6450	
		Median		3,6667	
		Variance		,507	

Std. Deviation	,71227	
Minimum	2,00	
Maximum	5,00	
Range	3,00	
Interquartile Range	,67	
Skewness	-,203	,264
Kurtosis	-,300	,523

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p			Lower	Upper
Green perception	Equal variances assumed	4,715	,031	-2,894	149	,002	,004	-,40632	,14038	-,68372	-,12892
	Equal variances not assumed			**-2,858**	**134,771**	**,002**	,005	-,40632	,14216	-,68748	-,12515
Lifestyle	Equal variances assumed	,018	,894	**-5,113**	**149**	**<,001**	<,001	-,53840	,10530	-,74647	-,33034
	Equal variances not assumed			-5,109	142,698	<,001	<,001	-,53840	,10539	-,74674	-,33007
Technology	Equal variances assumed	1,335	,250	**-2,172**	**149**	**,016**	,031	-,23925	,11014	-,45689	-,02162
	Equal variances not assumed			-2,147	135,416	,017	,034	-,23925	,11144	-,45964	-,01886
Environment	Equal variances assumed	,165	,685	**2,064**	**149**	**,020**	,041	,26766	,12971	,01135	,52397
	Equal variances not assumed			2,069	144,627	,020	,040	,26766	,12936	,01198	,52333
Sharing	Equal variances assumed	1,125	,290	**-2,198**	**149**	**,015**	,029	-,25740	,11710	-,48878	-,02601
	Equal variances not assumed			-2,173	135,551	,016	,032	-,25740	,11846	-,49167	-,02313
Driving	Equal variances assumed	3,688	,057	**-,703**	**149**	**,242**	,483	-,08953	,12743	-,34134	,16227
	Equal variances not assumed			-,690	130,520	,246	,491	-,08953	,12974	-,34619	,16712

Appendix F: Logistic Regression Outlier's Detection

Outlier detection prior to logistic regression is important to identify potential data points that could deviate strongly from the general trends of the data. These outliers could influence the analysis by distorting the parameters of the logistic regression and lead to inaccurate predictions. By identifying and handling outliers prior to regression, the accuracy of the model can be improved by minimising interfering influences.

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	151	100,0
	Missing Cases	0	,0
	Total	151	100,0
Unselected Cases		0	,0
Total		151	100,0

a. If weight is in effect, see classification table for the total number of cases.

Casewise List[b]

		Observed			Temporary Variable		
Case	Selected Status[a]	Ever used electric carsharing	Predicted	Predicted Group	Resid	ZResid	SResid
37	S	N**	,852	S	-,852	-2,401	-2,016
46	S	N**	,909	S	-,909	-3,155	-2,233
107	S	N**	,850	S	-,850	-2,381	-2,034

a. S = Selected, U = Unselected cases, and ** = Misclassified cases.
b. Cases with studentized residuals greater than 2,000 are listed.

Appendix G: Simple Linear Model Assumption

When testing the assumptions of the simple linear model, an ANOVA is used to check whether the explained variation of the dependent variable by the independent variable is statistically significant. The unstandardised coefficients indicate the direct effects of the independent variable on the dependent variable and help to describe the relationship between these variables.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	,062	1	,062	,080	,778[b]
	Residual	115,865	149	,778		
	Total	115,927	150			

a. Dependent Variable: Green perception

b. Predictors: (Constant), Environment

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3,582	,329		10,878	<,001
	Environment	-,025	,090	-,023	-,282	,778

a. Dependent Variable: Green perception