Battery Electric Vehicles in Shared Mobility Services – Analysing Drivers and Barriers to Understand Restrained Consumer Demand

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Abstract

Battery electric vehicles (BEVs) and shared mobility services are potential solutions for reducing greenhouse gas (GHG) emissions to combat climate change. However, consumer demand for BEVs, whether purchased privately or used for shared mobility, is restrained. While the drivers and barriers for BEVs in the context of private ownership have been analysed to some extent, there has been little research in shared mobility contexts such as carsharing and car rental. The present paper attempts to fill this gap by investigating whether consumer drivers and barriers differ for shared mobility use cases compared to ownership. This is done by surveying customers of a global carsharing and car rental company. A total of 1,888 customers of the carsharing and rental business models in Germany were surveyed in two independent online surveys with closed and open-ended questions. The findings indicate that environmental concerns are the primary driver for BEV bookings. The main barriers are limited range, charging infrastructure, and booking costs of BEVs. These results are similar to those for the ownership context. It appears that consumers do not distinguish between the different use cases, suggesting that there are prejudices against BEVs regardless of the use case. It remains unclear whether psychological factors might influence the rejection of BEVs.

Keywords: battery electric vehicles, shared mobility, e-carsharing, car rental, consumer choice

1 Introduction

The transportation sector accounted for 20% of global greenhouse gas (GHG) emissions in 2018 and is considered one of the main drivers of climate change (Ritchie, 2020). In 2020, road transport was responsible for 25% of total GHG emissions in the European Union, with passenger cars and vans accounting for 15% (COM, 2024; EEA, 2022). Therefore, this sector is under increasing pressure to reduce its GHG emissions (Morfeldt & Johansson, 2022). Battery electric vehicles (BEVs) and shared mobility services are seen as potential drivers for a more environmentally friendly transportation sector. There has been extensive research, mostly focusing on the ownership context, on how the electrification of private motorised transport, specifically cars and vans, could reduce transport-related GHG emissions (see the review by Raugei (2022)). Extensive research has also been conducted on sharing models and their innovative (e.g., Belezas & Daniel, 2023) and sustainable and collaborative consumption character (e.g., Boar et al., 2020). Specifically, research has focused on sharing models in the mobility sector, such as carsharing (e.g., Arbeláez Vélez, 2023). In addition, the potential of carsharing solutions to reduce GHG emissions in the transportation sector has been analysed comprehensively (e.g., Ortega et al., 2023; Yoshizawa et al., 2023).

However, although all major car manufacturers today offer BEVs, albeit with different product portfolios and delivery rates (dena, 2023; Wallington et al., 2022), consumer demand is rather restrained. It is expected that the breakthrough for BEVs is still to come (Almeida Neves et al., 2019; Hebermehl, 2024). There are some exceptions (such as Norway) in terms of BEV adoption, but overall demand for BEVs, although growing in recent years, is still at a low level (Anastasiadou & Gavanas, 2022; Yang et al., 2023). This is noteworthy given that switching from a conventional internal combustion engine vehicle (ICEV) to a BEV can be broken down to a change of powertrain and is not expected to fundamentally alter mobility behaviours and attitudes (Haas, 2023). Research indicates that BEVs offer many advantages in terms of transport-related GHG emissions (Sacchi et al., 2022) and positive local impacts on human health and the environment (Pan et al., 2023), especially when charged with renewable energy (Ellingsen et al., 2016). Furthermore, numerous governments have set a transition in mobility as a key strategic goal to achieve the goals of the Paris Climate Agreement (BMUB, 2016). Regarding this transition, the shift to BEVs would be a first step. The implementation of shared mobility services could further facilitate this transition and, in combination with BEVs, lead to even greater environmental benefits (e.g., Ahonen et al., 2023; Boyacı et al., 2017). However, consumer interest in BEVs for sharing purposes is limited (Ecomento, 2022). As a result, some of the major car rental companies are currently reducing their supply of BEVs (Gomes & White, 2024). The decline in demand for shared BEVs poses a problem for the government's proposed mobility transition goals, as shared products are seen as a promising way to achieve this transition. Generally, shared products offer a promising way for consumers to explore new and innovative technologies while mitigating individual financial risks (Brendel et al., 2018; Schlüter & Weyer, 2019). Research investigating BEVs in the context of shared mobility remains notably scarce (Isaksson & Pongolini, 2023; Pamidimukkala et al., 2023), providing an opportunity for exploratory research. This might yield outcomes that differ from those observed in traditional ownership contexts.

Therefore, this paper aims to investigate the factors that influence the booking of BEVs among carsharing and car rental customers. A sample of 1,888 customers of a global carsharing and car rental company in Germany were surveyed using both closed and open-ended questions. The customers were categorised according to their preferred powertrain, and the responses were coded. The emerging categories and sub-categories were listed according to their frequency. The results were then compared to existing literature on the drivers and barriers to BEV ownership among consumers.

The remainder of the paper is organised as follows: Section 2 provides an overview of the relevant literature, followed by Section 3, which describes the methodology applied and the data collected. Section 4 presents and discusses the results. Finally, Section 5 concludes with implications, limitations, and future research opportunities.

2 State of the Literature

2.1 Consumer Demand for Battery Electric Vehicles

There is a large body of literature focusing on the relevant actors for BEV uptake[1]. In their literature review on the adoption of electric vehicles in the European market, Corradi et al. (2023) analyse and identify four main actors: industry (i.e., car manufacturers, suppliers), policymakers, civil society (i.e., citizens, workers, trade unions, environmental organisations, NGOs), and consumers (i.e., car drivers). This paper reviews literature on the barriers to consumer demand for BEVs from a consumer research perspective. Since the market entry of BEVs, the literature has addressed the reasons that motivate consumers to switch to BEVs or prevent them from doing so (e.g. Coffman et al., 2016; Liao et al., 2016). Several reviews and meta-analyses have been conducted (see table 1). However, the major technological advances in the field of BEVs in recent years may limit the predictive validity of these studies for today's development stage. For example, charging infrastructure has been expanded significantly and the range of BEVs has increased considerably (Bundesnetzagentur, 2024; Greiner et al., 2020). Table 1 lists five recent reviews, all of which used different approaches to summarise previous studies on BEV uptake. However, the factors identified vary, as does the consumer focus. Also, many different terms are used in research to explore the topic of BEV uptake. To be consistent with other streams of literature, this paper uses the term "acceptance" as used by Wicki, Brückmann, Quoss, et al. (2022). This includes terms such as "intention to buy a BEV", "willingness to buy a BEV", "intention to book a BEV", "willingness to book a BEV", "support for BEV adoption", "willingness to pay for a BEV", "intention to use a BEV", and "general opinions about BEVs" (Wicki, Brückmann, Quoss, et al., 2022).

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[1] The focus of this paper is on BEVs. As the global carsharing and car rental company offers other powertrain options such as hybrid vehicles, these will be included as the study progresses. However, there will not be an explicit literature section on other powertrain choices. For the remainder of this paper, all vehicle types other than BEVs and ICEVs will be referred to as Others.

Table 1

Selected literature reviews considered for the definition used in this paper

Authors	Key factors
Corradi et al. (2023)	Consumers, industry manufacturers, industry suppliers, policymakers, civil society representatives, NGOs, citizens
Wicki, Brückmann, Quoss, et al. (2022)	Technical, contextual, cost-related, sociodemographic, attitudinal and behavioural factors, BEV-specific experience, social factors
Anastasiadou and Gavanas (2022)	Technological/technical, political, economic, socio-demographic, environmental, legal factors
Hoang et al. (2022)	Behavioural, contextual, demographic factors, product attributes
Li et al. (2017)	Demographic, situational, psychological factors

Most reviews agree that cost, charging and range are the main consumer concerns regarding acceptance of BEVs (e.g., Anastasiadou & Gavanas, 2022). These concerns often lead to restrained purchase behaviour. However, Wicki, Brückmann, Quoss, et al. (2022) note that it remains uncertain whether these issues are uniform across different socio-cultural and decision-making contexts. Therefore, it is important to consider these issues when evaluating BEV acceptance.

The cost of BEVs compared to ICEVs, usually referring to purchase price and operating costs, is one of the most studied factors inhibiting consumer acceptance of BEVs (Wicki, Brückmann, Quoss, et al., 2022). Hagman et al. (2016) were able to show that consumer perception is not always rational in this regard, as consumers tend to overestimate the total cost of ownership (TCO) of BEVs by focusing on the higher purchase prices of BEVs (Austmann & Vigne, 2021; Brückmann et al., 2021; Jia et al., 2023; Nielsen & Haustein, 2018). Perceived higher operating costs, typically measured in energy costs, can also lead to lower acceptance of BEVs (Li et al., 2020). However, consumers also tend to overestimate the operating costs of BEVs (Krishnan & Koshy, 2021). Mandys (2021) showed that consumers assess the resale value of BEVs in the same way as that of ICEVs. Put differently, resale value is considered, but not with a higher or lower weight (Mandys, 2021). Instead, consumers tend to focus more on direct costs such as purchase price and recharging costs (Mandys, 2021). In conclusion, it becomes apparent that the cost of BEVs is a significant factor limiting their acceptance.

Another widely researched constraint to consumer acceptance of BEVs is charging, specifically charging times and the availability of charging points (Hardman et al., 2018). In recent years, the charging time of BEVs has decreased significantly due to the introduction of new fast charging stations. The possible range per hour of charging has increased from about 12 kilometres to 350 kilometres for light-duty BEVs (BFE, 2024; DOT, 2023). However, charging time is still negatively related to BEV acceptance (Hardman et al., 2018; Higueras-Castillo et al., 2020; Miele et al., 2020). It is worth noting that charging time depends on the vehicle type, battery status, and charger type (Wicki, Brückmann, Quoss, et al., 2022). In recent years, the European Union has deployed a (fast) charging infrastructure, which will be further accelerated as part of the Alternative Fuels Infrastructure Regulation (AFIR) under the European Green Deal (COM, 2023). The availability of charging infrastructure and its expansion have a positive impact on BEV acceptance by consumers (Jia & Chen, 2021; Miele et al., 2020). Several studies conclude that the expansion of (fast) charging stations is necessary to increase BEV purchases (e.g., Brückmann & Bernauer, 2023).

Range is also one of the most frequently mentioned and analysed factors related to consumer acceptance of BEVs (Anastasiadou & Gavanas, 2022; Rainieri et al., 2023). In recent years, higher capacity batteries have been developed, resulting in significantly longer ranges. Thus, the average has increased from 150 kilometres in 2011 to over 350 kilometres in 2021 (Greiner et al., 2020; IEA, 2023; TCS, 2024). However, consumers remain cautious about recent developments and are hesitant to adopt BEVs due to their (perceived) shorter range compared to ICEVs (Tan et al., 2023), resulting in range anxiety (Rainieri et al., 2023). Furthermore, many consumers are concerned about weather conditions and the potential lack of battery capacity for heating in winter (Jakobsson et al., 2022). Overall, longer range leads to higher consumer acceptance of BEVs.

Research has also examined additional factors that foster consumer acceptance of BEVs. Frequently cited factors include a general inclination towards new technologies (e.g., Plötz et al., 2014), policies and incentives such as tax benefits or dedicated parking spaces (e.g., Wang et al., 2018; Wang et al., 2021; Wicki et al., 2019), and previous experience with BEVs (e.g., Wicki, Brückmann, Quoss, et al., 2022). Yet, the most important factors contributing to BEV acceptance are generally identified as their perceived positive environmental impact (e.g., Sierzchula, 2014) and consumers' general environmental attitudes (e.g., Bösehans et al., 2023; Carley et al., 2013; Rotaris et al., 2021; Tchetchik et al., 2020). However, Hidrue et al. (2011) found that although 3,029 US respondents stressed the importance of reducing environmental impact when buying a new car, this factor had a significantly smaller effect than their assessment of vehicle performance. Forsythe et al. (2023) confirmed this by showing that the increase in BEV purchases in the US is primarily due to technological advances leading to greater range, rather than changes in consumer preferences or attitudes.

2.2 Carsharing and Shared BEVs

The literature on shared mobility and carsharing is varied.[2] Many papers focus on the different definitions of shared mobility in general and in the context of carsharing (e.g. Castellanos et al., 2021; Shaheen & Cohen, 2018). Nobis (2006) defines carsharing as "[…] a service by which members of shared-use vehicle organizations get access to a fleet of vehicles." In Germany, carsharing started in the late 1980s (BCS, 2024b; Nobis, 2006). In most of the country's larger cities various providers compete with each other, and it is important to differentiate between the two main types of carsharing: free-floating and station-based (BCS,

[2] The remainder of the paper also includes data collected from car rental users. However, as the literature on car rental and BEVs is not as extensive, it is not discussed further in this section (Hoerler, 2022).

2024a; Ortega et al., 2023). Free-floating carsharing began in Germany around 2009 (BCS, 2024b) and is now established in many cities (Burghard & Scherrer, 2022). In free-floating carsharing, customers usually access the car via an app.

The service offers flexible pick-up and drop-off options within a pre-defined geographical area, allowing for one-way journeys (Ortega et al., 2023). Costs are usually calculated per minute or per kilometre driven (Balac et al., 2017). Station-based carsharing, on the other hand, limits pick-up and drop-off locations to predefined areas or specific parking stations. Users can return the car to the same (round trip) or to a different car station (one-way) (Ortega et al., 2023).

Despite these different options, carsharing, has not yet been widely adopted in Germany and other countries (Lagadic et al., 2019; Seyerlein, 2023). Yet there has been extensive research on the environmental benefits of shared mobility, and carsharing in particular (Arbeláez Vélez, 2023). While some researchers explored the potential of carsharing on a theoretical basis (e.g., Kurisu et al., 2023), others have focused on calculating the environmental benefits, particularly in terms of GHG emissions, with a specific interest in CO_2 equivalents (e.g., Amatuni et al., 2020). However, the main environmental benefits result from a change in the modal split of users, i.e., a reduction in the number of kilometres travelled by car. While carsharing pools may facilitate a resource-efficient use of cars, simply changing ownership from private to shared does not significantly reduce GHG emissions (Ortega et al., 2023).

The combination of shared mobility and BEVs could achieve significant environmental benefits (Harris et al., 2021; Wappelhorst et al., 2014). Some studies have calculated the specific GHG emissions savings of BEV carsharing (e.g., Luna et al., 2020; Yoshizawa et al., 2023), with varying results depending on the market, data and methodology used. However, it can be concluded that the introduction of BEVs in carsharing would lead to savings in GHG emissions, especially in CO_2 equivalents.

While there is a vast literature on BEVs in the ownership context and on carsharing, the literature on BEVs in the shared mobility context is still in its infancy (Pamidimukkala et al., 2023). Jin, Yao, et al. (2020a) conducted a mode choice behaviour analysis in Beijing to investigate the potential demand and found that BEV carsharing has only a small effect on displacing private cars and that potential trips are usually concentrated in the morning peak hours and end in commercial or green areas. In a stated preference survey, Jin, An, et al. (2020) showed that BEV carsharing can replace taxis for long-distance trips. Furthermore, the study revealed that consumers are more likely to tolerate a greater distance to access BEV carsharing services if their intended trip is longer and the range of the BEV is sufficient. Brendel et al. (2018) investigated how BEVs can be integrated into the fleet of a carsharing provider in Germany by developing a framework for a BEV utilisation management system to avoid under-utilisation of BEVs in mixed fleets, improve charging schedules, increase battery life, and reduce consumer range anxiety. Abouee-Mehrizi et al. (2021) demonstrated in their mixed fleet study that the integration of BEVs can even have a negative impact on the overall emissions of a fleet if BEV carsharing prices are too low and public transport could be substituted. However, the authors also note that charging infrastructure and charging speed are more critical to the success of BEV carsharing than the range of the BEV. Yao et al. (2022) conducted a literature review on the integration of BEVs into fleets, taking the supply and demand sides into account. They recommend further research on consumer needs to better integrate them into operator models (Yao et al., 2022).

Jin, Yao, et al. (2020b) analysed the drivers of BEV carsharing at the user level and found that environmental awareness, social benefits, satisfaction with the transport system and reliability are the main drivers of usage. The main barriers to BEV carsharing in a free-floating model are range and availability. Wang et al. (2020) were able to show that carsharing users have different usage patterns for BEV and ICEV carsharing. BEV carsharing is used to fulfil usage purposes, while ICEV carsharing is used to satisfy the demand for higher-speed cars.

Isaksson and Pongolini (2023) investigated user barriers to BEV carsharing from a social perspective by interviewing potential BEV carsharing users in a low-income, suburban area with rental apartments in Sweden. The authors identified three main challenges: making the technology understandable and useful, integrating BEV carsharing into everyday practice, and negotiating and communicating the appropriate way to share a car.

Curtale et al. (2021) analysed the Dutch market in terms of user acceptance of BEV carsharing services. Their survey of 656 respondents showed that social influence is the most important driver of behavioural intention, followed by performance expectation and personal attitude. Burghard and Dütschke (2019) examined consumer profiles in the German BEV carsharing market. Their research indicates that BEV carsharing is particularly attractive to younger demographic groups, including car-free couples and young families who use it as a supplement to their private cars. Attitudes towards BEV carsharing are primarily determined by its compatibility with daily routines, as well as social norms. Several studies have investigated and confirmed that BEV carsharing has a positive impact on future BEV car purchases (e.g., Firnkorn & Müller, 2015; Hoerler et al., 2021; Shaheen et al., 2020), because sometimes BEV carsharing users seem to use their bookings to evaluate a particular BEV model (Schlüter & Weyer, 2019). However, consumer demand for BEVs in carsharing and rental contexts remains relatively low (Ecomento, 2022). In response, some carsharing and rental companies are phasing out a portion of their BEV fleets (Gomes & White, 2024).

In addition to low consumer demand, there is also, to the best of the author's knowledge, a research gap regarding the drivers and barriers in the context of shared mobility. There are distinct differences between carsharing, car rental and car ownership in terms of use cases, e.g. the distance travelled per car sharing trip is around 10 km (Wien, 2022), while the average daily mileage for a German car is around 37 km (MotoIntegrator, 2022; Nobis & Kuhnimhof, 2018). Consumers' preference for BEV usage is therefore likely to vary depending on the specific application due to differences in mileage, financial risk, and period of use compared to car ownership (Brendel et al., 2018; Wappelhorst et al., 2014). The barriers often cited by consumers, such as limited range or high purchase price, apply only to a limited extent to the carsharing and car rental use cases. Therefore, this paper explores the drivers and barriers associated with BEV bookings in the carsharing and car rental context, and whether these differ from the ownership context. The aim is to fill the research gap with regard to transparent studies and rigour documentation on BEV acceptance identified by Wicki, Brückmann, Quoss, et al. (2022). The research questions addressed in this exploratory study are:

> *RQ1: What are the drivers and barriers for BEV bookings among users of carsharing and car rental services?*
>
> *RQ2: Do the drivers and barriers for BEV bookings differ depending on the user's preferred powertrain?*

3 Data and Methods

To address the research questions, a collaboration was established with a global car rental and carsharing company that has been providing car rental services worldwide for many years and has introduced carsharing in Germany in recent years. In major German cities, carsharing is operated as a free-floating model, with payment based on distance or time. As the company offers both car rental and carsharing services, the data has the advantage of providing more comparable results, e.g., compared to data from various providers, as it can be assumed that customer groups are similar. In addition, the data was collected only from customers in Germany to reduce country-specific variations.

3.1 Data Collection

Data was collected through two cross-sectional online surveys resulting in two independent samples; one each from the carsharing product and rental product. The carsharing survey was conducted online in the booking app for twelve days in April–May 2023. A 5 EUR voucher was offered for participating in the survey when opening the German version of the app. However, these customers didn't need to complete a vehicle booking before conducting the survey. A total of 1,025 users participated in the survey, and after data cleaning, 935 responses were used for further analysis. For the rental product, the survey was displayed as a pop-up notification on the German version of the company's website for 23 days in June–July 2023 after successfully booking a car. No voucher or other benefit was offered. A total of 1,218 users completed the survey, and after data cleaning, 953 responses were used for further analysis. The survey included questions on the preferred powertrain, gender, age, possession of a driver's license, access to a vehicle in the household, and, in the case of the rental product, the reason for booking, such as a business trip or leisure (see Appendix 1).

3.2 Measures and Sample Description

3.2.1 Measure 1: Preferred Powertrain

The survey sorted customers into different user groups based on their preferred powertrain. For carsharing, the groups were named *BEV-CS* (n=461) and *ICEV-CS* (n=474). For rental, the groups were named *BEV-R* (n=128), *ICEV-R* (n=750) and *Other-R* (n=75). The *Other* category includes vehicles with powertrains such as plug-in hybrid, hybrid, etc. that are solely available as rental cars. Analysing the drivers and barriers based on powertrain choice allows for a comparison between customers who prefer a BEV and those who prefer a different powertrain, highlighting the differences between them.

3.2.2 Measure 2: Drivers and Barriers for the Use of BEVs

Participants were asked open-ended questions regarding the factors that drive or hinder their booking of BEVs. This approach was taken to avoid biased responses that might result from providing users with pre-defined options or categories. If participants indicated a preference for BEVs, they were first asked about their reasons for booking this powertrain and then about any barriers to doing so. If users selected ICEV or *Other* as their preferred powertrain, they were first asked about their barriers to booking a BEV and second, what might motivate them to do so. The detailed questionnaire can be found in Appendix 1.

3.2.3 Sample Description

The sample *Carsharing* has a final size of 935. The survey was mainly conducted on the mobile phone version of the company's app (99.7%). The *BEV-CS* group (n=461) represents 49.3% of the total *Carsharing* sample, with 74.8% male (n=345) and 25.2% female (n=116). The average age of the *BEV-CS* group is 36.4 years (SD=11.19). Access to a vehicle in the household is reported by 47.5% (n=219), while no access to a vehicle in the household is reported by 52.5% (n=242). The *ICEV-CS* group represents 50.7% (n=474) of the total Carsharing sample, with 74.7% male (n=354) and 25.3% female (n=120). The average age of the *ICEV-CS* group is 34.2 years (SD=10.11). Access to a vehicle in the household is reported by 58.0% (n=275), while no access to a vehicle in the household is reported by 42.0% (n=199).

The sample size for the *Rental* sample is 953. The survey was mainly conducted via desktop (86.5%), followed by mobile phone (12.4%) and tablet (1.2%). The *BEV-R* group represents 13.4% (n=128) of the total *Rental* sample, with 78.9% male (n=101) and 21.1% female (n=27). The mean age of the *BEV-R* group is 48.4 years (SD=11.13). Access to a vehicle in the household is reported by 82.8% (n=106), while no access to a vehicle in the household is reported by 17.2% (n=22). The reason for booking is reported as private by 48.4% (n=62), private and business by 35.2% (n=45) and business by 16.4% (n=21). The *ICEV-R* group represents 78.7% (n=750) of the total *Rental* sample, with 81.2% male (n=609) and 18.8% female (n=141). The mean age of the *ICEV-R* group is 48.5 years (SD=12.42). Access to a vehicle in the household is reported by 89.9% (n=674), while no access to a vehicle in the household is reported by 10.1% (n=76). The reason for booking is reported as private by 46.9% (n=352), private and business by 28.0% (n=210) and business by 25.1% (n=188). The *Other-R* group represents 7.9% (n=75) of the total *Rental* sample, with 65.3% male (n=49) and 34.7% female (n=26). The mean age of the *Other-R* group is 50.6 years (SD=13.17). Access to a vehicle in the household is reported by 74.7% (n=56), while no access to a vehicle in the household is reported by 25.3% (n=19). The reason for booking is reported as private by 53.3% (n=40), private and business by 30.7% (n=23) and business by 16.0% (n=12). The detailed characteristics of the two samples are presented in Table 2.

Table 2

Characteristics of the sample

Sample attributes							
		Carsharing[1]		**Rental**[2]		
Sample size		935		953		
Device	Mobile Phone	932 (99.7%)		118 (12.4%)		
	Desktop	3 (0.3%)		824 (86.5%)		
	Tablet			11 (1.2%)		
Group		***BEV-CS***	***ICEV-CS***	***BEV-R***	***ICEV-R***	***Other-R***
Group size		461 (49.3%)	474 (50.7%)	128 (13.4%)	750 (78.7%)	75 (7.9%)
Gender	Male	345 (74.8%)	354 (74.7%)	101 (78.9%)	609 (81.2%)	49 (65.3%)
	Female	116 (25.2%)	120 (25.3%)	27 (21.1%)	141 (18.8%)	26 (34.7%)
Age (mean)[3]		36.4 (11.19)	34.2 (10.11)	48.4 (11.13)	48.5 (12.42)	50.6 (13.17)
Access to Vehicle in Household	Yes	219 (47.5%)	275 (58.0%)	106 (82.8%)	674 (89.9%)	56 (74.7%)
	No	242 (52.5%)	199 (42.0%)	22 (17.2%)	76 (10.1%)	19 (25.3%)
Booking Reason	Private	Booking reason not levied for carsharing		62 (48.4%)	352 (46.9%)	40 (53.3%)
	Private & Business			45 (35.2%)	210 (28.0%)	23 (30.7%)
	Business			21 (16.4%)	188 (25.1%)	12 (16.0%)

Note. [1] Gender was specified as diverse in three cases. However, due to the small number of cases, these were not included in the overall study and were excluded from the sample *Carsharing*. Ownership of a driving license, which was 99.4%, is also not listed separately.

[2] Gender was specified as diverse in three cases. However, due to the small number of cases, these were not included in the overall study and were excluded from the sample *Rental*. Ownership of a driving license, which was 99.9%, is also not listed separately.

[3] The values in brackets indicate the standard deviation.

3.3 Data Analysis

The *Carsharing* sample was analysed first, followed by the *Rental* sample. The following steps were applied identically to both datasets. The data were analysed in two stages. In the first stage, descriptive statistics were used to analyse the socio-demographic data of the two samples. In the second stage, the responses to the open-ended questions on drivers and barriers to booking BEVs were coded and analysed according to the three steps proposed by Hruschka et al. (2004). This data analysis has been applied in various types of transportation research (e.g., Baburajan et al., 2021; Hess & Schubert, 2019). As a first step, an initial broad coding scheme of drivers and barriers was developed by analysing a subset of the responses and comparing them with the relevant literature (e.g., Wicki, Brückmann, Quoss, et al., 2022). In a second step, each response was initially coded by two researchers independently. This process involved several iterations to arrive at a final number of sub-categories. In a third and final step, both researchers cross-checked each other's sub-category codes. Responses with different classifications were reviewed again by both researchers and then a joint decision was made in favour of one sub-category. The sub-categories were then grouped by both researchers into four overarching categories: *ecological, economical, individual, and technological*. Table 3 provides an overview of the driver categories and sub-categories that appeared in both data sets, with an example of coding. As the themes appeared with different frequencies, sub-categories with few mentions are grouped under other drivers in subsequent sections of this article. Table 4 is structured in the same manner as Table 3 however refers to the barrier of the two samples.

Table 3

Coding schemes for the open-ended drivers of BEV booking questions

Category	Sub-Category	Quote
Ecological		
	City suitability & parking benefits	*"Less sluggish after a stop and at low speeds than some, especially larger, internal combustion engines -> practical in the city" / "You can park them in electric car parks. This makes parking in the city easier."*
	Environmental reasons	*"Environmental protection, low noise"*
Economical		
	BEV price/costs	*"If the price is the same as or cheaper than an internal combustion engine vehicle"*
	Ease of payment & greater price transparency at charging stations	*"If a card for charging the vehicle is included" / "A clearer system of payment and charging stations"*
Individual		
	BEV experience/information/less insecurity	*"I would need my own routine first. Then there would be nothing against an electric car." / "...if I had driving experience with electric cars."*
	Convenience/simplicity/comfort of BEVs	*"… and simply more enjoyable to drive. Most electric cars are also simply more comfortable"*
	Driving pleasure when riding BEVs	*"Simply more pleasant to ride!"*
	Interest/curiosity about BEVs	*"Trying out a new kind of driving experience"*
	No drivers	*"No factors!" / "No reasons" / "Never ever"*
	Various drivers	*"Inductive charging on the road at no extra cost."*
Technological		
	(Car) availability/car options	*"Availability of attractive vehicles"*

Charging infrastructure/possibilities	*"If there are more charging points that are not occupied all the time."*
Charging process/time & battery level	*"If the time it takes to charge were fast"* / *"Recharging times similar to refuelling,…"* / *"Battery level over 50% charged"*
Charging station at home	*"If I had my own electricity connection at home. Unfortunately, I live in rented accommodation."*
Range	*"A realistic range of a minimum of 500 km."*
Short distances in urban areas	*"Using BEVs for short urban trips is simply more efficient."*
Technological superiority, innovation & modernity	*"The feeling of being part of modern mobility"* / *"Better acceleration, quieter ride, more advanced technology"*

Note. As the themes appeared with different frequencies, sub-categories with few mentions are grouped under various drivers in subsequent sections of this article.

Table 4

Coding schemes for the open-ended barriers of BEV booking questions

Category	Sub-Category	Quote
Ecological		
	Concerns about BEV production, (battery) recycling & electricity generation	*"Although they are almost climate neutral, their production (the batteries) is more than questionable. Unfortunately, the production of the batteries and their disposal do not speak in their favour." / "In Munich, 80% of the electricity is generated from coal power, so the electricity used to charge electric vehicles is not even remotely green."*
Economical		
	BEV price/costs	*"Higher price than cars with combustion engines."*
	Complexity of payment & missing price transparency at charging stations	*"I don't use these vehicles at the moment, because the payment at the charging stations is not done regularly with EC, but with several apps from different providers."*
Individual		
	BEV inexperience/lack of information/insecurity	*"No driving experience"*
	Complexity/inflexibility/extra effort for BEVs in route planning	*"Time consuming to find and organise charging stations"*
	Lack of driving pleasure when riding BEVs	*"Strange feeling while driving" / "Powerful breaking effect when you take your foot off the accelerator"*
	Inconvenience of return	*"Problems with pre-delivery charging"*
	No barriers	*"No reasons"*
	Habit/preference for ICEVs	*"The combustion engine is more fun."*
	Various barriers	*"A car is a car, the only difference is that electric cars make you tired."*

	Safety concerns about BEVs	*"… fire hazard in the event of an accident and in car parks…"*
	Uncertainty about charging at destination/abroad	*"Unclear charging situation at destination."*
Technological		
	(Car) availability/car options	*"Availability of attractive vehicles"*
	Charging infrastructure/possibilities	*"Too few charging stations"*
	Charging process/time & battery level	*"Too long waiting time for charging, especially on longer journeys." / "Battery is often empty or insufficient for my routes."*
	Charging station at home	*"No own charging station"*
	Range	*"As long as the issue of distance remains, there is nothing to be said for it."*

Note. As the themes appeared with different frequencies, sub-categories with few mentions are grouped under various barriers in subsequent sections of this article.

4 Results and Discussion

The following sections present and discuss the drivers and barriers to booking a BEV, as derived from the open-ended questions, by business model and preferred powertrain.

4.1 Drivers of BEV Bookings in the Sample *Carsharing*

Table 5 shows the drivers for booking BEVs in the *Carsharing* sample for each group. In the *BEV-CS* group, environmental reasons were cited most frequently (67.4%), followed by driving pleasure when riding BEVs (41.7%) and the factor technological superiority, innovation & modernity (8%). City suitability & parking benefits (6.3%), convenience/simplicity/comfort of BEVs (5.2%) and BEV price/cost (3.5%) were also mentioned, but comparatively less often. All other drivers were mentioned with a percentage below 3.5%. In the *ICEV-CS* group the figures are more balanced. BEV price/cost was cited most frequently (22%), followed by environmental reasons (17.8%), range (15%), and driving pleasure when riding BEVs (13.1%). Availability/car options (9.1%), charging infrastructure/possibilities (8.7%), and charging process/time & battery level (8.5%) followed. 11.4% of the group stated that they could not think of any drivers that would make them want to book a BEV.

Table 5

Drivers of BEV bookings mentioned by the groups BEV-CS and ICEV-CS (sample Carsharing)

(Sub-)Category	BEV-CS (n=460)[1]	ICEV-CS (n=472)[1]
Ecological		
City suitability & parking benefits	29 (6.3%)	8 (1.7%)
Environmental reasons	310 (67.4%)	84 (17.8%)
Economical		
BEV price/costs	16 (3.5%)	104 (22.0%)
Individual		
Convenience/simplicity/comfort of BEVs	24 (5.2%)	14 (3.0%)
Driving pleasure when riding BEVs	192 (41.7%)	62 (13.1%)
No drivers	1 (0.2%)	54 (11.4%)
Technological		
(Car) availability/car options	14 (3.0%)	43 (9.1%)
Charging infrastructure/possibilities	5 (1.1%)	41 (8.7%)
Charging process/time & battery level	1 (0.2%)	40 (8.5%)
Range	4 (0.9%)	71 (15.0%)
Technological superiority, innovation & modernity	37 (8.0%)	7 (1.5%)
Various drivers[2]	50 (10.9%)	58 (12.3%)

Note. [1] n refers to all respondents per group who named at least one current or possible future driver of BEV bookings. The percentages always refer to the n of the respective group. As many respondents indicated more than one topic, they may appear in more than one (sub-) category.

[2] *Various drivers* also include all drivers that make up less than 5% of the total sample.

More than two thirds of the *BEV-CS* group cite environmental reasons as the main driver for booking a BEV. This is also evident in studies on BEV ownership (e.g., Rotaris et al., 2021; Sierzchula, 2014), indicating that BEVs are perceived as environmentally friendly by a large proportion of users. Driving pleasure when riding BEVs is another booking driver mentioned by the *BEV-CS* group. These findings again align with studies in the ownership context (e.g., Haustein & Jensen, 2018). Driving pleasure is generally an important factor in car selection (e.g., Hagman, 2010). Several studies have shown that positive experiences with

BEVs can increase acceptance and reduce concerns such as range anxiety (e.g., Franke & Krems, 2013; Wang et al., 2018). This may explain why in this group all other drivers were mentioned considerably less often.

In the *ICEV-CS* group the figures for the factors that would induce customers to book BEVs are more balanced. The main factor that would drive this group's choice is the price/cost of BEV bookings. This is in line with studies in the ownership context that have identified the price/cost of a BEV as an important factor (e.g., Brückmann et al., 2021; Jia et al., 2023). However, the results are noteworthy in that shared mobility is a low-involvement product, and the financial burden of a short-term rental is significantly lower than that of purchasing a car. Prices for BEVs and ICEVs in the company's carsharing product are in a similar range, partly higher for BEVs It is therefore notable that this is the most frequently mentioned issue, as it offers the opportunity to experience without significant cost differences for customers. Studies have shown that the likelihood of buying a BEV decreases with age; however, younger customers are also more price-sensitive (Ji & Gan, 2022). This could explain the high percentage of customers who mention this factor, as the *Carsharing* sample is comparably younger. Environmental reasons are also cited by many users, but less frequently than by the *BEV-CS* group. These results are consistent with ownership studies where consumers' environmental attitudes are a driver for BEV purchase (e.g., Bösehans et al., 2023; Sierzchula, 2014). The *ICEV-CS* group also addresses the issue of range, which is consistent with research in the ownership context (e.g., Rainieri et al., 2023). However, this finding is rather unexpected as the average range required in the context of carsharing is only 10 km per ride (TU Wien, 2022), which is well within the range of all vehicles. This may indicate that some users lack experience with BEVs or that certain prejudices have taken hold. Some users state that they prefer ICEVs over BEVs and cannot think of any BEV booking drivers. This suggests that there may be a segment of users who are not interested in booking BEVs at all, regardless of any possible future technological advances or lower costs.

4.2 Drivers of BEV Bookings in the Sample *Rental*

Table 6 shows the booking drivers for BEVs in the *Rental* sample for each group. In the *BEV-R* group, environmental reasons are the most frequently cited factor (64.3%), followed by driving pleasure when riding BEVs (23.8%), interest/curiosity about BEVs (13.5%) and technological superiority, innovation & modernity (8.7%). All other drivers are mentioned at a lower level. Again, in the *ICEV-R* group the figures for the different factors are more evenly distributed. Range (24.6%), charging infrastructure/possibilities (22.4%), and BEV price/costs (12.1%) are the most frequently cited factors. Charging process/time & battery level (9.2%), short distances in urban areas (6.9%), and BEV experience/information/insecurity (5.1%) are also mentioned, although with lower frequency. In this group, 23.8% of respondents stated that they do not have a BEV driver. The group *Other-R* mentions range (25.4%), charging infrastructure/possibilities (20.9%), BEV price/costs (19.4%), followed by environmental reasons (13.4%). In this group, 10.4% state that they are not interested at all in BEV bookings and cannot cite any potential drivers.

Table 6

Drivers of BEV bookings mentioned by the group BEV-R, ICEV-R and Other-R (sample Rental)

(Sub-)Category	BEV-R (n=126)[1]	ICEV-R (n=710)[1]	Other-R (n=67)[1]
Ecological			
Environmental reasons	81 (64.3%)	33 (4.6%)	9 (13.4%)
Economical			
BEV price/costs	10 (7.9%)	86 (12.1%)	13 (19.4%)
Individual			
BEV experience/information/ less insecurity	0 (0.0%)	36 (5.1%)	4 (6.0%)
Convenience/simplicity/comfort of BEVs	6 (4.8%)	18 (2.5%)	4 (6.0%)
Driving pleasure when riding BEVs	30 (23.8%)	10 (1.4%)	3 (4.5%)
Interest/curiosity about BEVs	17 (13.5%)	9 (1.3%)	0 (0.0%)
No drivers	0 (0.0%)	169 (23.8%)	7 (10.4%)
Technological			
Charging infrastructure/possibilities	0 (0.0%)	159 (22.4%)	14 (20.9%)
Charging process/time & battery level	1 (0.8%)	65 (9.2%)	4 (6.0%)
Range	1 (0.8%)	175 (24.6%)	17 (25.4%)
Short distances in urban areas	4 (3.2%)	49 (6.9%)	2 (3.0%)
Technological superiority, innovation & modernity	11 (8.7%)	3 (0.4%)	2 (3.0%)
Various drivers[2]	15 (12%)	86 (12.1%)	8 (11.9%)

Note. [1] n refers to all respondents per group who named at least one current or possible future driver of BEV bookings. The percentages always refer to the n of the respective group. As many respondents indicated more than one topic, they may appear in more than one (sub-) category.

[2] *Various drivers* also include all drivers that make up less than 5% of the total sample.

The results for the *BEV-R* group are comparable to those for the *BEV-CS* group (see 4.1). Environmental reasons are the most frequently cited drivers for booking a BEV, followed by driving pleasure when riding BEVs. These results are again in line with the literature on BEV ownership in terms of environmental reasons (e.g., Rotaris et al., 2021) and driving pleasure (e.g., Haustein & Jensen, 2018). In addition, some users explicitly book a BEV out of interest and curiosity. The *ICEV-R* group most often cites higher range, better charging infrastructure/possibilities, and lower BEV price/cost, which is in line with the results for the *Other-R* group. Again, users cite similar reasons that would induce them to book BEVs as they do in the ownership context, such as higher range (e.g., Rainieri et al., 2023), better charging infrastructure (e.g., Brückmann & Bernauer, 2023) and lower price/costs (e.g., Wicki, Brückmann, & Bernauer, 2022). The results for the *Rental* sample are less surprising than those for the *Carsharing* sample, probably because the reasons for renting a car are more comparable to those for purchasing a car. Consumers typically rent cars for longer trips lasting several days and are price-sensitive, which makes the rental business very competitive (Pachon et al., 2006).

It is worth noting that the issues of range, charging infrastructure and charging process are mainly mentioned by the *ICEV-R* or *Other-R* groups. This may indicate, as in section 4.1, that these users have limited experience with BEVs and therefore may have a biased view against them. This is supported by the fact that the *BEV-R* group only mentions these issues to a negligible extent, although the use cases are comparable. In addition, almost a quarter of *ICEV-R* and *Other-R* users state that they cannot think of any drivers for renting BEVs, which may indicate that some users reject BEVs altogether. This is particularly noteworthy in the context of a sharing model, as the risks associated with the use of a different technology or product are very manageable. However, this finding may be consistent with Wang et al. (2020) analysis that carsharing users tend to book fast ICEVs rather than BEVs.

4.3 Barriers to Booking BEVs in the Sample *Carsharing*

Table 7 shows the barriers to BEV bookings identified in the *Carsharing* sample. For the *BEV-CS* group, the most frequently cited barriers are the charging process/time & battery level (33.1%), BEV price/costs (30.5%), range (18.7%), (car) availability/car options (10.9%) and charging infrastructure/possibilities (5.7%). 14.6% of the group report that they see no barriers that might prevent them from booking BEVs. The *ICEV-CS* group most often mentions range

(29.5%), followed by charging process/time & battery level (19.2%), charging infrastructure/possibilities (14.3%), and lack of driving pleasure when riding BEVs (12.7%). At a lower level, this group cites (car) availability/car options (7.4%), BEV inexperience/lack of information/insecurity (7.0%) and BEV price/costs (5.7%). 14.1% of the group see no barriers that might prevent them from booking BEVs.

Table 7

Barriers to booking BEVs mentioned by the groups BEV-CS and ICEV-CS (sample Carsharing)

(Sub-)Category	BEV-CS (n=459)[1]	ICEV-CS (n=474)[1]
Economical		
BEV price/costs	140 (30.5%)	27 (5.7%)
Individual		
Lack of driving pleasure when riding BEVs	6 (1.3%)	60 (12.7%)
BEV inexperience/lack of information/insecurity	1 (0.2%)	33 (7.0%)
No barriers	67 (14.6%)	67 (14.1%)
Technological		
(Car) availability/car options	50 (10.9%)	35 (7.4%)
Charging infrastructure/possibilities barrier	26 (5.7%)	68 (14.3%)
Charging process/time & battery level	152 (33.1%)	91 (19.2%)
Range	86 (18.7%)	140 (29.5%)
Various barriers[2]	29 (6.3%)	89 (18.8%)

Note. [1] n refers to all respondents per group who named at least one current or possible future barrier of BEV bookings. The percentages always refer to the n of the respective group. As many respondents indicated more than one topic, they may appear in more than one (sub-) category.

[2] *Various barriers* also include all barriers that make up less than 5% of the total sample.

Overall, the *BEV-CS* group seems to have a positive attitude regarding the use of BEVs in the carsharing context. The high figures for charging process/time & battery level and range probably reflect the close relationship between these issues and are in line with the results of Gutjar and Kowald (2023), who demonstrated that German users prefer a simpler charging process, e.g., standardised charging cable, simpler payment options, and charging per amount of power consumption. These results suggest that, despite a preference for BEVs, the charging process remains a barrier for users when compared to the refuelling process of ICEVs, as also observed in the ownership context (e.g., Hardman et al., 2018).

The *ICEV-CS* group identifies range as the most frequent barrier to booking BEVs, followed by charging process/time & battery level and charging infrastructure. This may again indicate that *ICEV-CS* users are prejudiced against BEVs, as the range is more than sufficient for carsharing use cases (TU Wien, 2022). In contrast, the *BEV-CS* group does not mention range as frequently and cites charging process/time & battery level the most. This could indicate that the *ICEV-CS* group has less experience with BEVs, especially with the charging process. However, the *ICEV-CS* group also mentions lack of driving pleasure when riding BEVs as a barrier, suggesting that some experience with BEVs has been gained. This is supported by the fact that *ICEV-CS* users also state that they still have BEV inexperience/lack of information/insecurity about BEVs. Finally, some of the *ICEV-CS* users also state that they perceive no barriers at all that might prevent them from booking BEVs.

4.4 Barriers to Booking BEVs in the Sample *Rental*

Table 8 shows the barriers to booking BEVs in the *Rental* sample. For the *BEV-R* group, range is the main barrier (37.7%), followed by BEV price/cost (27.0%), charging infrastructure/possibilities (20.6%), (car) availability/car options (7.9%) and charging process/time & battery level (5.6%). Of the group, 11.1% state that there are no barriers to booking BEVs. For the *ICEV-R* group, the most frequently mentioned barrier is range (46.8%), followed by charging infrastructure/possibilities (28.3%), charging process/time & battery level (19.2%) and BEV inexperience/lack of information/insecurity (12.4%). At a lower level, complexity/inflexibility/extra effort for BEVs in route planning (8.0%), uncertainty about charging at destination/abroad (6.1%) and (car) availability/car options (5.4%) are mentioned as barriers. In the *Other*-R group, the barriers start with range (40.3%), followed by charging infrastructure/possibilities (29.9%), charging process/time & battery level (16.4%), (car) availability/car options (9.0%), uncertainty about charging at destination/abroad (7.5%), and concerns about BEV production, (battery) recycling & electricity generation (6.0%). Of this group, 13.4% reported no barriers to booking BEVs.

Table 8

Barriers to booking BEVs mentioned by the groups BEV-R and ICEV-R (Sample Rental)

Sub-Category	**BEV-R (n=124)[1]**	**ICEV-R (n=750)[1]**	**Other-R (n=73)[1]**
Environmental			
Concerns about BEV production, (battery) recycling & electricity generation	0 (0.0%)	34 (4.8%)	4 (6.0%)
Economical			
BEV price/costs	34 (27.0%)	26 (3.7%)	3 (4.5%)
Individual			
BEV inexperience/lack of information/insecurity	4 (3.2%)	88 (12.4%)	2 (3.0%)
No barriers	14 (11.1%)	30 (4.2%)	9 (13.4%)
Uncertainty about charging at destination/abroad	4 (3.2%)	43 (6.1%)	5 (7.5%)
Technological			
(Car) availability/car options	10 (7.9%)	38 (5.4%)	6 (9.0%)
Charging infrastructure/possibilities barrier	26 (20.6%)	201 (28.3%)	20 (29.9%)
Charging process/time & battery level	7 (5.6%)	136 (19.2%)	11 (16.4%)
Complexity/inflexibility/extra effort for BEVs in route planning	0 (0.0%)	57 (8.0%)	1 (1.5%)
Range	50 (39.7%)	332 (46.8%)	27 (40.3%)
Various barriers[2]	5 (4.0%)	106 (14.9%)	10 (14.9%)

Note. [1] n refers to all respondents per group who named at least one current or possible future barrier of BEV bookings. The percentages always refer to the n of the respective group. As many respondents indicated more than one topic, they may appear in more than one (sub-) category.

[2] *Various barriers* also include all barriers that make up less than 5% of the total sample.

All three groups identify range and charging infrastructure as barriers to BEV bookings. This may be due to the fact that people use rental cars on average for longer distances compared to carsharing vehicles. However, the *BEV-R* group does not mention charging process/time & battery level as often as the *ICEV-R* and *Other-R* groups. One possible explanation for this difference could be that the *BEV-R* group has more experience with the charging process and does not consider it an important barrier. This is supported by the fact that a high number of *ICEV-R* users cited BEV inexperience/lack of information/insecurity as a barrier. Compared to *ICEV-R* and *Other-R*, the *BEV-R* group mentions the price/cost of BEVs more often. This may indicate that this group would not book BEVs if the price/cost of the rental product would be too high compared to ICEVs or Other. This is consistent with the literature in the ownership context, where cost is a barrier to BEVs for consumers (e.g., Wicki, Brückmann, & Bernauer, 2022). Compared to the *BEV-R* and *Other-R* groups, the *ICEV-R* group has a smaller number of respondents who report no barriers to BEV bookings. This suggests that many users still prefer ICEVs and are not interested in booking BEVs.

5 Conclusion

This study analysed the drivers and barriers for BEV bookings in the field of shared mobility, specifically carsharing and car rental. The results provide answers to the two research questions raised above.

With regard to research question 1, the drivers and barriers appear to be similar for both carsharing and car rental. Environmental reasons, driving pleasure and price/costs are the most common drivers for booking a BEV. Range, charging infrastructure/time and BEV price/costs are frequently cited as barriers in both samples.

With regard to research question 2, the study found that the topics mentioned and their frequency varied according to the preferred powertrain choice. Users who prefer ICEVs cite range, charging infrastructure, and charging time considerably more often than those who prefer BEVs. This suggests that many users may not be familiar with BEVs and hold biases against them. This is supported by the fact that many prejudices do not apply in the case of carsharing, as the use case normally excludes the issue of range, for instance.

Based on these results, shared mobility providers have various options to encourage their customers to book BEVs.

Firstly, many consumers seem to lack knowledge about BEVs. Shared mobility providers could address this by launching information campaigns to dispel certain prejudices and overcome unfamiliarity, e.g. regarding the BEV charging process or range.

Secondly, BEV experience seems to dispel some preconceptions about BEVs. Shared mobility providers could encourage customers to book BEVs by offering lower prices for first bookings. This would allow users to experience the benefits of BEVs, such as the widely stated driving pleasure.

Additionally, shared mobility providers should be cautious about adding BEVs to their fleets due to the current market situation. A certain proportion of users do not seem to be convinced by BEVs, do not want to be convinced, and categorically reject them. Shared mobility providers should take this into account in their BEV deployment plans.

This study has limitations, particularly with regard to sampling and methodology. The results are based exclusively on customers of one company. This may introduce bias in respondent selection. Moreover, the study has a limited geographical scope, as it only surveyed customers on the German website and app. Due to the nature of the survey, it is therefore not clear whether the responses generally refer to carsharing or car rental bookings in Germany or, in the case of renting, for a trip abroad. Additionally, it should be noted that there is an over-representation of men in the carsharing sample. Although this is in line with other carsharing studies and actual carsharing usage (Ortega et al., 2023), and though the results in our study do not differ very much for men and women, it is important to note that there may be gender differences that were not accounted for.

Another limitation of the study is the methodology applied. Open-ended questions were used for an exploratory approach, but there may be personal bias in the evaluation of the answers. To mitigate this, two researchers independently coded the two samples, but it is still possible that there was a bias in the interpretation of the open-ended questions, resulting in subjectively biased codes. In addition, it is not possible to assign concrete weights to the sub-categories. For instance, it cannot be inferred that range is more important than charging infrastructure simply because it was mentioned more frequently. Moreover, with this kind of questionnaire, it is important to bear in mind that respondents may provide answers that they believe the interviewer wants to hear, leading to a social desirability bias (e.g., Baburajan et al., 2021). Therefore, there may be other underlying issues that have not been reported due to the nature of the survey.

Despite these limitations, the study provides a solid foundation for further research. The exploratory results may serve as a basis for quantitative analysis of the weighting of each driver and barrier. This analysis could be conducted with other companies or in a laboratory setting, as well as in different (international) markets. As the results obtained only represent a specific survey period, it would be worth investigating whether they depend on the time of year. For instance, range anxiety might be higher during the winter months due to lower battery capacity resulting from heating.

In addition, future research should investigate which consumer clusters can be formed in the area of BEV sharing. This could lead to more targeted interaction approaches between providers and consumers. It could also be investigated whether customer bookings are determined by drivers or barriers. It may even be possible to influence customer booking behaviour by modifying the information provided in mobility apps or on websites.

Appendix

Appendix 1

Questions and answer options of the two questionnaires

No.	Question	Answer options
1	How old are you?	
2	What is your gender?	male female diverse
3	Do you have a driver's license?	yes no
4	Do you own or have access to a car in your household?	yes no
5	Do you usually book rental cars for private or business reasons? (Only questionnaire *Rental*)	private business both
6	What type of powertrain do you prefer when booking a carsharing / rental service?	Electric vehicle (100% battery) Internal combustion engine vehicle (diesel or petrol) Other (hybrid, plug-in hybrid, etc.))
7	What are the factors that make you choose a battery electric vehicle?	
8	What factors would prevent you from booking a battery electric vehicle?	
9	What are the factors that prevent you from choosing a battery electric vehicle?	
10	What factors would make you choose a battery electric vehicle?	

Note. The questionnaire was originally written in German and has been translated into English for the purposes of this paper. Fields without an answer option were open questions. Questions 7 and 8 only appeared for respondents who chose an electric vehicle (100% battery) as response to question 6. Questions 9 and 10 only appeared for respondents who chose an internal combustion engine vehicle (diesel or petrol) or other (hybrid, plug-in hybrid, etc.) as response to question 6.

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