

# **Analyzing the Impact of Drivers' Experience with Electric Vehicles on the Intention to Use Electric Carsharing: A Qualitative Approach**

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and Michael H. Breitner<sup>4</sup>**

Main categories	Variables	Definition	Coding rules	Anchor example	Number of mentions
Overall perception	generally positive impression without restriction	Participant has generally positive impressions when driving an electric vehicle without restriction	Overall impression of the statement is positive without restriction	"sehr gut" (3) "angenehm" (5) "Gutes Gefühl" (17)	11
	generally positive impression with restriction	Participant has generally positive impressions when driving an electric vehicle with restriction	Overall impression of the statement is positive with some restriction	"angenehmes Fahrgefühl, trotzdem Sorge..." (1)	9
	rather negative impression	Participant has rather negative impressions when driving an electric vehicle	Overall impression of the statement is negative	"komisch, ungewohnt" (7)	1
	neutral impression	Participant has no judgmental impressions when driving an electric vehicle	Overall impression of the statement is neither positive nor negative	"leise" (2)	3

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## 1. Introduction

In 2009, the German Federal Government set the target of developing Germany into the leading market for electric mobility. One million electric vehicles should drive on Germany's roads by the year 2020 to ensure environmental sustainability, economic independence and technological leadership (cf. Die Bundesregierung, 2009, p. 18). This target seems to be unrealistic today because only 12,156 cars with electric drive were registered in Germany in 2013<sup>5</sup> (cf. Kraftfahrtbundesamt, 2014, p. 1). Electric vehicles are seen as a key technology for an energy-efficient and climate friendly future mobility and they are necessary against problems like global warming or dwindling oil resources. But their diffusion is delayed by several disadvantages in comparison to conventional vehicles such as high cost of acquisition, limited range, long charging times or a limited charging infrastructure (cf. Wappelhorst et al., 2014, p. 3; Clemente et al., 2013, p. 251). In consideration of these challenges it has to be reassessed if it makes sense to offer electric vehicles in the same way as conventional cars. The integration of electric vehicles into shared-use vehicle systems can reduce or even compensate essential obstacles (cf. Baum et al., 2012, p. 104; Peters and Hofmann, 2011, p. 56). Carsharing offers users the benefits of a private ownership, without bearing all the cost and obligations of a car (cf. Shaheen and Cohen, 2013, p. 3). Electric carsharing enables individuals to gain experience with an electric drive, decreases uncertainties with the new technology and pushes the widespread adoption of electric vehicles. In order to support the diffusion of electric vehicles, it is important to investigate perceptions when using electric vehicles to draw conclusions to the intention to use electric vehicles in carsharing services.

This is where the following research applies to analyze if a test drive with an electric vehicle has a positive influence on the intention to use electric carsharing. First the impressions of the test drive will be examined. Both positive and negative aspects of the test drive with an electric vehicle appear. Then the impact of this experience on the intention to use electric vehicles in carsharing concepts is determined. The qualitative content analysis according to Mayring serves as a guide for the evaluation of the data.

The second chapter will outline the current state of research in the area of electric carsharing. The characteristics of (potential) consumers who use electric vehicles in carsharing concepts are in focus. The next chapter discusses the evaluation of the survey of the test drive with an electric vehicle. Beginning with the method of evaluation the qualitative content analysis ac-

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<sup>5</sup> Preferred modes of drive are diesel (30.1%) and primarily petrol (68.3%). There are just 1.6% vehicles with alternative drives and most of them are hybrids (cf. Kraftfahrtbundesamt, 2014, p. 1).

ording to Mayring will be described. The data set must be determined firstly in this process model. Following, the direction of the analysis will be defined and the research question is differentiated theory-guided. The end of the third chapter characterizes the analytical approach for the analysis of the determined material and the category systems are developed. In the fourth chapter the results are interpreted and implications are presented. This is followed by the discussion section in which the limits of the research study will be described. In the end a summary of key findings takes place.

## **2. Electric carsharing – State of research**

Carsharing has become an essential part of transportation systems worldwide and has been around for over two decades (cf. Schäfer, 2013, p. 69). By January 2014, there were 757000 customers registered for carsharing in Germany, which correspond to an increase of 67.1 percent compared to 2013 (cf. bcs, 2014, p 1). This growth is already an indication of the success and acceptance of this alternative mobility concept (cf. Arnold et al., 2010, p. 53). The quota of carsharing customers in relation to potential driver's license owners in Germany is 1.13 percent (cf. bcs, 2014, p 1). This shows that carsharing still is a niche offer (cf. Seign and Bogenberger, 2013, p. 1; Kiermasch, 2013, p. 55). Electric vehicles are integrated in traditional station based concepts as well as in new so-called free-floating concepts<sup>6</sup> (cf. Dütschke et al., 2013, p. 4). Shaheen and Cohen interviewed twenty five carsharing experts who suggested that the use of electric vehicles in carsharing fleets is one of the key trends over the next five years across the globe (cf. Shaheen and Cohen, 2013, p. 16). Degirmenci and Breitner recognized electric carsharing as one of six key concepts in their literature review on the field of carsharing with regard to information systems research and identified ten articles that deal with the topic, such as Shaheen and Cohen above and the following two studies (cf. Degirmenci and Breitner, 2014, pp. 964-968). Heling et al. investigated the attitude towards electric carsharing and compared non-users to users, who perceived electric vehicles as more environmentally friendly, less inconvenient and more fun to drive (cf. Heling et al., 2009, p. 9). A typical electric carsharing user is a highly educated male in his early forties (cf. *ibid.*, p. 7). Ohta et al. conducted that the level of acceptance of eco-cars is higher than that of carsharing in Japan and non-car owners had a greater acceptance of electric vehicles and carsharing (cf. Ohta et al., 2013, pp. 457-459). Peters and Dütschke introduced results that

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<sup>6</sup> Station-based carsharing offers vehicles at fixed stations where customers must return them and cars are booked before usage (cf. Wappelhorst et al., 2013, p. 1). Free-floating concepts allow returning vehicles in any public parking space within a defined area and offer spontaneous booking (cf. Dütschke et al., 2013, p. 4).

In the qualitative content analysis three open questions were examined. In open questions, respondents can freely express their answers, attitudes or opinions and they are not forced by predetermined response options. This question type is particularly suitable to have a variety of different assessments. But the answers are often not very detailed or answers will be completely denied. Overall there are three open questions in this survey, from which twelve participants denied the answers and the rate of unanswered questions increases with the number of total questions. The survey is based on subjective statements that cannot monitor conclusively if the participants actually behave as they mentioned it. Furthermore it seems advisable to complete qualitative research with quantitative studies in order to increase the credibility of the analysis.

Advantages of the qualitative content analysis are the rule-based approach and the category system, which allows the traceability of the analysis (cf. Mayring and Brunner, 2013, pp. 325 f.). The category systems and coding agendas are in the appendix of this study. The validity of the analysis has been partially verified by comparing the results with those of similar studies.

## **6. Conclusion**

This present research explores perceptions of participants of a test drive with an electric vehicle and the impact of their experiences on their intention to use electric carsharing. Although some unfamiliarity and uncertainties appear, the test drivers have mainly positive perceptions when driving an electric vehicle. The diffusion of this innovation might be supported by positive perceptions like pleasant driving and the low noise emission. New marketing strategies could be developed to demonstrate that electric vehicles have beneficial features beyond the environmental advantages. More opportunities to try out electric vehicles allow consumers to get used to unfamiliar characteristics. The limited range still is a barrier for widespread market success of electric vehicles. Carsharing concepts could help to overcome such disadvantage, because these services are mostly used in local city transport and for short distances. In this study the mainly positive perception of a test drive with an electric vehicle influences positively on the intention to use electric vehicles in carsharing concepts but the most users are not willing to pay more for an electric vehicle than a conventional car. The actual use of electric vehicles can be pushed by electric carsharing which could help to increase the impact of the social environment due to word of mouth recommendation. This could influence positively on the diffusion of electric vehicles.