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

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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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Content

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[5] (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-

[5] 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).

cording 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[6] (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

[6] 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).

explore aspects upon user acceptance of electric vehicles and define potential target groups, as well as attractive vehicle and mobility concepts from interviews with eight experts, a workshop with six experts and an analysis of test reports on using electric vehicles which are located in the internet. They used a qualitative approach, because for consumers it is challenging to express valid intentions and attitudes regarding new, rather unknown vehicle types and their statements would be based on comparisons with conventional cars and previous mobility patterns (cf. Peters and Dütschke, 2010, p. 5 f.). Actual user experience is rare due to low market share of electric vehicles. The authors note that offerings of options to test electric vehicles should be optimized to simplify consumers the access to electric mobility (cf. ibid., p. 30). The interviewed experts assessed an integration of electric vehicles in carsharing fleets as promising (cf. ibid., p. 20). The expert workshop identified four potential target groups of electric mobility: the *technology enthusiasts*, the *environmentally aware*, the *urban individualists* and the *well-off consumers* (cf. ibid., p. 22 f.). For *environmentally aware* consumers and *urban individualists*, who already use various means of flexible transportation and attach great importance to environmental sustainability, carsharing could be attractive and useful, depending on their needs and living situation (cf. Dütschke et al., 2013, p. 9). In addition, another group was discussed, the young vehicle users, who want to be mobile but have limited financial resources to buy an electric vehicle and thus flexible shared-use vehicle systems could be more suitable (cf. Peters and Dütschke, 2010, p. 23). A study by the Institute for Mobility Research indicated similarly that particularly younger individuals are less interested to own a car and therefore potentially more open to carsharing services (cf. Institute for Mobility Research, 2011, p. 26; Dütschke et al., 2013, p. 13). The Centre for Regional and Innovation Economics published results from an online survey of 706 potential users of electric vehicles in the model region[7] Bremen/Oldenburg and identified that the two user group students and urban singles showed the greatest interest for using electric carsharing (cf. Fornahl et al., 2011, p. 112). Based on the results of Dütschke and Peters above, Peters and Hoffmann developed a focus group design with forty one private and seven commercial members representing the four target groups of electric mobility but the participants are only potential and not actual users, i. e. they had no driving experience with electric vehicles (cf. Peters and Hoffmann, 2011, pp. 11-15, 26). Three-quarters of the participants were male, the average age was 41.2 years, the level of education was high and potential users of electric carsharing were expected to live in cities (cf. ibid., pp. 21-24). Electric carsharing were imaginable for many

[7] In eight model regions, the German Federal Government sponsors projects which support their target to become the leading market for electric mobility (cf. Dütschke et al., 2012, p. 4).

potential users and were increasingly positively appraised during the group discussions, but the participants generally preferred the traditional ownership (cf. ibid., p. 52). Only potential users belonging to the *environmentally aware* consumer group evaluated carsharing as more attractive than the conventional model of owning an electric vehicle (cf. Dütschke et al., 2013, p. 9). Dütschke et al. designed a survey of test users of all kinds of battery electric vehicles (inclusive two-wheelers) in the German model regions with partly identical participants before starting the usage (T_0: n = 835), after up to three months (T_1: n = 781) and more than three months of usage (T_2: n = 690) (cf. Dütschke et al., 2012, p. 8). The electric vehicles were used for private and commercial purpose and more than half of the sample drove passenger cars. Already thirty seven percent (in T_0; T_1: 24 %) took part in carsharing concepts (cf. ibid., p. 9). The test users were about forty years old, highly educated and over three-quarter were male (cf. ibid., p. 9). A quarter of the drivers (T_2) planned to use sharing concepts in the future (cf. ibid., p. 10). Sixty nine percent agreed that there is a high potential for electric carsharing and seventy percent mentioned that electric vehicles will become accepted in intermodal transport[8] (cf. ibid., p. 10). However, the restriction applies, if these test users were asked precisely for their preferred pricing model for the usage of an electric vehicle, a majority of fifty eight percent chose the conventional model of buying an electric vehicle (cf. ibid., p. 13). Similar to the findings of Peter and Hofmann above, this shows that carsharing is still unfamiliar to many consumers. Hoffmann et al. aimed at the integration of electric carsharing in multimodal transport concepts. The participants of the new developed mobility concepts were asked before the field trail (T_0: n = 311), shortly after beginning (T_1: n = 160) and after a few months (T_2: n = 178) (cf. Hoffmann et al., 2012, p. 10). The sample was predominantly male, highly educated, between 30 - 40 years, residents of Berlin and described as being above-average environmentally conscious and as frequent users of public transport (cf. ibid., p. 12 f.). The combination of public transport and electric carsharing is a good option to cope with everyday mobility for sixty seven percent of the test users at the beginning of the field trail and for seventy four after a few months (cf. ibid., p. 16 f.). High customer retention was measured, but electric carsharing were rarely used by a number of participants, because of several barriers like the limited range, long charging times, the low density of stations and vehicles (cf. ibid., p. 29). Electric carsharing was used rather for short distances. Two groups of mobility types show particularly high potential for electric carsharing: The ecologically convinced cyclists and multimodals and the pragmatically oriented public transport users (cf.

[8] Intermodal transport is a combined usage of various means of transport on a route, like public transport, bike and carsharing (cf. Dütschke et al., 2012, p. 32).

ibid., p. 26 f.). Wappelhorst et al. compared users of station-based electric carsharing in an urban (Berlin, n = 25) and a rural (Garmisch-Partenkirchen n = 23) context who had similar socio demographics to presented studies above. The results reflected different mobility behavior, so that residents of Garmisch-Partenkirchen reacted more reluctant than their urban counterparts about the statement that they will probably use electric carsharing (cf. Wappelhorst et al., 2014, p. 13). People from rural areas who belong to the group of the innovative technology-loving multioptionals are particularly open to new mobility services and could be offered to try out electric carsharing (cf. ibid., p. 19). Fazel developed a model to explain the acceptance factors of electric mobility which considered the influence of using electric carsharing. To validate the model empirically an online survey was conducted with 424 participants, where forty two and fifty seven out of the participants had already experience with electro mobility and carsharing (cf. Fazel, 2014, p. 236). The behavioral intention to use electric carsharing was significantly higher than the behavioral intention to buy an electric vehicle (cf. ibid., p. 282). Experience with electric mobility influenced significantly perceived ease of use and general behavioral intention to use electric vehicles and experience with carsharing had no significantly influence on acceptance behavior (cf. ibid., p. 276).

Potential consumers have knowledge gaps because of the novelty of electric vehicles and carsharing. Habits and routines play an important role in everyday mobility behavior and have to be crossed, so that users engage with electric carsharing and successfully use it (cf. Peters and Dütschke, 2010, p. 16). The studies show that the potential of electric carsharing is promising. Potential users have positive attitudes towards electric carsharing and with experiences in electric mobility their intention to use electric vehicles in carsharing services is much higher. Therefore, there is a call for more test options (cf. Dütschke et al., 2012, p. 32; Peters et al., 2011a, p. 9; Fazel, 2014, p. 296; Kiermasch, 2013, p. 55).

3. Qualitative content analysis as a guide of evaluation

3.1 Qualitative content analysis according to Mayring

Content analysis is an empirical method for the systematic, intersubjectively comprehensible description of content and formal characteristics of communication (cf. Früh, 2004, p. 119). Qualitative content analysis characterizes by the following central points: it is embedded in a model of communication, a rule guided procedure, it uses quality criteria and categories are in the center of analysis (cf. Mayring and Brunner, 2013, pp. 325 f.). Mayring defines qualitative

content analysis as "an a*pproach of empirical, methodological controlled analysis of texts within their context of communication, following content analytical rules and step by step models, without rash quantification*" (Mayring, 2000, p. 2). Kuckartz suggested that the scheme of Mayring is suitable for research with insufficient previous knowledge or where the exploration is in the foreground as well as for analyzing already collected data sets (cf. Kuckartz, 2010, p. 96). Focusing on the method of Mayring is useful because these aspects are relevant to the present work. The prespecified step model is one of the strengths of qualitative content analysis because it makes the process understandable and easy to learn. Content analysis is not a standard instrument that always looks the same. Every study has its own individual step model which is designed towards a specific problem and it must be adapted to the precise object, the material (cf. Mayring, 2010, p. 49). Mayring developed a general model for orientation which is used in the following analysis (s. figure 1).

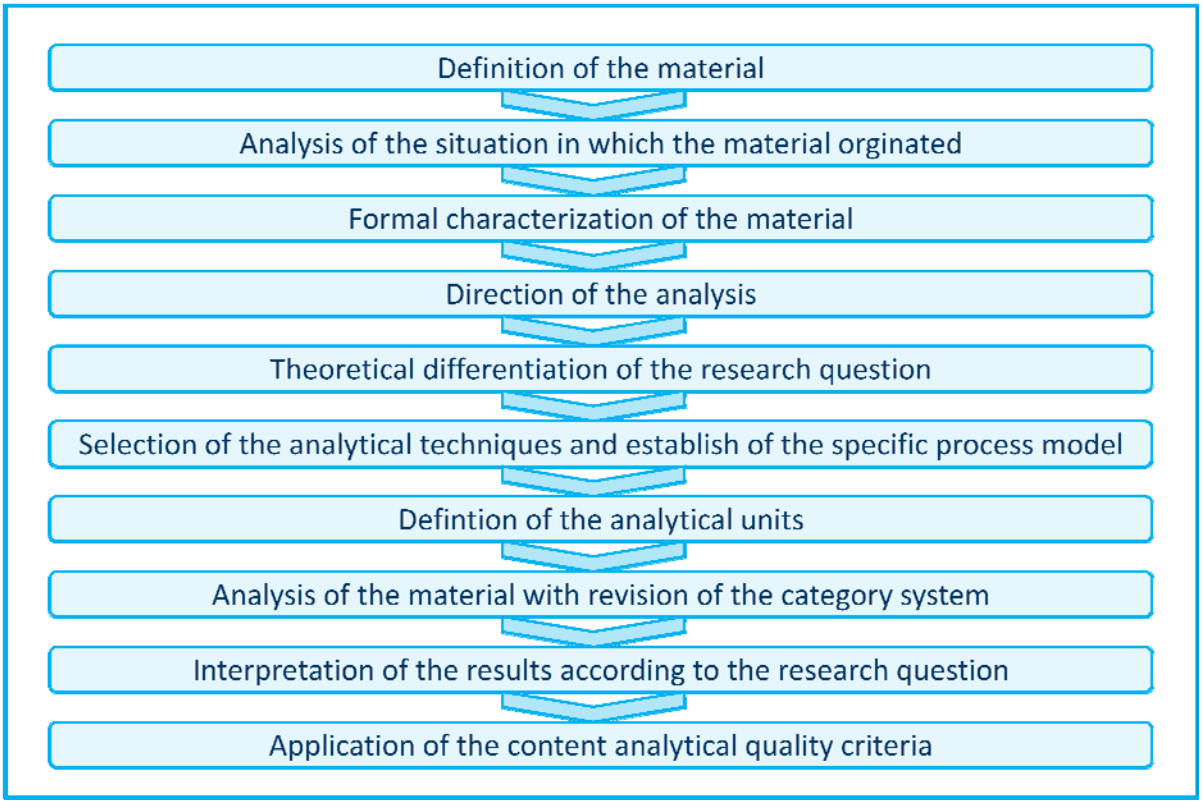

Figure 1: General content analytical process model (cf. Mayring, 2010, p. 60)

The first step of this general content analytical process is to define the underlying material of the analysis. In the second step the situation is examined in which the material originated. Thirdly the formal characterization of the material shows in what form the basic material is available. These three steps of the determination of the material are related to the present study in the next section. Mayring defines the direction of the analysis in the next step and

follows the question what should be interpreted out of the determined material (cf. Mayring, 2010, p. 56). In addition to the rule based approach (step model) the theory-guided analysis is an important feature of qualitative content analysis (cf. ibid., p. 50 f.). In the fifth step the research question is differentiated based on theories. The determination of the question follows in section 3.3. The sixth step is to select the analytical techniques and to establish the specific content analytical process model. Mayring differentiates three main techniques summary, explication and structuring. They include seven analytical methods. The summarizing technique reduces the material to get the essential content and to develop a manageable corpus which still pictures the basic material (cf. ibid., p. 65). This procedure includes the summarizing content analysis and the inductive category development (see below). The content analytical technique explication does not reduce the material but considers further material from the direct environment of the text (narrow context analysis) or beyond the text (broad context analysis) in order to clarify and explain unclear passages (cf. Mayring, 2002, p. 118). The aim of structuring content analysis is to filter out particular structure from the material according to formal, content, scaling and typifying aspects by using predetermined categories (cf. Mayring, 2010, p. 92). These content analytical techniques may be carried out in combination or either independently and they do not need to be applied consecutively, because the selection depends on the particular research question and the present material (cf. Mayring & Brunner, 2013, p. 328). In the seventh step of the content analytical process model the analytical units are defined. Mayring describes three different units of analysis as follows: the coding unit is the smallest text segment which may assign to a category; the contextual unit defines the largest text passage which may assign to a category; the analytic unit indicates which text parts are evaluated one after the other (cf. Mayring, 2010, p. 59). After that, the actual analysis is being conducted using the category system. This category system is the central instrument of qualitative content analysis and enables to simulate the analysis for others (intersubjectivity) (cf. ibid., p. 49). Krippendorff wrote “how categories are defined… is an art” (Krippendorff, 1980, p.76). Mayring marks two approaches as central to developing a category system: inductive category development and deductive category application (cf. Mayring, 2000, p. 3). The inductive approach filters the categories directly from the material without distortion by presuppositions of the researcher. First the general definition of a category must be derived from theoretical background and research question (criterion of selection) and the level of abstraction of the created categories must be determined (cf. Mayring and Brunner, 2013, p. 327). The revision of the categories happens after 10 - 50 percent of the material is worked through (cf. Mayring, 2010, p. 85). Inductive category development is an important qualita-

tive content analytical approach, because the category system is often not clearly formulated in advance. The deductive category application is based on previous theoretical considerations of the analysis. The centerpieces of a category system are explicit definitions of categories, anchor examples which show prototypal passages and coding rules for the distinction of categories (cf. Mayring, 2000, p. 5). The deductive approach generally applies in structuring content analysis. The reassessment of the category system against theory (research question) and material takes place during the analysis. If there are changes, the material must be worked through again. The final steps of the content analytical process are the interpretation of the results with respect to the research question and the evaluation of validity on the basis of content analytical quality criteria.

3.2 Determination of the material

Object of this analysis is a survey of a test drive with an electric vehicle that has been done in a study at the Institute for Information Systems Research of Leibniz Universität Hannover. The electric vehicle was an all-electric, lithium-ion battery powered, small passenger city car.

Gender	Male	75.0%
	Female	25.0%
Age	21 - 30	88.0%
	31 - 40	8.0%
	> 40	4.0%
Current occupation	Student	67.0%
	Employee	33.0%
Highest educational achievement	University entrance qualification	41.7%
	Completed apprenticeship	12.5%
	Bachelor	20.8%
	Master / Diploma	25.0%
Annual net income per household	≤ €20,000	50.0%
	€20,001 - €40,000	21.0%
	€40,001 - €60,000	4.0%
	€60,001 - €100,000	4.0%
	> €100,000	4.0%
	No specification	17.0%
Did you drive an electric vehicle for the first time?	Yes	87.5%
	No	12.5%

Table 1: Participant characteristics

The test drives and the survey took place from 18-03-2014 till 17-06-2014. Only owners of a driver's license for category B have been considered in the sample. The selection of the sample was randomly, for example some of them won the test drive in a lottery. The twenty four participants (n = 24) are mostly from the university context: sixteen test drivers are currently students and eight are employees, whereof six employees holding a university degree (s. appendix G). Three-quarters of the participants are male and all interviewed persons are older than twenty-one years, with the majority between 21 and 30 years. Half of the sample is living in a household with an annual net income of less than 20,000 Euro, but seventeen percent make no specification. Twenty one participants drove an electric vehicle for the first time. The questionnaires were available in printed form (paper-pencil-method) and therefore could be completed of the driver himself after the test drive. All data was treated anonymously. The questionnaires included both open and closed response options. It begins with the question, if the participant drove an electric vehicle for the first time. The demographic data is always requested in the end. Some questions and the order of the questions changed during the survey. The following analysis does not consider the whole questionnaire. There are questions that were skipped after a few surveys which would decrease strongly the sample size. The questions about electric vehicles and environment were asked related to different kinds of power generation, which make them less comparable. Some sets of questions have been omitted in respect to the research questions and the research background (see next section). In addition to the socio demographic questions in the end of the questionnaire and the first question about experience with driving an electric vehicle, the question if the participant uses carsharing will be considered. The carsharing part is used not until the third test drive, accordingly only twenty two drivers could respond to these questions. This part follows after the request of the impressions when driving the electric vehicle. The qualitative content analysis is used for three open questions. First participants were asked to report their impression when driving an electric vehicle. All twenty four participants answered this question. The second content analyzed question if a participant would use electric vehicles in carsharing concepts, was answered by twenty two test drivers. It is a closed question with the answer options yes and no, which should be justified in the free text field. Further the subsequent question is examined where the participants should specify the residual range from which they were no longer willing to use electric carsharing. The next question is about the willingness to pay more for an electric vehicle than for a conventional car in carsharing concepts. It is a yes-no-question and the respondents should give an explanation which is analyzed according to the qualitative content analysis.

3.3 Determination of the question of the analysis

To interpret the determined material, the direction of the analysis must be defined and the research question must be differentiated theory-guided. In this analysis the impressions of a test drive with an electric vehicle will be investigated and the influence of these impressions on the intention to use electric vehicles in carsharing will be examined. This leads to the research question:

Which perception do users perceive at the test drive and how do the perceptions influence their usage intention to electric carsharing?

It is important to get a better comprehension of consumers' perception of electric vehicles to support their diffusion. Electric vehicles are in an early stage of market penetration and a disruptive technology[9] (cf. Arnold et al., 2010, p. 29). From the user perspective new technologies represent a risk at first, because the decision for the technology is afflicted with uncertainties regarding actual characteristics and consequences and the usage seems to be unfamiliar in comparisons with the conventional technology (cf. Peters and Dütschke, 2010, p. 15).

H_1: Uncertainties and unfamiliarity are perceived when testing an electric vehicle.

There are already studies which show that participants have a positive perception after using an electric vehicle (cf. Bühler et al., 2014, pp. 35 - 40; Peters et al., 2011b, p. 993). Other critical aspects appear quite compensated through drivability and driving comfort which are experienced generally positive (cf. Peters and Hoffmann, 2011, p. 11). Thus, this analysis expects:

H_2: *The perception* is mainly positive after a test drive with an electric vehicle.

If an individual has a mainly positive perception after experiencing an electric vehicle, his attitudes towards this vehicle are positive (cf. Bühler et al., 2014, p. 37). The willingness to use a product, the associated formation of positive attitudes and usage intentions are recognized under the term acceptance (cf. Dethloff, 2004, p. 18). Acceptance is an essential requirement for the success or failure of technological innovations (cf. Königstorfer, 2008, p. 10). Bühler et al. reviewed some studies which evaluate perception and acceptance of electric vehicles after participants testing them, but they concentrate on a conventional usage or buying intentions (cf. Bühler et al., 2014, p. 35 f.). Even if the single usage like a test drive does not

[9] Disruptive technologies have different and novel attributes comparing to conventional technologies and are inferior to conventional technologies along the dimensions of attributes which are crucial to conventional consumers. In their early stages they only occur in niche segments (cf. Adner, 2002, p. 668).

equate with an extensive usage over a longer period of time, the influence on the individual acceptance behavior can be examined with the experience of an electric vehicle (cf. Fazel, 2014, p. 234). The theory of reasoned action is a model that has been applied to explain user acceptance of new technologies (cf. Peters et al., 2011b, p. 984; Fazel, 2014, p. 103). In this model the two constructs attitude towards act or behavior and subjective norm impact on the behavioral intention which determines the actual behavior (cf. Ajzen and Fishbein, 1975, p. 15).

H_3: *The positive perceptions and attitudes toward electric vehicles* from a test drive have a positive impact on the intention to use an electric vehicle in carsharing concepts.

3.4 Analysis of the material

For this study, mainly a combination of summarizing and structuring has been chosen. In addition, some unclear statements are determined with additional text passages (narrow context analysis). The analytical units are the three open questions about the impression when driving an electric car, about the motivation of the usage intention to electric carsharing and about the willingness to pay more for an electric vehicle in carsharing concepts. These units are successively analyzed chronologically. There are twenty four analytical units for the first analyzed question and twenty two for the other two questions. The contextual units were set to all answers of a test driver to one of the three questions. Thus the number of contextual units is twenty four respectively twenty two. The answers are rarely formulated as complete sentences. They usually consist of single words and short sentences. These are the coding units. A central step in a qualitative content analysis is the creation of the category system based on the present data material and with regard to the hypothesis. The decision was made for inductive category development because it could not revert to an existing category system and to identify all mentioned aspects of the material. First all impressions and perceptions shall be evaluated that have arisen during the test drive with an electric vehicle. References about specific properties of the vehicle are not included because they are rather model-dependent such as “leichtes Lenkrad-Gefühl” (light-*feeling* steering wheel) (participant 4) or “etwas klapprig” (a bit rattly) (participant 19). The material is worked through until the criterion of selection is fulfilled, then the first category is formed under the consideration of the level of abstraction (cf. Mayring, 2010, p. 85). When a criterion of selection is fulfilled the next time, it will be decided if the passage falls under the already formed category (subsumption) or a new catego-

ry is formed. Similar and synonymous statements were subsumed like “leise” (silent) and “ruhig” (quiet) under “low-noise driving”. After a huge part of the material is worked through and only less new categories are formed, the revision of the category system takes place. It will be checked if the category system fulfills the objective of analysis and thereby represents a formative proof of reliability at the same time (cf. Gläser-Zikuda, 2008, p. 71). Some categories have been renamed in the revision partly by deductive aspects. A total of twenty four categories were developed inductively. The categories are listed in the order they appear in the analytical units (s. appendix A). The denotation of the inductive categories is performed on German to ensure the traceability of the analysis, because some categories could be misinterpreted by changes in meaning in the course of translations. Nine main categories were determined by inductive und deductive approaches. Some categories are grouped according to specific content areas (content structuring) and some categories are assessed according to specific dimensions in scale form (scaling structuring). The main categories *low-noise driving*, *general unfamiliarity* and *uncertainties and concerns* each have two subcategories and recuperation and limited range each have one subcategory. The subcategory describes special characteristics of their main category. The category overall perception contains four variables. The definitions of the main categories and subcategories are listed in the coding agenda (s. appendix B). As well as the anchor examples and coding rules. To check the third hypothesis the declared motivation why a participant would or would not use electric vehicles in carsharing concepts shall be evaluated. As described above inductive categories are also developed. Again, references about specific properties of the electric vehicle are omitted. A total of twenty categories were developed inductively and are listed in the order they appear in the analytical units (s. appendix C). These categories are summarized to eight main categories (s. appendix D). No subcategories were formed. Main categories have at least two nominations. Four participants do not give any justification and thus they fall in the category "no specification". The categorization of the question if participants are willing to pay more for an electric vehicle than a conventional car, offers ten inductive developed categories (s. appendix E). No explanation is given by seven respondents who fall in the category "no specification". There are five main categories which have at least two nominations (s. appendix F).

4. Interpretation and implications

To investigate perceptions of testing an electric vehicle, frequencies of reported categories are analyzed. The most frequently reported impression is the *low-noise driving* of the electric vehicle. Fifteen participants notice this attribute. Low noise can be directly experienced when driving an electric vehicle. This attribute was often called in other studies, too (cf. Baum et al., 2012, p. 78; Bühler et al., 2014, p. 35, 40). Low noise is described mostly as a pleasant consequence for the driver itself, e. g. "angenehm ruhiges fahren" (pleasantly quite ride) (participant 16). One driver reports that he is not exhausted with regard to the noise (s. participant 20). However, there are two special characteristics that are listed in the two subcategories. Two participants are concerned about the safety consequences of low noise especially for pedestrians and cyclists (s. participant 1). Five participants need to get used to the low noise or perceive this attribute as unfamiliar. Some participants are conflicted about this attribute and simultaneously explain it as unfamiliar and pleasant, e. g. "ungewohnt leise, aber angenehm" (unusually quiet, but pleasant) (participant 13). This indicates that positive attitude towards low noise driving predominates after more experience, because users getting used to it. These five participants state that they drive an electric vehicle for the first time. The second most frequently appeared impression is pleasant driving which is mentioned explicitly by nine test drivers. Thirteen percent of the test drivers mention the dynamic driving style of the electric vehicle, e. g. "Das Auto ist flink" (The car is brisk) (participant 19). A quarter of the participants point out positively features such as acceleration and performance, which were also reported in comparable surveys (cf. Peters et al., 2011b, p. 988; Dütschke et al., 2012, p. 17). Another technical feature is called by four riders, the recuperation[10]. One user observes the low consumption due to recuperation (s. participant 16). But two drivers express that braking is unfamiliar and they need to get used to it, e. g. "ungewohntes Abbremsen" (unusual braking) (participant 23). Again, it can be assumed that recuperation is described positive and usable after familiarization. One of the most critical characteristics of an electric vehicle is the limited range (cf. King et al., 2013, p. 2). Only a few people express explicitly about the range. Presumably, the range of a vehicle is not so important on a test drive, because only a short distance is driven. Two test drivers have anxiety about the limited range, "*Gefühl der begrenzten Reichweite im Hinterkopf*" (*Sense of limited range at the back of one's mind*) (participant 10). Research indicates that the perception of range remains a pressing issue for the diffusion of electric vehicles even after gaining substantial experience (cf. Bühler et al., 2014,

[10] Recuperation is the regenerative braking system of the electric vehicle which converts kinetic energy during braking manoeuvres into electric energy and stores it back into the battery (cf. Cocron et al., 2013, p. 1203).

p. 46). The combination of carsharing and electric vehicles could reduce this barrier (cf. Baum et al., 2012, p. 104). Driving an electric vehicle implies many issues to which a user of conventional vehicles has to adapt, like low noise, recuperation and limited range. Accordingly, one third of the participants review some aspects as unfamiliar or that they have to get used to some characteristics of the electric vehicle. Under this category, called general unfamiliarity, fall the two previously mentioned subcategories unfamiliar low-noise driving and unfamiliar recuperation. Uncertainties and concerns are reported by five test drivers. Beneath this the subcategories low-noise driving as safety issue and range anxiety are subsumed. Overall, statements of forty six percent of the participants are classified in one of the last-mentioned two main categories. Thus, the first hypothesis (**H_1**) that uncertainties and unfamiliarity are perceived when testing an electric vehicle is supported by the data. For the second hypothesis (**H_2**) which proposes that the perception is mainly positive after a test drive with an electric vehicle the main category *overall perception* is built with four variables. One participant reports *rather negative impressions*, e. g. "*komisch, ungewohnt*" (*strange, unfamiliar*) (participant 7) and three drivers have no judgmental impressions when driving an electric vehicle (*neutral impression*). Overall impression of the statements of nine participants is positive with some restriction. Restrictions are among others concerns about the limited range or unfamiliar low noise, e. g. "*Erste Umstellung (…) ansonsten sehr angenehm*" (*First reorientation (…) apart from that very pleasant*) (participant 6). There are eleven drivers who have *generally positive impressions without restriction*. For eighty three percent of the sample the perception is mainly positive. This result supports the second hypothesis (**H_2**).

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

Table 2: Main category: Overall perception

To check the third hypothesis, the carsharing part of the questionnaire is analyzed. It already has been noticed that the first two test drivers could not fill out these questions. First, it is asked whether the participants use carsharing, and if so, which provider. Five participants state that they use carsharing. One participant admits that he is registered but did not use the service (s. participant 20). This information confirms that the number of users does not necessarily have significance on how many of the registered persons actually use carsharing. Some carsharing providers have up to forty percent passive customers (cf. Maertins, 2006, p. 8). If the intention to use electric vehicles in carsharing concepts is influenced positively by positive perceptions when testing an electric vehicle could check with a comparison of the two possible answers on the next analyzed question. Eighty three percent of the sample has mainly positive perception after the test drive with the electric vehicle (s. above). Eighty six percent of the remaining twenty two respondents answer that they would use electric vehicles in carsharing concepts. This result supports the third hypothesis (**H_3**), but can be examined in more detail, because participants shall give justifications on the responses which are analyzed according to qualitative content analysis. Except for one person, all other participants with positive intention to use electric carsharing make a statement about their chosen answer. The most frequently reported main category is *local city transport and short distances*. Almost a third of the respondents would use electric carsharing for short distances or within the local city transport, e. g. "*CS-Nutzung im Stadtverkehr*" (*carsharing usage in local city transport*) (participant 11). One test driver declares that he would use it as an alternative to public transportation within the local city transport (s. participant 3). Carsharing offerings take place mostly in metropolitan areas and are part of the multimodal mobility behavior (cf. Schäfer, 2013, p. 69 f.). The usage of electric carsharing in short distances and local city transport could impact positively on the range anxiety. Four participants express explicitly the *limited range*. One driver would use electric carsharing if the range is not limited (s. participant 12). Two respondents expect that the range is enough in local city transport (s. participants 8 and 11). The next question covers in-depth the range problem. The participants should specify the residual range from which they were no longer willing to use electric carsharing. One respondent makes no specification. The most frequently reported remaining range is 20 kilometers which is simultaneously the lowest declared value. The highest count is 200 kilometers. But the range of today's most electric vehicles is well below 200 kilometers (cf. ADAC, 2014, pp. 2-3). The average residual range is circa 52 kilometers overall twenty one responses. The distribution results the following: fifty two percent express a value below 50 kilometers, twenty four percent the value 50 kilometers and twenty four percent a value above 50

kilometers. In sum, half of the sample specifies a residual range below 50 kilometers (s. appendix H). Two drivers mention *charging* of an electric vehicle. The limited range, charging time and the limited charging infrastructure represent barriers for many consumers (cf. Dütschke et al., 2013, pp. 2-3). It is noted that electric carsharing vehicles can be charged at night (s. participant 8). Another participant wants the opportunity to charge at every gas station (s. participant 12). But this hardly makes sense with respect to the long charging time compared to the minutes needed to fill a conventional car (cf. Baum et al., 2012, p. 75). Two participants would use electric vehicles in carsharing services if costs are lower or at least equal, e. g. "Zum gleichen Preis" (For the same price) (participant 19). This topic has been discussed in depth in a further question about the willingness to pay more for an electric vehicle than for a conventional vehicle in carsharing concepts. An explanation should be given again, which was analyzed with the qualitative content analysis according to Mayring. Eighty six percent of the remaining twenty two respondents are not willing to pay more for electric vehicles comparing to conventional cars in carsharing concept. Seven drivers make no specification about their unwillingness to pay more. For three participants it does not matter which vehicle they use in carsharing and do not want to pay more than for a conventional vehicle. Two test drivers see no added value of using electric carsharing. Another three participants are not willing to pay more, because the charging costs of an electric vehicle are lower than costs for fuel, e. g. “da Strom billiger als Benzin” (because electricity is cheaper than gasoline) (participant 20). Only three participants are willing to pay more for an electric vehicle in carsharing concepts. Their willingness to pay is higher due to environmentally friendly aspects, e. g. “da es umweltfreundlicher ist” (because it is more environmentally friendly) (participant 12). Summarized, the willingness of the participants to pay more for electric carsharing lies at fourteen percent. This is roughly comparable with the eleven percent by Hoffmann et al. (cf. Hoffmann et al., 2012, p. 19). The acceptance could be enhanced by various additional services such as free parking. The environmental aspect is an important part of carsharing concepts and can be more strengthened by combining with electric vehicles to be even more attractive to the environmentally conscious target group (cf. Baum et al., 2012, p 79). Motivation of usage electric carsharing due to environmentally friendly aspects is mentioned only by two test drivers, e. g. “aufgrund der Umweltbelastung” (due to the environmental impact) (participant 14). Two respondents justify their intention to use electric carsharing with gaining experience with an electric vehicle, e. g. "Gute Gelegenheit zum Kennenlernen von e-Fzg" (Good opportunity to get to know electric vehicles) (participant 10). Electric carsharing gives an opportunity to try out electric vehicles which helps to remove un-

certainties of users and creates a higher observability of electric vehicles in the streets (cf. Seign and Bogenberger, 2013, p. 6). Trialability and observability are two factors of the diffusion of innovation model according to relative advantages, compatibility and complexity which can support that a new technology spreads faster (cf. Rogers, 2003, p. 15). Thirty two percent justify their intention to use electric carsharing due to positive perception of an electric vehicle for example pleasant and low noise driving. These explanations support directly the hypothesis that positive perceptions of an electric vehicle from a test drive influence positively the intention to use electric vehicles in carsharing concepts. Ten of the eleven drivers who have generally positive impression without restriction when driving an electric vehicle also would use electric carsharing. Eighty six percent of the remaining twenty two respondents of the carsharing part have a mainly positive perception of the test drive. Sixteen of these nineteen participants with mainly positive perception have the intention to use electric vehicles in carsharing concepts. This confirms of the third hypothesis. Three participants would not use electric carsharing and they do not justify their response. They do not use carsharing and they drove an electric vehicle for the first time. One of them has generally positive impression without restriction and two have generally positive impression with restriction, namely they mention unfamiliarity. In the last text field participant four notes that she has problems during the driveaway because of the rapid acceleration which is slightly unpleasant in local city transport. Participant 15 has issues with the limited range. He gives the highest count of 200 kilometers when asking for the lowest residual range (s. above). He is not willing to pay more for electric carsharing because the limited range decreases strongly the added value. The third driver who would not use electric vehicles in carsharing service is not willing to pay more due to the fact that it does not matter which vehicle he uses (s. participant 21). Therefore it can be assumed that the electric vehicle is an obstacle towards using electric carsharing rather than the carsharing service itself.

This study suggested that using electric vehicles in carsharing concepts could be attractive for consumers who already have experience with electric vehicles. It is important for the consumer to be able to fulfill his mobility needs without too many restrictions such as higher costs or limited range. Electric carsharing is interesting especially for environmentally aware consumers. There should be created more opportunities to try out electric vehicles to enable consumers obtaining positive perception. The expressed uncertainties and unfamiliarity of the test drivers illustrate that a good introducing in the topic of electric mobility is important. The higher popularity of carsharing can be used to spread the experiences with electric mobility.

The promotion of electric carsharing would be important to strengthen public understanding of pleasant features of electric carsharing and to decrease prejudices.

5. Discussion and limitations

It was demonstrated that consumer have mainly positive perception when driving an electric vehicle, but also some unfamiliarity and uncertainties appear. The mainly positive perception influences positively on the intention to use electric vehicles in carsharing concepts.

The sample mostly consists of male participants who are highly educated and assumedly urban resident, because the study with the test drive took place in Hannover. These characteristics are also found in the samples of the research literature (cf. Hoffmann et al., 2012, p. 12; Dütschke et al., 2012, p. 9). The low number of female participants is likely associated with the topic car, which seems generally to arouse less interest for women and on the topic of electric mobility, because men are generally more interested in technology and innovation (cf. Fazel, 2014, p. 227). The test drive was voluntary. The participants decided themselves to participate and were therefore already curious and not entirely averse of the electric vehicle. The test drivers seem interested in the new technology, but there is nothing known about their prior knowledge on electric mobility. Only three people were interviewed, who already had experience of driving an electric vehicle. The degree of experience has not been determined. The survey was conducted during an early adoption stage of electric vehicles and the results may change with the further development of the market and with higher observability of electric vehicles. Similarly carsharing is still unfamiliar to many consumers (cf. Dütschke et al., 2013, p. 11). In this survey five participants already registered at a carsharing provider. So more respondents have experience with carsharing than with an electric vehicle. The online survey of Fazel also contains more carsharing experienced participants and a field test was conducted to gain more participants with electric mobility experience (cf. Fazel, 2014, p. 236). This could suggest a greater acceptance of carsharing services. However, this number is too low to form suitable subgroups because the literature calls for a value of $n \geq 30$ (cf. Fazel, 2014, p. 227). It would be interesting to compare persons who have experience with an electric vehicle and persons who have experience with carsharing to evaluate which experience influences more on the intention to use electric carsharing. In this survey all experienced participants whether with an electric vehicle or carsharing have positive intention to use electric vehicles in carsharing concepts. The survey also provides no comparison between persons

who participated in the test drive and persons who did not. Furthermore it would be interesting to know how the usage intention towards electric carsharing was before the test drive. The results also may change after these first test drives, especially in terms of more experience with electric mobility respectively carsharing and in terms of the actual use of electric carsharing. More experience can change perceptions of the electric vehicle (cf. Bühler et al., 2014, p. 43). Barriers like unsatisfying charging infrastructure or long charging duration were not mentioned by the participants. In a short test drive charging does not matter much, but it could get a challenge in everyday situations. Uncertainties regarding charging could be reduced in the context of electric carsharing (cf. Fazel, 2014, p. 300). An important advantage of electric vehicles was not called, their environmentally friendliness. This could be connected with the fact that the environmental friendliness of electric vehicles could not be experienced directly. The environmental aspect was expressed in relation to electric carsharing. Assumingly environmental friendliness is perceived stronger when combining carsharing and electric vehicles. Other features like low noise driving or pleasant driving occur much more visible and should be considered in marketing strategies of electric carsharing providers. In comparison to the existing studies the sample is younger (s. chapter 2). Many students attended the test drives because they were offered as part of a university study. Therefore it can be assumed that many participants belong to the group "*younger* vehicle users". They are less interested in buying a car mostly due to limited financial resources and the usage of cars in sharing concepts could be more suitable (cf. Peters and Dütschke, 2010, p. 23). This probably had an impact on the high usage intention toward electric carsharing in this study. Particularly younger individuals are less interested to own a car (cf. Institute for Mobility Research, 2011, p. 26). Carsharing would be more accepted by consumers who do not have a high requirement to own a vehicle (cf. Ohta et al., 2013, p. 465). Questions about vehicle ownership and mobility behavior could provide information about possible rather carsharing affine consumers. Further research should include participants with more versatile socio demographic characteristics and a sample that is more representative of the population of Germany. It would be interesting to determine how people living under other circumstances perceive driving an electric vehicle and if they also have high intention to use electric vehicles in carsharing concepts or what aspects are necessary to change their behavioral intention. In order to support the diffusion of electric carsharing, it is important to get a better comprehension of the behavioral intentions of the potential consumers.

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.

References

1. ADAC Allgemeiner deutscher Automobilclub (2014): Elektroautos: Marktübersicht/Kenndaten, http://www.adac.de/_mmm/pdf/Elektroautos_Marktuebersicht_Kenndaten_49KB_46583.pdf Retrieved 2014-09-16.

2. Adner, R. (2002): When are technologies disruptive? A demand-based view of the emergence of competition. In: Strategic Management Journal, 23 (8), pp. 667-688.

3. Ajzen, I.; Fishbein, M. (1975): Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research. Addison-Wesley, Reading (Massachusetts).

4. Arnold H.; Kuhnert F.; Kurtz R.; Bauer W. (2010): Elektromobilität – Herausforderungen für Industrie und öffentliche Hand, http://www.iao.fraunhofer.de/images/downloads/elektromobilitaet.pdf Retrieved 2014-09-16.

5. Baum, H.; Heinicke, B.; Mennecke, C. (2012): Carsharing als alternative Nutzungsform für Elektromobilität. Zeitschrift für Verkehrswissenschaft 83 (2), pp.63-109.

6. bcs Bundesverband CarSharing e. V. (2014): Carsharing boom continues. Bundesverband CarSharing e. V. (bcs) releases annual balance 2013, Berlin, http://carsharing.de/presse/pressemitteilungen/carsharing-boom-continues Retrieved 2014-09-16.

7. Bühler, F.; Cocron, P.; Neumann, I.; Franke, T.; Krems, J. F. (2014): Is EV experience related to EV acceptance? Results from a German field study. In: Transportation Research Part F: Traffic Psychology and Behaviour, Vol. 25, Part A, pp. 34-49.

8. Clemente, M.; Fanti, M. P.; Mangini, A. M.; Ukovich, W. (2013): The Vehicle Relocation Problem in Car Sharing Systems: Modeling and Simulation in a Petri Net Framework. In: Colom, J. M.; Desel, J. (Eds.), Proceedings of the 34th International Conference on Application and Theory of Petri Nets and Concurrency, June 24 – 28, Milan, Italy, Lecture Notes in Computer Science, Vol. 7927, Springer, Berlin, pp. 250-269.

9. Cocron, P.; Bühler, F.; Franke, T.; Neumann, I.; Dielmann, B.; Krems, J. F. (2013): Energy recapture through deceleration – Regenerative braking in electric vehicles from a user perspective. In: Ergonomics, 56 (8), pp. 1203-1215.

10. Degirmenci, K.; Breitner, M. H. (2014): Carsharing: A Literature Review and a Perspective for Information Systems Research. In: Proceedings of the Multikonferenz Wirtschaftsinformatik (MKWI), February 26-28, Paderborn, pp. 962-979.

11. Dethloff, C. (2004): Akzeptanz und Nicht Akzeptanz von technischen Produktinnovationen. Lengerich, Pabst Science Publishers.

12. Die Bundesregierung (2009): Nationaler Entwicklungsplan Elektromobilität der Bundesregierung,

http://www.bmbf.de/pubRD/nationaler_entwicklungsplan_elektromobilitaet.pdf Retrieved 2014-09-16.

13. Dütschke, E.; Schneider, U.; Sauer, A.; Wietschel, M.; Hoffmann, J.; Domke, S. (2012): Roadmap zur Kundenakzeptanz : Zentrale Ergebnisse der sozialwissenschaftlichen Begleitforschung in den Modellregionen. Frauenhofer - Institut für Systemtechnik und Innovationsforschung, Karlsruhe.

14. Dütschke, E.; Schneider, U.; Peters, A. (2013): Who will use electric vehicles? Working Paper Sustainability and Innovation No. S 6/2013, Karlsruhe.

15. Fazel, L. (2014): Akzeptanz von Elektromobilität : Entwicklung und Validierung eines Modells unter Berücksichtigung der Nutzungsform des Carsharing, Springer Gabler, Wiesbaden.

16. Fornahl, D.; Meier-Dörzenbach, C.; Santner, D.; Werner, N.; Kahle, S.; Bensler, A. (2011): Mobilitätsstrukturen in der Modellregion Elektromobilität Bremen/Oldenburg. Centre for Regional and Innovation Economics, Bremen.

17. Früh, W. (2004): Inhaltsanalyse. Theorie und Praxis. UVK, Konstanz.

18. Gläser-Zikuda, M. (2008): Qualitative Inhaltsanalyse in der Lernstrategie- und Lernemotionsforschung. In: Mayring, P.; Gläser-Zikuda, M. (Eds.): Die Praxis der Qualitativen Inhaltsanalyse, 2nd ed., Beltz Verlag, Weinheim, pp. 63-83.

19. Heling, M. G.; Saphores, J. D.; Samuelson, G. S. (2009): User characteristics and reponses to a shared-use station car program: An analysis of ZEV•NET in Orange County, CA. In: Transportation Research Board 88th Annual Meeting, January 11 – 15, Paper No. 09-3260, Washington, D. C.

20. Hoffmann, C.; Graff, A.; Kramer, S.; Kuttler, T.; Hendzlik, M.; Scherf, C.; Wolter, F. (2012): Bewertung integrierter Mobilitätsdienste mit Elektrofahrzeugen aus Nutzerperspektive. Ergebnisse der Begleitforschung im Projekt BeMobility – Berlin elektroMobil. InnoZ-Baustein 11, Berlin.

21. Institute for Mobility Research (2011): Mobilität junger Menschen im Wandel – multimodaler und weiblicher, München.

22. Kiermasch, C. (2013): Carsharing mit Elektroautos: Welches Mobilitätskonzept eignet sich für Großstädte? disserta Verlag, Hamburg.

23. King, C.; Griggs, W.; Wirth, F.; Shorten, R. (2013): Using A Car Sharing Model To Alleviate Electric Vehicle Range Anxiety. In: 16th Yale Workshop on Adaptive and Learning Systems. New Haven, Connecticut, pp. 1-6.

24. Königstorfer, J. (2008): Akzeptanz von technologischen Innovationen: Nutzungsentscheidungen von Konsumenten dargestellt am Beispiel von mobilen Internetdiensten. Gabler, Wiesbaden.

25. Kraftfahrtbundesamt (2014): Der Fahrzeugbestand am 1. Januar 2014, http://www.kba.de/SharedDocs/Publikationen/DE/PM/2014/pm_10_14_bestand_2014_pdf Retrieved 2014-09-16.

26. Krippendorff, K. (1980): Content Analysis. An introduction to its Methodology. Sage, Beverly Hills.

27. Kuckartz, U. (2010): Einführung in die computergestützte Analyse qualitativer Daten, 3rd updated ed., VS Verlag für Sozialwissenschaften, Wiesbaden.

28. Maertins, C. (2006): Die intermodalen Dienste der Bahn: mehr Mobilität und weniger Verkehr? Wirkungen und Potenziale neuer Verkehrsdienstleistungen, WZB Discussion Paper, No. SP III 2006-101, Wissenschaftszentrum Berlin für Sozialforschung.

29. Mayring, P. (2000): Qualitative Content Analysis. Forum: Qualitative Social Research 1 (2), Art. 20.

30. Mayring, P. (2002): Einführung in die qualitative Sozialforschung: eine Anleitung zu qualitativem Denken, 5th updated ed., Beltz, Weinheim.

31. Mayring, P. (2010): Qualitative Inhaltsanalyse: Grundlagen und Techniken. 11th updated and revised ed., Beltz, Weinheim.

32. Mayring, P.; Brunner, E. (2013): Qualitative Inhaltsanalyse. In: Friebertshäuser, B.; Langer, A.; Prengel, A. (Eds.), Handbuch qualitative Forschungsmethoden in der Erziehungswissenschaft, 4th revised ed., Beltz Juventa, Weinheim, pp. 323-333.

33. Ohta, H.; Fujii, S.; Nishimura, Y.; Kozuka, M. (2013): Analysis of the acceptance of carsharing and eco-cars in Japan. In: International Journal of Sustainable Transportation, 7(6), pp. 449-467.

34. Peters, A.; Dütschke, E. (2010): Zur Nutzerakzeptanz von Elektromobilität: Analyse aus Expertensicht. Frauenhofer - Institut für Systemtechnik und Innovationsforschung, Karlsruhe.

35. Peters, A.; Hoffmann, J. (2011): Nutzerakzeptanz von Elektromobilität: Eine empirische Studie zu attraktiven Nutzungsvarianten, Fahrzeugkonzepten und Geschäftsmodellen aus Sicht potenzieller Nutzer. Frauenhofer - Institut für Systemtechnik und Innovationsforschung, Karlsruhe.

36. Peters, A.; Agosti, R.; Popp, M.; Ryf, B. (2011): Elektroautos in der Wahrnehmung der Konsumenten: Zusammenfassung der Ergebnisse einer Befragung in Deutschland. Frauenhofer - Institut für Systemtechnik und Innovationsforschung, Karlsruhe.

37. Peters, A.; Popp, M.; Agosti; R.; Ryf, B. (2011b): Electric Mobility – A survey of different consumer groups in Germany with regard to adoption. European Council for an Energy Efficient Economy (ECEEE) Summer Study Proceedings – Energy efficiency first: The foundation of a low-carbon society, Stockholm.

38. Rogers, E. M. (2003): Diffusion of innovations. 5th ed., Free Press, New York.

39. Schäfers, T. (2013): Exploring Carsharing Usage Motives: A Hierarchical Means-End Chain Analysis, Transportation Research Part A 47, pp. 69-77.

40. Seign, R.; Bogenberger, K. (2013): Prescription for successful diffusion of carsharing with electric vehicles, conference contribution and proceedings: 2nd "Conference on Future Automotive Technology", March 18 – 19, Munich.

41. Shaheen, S. A.; Cohen, A. P. (2013): Carsharing and Personal Vehicle Services: World-wide Market Developments and Emerging Trends, International Journal of Sustainable Transportation, 7(1), pp. 5-34.

42. Wappelhorst, S.; Graff, A.; Steiner, J.; Hinkeldein, D. (2013): New Car Sharing Offers and Customer Groups: Implications for a Growing and Diversifying Market. Proceedings of the European Transport Conference (ETC) 2013, Frankfurt.

43. Wappelhorst, S.; Sauer, M.; Hinkeldein, D. (2014): Electric carsharing for a sustainable future mobility - Potential in rural areas. Paper presented at the mobil.TUM, International Scientific Conference on Mobility and Transport, Munich.

Appendix A: Inductive categories of perception when testing an electric vehicle

K	inductive categories/participants	∑	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	angenehmes Fahren	**9**	1			1	1	1						1	1			1				1				1
2	positives Fahrgefühl	**4**	1			1								1						1						
3	generell positiver Eindruck mit Einschränkung	**9**	1					1					1		1	1	1				1		1		1	
4	geräuscharme Fahrweise als Sicherheitsrisiko	**2**	1														1									
5	geräuscharme Fahrweise	**15**	1	1		1	1	1		1				1	1	1	1	1				1		1	1	1
6	neutraler Eindruck	**3**		1								1								1						
7	generell positiver Eindruck ohne Einschränkung	**11**			1	1	1			1	1			1				1	1			1		1		1
8	gute Beschleunigung	**5**					1											1	1				1	1		
9	Eco Modus	**1**					1																			
10	ungewohnte geräuscharmer Fahrweise	**5**						1							1	1	1								1	
11	Ungewohntheit	**8**						1	1			1			1	1	1						1		1	
12	Rekuperation ungewohnt	**2**						1																	1	
13	Rekuperation	**4**						1										1			1				1	
14	eher negativer Eindruck	**1**							1																	
15	dynamische Fahrweise	**3**								1	1										1					
16	fortschrittlich/futuristisch	**1**								1																
17	Reichweite	**3**									1	1	1													
18	spannend	**1**										1														
19	Sorge um begrenzte Reichweite	**2**										1	1													
20	niedriger Verbrauch	**1**																1								
21	Unsicherheit	**1**																		1						
22	bzgl. Geräusch nicht erschöpft	**1**																				1				
23	starke Leistung	**2**																					1		1	
24	hoher Fahrkomfort	**1**																						1		

Appendix B: Coding agenda of perception when testing an electric vehicle

main categories	subcategories	definition	coding rules	anchor example	inductive categories	Number of mentions
pleasant driving		Participant perceives a pleasant drive	"Pleasant" is expressed explicitly in a statement	"angenehmes Fahren" (24); "Angenehm" (5)	K1	9
dynamic driving		Dynamic driving style of the electric vehicle	Paritcipant reports about the dynamic driving style	"rasant" (8); "flottes Auto" (9); "flink" (19)	K15	3
acceleration and performance		Perception of some features such as acceleration and performance	Features such as acceleration and performance are mentioned in a statement	"starke Beschleunigung" (16); "schnelle Anfahrt" (17); "starke Kraftentfaltung" (23)	K8, K23	6
low-noise driving		Participant notices low-noise driving	All statements in which the low noise is noticed	Leise (2); "ruhig" (5); "Geräuschlosigkeit" (14); "kaum Fahrgeräusche" (23)	K4, K5, K10, K22	15
	low-noise driving as safety issue	Participant concerns about the safety consequences of low noise	Concerns about impact of low noise is expressed	"Sorge wg. Fahrradfahrern + Fußgängern (Auto so leise)" (1); "Umwelt reagiert kaum" (15)	K4	2
	unfamiliar low-noise driving	Low-noise driving is unfamiliar	Paritcipant needs to get used to low noise or they are mentioned as unfamiliar	"ungewohnt leise" (13) "Geräuschlosigkeit ist gewöhnungsbedürftig" (14)	K10	5
recuperation		Participant notices recuperation	All statements in which recuperation is noticed	"Rekuperation" (16)	K13, K12	4
	unfamiliar recuperation	Recuperation is unfamiliar	Paritcipant needs to get used to recuperation or it is mentioned as unfamiliar	"an die Rekuperation gewöhnen" (6) "ungewohntes Abbremsen" (23)	K12	2
limited range		Limited range is noted	Limited range is mentioned or the usage of short distance	"City Auto" (9) "Reichweite" (10)	K17, K19	3
	range anxiety	Participant concerns about the limited range	Limited range is distressing	"Gefühl der begrenzten Reichweite im Hinterkopf" (10)	K19	2

main categories	subcategories	definition	coding rules	anchor example	inductive categories	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)	K7	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) "Erste Umstellung (…) ansonsten sehr angenehm" (6)	K3	9
	rather negative impression	Participant has rather negative impressions when driving an electric vehicle	Overall impression of the statement is negative	"komisch, ungewohnt" (7)	K14	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)	K6	3
general unfamiliarity		The ride experience or features of the electric vehicle are unfamiliar	Paritcipant needs to get used to some aspects or something is mentioned as unfamiliar	"ungewohnt" (10) "gewöhnungsbedürftig" (14)	K11, K12, K10	8
	unfamiliar low-noise driving	Low-noise driving is unfamiliar	Paritcipant needs to get used to low noise or they are mentioned as unfamiliar	"ungewohnt leise" (13) "Geräuschlosigkeit ist gewöhnungsbedürftig" (14)	K10	5
	unfamiliar recuperation	Recuperation is unfamiliar	Paritcipant needs to get used to recuperation or it is mentioned as unfamiliar	"an die Rekuperation gewöhnen" (6) "ungewohntes Abbremsen" (23)	K12	2
uncertainties and concerns		Participant are uncertain and concerned about something	Statements where uncertainties and concerns are expressed	"Unsicherheit" (18); "Angst" (11)	K21, K4, K19	5
	low-noise driving as safety issue	Participant concerns about the safety consequences of low noise	Concerns about impact of low noise is expressed	"Sorge wg. Fahrradfahrern + Fußgängern (Auto so leise)" (1); "Umwelt reagiert kaum" (15)	K4	2
	range anxiety	Pparticipant concerns about the limited range	Limited range is distressing	"Gefühl der begrenzten Reichweite im Hinterkopf" (10)	K19	2

Appendix C: Inductive categories of usage intention towards electric carsharing

K	inductive categories/participants	∑	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	Nutzung im Stadtverkehr/kurze Strecken	7			1			1	1	1			1						1						1	
2	Alternative zum öffentl. Nahverkehr	1			1																					
3	keine Angabe	4				1					1						1						1			
4	positive Wahrnehmung von EV	7					1						1		1	1		1				1				1
5	Reichweite genannt	4						1		1			1	1												
6	bis zu einer bestimmten Reichweite	1						1																		
7	Reichweite reicht im Stadtgebiet aus	2								1			1													
8	Nachts laden	1								1																
9	um Erfahrungen zu sammeln	2										1										1				
10	spritzig	1											1													
11	leise	3											1		1							1				
12	umweltfreundlich	2											1			1										
13	Wenn keine Reichweitenbegrenzung	1												1												
14	Wenn Ladenmöglichkeit an Tankstellen	1												1												
15	angenehmes Fahren	2													1											1
16	Macht Spaß beim Fahren	1																1								
17	Wenn günstiger oder genauso viel kostet	2																		1	1					
18	praktisch	1																						1		
19	große Transporte fraglich eher kleine Einkäufe	1																							1	
20	im CS keine Nachteile	1																								1
	Intention to use electric carsharing yes=1; no=2				1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	1	2	1	1	1

Explication: K12 Participant 14: Volle Zustimmung bei "Ich würde beabsichtigen, ein Elektroauto aufgrund des Umweltschutzes zu nutzen.“

Appendix D: Coding agenda of usage intention towards electric carsharing

main categories	definition	coding rules	anchor example	inductive categories	Number of mentions
no specification	Driver do not give any justification	Free text field is not filled	(4)	K3	4
local city transport and short distances	Use in local city transport and for short distances is conceivable	All statements in which usage in cities or for short distances is noticed	"nur für kurze Strecken" (6); "für Stadtverkehr" (23)	K1	7
positive perception of an electric vehicles	Motivation of usage due to positive perception of an electric vehicle	Participant notes positive impressions of an electric vehicle	"Angenehmes und ruhiges Fahren" (13)	K4, K10, K11, K15, K16	7
limited range	Limited range is noted	Participant expresses explicitly limited range	"Reichweite reicht im Stadtgebiet aus" (8)	K5, K6, K7, K13	4
charging	Charging is noted	Participant expresses explicitly charging	"Nachts laden" (8)	K8, K14	2
gaining experience	Usage for gaining experience with an electric vehicle	Participant likes to gain more experience	"Gute Gelegenheit zum Kennenlernen von e-Fzg" (10)	K9	2
environmentally friendly	Motivation of usage due to environmentally friendly aspects	Environmentally friendly aspects are expressed	"aufgrund der Umweltbelastung" (14)	K12	2
no additional costs	Usage costs must not be higher compared to a conventional car	Usage if the cost are equal or lower	"Zum gleichen Preis" (19)	K17	2

Appendix E: Inductive categories of willingness to pay more

K	inductive categories/participants	∑	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	Umweltschutzgründe	3			1								1	1												
2	keine Angabe	7				1			1			1			1			1			1			1		
3	genutzte Fahrzeugart ist irrelevant	3					1			1													1			
4	Ladungskosten sind günstiger	3						1											1			1				
5	schlechtere Mobilität	1									1															
6	Zahlungsbereitschaft für Umweltbelastung eher gering	1														1										
7	begrenzte Reichweite mindert Mehrwert	1															1									
8	nicht genug Mehrwert	1																		1						
9	fordert staatliche Förderung	1																							1	
10	kein wirtschaftlicher Nachteil sollte gelten.	1																								1
	willingness to pay more yes=1; no=2				1	2	2	2	2	2	2	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2

Appendix F: Coding agenda of willingness to pay more

main categories	definition	coding rules	anchor example	inductive categories	Number of mentions
no specification	Driver do not give any justification	free text field is not filled	(4)	K2	7
environmentally friendly	willingness to pay is higher due to environmentally friendly aspects	Participant express environmentally aspects	"da es umweltfreundlicher ist" (12)	K1	3
type of vehicle does not matter	For participant it does not matter which vehicle	type of vehicle is irrelevant	"Auto sollte Auto sein" (5)	K3	3
Charging costs are lower	Electricity is cheaper than fuel	Participant express charging costs	"günstigere Engergiekosten" (17)	K4	3
added value too low	added value of an electric vehicle is too low	Participant express low added value	"nicht genug Mehrwert" (18)	K7, K8	2

Appendix G: Socio demographics and closed questions

	n = 24	Number	
Gender	female	6	25.0%
	male	18	75.0%
Age	21 - 30	21	88.0%
	31 - 40	2	8.0%
	> 40	1	4.0%
Current occupation	Employee	8	33.0%
	Student	16	67.0%
Highest educational achievement	University entrance qualification	10	41.7%
	Completed apprenticeship	3	12.5%
	Bachelor	5	20.8%
	Master / Diploma	6	25.0%
Annual net income per household	≤ €20,000	12	50.0%
	€20,001 - €40,000	5	21.0%
	€40,001 - €60,000	1	4.0%
	€60,001 - €100,000	1	4.0%
	> €100,000	1	4.0%
	No specification	4	17.0%
Did you drive an electric vehicle for the first time?	Yes	21	87.5%
	No	3	12.5%
carsharing part	**n = 22**		
Do you use carsharing?	Yes	5	22.7%
	No	17	77.3%
Would you use electric vehicles in carsharing?	Yes	19	86.4%
	No	3	13.6%
Are you willing to pay more for an electric vehicle in carsharing?	Yes	3	13.6%
	No	19	86.4%

Appendix H : Residual range

	n = 21	Number	
Residual range	< 50 kilometers	11	52%
	50 kilometers	5	24%
	> 50 kilometers	5	24%

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