Purchase Decision Electric Car: An Analysis and Discussion of Interview Data

Masterarbeit

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1 Introduction

1.1 Problem of the Thesis

In a world of limited resources, governmental requirements and environmental awareness thinking, it is important to manifest an alternative for conventional driven cars (cf. Sierzchula, et al., 2014, p. 183). In the last years the development and popularity of electric cars increased all over the world. However, electric cars are not an innovation of the 21st century. Even in the 19th century electric cars were popular. The current popularity of electric cars is reflected in strong media presence, extended manufacturer portfolios and governmental support, which contribute to the distribution of an increasing range of different types of electric cars. On the one hand, the growing need of safe and financeable cars and on the other hand the reduction of emissions boosting the distribution (cf. Kleine-Möllhoff, et al., 2013, p. 159). The society is more aware of a sustainable and healthy lifestyle. People know about the problem of limited resources and the urgency for developing alternative drives. Another aspect for the distribution of electric mobility is the urbanization. More and more people are living in cities. Today the amount of people living in cities exceeds the amount of people living in rural areas. The growing world population and the demand of mobility require a sustainable solution to reduce the car emissions and the noise level to achieve clean air in the cities for a healthy human life. Regarding the environment and the mobility need of the people, the consideration of a sustainable driving concept is required and elctric mobility seems to be the solution for these problems, because electric driven cars are quiet and have low carbon emissions (cf. Ober, et al., 2013, p. 132; Spiegelberg, 2014, p. 60).

Regarding the environmental aspect, the limited availability of oil is the main environmental reason for developing alternative driving concepts (cf. Ober, et al., 2013, p. 131). Other reasons are the increasing CO2-emissions. The reduction of the CO2-emissions is necessary to protect the environment (cf. Jung, 2015, p. 156). Electric cars can be seen as a key technology for a sustainable driving concept. In comparison to conventional cars, electric cars produce no pollutants on local area (cf. Keuschen and Marner, 2015, p. 461). Although people are aware of the environmental problems and a sustainable lifestyle is more and more widespread, the sales numbers of electric driven cars are quiet low (cf. Ober, et al., 2013, p. 131). Today the limited driving range of battery electric cars (BEV) requires a change of people's mobility behavior. One problem hereby is, that due to the expectations consumers have when buying a car, they do not want to change their behavior (cf. Keichel and Schwedes, 2013, pp. 3-4). The potential user has the same requirements to an electric car as to a conventional car. Especially the range, availability and safety are considered in comparison to conventional cars. Critical is the perceived mobility demand in comparison to the actual need. The actual driveways are often shorter than the perceived driveway per day (cf. Burkhardt, et al., 2015, p. 159).

This challenge leads to the car manufacturer and the supply industry, especially the battery manufacturer, to develop a concept which is competitive to conventional driven cars. Another part of the electric car distribution is the governmental support. Emissions restrictions are made by governments all over the world and electric cars contribute to these goal attainments. It is on behalf of these governments to support their interests and therefore the distribution of electric cars. Many countries develop concepts and programs for an increasing distribution. The political instruments for a diffusion of electric cars are CO2-restrictions for cars, tax reliefs or buyer's premium (cf. Jung, 2015, p. 156). For a sustainable distribution of electric cars it requires the involvement of several groups of a society (cf. Ober, et al., 2013, p. 144). A higher distribution of electric cars is not only to be achieved by customers, science, manufacturers or the government. All the actors of a society have to work together to reach to goals (cf. Keichel and Schwedes, 2013, p. 3).

The topic of electric car distribution rose in social science and public discussion. The German government wants to set Germany as the leading market for electric cars (cf. Burkhardt, et al., 2015, p. 156). Much support is given by the government, but the sales numbers are quiet low until today. Particularly private customers are not willing to buy an electric car. This work contributes to the research of the purchase decision of private persons to electric cars.

1.2 Motivation and Objective

To gain a sustainable distribution and market share of electric cars it is important to consider private persons. The purchase decision of private persons is a complex construct. Many factors influence the decision to buy a new car. This work contributes to the question which factors influence the purchase decision of private persons for electric cars in Germany. To understand the purchase decision of private persons it is important to consider as many factors as possible. Therefore, in the first section the purchase decision itself and the influencing factors are described based on theory. In this work electric cars are defined as hybrid cars, plug-in hybrids and battery electric cars. For an understanding of the different technologies a short overview is given. Furthermore, the sales incentives on the political level are examined. Governmental support has a great influence on the distribution of new technologies like electric cars. The policy goals are the main drivers for an increasing distribution. On this level those factors contributing to the purchase decision are observable. Governments set the goal of emission reduction and they are responsible for an adequate infrastructure. Therefore, it is necessary to consider the policy efforts and development regarding electric cars. Governmental supports are differentiated in research & development, charging infrastructure and financial incentives. Policy efforts and the sales numbers in Germany are compared with three other countries to have a global overview. For a country comparison, Norway, the USA and China are selected. The comparison of Germany with other countries gives a global review about which actions lead to success in order to give recommendations. Norway is one of the best examples for which governmental support is necessary for a fast and extensive distribution of electric cars.

The USA is one of the world's greatest car manufacturers and American automotive industry has a great impact on the American economy. China is in comparison to the other countries still a growing market for automotive sales and also the sales numbers of electric cars grow. All countries support the distribution of electric cars (cf. Carley, et al., 2013, p. 39).

In the next section the inner construct of private persons is contemplated. This construct is examined in this work to answer the question which factors lead to purchase of electric cars. Other studies have also examined the construct of latent attitudes which influence the purchase of electric cars in combination with social influence (cf. Kim, et al., 2014). In this work, the model is built following the purchase funnel which includes several stages from the recognition of a need to the purchase of private persons. The purchase funnel describes the stages a consumer passes during decision making. A survey is the basis for the building and the evaluation of the model. Answered questions of the survey built the reflective construct of the model building. With the help of a structural equation model (SEM) the developed model is evaluated. In previous research SEM is used to examine the adoption intention of electric cars (cf. Barbarossa, et al., 2015; Dudenhöffer, 2015; Ozaki and Sevastyanova, 2011). SEM is a method for statistical data analysis and a combination of factor and regression analysis. Relations between latent constructs are examined by manifest variables (cf. Werner, et al., 2016, p. 946). A SEM model is also an appropriate way to examine the purchase intention of private persons. The inner perception of people towards a product is not directly observable. Therefore it is necessary to investigate the latent factors which lead to the purchase intention of electric cars. Consumer and customer are not distinguished in this work. Although not always the customer is the consumer of a product (e.g. family members), the terms consumer behavior and customer behavior are often used identically (cf. Müller-Hagedorn, 1986, p. 39).

The examination of consumer choices is relevant for all market players (cf. Bettman, et al., 1998, p. 187). For all players which have an interest on the distribution of electric cars it is very important to know about the factors which lead to a purchase decision of electric cars. Car manufacturer have a special interest in this question, because they build and sell the cars. When knowing the factors which lead to the purchase, cars can be more customized and the purchase incentives can be adjusted. Negative influencing factors can be eliminated and positive factors can be extended. Studies examine that especially the customer group of early adopters and niche consumers are the first customer groups of electric cars (cf. Carley, et al., 2013, p. 40). The challenge is to create consumer demand which focus not only on this two target groups but for a wide range of customers. Policy efforts which influence the purchase decision and the results of the model evaluation are compared to identify the factors which result in a purchase of electric cars.

1.3 Structure of the Thesis

After the introduction, chapter 2 explains the private purchase decision, the classification of electric cars and motivational and resistance factors for electric cars based on theory. The first part of chapter 2 explains the purchase decision from a research perspective. Different kinds of products in general and the associated kind of purchase decisions are described. Goods are classified after frequency of purchase and the internal efforts which a customer makes to buy the product. Also the involved people play a great role when decision making. There exists a difference between an organizational and private purchase which is explained in this section. Depending on the good, customer efforts differ and inner personal processes which lead to the purchase decision are described. Chapter 2.1.1 illustrates the influencing factors on a purchase decision. Focused on the inner construct of a person the steps which have an impact and lead to a decision are explained. The focus is on the psychological, personal, social and cultural determinants. After describing the critical influencing factors, the steps towards a purchase decision are explained. There exist several models which explain the steps of the purchase. In this work the explanations are made following the purchase funnel. In chapter 2.2 the different kinds of electric cars are depicted. This work considers hybrid cars and battery electric cars. The different kinds of electric cars are described considering the level of electrification and electric driving range. For the further analysis it is important to know the motivational and resistance factors which are examined in several studies and research. Considered are global and personal factors which force the distribution of electric cars. They are described in chapter 2.3.

Governmental support has a great effect on the distribution of new technologies. Therefore, in chapter 3 the market development and support of electric cars is explained with the example of Germany, Norway, USA and China. All these countries have the goal to support the diffusion of electric cars and the different actions are part of their governmental programs. The policies are divided in efforts on research and development, charging infrastructure and financial support.

The purchase model of electric cars is modeled in chapter 4. Influencing factors are examined with the regard of the interview data. The collected data are used to explain the latent construct of the purchase decision towards electric cars and reflect the motivational and resistance factors of chapter 2.3. After describing the used data the purchase model is build. The model is constructed after the explained purchase models of chapter 2.1.2.

Chapter 5 describes the methodical approach and the analysis of the model. A structural equation model (SEM) is used to evaluate the data. First an explanatory factor analysis (EFA) explores the underlying latent constructs of the factors. A confirmatory factor analysis (CFA) proves the assumed construct and with test criteria the model is evaluated. After explanatory and confirmatory factor analysis, the relations within the construct are analyzed.

Critical appraisal of the model and recommendations are made in chapter 6. The developed model is discussed in this section with the relation to the examined governmental support in Germany. Other examined countries are compared with each other to describe the factors which have an impact on the purchase decision and to give recommendations for further development of electric cars.

In chapter 7 a conclusion of the work is given and further outlook is described.

2 Background

2.1 The Purchase Decision

A decision is defined as a choice of an option of a certain amount of alternative options which distinguish in their properties. Consumers can choose between two or more products which have different product properties (cf. Moser, 2007, p. 32). The purchase decision is made within a purchase process. A purchase process is the whole process from the beginning of a certain need through different kinds of decision-making processes with information reception and processing, selection of a product, the buying behavior, the use and the disposal of a product (cf. Kuß and Tomczak, 2000, p. 87).

The purchase decision of people is a complex construct. At all marketing activities, the buying behavior is the center of interest. Only a detailed knowledge of the buying behavior makes it possible to estimate the effect of marketing instruments and to determine buyers and market potential. Central questions of the purchase behavior analysis are: who does the purchase decision, how is the purchase decision-making process, where is the purchase and determinants of buying behavior. The clarification of these questions is the focus of buying behavior research as part of the market research. An understanding of the buying behavior can be part of several marketing fields. Based on market segmentation, the identification of the buying behavior helps to identify the target segment and the right addressing. Working on the basis improves customer loyalty (cf. Bröring and Griese, 2011, p. 63). The purchase decision-making process is not standardized. Knowledge of some criteria and the involved types of buying decision enables to describe the purchase decision-making process. For the description of the buying process, the following criteria exist.

Three kinds of consumer goods can be described. The kind of good plays a role in the purchase decision-making process because the effort of information search differs between the product categories.

- Convenience goods are frequently purchased with low information search and price comparison. These are products of the daily need, e.g. food.

aspects of a single purchase decision. Information has also a great influence on the extensive purchase intention (cf. Felser, 2015, p. 156). It would also be interesting to know which information sources play a role when decision making. As explained in section 2.1.1 the information source has also an impact on the purchase decision.

Because of low indicator reliability many factors are eliminated of the models, especially in the BEV model. Further research should consider this factor, like the requirement of the mobility patterns. The inclusion of further indicators would probably lead to other results.

Regarding the interview data, respondent's answers are subjective and as explained in section 2.1.1 the inner construct which lead to the purchase decision is influenced by many factors. Further tests after e.g. making experiences with electric cars would be different.

The evaluated data set includes only German respondents. For automotive manufacturer a detailed analysis of other countries would also be helpful.

7 Conclusion and Outlook

Today, especially governments are interested in a wide spread distribution of electric cars to become independent of resources and corresponding independence of other countries. Environmental factors like the reduction of CO2-emissions are also important drivers towards the support of electric cars.

The distribution of electric cars continuously develops in the examined countries. Countries with a domestic automotive industry spend their efforts especially on R&D. R&D is an appropriate tool to support the domestic car manufacturer industry for an improvement of the battery capacity. The effect of an improved battery will only become significant in the future when especially the price of electric cars is comparable to conventional cars and an extended driving range is possible. In a short-term perspective, this kind of incentive is not useful for a fast distribution. Norway is an example which governmental incentives are necessary for a fast increase of electric car sales. The Norwegian government focus mainly on financial support. Financial incentives make the purchase price of electric cars competitive. In Norway also a wide spread infrastructure exists which reduces concern about the limited driving range In Germany the only financial incentive is the tax exception for BEV and tax reduction for HEV. The sales numbers illustrate that the buying incentives are too low for customer activation to purchase an electric car. Therefore, price reduction and an improving infrastructure are necessary to increase the sales number. The German government focus on the support of R&D which impact is noticeable in the future. Country comparison indicates that the governmental price incentives have an influence on the purchase decision of private persons. The electric car sales numbers of Norway drastically increases in the last years and electric cars have a considerable market share.

To overcome the low sales numbers in Germany and to become electric cars comparable to conventional cars several actions are necessary to shift the focus from an expensive and unusable car towards a future and trend setting technology. Governmental support is required to remove barriers like the infrastructure and the price. Automotive manufacturer should highlight the advantages and remove the barriers.

Two different models are constructed to identify the factors which influence the decision towards a BEV and a HEV. The results of the data and model evaluation indicate that the attitude towards electric cars has an influence on the purchase decision in both models. Attitude is the latent construct which reflects the manifest variables of the interview data. Especially the explored underlying factor trend orientation is reflected by the attitude. The target is to increase the attitude to achieve a higher probability for the purchase intention of electric cars in Germany. The Federal German Government has to set the framework for an ongoing distribution of electric cars. In a short term perspective financial incentives are useful, but in the long term perspective the attitude of persons has to be influenced positively.

For a whole reflection of influencing factors of the purchase decision other factors are also important. The represented model in this work focusses on the inner construct of a person and does not include all factors which have an influence on the purchase decision. Further research should address on other influencing factors like the social influence.