



Direct experience with battery electric vehicles (BEVs) matters when evaluating vehicle attributes, attitude and purchase intention



Franziska Schmalfuß^{a,*}, Kristin Mühl^b, Josef F. Krems^a

^a Technische Universität Chemnitz, 09107 Chemnitz, Germany

^b Ulm University, 89081 Ulm, Germany

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ABSTRACT

Battery electric vehicles (BEVs) can contribute to the realization of more sustainable mobility systems. The actual adoption rate however of BEVs in Germany remains low, and strategies for enhancing BEV acceptance are required. Providing direct experience can, for instance, help to overcome prejudices relating to relatively new products, with this being a potential marketing strategy. The present research contributes to the question of what role direct experience plays in acceptance of BEVs.

Two studies were conducted to address the relationship between these variables: (1) an online survey ($N = 286$) and (2) a 24-h field test ($N = 30$). Both studies showed several experience-based differences in evaluations of BEV attributes, attitude and purchase intention, with most BEV attributes being evaluated more positively when people had BEV experience. Path analyses revealed a direct experience effect on purchase intention in the online study. Findings from the 24-h field test, showed effects of BEV experience on BEV attributes and attitudes, but no BEV experience effect for purchase intention was found. Based on the results of both studies, we can conclude that practical (and also short-term) experience with BEVs has the potential to change the evaluation of BEVs and psychological factors relevant for determining behavioral intention. As many effects were positive, providing short-term BEV experience to enhance acceptance has the potential to change BEV evaluation as well as the satisfaction with such a vehicle and might be a promising strategy for promoting BEVs.

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1. Introduction

Battery electric vehicles (BEVs), vehicles with an electric powertrain that work on battery, represent a promising technological development with the potential to significantly reduce CO₂-emissions emitted by automobiles (King, 2010). According to Schill, Gerbault, and Kasten (2015), the potential of BEVs can only be fully realized if, among other things, a high percentage of the energy is generated from renewable energy resources. Although the BEV market has grown (with at least 8 BEV models available in 15 of the 30 investigated countries), the market share of BEVs is relatively low in many countries such as Germany, Denmark and the United Kingdom (Sierzchula, Bakker, Maat, & van Wee, 2014). To achieve higher BEV

* Corresponding author.

E-mail address: franziska.schmalfuss@psychologie.tu-chemnitz.de (F. Schmalfuß).

adoption rates, policies should not only build on financial incentives and aim to increase the quantity and quality of charging infrastructure (Sierzchula et al., 2014), but experience with BEVs should also be considered, given that this has been argued as relevant to policy interventions (Larson, Viáfara, Parsons, & Elias, 2014), and moreover implementing experience programs may prove cheaper than subsidies (Sierzchula, 2014). As Germany is currently in an “early adopter stage” (Barth, Jugert, & Fritsche, 2016) and many German car drivers have never driven a BEV, knowledge and experience of BEVs is limited. One interesting approach therefore is to investigate what role experience plays in BEV acceptance. The objective of this study was to investigate if and how the evaluation and acceptance of BEVs changes with increasing BEV experience, and if BEV experience might have indirect effects on attitude and purchase intention. To address these research questions, data from (Study I) an online survey ($N = 286$) and (Study II) a 24-h field test ($N = 30$) were analyzed.

In the following Section 1.1, we will derive our theoretical framework of BEV acceptance (i.e. BEV purchase) from the literature on BEV adoption. The subsequent Section 1.2 summarizes findings regarding BEV experience, and finally in the last introductory Section 1.3 reviewed results on BEVs are integrated into our theoretical framework and our research questions are generated.

1.1. Theoretical framework for BEV attitudinal and behavioral acceptance

A theoretical framework for BEV acceptance is necessary for identifying relevant variables that might vary at different levels of experience. Within the present research, the definition of Schade and Schlag (2003) is applied, who argued that acceptance is reflected by attitudes (attitudinal acceptance) and behavior (behavioral acceptance). BEV purchase, ownership and usage are often used indicators for behavioral acceptance (see Hjorthol, 2013; Rezvani, Jansson, & Bodin, 2015). In accordance with other researchers investigating BEV acceptance (e.g., Carroll, 2010; Noppers, Keizer, Bolderdijk, & Steg, 2014), purchase intention was studied in the present contribution. Purchase intention has proved to be the strongest predictor for purchase behavior in different contexts (e.g., Arndt, 2011; De Cannière, De Pelsmacker, & Geuens, 2010).

Reviewing literature on BEV adoption (i.e., a behavioral response including purchase and usage), Rezvani et al. (2015) argued that various factors influence the adoption process. Technical (e.g., instrumental, functional BEV attributes), contextual (e.g., policy, charging infrastructure), cost (e.g., purchase prize, fuel costs), individual and social factors (e.g., knowledge, perceived behavioral control, emotions, symbolic meaning of BEV, subjective social norm) are all associated with BEV adoption. Klöckner (2014) argues that a BEV purchase decision can be described with different stages (i.e. pre-decisional, pre-actional, actional and post-actional) in which different influencing psychological variables play a role. People transit from one stage to the next by developing specific intentions. For instance, when an individual forms a goal intention, he/she transits from the pre-decisional stage to the pre-actional stage. Klöckner (2014) analyzed the impact of selected psychological variables at the different stages and could show that in the pre-decisional stage, a person's goal intention to buy a BEV is determined by positive emotions as well as personal and social norms. In the following pre-actional stage, attitudes and knowledge about car types form the behavioral intention, but the impact of perceived behavioral control could not be confirmed. In the next stage, the actional stage, planning ability and car availability predict the actual purchase. With regard to BEVs, many Germans are still at the pre-decisional stage (Barth et al., 2016). Thus, purchase intention investigated within this contribution represent most likely goal intention.

In several studies (e.g., Moons & De Pelsmacker, 2015; Wang, Fan, Zhao, Yang, & Fu, 2016), the Theory of Planned Behaviour (TPB, Ajzen, 1991) has been applied in order to explain BEV adoption. According to Ajzen (1991), the behavioral intention (purchasing a BEV) is determined by the *attitude towards the behavior* (the purchase), the perceived social pressure resulting from the perceived expectations or behaviors of important people of one's social environment (*subjective norm*), and one's perceived ability to perform the purchase (*perceived behavioral control*) depending on internal (i.e., self-efficiency) and external resources. Various researchers have extended the TPB (Moons & De Pelsmacker, 2015; Wang et al., 2016). Moons and De Pelsmacker (2015) added emotions, focused on the attitude towards BEVs and included some attitudes towards specific BEV attributes. Ajzen and Fishbein (2005) stated that the attitude towards an object is normally a poor predictor for specific behavior, but if the selected behavioral criterion is representative for the selection of behavioral options regarding one object, strong relations can be found.

Several authors (e.g., Ajzen & Fishbein, 2005; Crites, Fabrigar, & Petty, 1994) proposed that attitude towards a behavior include two different sub-components: instrumental (e.g., desirable – undesirable) and experiential (e.g., pleasant – unpleasant). Regarding the attitude towards an object, a similar distinction is assumed by Van der Laan, Heino, and De Waard (1997). They defined attitudes as “predispositions to respond, or tendencies in terms of ‘approach/avoidance’ or ‘favourable/unfavourable’ ” (Van der Laan et al., 1997, p. 2), and suggested two dimensions (satisfaction and usefulness) that cover ‘attitudinal’ acceptance of technological innovations. This definition of attitude has been successfully implemented in other studies concerning BEVs (e.g., Bühler, Cocron, Neumann, Franke, & Krems, 2014).

In sum, the TPB seems to be a promising and economical theoretical framework, but it covers few individual and social aspects described by Rezvani et al. (2015). It also does not account for the importance of BEV attributes, although it is indisputable that the evaluation of BEV attributes plays an essential role in predicting BEV adoption (Rezvani et al., 2015; Schuitema, Anable, Skippon, & Kinnear, 2013). In addition to instrumental or functional attributes (i.e., BEV characteristics such as performance, driving range or charging duration) and symbolic attributes (characteristics that reflect driver's identity, show that s/he is conscious, and/or ‘green’) (Noppers, Keizer, Bockarjova, & Steg, 2015; Noppers et al., 2014; Schuitema et al., 2013), the role of emotions (e.g., Moons & De Pelsmacker, 2015) in terms of hedonic attributes (e.g., Schuitema et al.,

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