

How do Social Signals Foster the Adoption of Battery Electric Vehicles in Corporate Fleets? A Multilevel Framework



Ellen Roemer* and Lukas Burs

Market Research and International Marketing, University of Applied Sciences, Germany

Submission: December 09, 2020; Published: January 07, 2021

*Corresponding author: Ellen Roemer, Professor of Market Research and International Marketing, Hochschule Ruhr West, University of Applied Sciences, Duisburger Str. 100, 45479 Mülheim an der Ruhr, Germany

Abstract

This paper investigates the impact of social signals on the adoption of Battery Electric Vehicles (BEVs) in Corporate Fleets. The acceptance of BEVs in organizations takes place on different hierarchical levels. We conducted an exploratory research using depth interviews with 16 employees responsible for the purchase BEVs within their companies. Findings show evidence for both factors affecting individual acceptance on the different levels, following the Theory of Reasoned Action as well as social signals influencing the inferiors' adoption of BEVs. We developed a multi-level-framework, which integrates the adoption on different levels and demonstrates the impact and mechanisms of social signals on intra-organizational adoption of innovations. Based on this framework, implications for theory and managerial practice are developed to enhance the success of the adoption of BEVs.

Keywords: Eco-innovation; Adoption; Social signals; Battery electric vehicles

Introduction

Despite serious efforts, the rate of successful implementation of innovations in companies is still dramatically low [1]. One main reason is the lack of adoption on the level of the employees using the innovation [2]. Therefore, a deep understanding of the adoption of eco-innovations on the individual level of the employees is necessary in order to increase the likelihood of successful implementation of innovations in companies.

In this paper, we posit that social signals, as one element of social influences, have a high impact on the adoption of eco-innovations [3]. This holds particularly for larger companies with a number of hierarchical levels and a high number of employees. This is due to the fact that social signals, in contrast to word-of-mouth and networks, can be sent immediately without the need for communication between the individuals on different hierarchical levels. As a result, this paper's research question can be formulated as follows: *How far can social signals foster the adoption of BEVs across organizational levels within firms?*

Well-established theories, investigating the user's adoption of new technologies, like the Theory of Reasoned Action (TRA) [4], the Theory of Planned Behavior (TPB) [5] or the Technology Acceptance Model (TAM) [6] are valuable approaches to explain

individual adoption behavior. However, these approaches fail to conceive

- a) The different levels of adoption in companies and
- b) The impact of the adoption of employees on higher hierarchical levels on the adoption of employees on lower hierarchical levels.

More precisely, the understanding of the role of social influences of superiors on lower-level employees is still limited. Social influences fall into three categories: social signals, word-of-mouth and network externalities [3]. Even if some researchers have already investigated social influences on a general level [7,8], the particular elements of social influences and their mechanisms affecting the adoption of innovations across organizational hierarchical levels have to be investigated.

With this research, we make the following contributions. First, we develop a multi-level framework explaining the impact of social signals of higher hierarchical levels on lower hierarchical levels. Thus, we investigate the individual level adoption of BEVs in more detail. In particular, this paper conceives companies as a social system in which individuals interact and influence each other on and between different hierarchical levels instead of

viewing the organization as an abstract construct. Second, we provide empirical evidence of social influences in companies by exploring the mechanism of social signals and its impact on the adoption of innovations on individual levels in companies in more detail. Third, we elaborate the impact of information transmitted by non-verbal communication (signals) across different levels of a company.

Using the case of battery electric vehicles (BEVs) in corporate, we investigate the impact of superiors' demonstrative use of BEVs as a social signal on the employees' use of BEVs. Using BEVs is suitable to send signals to other staff in the company due to the following properties. The design of the cars (often the color white is used), the brand and the model (e.g., Tesla Model S), the necessary charging at a charging station or noiseless driving are unique properties of BEVs, which realize visual and auditive perception.

The remainder of this paper is structured as follows. Section II briefly summarizes the existing literature on the adoption of innovations in companies and on social influences. In Section III, we specify the methodology used in this research. In Section IV, we discuss the results of our study and introduce a multi-level framework. The paper concludes with implications for theory and managerial practice, limitations and directions for future research.

Literature Review - Summary

Generally, three different streams of literature contribute to our research question. First of all, researchers have dealt with the question of the adoption of innovations in organization [9]. From their point of view, adoption can be regarded as a two-step process. In a first step, management has to decide on the purchase of an innovative product, service or system. In a second step, employees have to adopt the innovation and therefore start using it in their daily operations [10]. In this line of research, also the traditional organizational buying behavior literature is useful to explain organizational adoption such as the Buying Center Model [11] or the Buy Class Model [12]. However, these approaches are more descriptive in nature and they focus on the purchasing decision, i.e., the first step. The second step, the implementation and the individuals' adoption and use of the new product, service or system is not in the focus.

A second stream of literature, focusing more on the users' adoption (second step), corresponds to the Theory of Reasoned Action which is in line with other adoption theories (e.g., Theory of Planned Behavior, Technology Acceptance Model). According to TRA, adoption of innovations the user's level is influenced by the intention to use, by the individual's attitudes and by the so-called subjective norm. Subjective norm is defined as "the perceived social pressure to perform or not to perform the behavior" [5]. Thus, subjective norm is a variable that considers that the

individual is embedded in a social environment, inside and outside the organization. However, TRA neglects the antecedents of social norms and therefore does not explain how subjective norms come into existence in the social environment and influence the individual.

A closer focus on the individual's social environment, and its influence on the individual, has been brought up by a third stream of research, i.e., the research on social influences. For example, Higgins & Hogan [13] identified top management's support as an important determinant of intra-organizational adoption of innovations. This support refers to the management's personal promotion and financial back-up of a new technology. Leonard-Barton & Deschamps [14] found that managers on higher hierarchical levels can foster or hinder the adoption behavior of their inferiors by direct delegation or more subtle support. However, these studies all presume a direct and verbal communication between the individuals or incentives that make the use of an innovation more attractive for the employees. The effect of social signals has not been analyzed in enough detail.

According to Peres et al. [3] social signals are "the social information that individuals infer from the adoption of an innovation by others. [...] These signals are transmitted to other individuals, who follow the consumption behavior of people of their aspiration group." Social information includes evidence about a user's status and indicates the belonging to a peer group. Social signals are highly important particularly in large companies with a number of employees since they can be conveyed without any verbal interaction to a large number of people.

Methodology

In this study, we investigate the case of the adoption of BEVs in corporate fleets. In order to explore the impact of social signals on the use of employees we conducted 16 in-depth interviews with employees from German companies that have already integrated BEVs into their corporate fleets. We developed a semi-structured interview guideline. All interviews were conducted by telephone and lasted from 29 to 86 minutes.

To ensure concise information on the phenomena of social signals and organizational adoption, respondents had to be directly involved into the purchasing decision regarding BEVs. For a comprehensive view, respondents were chosen from different industries. To avoid misleading information and single informant bias [15], the interview partners were asked to name co-workers involved in the purchasing process. They were interviewed as well. Table 1 shows the main sample characteristics.

The interviews were recorded and transcribed verbatim. To identify the impact of social signals on organizational adoption, we used a grounded theory approach using open, axial and selective coding [16].

Table 1: Qualitative Study Sample.

| No. | Industry | Position | Duration of Employment (in Years) | Age | Length of Interview (in Minutes) | Size of the Fleet | # of BEVs in the Fleet |
|-----|----------------------------------|-------------------------|-----------------------------------|-----|----------------------------------|-------------------|------------------------|
| 1 | Construction | Owner | 26 | 46 | 29 | 11 | 1 |
| 2 | Energy | Fleet Manager | 22 | 46 | 56 | 1700 | 8 |
| 3 | Energy | Head of Concessions | 6 | 40 | 63 | 350 | 6 |
| 4 | Energy | Municipal Consultant | 3 | 40 | 29 | 400 | 6 |
| 5 | Financial and insurance services | Head of Department | 16 | 45 | 50 | 800 | 6 |
| 6 | Financial and insurance services | Relationship Manager | 14 | 43 | 51 | 20 | 4 |
| 7 | Financial and insurance services | Director Head Office | 15 | 47 | 56 | 10 | 6 |
| 8 | Human Health and social services | Vice-Manager | 13 | 43 | 51 | 80 | 5 |
| 9 | Human Health and social services | Member | 4 | 47 | 51 | 6 | 6 |
| 10 | Information and communication | Project Manager CR | 4 | 46 | 50 | 15000 | 40 |
| 11 | Information and communication | Director Head Office | 15 | 55 | 86 | 30000 | 15 |
| 12 | Other services | Senior Manager | 12 | 56 | 35 | 20 | 1 |
| 13 | Public administration | Mayor | 1 | 53 | 44 | 5 | 1 |
| 14 | Transportation | Employee | 4 | 54 | 39 | 2800 | 450 |
| 15 | Transportation | Director Sustainability | 7 | 47 | 53 | 300 | 64 |
| 16 | Wholesale and retail | Category Leader CR | 13 | 44 | 64 | 500 | 6 |

Results and Discussion

Regarding our research question, we found empirical evidence in the interviews, which led to new insights of social influences

involved. Taking different hierarchical levels into account, indicators can be assigned to these levels. Figure 1 demonstrates the mechanisms of social signals identified in our research and integrates them into a multi-level-framework.

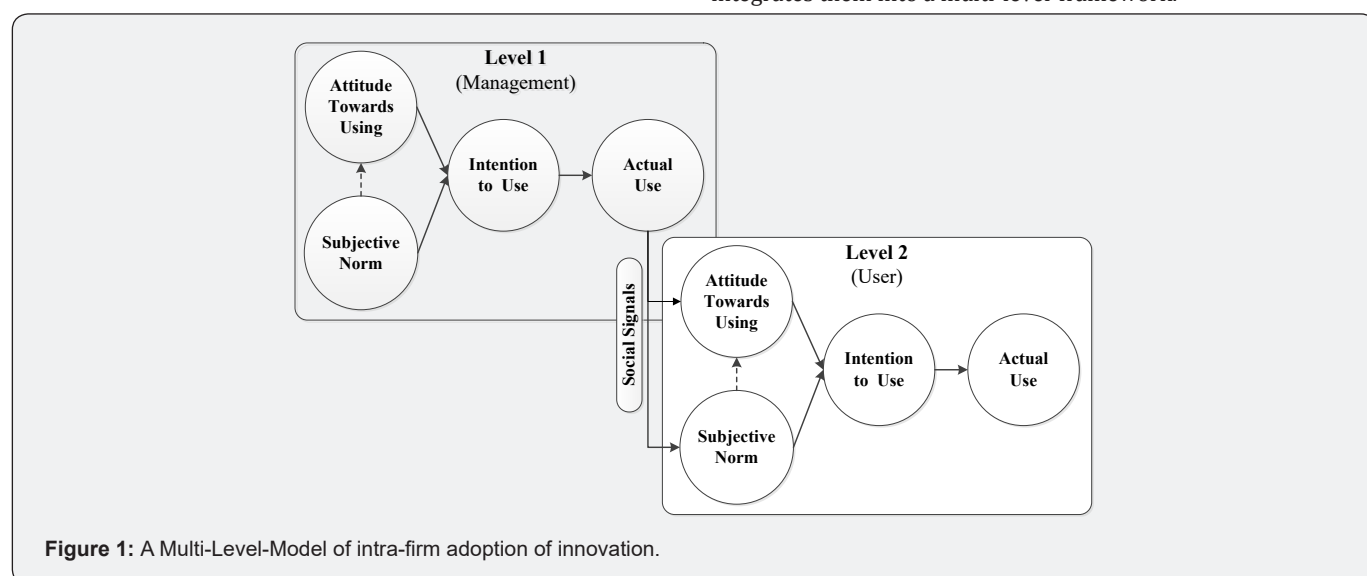


Figure 1: A Multi-Level-Model of intra-firm adoption of innovation.

Afterwards we outline the most important findings, focusing on the actual use of the management (level 1) and on the subjective norm and attitude towards using BEVs on the user's level (level 2). Hereby we provide results regarding social signals send from level 1 to level 2.

Level 1 - management

The participants illustrated, in cases where the use of BEVs is voluntary, that often CEOs are the first movers, who start to use BEVs for their daily operations:

"Our CEO drives a BMW i3 as his company car. [...] He covers his travel to work and if he has any appointments in the city or in the surrounding area, he uses this car as well." (I10, wholesale and retail)

Beside the above named operation purposes companies implemented BEVs into their fleets for airport shuttle services for the top management, or even start to offer the possibility to choose BEVs as company cars for the middle management.

"The vehicles are provided to the management namely for driving at our head quarter and to the airport. One of the colleagues [of the top management; authors' note] has generally chosen the car as company car." (I3, insurance services).

Interestingly, one participant stated an increasing interest about BEVs among other executive employees.

"There are first inquiries of some senior executives, here at our head quarter. They want to choose a battery electric vehicle as their company cars." (I10, wholesale and retail).

Level 2 - user

The majority of participants reported a positive attitude of their employees towards BEVs. This was mainly based on positive experiences of employees after test drives and first trials in daily operations. For example, one participant reported:

"In my view, there are definitely fewer prejudices against this topic [use of BEVs, authors' note] - people are more and more open-minded about electric cars." (I10; wholesale and retail).

In addition, our findings show that there is a general interest among employees towards BEV. This interest leads to employees' curiosity to try out BEVs, which fosters the adoption behavior of most of the employees.

"All parties, management as well as employees as well as our workers' council look favorably upon it [BEV, authors' note]." (I4, information and communication).

But not only test driving facilitates the attitude of the employees towards BEVs. Social signals sent by management's behavior foster the attitude of employees which in turn positively affects the intention to use BEVs. The impact of social signals can

be observed in statements like this:

"It is a clear sign, if the CEO steps into such a car [BEV; authors' note] and thus shows it works with a car like this. [...] This has a positive impact on middle management. This should not be underestimated! If they [middle management, authors' note] see their CEO using a BMW i3, they will say to themselves: If he can do this, why do I have to drive around with a black limousine?" (I3; insurance services).

Even if not all variables of TRA could have been observed in this exploratory study, the above named findings show that the management's adoption behavior towards BEVs will have an impact on inferior levels. The participants indicated clearly the non-verbal influence of the social signals send by management. Some participants used the word "role model", which from our point of view best summarize the shown impact of social signals.

Implications for Theory and Managerial Practice

Based on our findings, implications for theory can be deduced. First, this research shows that the adoption of innovations resides on several hierarchical levels within the organization. Thus, the findings enriches existing theories (e.g. TRA), which only focus on one individual, ignoring different levels, on which different facilitator and barriers are of importance. Second, it underlines the necessity of multi-level approaches within the adoption research area, aiming to reach a sound picture of intra-firm adoption of innovations.

The findings have some important implication for managerial practice regarding the adoption of innovations in companies. First, it indicates that there are some easy-to-handle ways for managers to improve the success of implementing innovations in their companies. By simply showing a positive behavior, like driving a BEV or parking it in front of the company's building, employees will get aware of the innovation and will be more likely to use it. Second, suppliers of new products, services or systems have to think about ways to get the innovation "on-screen". By offering test drives or even test weeks for managers, they can not only improve the management's adoption behavior directly, but also provoke first social signals, addressing lower hierarchical levels of the multi-level-framework.

Limitations and Future Research

Our research has some limitations which simultaneously indicate avenues for future research. First, the case of BEVs is a very special case. To identify social signals, the innovation has to be visible for employees. As BEVs are much more visible and thus send more visible signals than e.g., software solutions, future research has to investigate social signals even in cases with lower visibility than BEVs. This paper focuses on social signals as one element of social influence. Future research should also include the other elements of social influence such as word-of-mouth and network externalities. We have found evidence for different levels

of adoption within companies. Finally, our findings are based on a qualitative study. Future research should be directed towards a large-scale quantitative study in which the level of the impact of social signals can be assessed.

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DOI: [10.19080/IJESNR.2021.26.556198](https://doi.org/10.19080/IJESNR.2021.26.556198)

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