
The Road to Electromobility in Poland: Consumer Attitude Assessment

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Abstract:

Purpose: The article presents selected research results concerning the Polish path of electromobility development. The subject of the research was to gain extensive knowledge about contemporary consumer attitudes. This goal was achieved by trying to identify the most important factors determining the choice of electric vehicles by the demand side in the Polish automotive market.

Approach / Methodology / Design: CAWI techniques were used in the study. The study was conducted at the turn of 2020 and 2020. The research sample included 1,000 respondents - current owners of conventional fuel vehicles.

Conclusions: Increasing the share in the electric vehicle market is one of the pillars of the electromobility development program in Poland. The authors emphasize the essence of the relationship between consumers' attitudes towards electric vehicles and the willingness to buy them and continue to use them.

Practical implications: The study shows that the knowledge of consumer attitudes plays an important role in the development program electromobility in Poland. By verifying opinions about electric vehicles among their potential buyers.

Originality/Value: The survey attempts to fill a gap in the literature on the subject. An experimental research approach may clarify the essence of the relationship between the development of electromobility and the attitude of consumers.

Keywords: Electromobility, development plan, demand, consumer attitudes, market research, development strategies.

JEL Classification: L62, N74, O24, P42, R40.

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1. Introduction

Researchers agree that the growing mobility needs of people, coupled with the frequent use of private vehicles, are the main causes of serious socio-environmental problems (Christodoulou and Christidis, 2019; Hosseinzadeh-Bandbafha *et al.*, 2018; Profillidis and Botzoris, 2019). Many authors (Jorgensen, 2019; Tsakalidis, and Thiel, 2018) emphasize that the solution to this problem may be electric vehicles - EV type. It is assumed that their greater use will lead to a reduction in the consumption of fossil fuels and greenhouse gas emissions (Skrucany *et al.*, 2019; Tucki *et al.*, 2019; Veum and Bauknecht, 2019). The problem of high emissivity of transport has also been noticed by the European Commission, which in its plans aims to reduce greenhouse gas emissions (European, 2013).

As shown by numerous studies, the increase in the share of electric vehicles on the European Union market depends on many different determinants (Zhang *et al.*, 2014; Wappelhorst, 2018; Vassileva and Campillo, 2017; Hauff *et al.*, 2019). The available literature attempts to identify technical barriers, economic, legal, and organizational, which have a direct impact on the development of electromobility. At the same time, pointing to the most important contentious areas, such as technological progress in the field of batteries and their production costs and their service life, as well as recycling, density and availability of charging points, efficiency and connectivity with the power grid, impact on energy efficiency and greenhouse gas emissions, standardization of charging stations, infrastructure management, organizational readiness - business and industrial model, production opportunities, etc., (Alemanno *et al.*, 2012; Busse *et al.*, 2013, Christidis and Focas, 2019; Johansen, 2020; Coffman *et al.*, 2016; Campus *et al.*, 2011). Even though the links between the above-mentioned factors may play an important role in the development of the electric car market, in the current market realities it is consumer attitudes that may determine the increase in popularity and market success of electric vehicles (Barbarossa *et al.*, 2017; Schuitema *et al.*, 2013; She *et al.*, 2017; Mahwish *et al.*, 2020).

Consumer behavior and its determinants have been an important research trend in the automotive market for many years (Anderson *et al.*, 2008). In the scientific discussion on consumer behavior, there is a noticeable increase in interest in this issue, especially in the context of research on electromobility (Rezvani *et al.*, 2015; Axsen, 2012; Barbarossa *et al.*, 2015).

A report from the Electric Vehicles Initiative (EVI, 2013) indicates that several countries have set sales targets or defined inventory strategies for electric vehicles (EV) to signal their commitment to the development of electromobility. Poland, like many other European Union countries, is trying to meet the environmental and climate obligations contained in international agreements. The government's comprehensive strategy in this area was included in the Electromobility Development Program adopted a month later (Electromobility, 2017). So, there is a plan and a set of measures to promote the development of electromobility in Poland, but still researchers are

facing two challenges. The first is to recognize the real market needs of the demand side. The second is the lack of detailed research on the assessment of consumer attitudes in this topic.

Therefore, this study focuses on the identification of obstacles and barriers related to the increase in the market share of electric vehicles in Poland. To gain insight into these potential obstacles and barriers on the demand side, a consumer attitudes assessment study was conducted to investigate the awareness of potential electric car consumers and assess their attitude to the technology being implemented in the Polish automotive market.

Therefore, this article has many important practical implications, both political and economic. The article was organized as follows. Chapter 2 provides a detailed description of the research approach. Chapter 3 describes the results of experimental research and their interpretation. In turn, Chapter 4 discusses the results achieved by the authors and presents conclusions - indicating their limitations in the perspective of the research conducted so far, and the future directions of research in relation to the plans for the development of electromobility in Poland and the role of consumer attitudes in this process were defined.

2. Research Approach

2.1 Conceptual Assumption

The aim of the entire research project was to obtain extensive knowledge about the consumer basis in the field of electromobility development in Poland. The description of the selected issue related to electromobility focused on two approaches to research around decision making. In line with the aim of the study, the analysis included the assessment of consumer behavior and factors related to electric vehicle purchasing choices, which meant focusing the research attention on consumer behavior in the pre-purchase phase and in the vehicle purchase phase. Then, in the research area, the focus was on identifying the areas behind purchasing decisions of the demand side - individual customers. Following this lead, an attempt was made to answer the following research questions:

- Does the demand side consider buying an electric car when the Polish manufacturer appears on the market?
- How does vehicle range affect the purchasing preferences of future consumers?
- How do consumers perceive the costs of purchasing and operating electric vehicles?
- Which of the methods of vehicle charging is considered the most pro-consumer?

2.2 Sampling Method

Affirmative actions were taken regarding the correct selection of people for the research, sending the questionnaire to the environment of current passenger car users.

Therefore, the awareness criterion was the main factor determining the participation of a given person in the survey - potential respondents were initially asked whether they were individual owners of vehicles powered by conventional fuels. During the survey, all respondents confirmed this role and answered positively to the first question asked for this purpose. The selection of respondents for the research was carried out among the community of passenger vehicle. The respondents were professionally active respondents- Due to the diversity of respondents in terms of age, gender, and type of activity, one course was conducted research, using one communication channel - the internet. 1000 interviews were collected during the research phase. Therefore, the adopted strategy was associated with the recognition of the sample as sufficient for the adopted analysis scheme and made it possible to answer the research questions.

2.3 Description of the Tool

The CAWI method (interviews conducted via the internet) was used as part of the study. The questionnaire form enabling its completion by electronic means was sent to the respondents who expressed their willingness to participate in the survey. The survey was anonymous, which allowed for free expression of the respondents' opinions. The layout of the presented results reflects the completed questionnaires.

2.4 Analysis Scheme

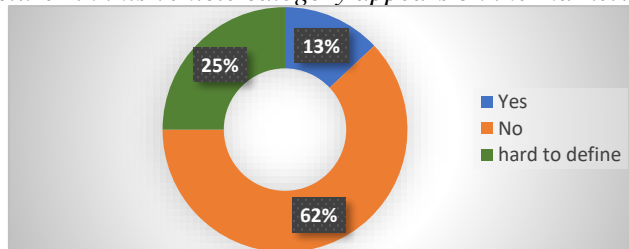
During the research, 1,000 completed answer sheets were obtained in an electronic form through an online questionnaire. The research was conducted in one of the European Union countries - Poland in the period from June 2020 to December 2020. The survey contained 10 questions related to the impact of consumer fundamentals in the field of electromobility (the answer to 5 of them is presented in the article). In the adopted scheme, the questions asked concerned, among others, purchasing preferences and decisions, knowledge of the costs of purchasing and operating electric vehicles, charging method. The study consists of substantive comments and charts containing the results of answers to the questions contained in the forms. After entering the answers to the spreadsheet, the obtained research data was subjected to statistical and substantive analysis. To make the obtained responses easier to read, the results are presented in the simplest form - percentages - in figures 1 to 5.

3. Results

In the first stage of the survey, respondents were asked if, the Polish brand appeared on the electric car market, they would consider buying an electric car in the next 5 years. The conducted research shows that as many as 62% of the respondents gave a negative answer. Only 23% of respondents indicated that they plan to purchase an electric car within the next 5 years. It is worth noting that 25% of the respondents did not give an unambiguous answer in this matter. At the next stage, the respondents

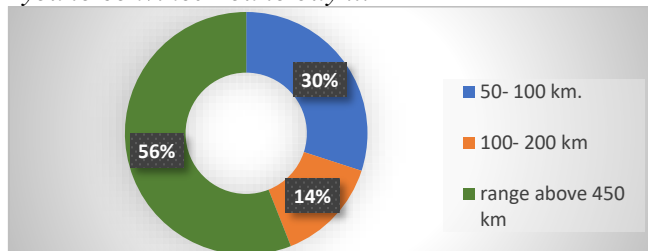
were asked to answer what range of electric vehicles would encourage the purchase of this category of vehicles.

Figure 1. Are You considering purchasing an electric car in the next 5 years if a Polish manufacturer in this vehicle category appears on the market?



Source: Own creation

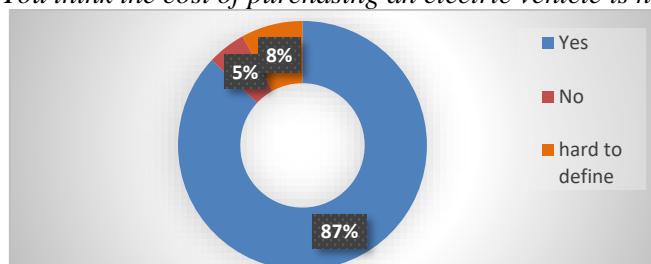
Figure 2. What range of an electric vehicle achieved on a single charge would be satisfactory for you to convince You to buy it.



Source: Own work.

The results of the obtained responses indicate that as many as 56% expect an electric vehicle to reach a range of more than 450 km on a single charge. 30% of respondents indicated that they expect a range of 50 to 100 km on a single charge. It is worth noting that only 14% of respondents indicated that they were interested in vehicles with a range from 100 to 200 km. At the next stage of the research, the respondents were asked about aspects related to the costs of purchasing and operating electric vehicles.

Figure 3. Do You think the cost of purchasing an electric vehicle is high?

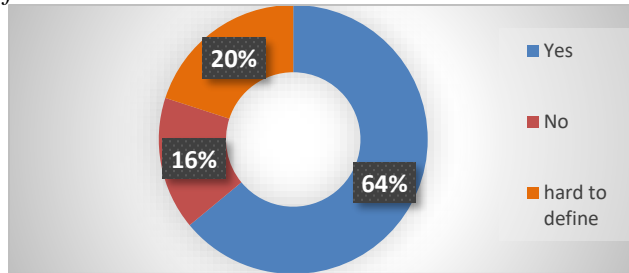


Source: Own work.

The results of the obtained responses indicate that as many as 87% of respondents perceive that the cost of purchasing an electric car is high. On the other hand, 8% of

respondents did not have an unambiguous opinion on this matter. It is worth noting that only 5% of respondents believe that the cost of purchasing an electric vehicle is not high. The next stage of the research concerned opinions on the costs of operating electric vehicles - i.e., servicing, maintenance failure rate.

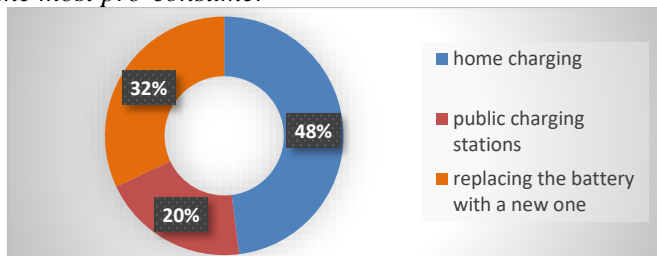
Figure 4. Do you think the cost of operating an electric vehicle is lower than that of a conventional fuel vehicle?



Source: Own work.

The analysis of the results of the obtained responses indicates that as many 64% of respondents perceive that the cost of operating an electric vehicle is lower than that of a vehicle powered by conventional fuels. However, 20% of respondents didn't have an unambiguous opinion on this issue. It is noteworthy that only 16% of respondents believe that the cost of operating an electric vehicle is higher than that of a vehicle powered by conventional fuels. At the next stage, the respondents were asked who, in their opinion, of the methods of charging the electric vehicle as the most pro-consumer.

Figure 5. Which of the methods of charging an electric vehicle in Your opinion is perceived as the most pro-consumer



Source: Own work.

The analysis of the results of the obtained responses indicates that as many as 48% of the respondents were considered to be the most pro-consumer charging a vehicle at home. However, only 20% of respondents indicated the use of public charging stations. On the other hand, over 32% of respondents believe that a pro-consumer solution in this regard would be the possibility of creating a system based on replacing the battery with a new one.

4. Discussion and Conclusions

In the literature on the subject, the dominant statement is that the road to electromobility is one of the more complicated transformations that the automotive industry must undergo (Ryghaugan and Skjølsvold, 2019). As emphasized by the researchers, the complexity of this process is influenced by, among others economic, technical, and organizational factors. However, many considerations overlook the social aspect, and more precisely the attitude of consumers themselves to the plans for electrification of individual transport (Degirmenci and Breither, 2017; Li *et al.*, 2017; Liao *et al.*, 2016; Lin and Wu, 2018).

Researchers dealing with the issue of consumer attitudes emphasize that the importance of research on consumer behavior for the development of a particular market can be considered from several different perspectives (Kotler, 2010; Edvardsson *et al.*, 2013; Christodoulou and Christidis, 2019). From the cognitive and scientific point of view - the issue of consumer behavior is a relatively wide, dynamically changing field of socio-economic life, requiring constant deepening and verification of knowledge in this area (development plans and strategies).

From the marketing point of view - knowledge about consumer behavior supports the strategic management processes of modern market entities (automotive concerns), constituting the basis for the development and implementation of an appropriate marketing strategy as well as for shaping and verifying market decisions. Moreover, from the point of view of the consumer (vehicle user) - knowing and understanding one's own behavior allows for making rational, individual choices, especially those of an economic nature. The conclusions of other researchers (Alemanno *et al.*, 2012; Schuitema *et al.*, 2013) show that consumer behavior has a significant impact on opinions about individual products. This practice is known to everyone manufacturers operating in the modern automotive market (Park *et al.*, 2018).

The presented results show that over 62% of respondents do not want to buy an electric vehicle within 5 years, despite the appearance of a Polish manufacturer on the market. Only 13% of respondents expressed the will to buy an electric car within the next 5 years. However, 25% of the respondents did not give a specific answer in this matter. According to the researchers, several factors influence this attitude. One of them is the economic crisis in the automotive market related to the COVID-19 pandemic. In addition, the users' concern resulting from the lack of experience in the production of electric vehicles and the all-present product and price competition in all market segments, which in the long term in 5-10 years may lead to a reduction in the purchase prices of new vehicles.

As for the expected range of an electric vehicle, the results of the responses received indicate that 52% of respondents expect the vehicle to reach a range of more than 450

km on a single charge. The authors see a correlation in the assessment of consumer attitudes resulting from the fact that such a large range enables driving both in city traffic and - on expressways. On the other hand, 30% of respondents expect that an electric vehicle should have a range of 50 to 100 km. The authors postulate that consumers, when making a possible purchase decision, assume that the vehicle will be used only in city traffic. The research showed low popularity of vehicles with a range of 100-200 km. In the absence of a charging infrastructure, this range does not allow you to travel outside the urban area - in this case, the user will most likely use a conventionally powered vehicle. The authors of the study believe that consumer perception of range is the result of a practical approach to vehicle usability and charging.

Regarding the cost of purchasing an electric vehicle, research confirmed the conclusions of other researchers (Fridstrøm and Østli, 2021) that purchasing an electric vehicle is still perceived as expensive. Therefore, future government actions in this matter must focus on changing the awareness of the demand side through appropriate tools, e.g., introducing subsidies for the purchase of new vehicles (Cansino *et al.*, 2018, Ryghaug and Skjølsvold 2019).

When referring to the issue of operating costs of electric vehicles, the majority of 64% respondents say that they are much lower than those of vehicles powered by conventional fuels. Such a shaped consumer attitude is also confirmed in other studies (Bubeck *et al.*, 2016, Szumska *et al.*, 2019). According to the authors, such an opinion may result from consumers' ignorance of the real costs of operating electric vehicles, e.g., the costs of replacing batteries in a longer operation process, or costs related to post-accident repairs (Johansen, 2020).

Analyzing the respondents' responses in terms of the most pro-consumer charging method, 48% of respondents indicated the use of a home electrical socket in this process. The authors argue that such a consumer approach results from the fact that most of the respondents live in single-family houses, therefore potentially, they had unlimited access to their own power source. It is worth noting that over 32% of respondents believe that the possibility of replacing the battery with a new one would be a pro-consumer solution. This may prove that consumers expect the improvement of electric vehicle charging methods so that the duration of this process and handling is minimized. A small number of respondents pointed to public charging stations. This is due to the current low availability of infrastructure to charging stations.

On the other hand, in a dispute with other authors on the way to the development of electro-mobility in Poland, there is the issue of plans to introduce the Polish brand of an electric vehicle to the global market. The current attitude of consumers, 65% of negative votes, indicates the adopted wait-and-see policy regarding the new made in Poland technology. Current market players, i.e., VW, Toyota, HONDA, Mercedes,

BWM, Hyundai, have many years of experience in the construction and marketing of electric vehicles, which is directly reflected in the attitudes of consumers and trust in given brands. The authors argue that it is necessary to verify the plans to produce the Polish brand of electric vehicles, especially in the times of the ongoing crisis on the automotive market related to the COVID-19 pandemic.

Summing up, the analysis of the presented research results indicates a clear impact of consumer attitudes on the development of electromobility in Poland. At the same time, it sets the directions for the suggested changes in the government's plans for the development of electromobility, and at the same time constitutes the answer to the research questions posed. According to the data (PAAF, 2021), 10,041 electric passenger vehicles have been registered in Poland by the end of December 2020. There were more of them than plug-in hybrids 8,834 units, i.e., vehicles that were the first step towards the development of electromobility in Poland. It should be assumed that the number of charging points at newly built or renovated buildings will certainly grow faster than before. Which will certainly translate into the availability of charging points and may lead to a change in the awareness of future consumers.

This document uses data from a survey on a specific research sample - 1000 respondents. Certainly, soon, much wider analyzes will be needed, in particular with the use of time series variability. For example, when it comes to comparing the trends in changes in purchasing preferences in connection with the COVID-19 pandemic. In addition, further research on this topic should focus on an analysis covering the breakdown of consumer preferences by different age groups. Future analyzes on this topic should include changes in consumer perception of technological changes taking place in low-emission vehicles, i.e., the shift from EVs or PHEV hybrids to hydrogen fuel cell vehicles.

The presented research on the development of electromobility in Poland in the assessment of consumer attitudes does not fully exhaust the essence of the issue but is an attempt to signal the complexity of the presented research problem. Certainly, this subject requires further analyzes and research to understand both the essence of the impact of assessments and consumer attitudes to the development of this vehicle market in Poland. Therefore, such analyzes will be the subject of future work to determine and identify the key factors for the implementation of the electro-mobility development plan in Poland and to answer the key question for the demand side. Should I buy an electric vehicle now or should I wait?

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