Transition from traditional cars to electric ones in Arctic regions

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Abstract. The study analyses the prospects for the transition from traditional vehicles running on gasoline and diesel fuel to more environmentally friendly types of vehicles (electric) in the northern and arctic northern and arctic regions. Using the example of two types of passenger cars (traditional and electric), the dynamics of changes in the readiness of residents of the northern and Arctic regions to choose an electric car for movement was analyzed. Measurements were taken before and after trial use. The results of the study on the prospects for the transition from traditional vehicles running on gasoline and diesel fuel to more environmentally friendly types of vehicles (electric) in the northern and arctic, northern and arctic regions may be of interest to companies producing electric vehicles and infrastructure designers for electric vehicles.

1 Introduction

The prospects for the transition from traditional vehicles running on gasoline and diesel fuel to more environmentally friendly types of vehicles (electric) in the northern and arctic northern and arctic regions have been actively discussed in recent years. The growth of production of new types of passenger cars, including electric ones, requires the development of the right strategy for promoting products such as electric cars to the market. Taking into account user preferences when choosing the type of passenger cars before and after trial use can directly affect the volume of production of electric vehicles by a company. At the moment, the basis of competition in the segment is two types of passenger cars (traditional and electric), each of which has its advantages. The analysis of user preferences when choosing the type of passenger cars can be changed before and after the introductory use. Measurement of the variability of user preferences when choosing the type of passenger cars before and after the introductory use is carried out on the example of two types of cars (traditional or electric) on the market.

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2 Materials and methods

To study the variability of user preferences when choosing the type of passenger cars, a survey of a group of 50 residents of the northern and Arctic regions was conducted before and after the introductory use (Table 1).

The survey was conducted in two groups of residents of the northern and arctic regions living in different types of settlements (Table 1).

Table 1. Distribution of the surveyed residents of the northern and arctic regions (depending on the type of area of residence).

<table>
<thead>
<tr>
<th>Type of location</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban agglomeration</td>
<td>25</td>
</tr>
<tr>
<td>Countryside</td>
<td>25</td>
</tr>
</tbody>
</table>

Taking into account the locality of residence of residents of the northern and arctic regions when analyzing the variability of user preferences when choosing the type of passenger cars is necessary to take into account the difference in the preferences of residents of the northern and arctic regions when choosing the type of passenger cars in the territorial context.

When choosing the type of passenger cars, all the surveyed residents of the northern and arctic regions were given questionnaires before and after the introductory use, including the question: which option of the type of passenger cars is preferable:

- traditional;
- electrical.

In order to collect and process the data of the study of the variability of user preferences when choosing the type of passenger cars, the mathematical and software methods proposed in the works [1-2] were considered.

The experiment matrix for analyzing the variability of user preferences when choosing the type of passenger cars is as follows (Table 2).

Table 2. Experiment matrix in the analysis of the variability of user preferences when choosing the type of passenger cars.

<table>
<thead>
<tr>
<th>User's choice when choosing the type of passenger car</th>
<th>Traditional</th>
<th>Electric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior to Trial Use</td>
<td>…</td>
<td>…</td>
</tr>
<tr>
<td>After Trial Use</td>
<td>…</td>
<td>…</td>
</tr>
</tbody>
</table>

3 Results and discussion

3.1 Results of the analysis of the variability of user preferences in the choice of the type of passenger cars

3.1.1 First series of measurements

The results of the survey of residents of the northern and arctic regions when choosing the type of passenger cars before and after the introductory use, in terms of traditional cars, are presented in Figure 1.
3.1.2 Second series of measurements

The results of a survey of residents of the northern and arctic regions when choosing the type of passenger cars before and after trial use, in terms of electric cars, are presented in Figure 2.

![Bar chart showing the variability of user preferences before and after use for electric cars.]

**Fig. 2.** Measurement of the variability of user preferences when choosing the type of passenger cars before and after trial use, in terms of electric cars.

The distribution of the arithmetic mean value (M) in the survey data of residents of the northern and arctic regions when choosing the type of passenger cars before and after the introductory use was estimated according to the formula proposed in [3-5]:

\[ M = \frac{X_1 + X_2 + \ldots + X_n}{n} \]  

where \( X_1 \ldots X_n \) is the value of the quantitative attribute, \( n \) is the number of observations.

Processing of the results of the survey of residents of the northern and arctic regions when choosing the type of passenger cars before and after the introductory use showed that the distribution of data is Gaussian (for all types of passenger cars).
3.2 Discussion

The results of the analysis of the variability of user preferences in the choice of the type of passenger cars before and after the trial use provide data that the user preferences for choosing the type of passenger cars before and after the trial use are unevenly distributed between several options (traditional or electric) (Table 3).

Table 3. Indicators of variability of user preferences when choosing the type of passenger cars before and after trial use.

<table>
<thead>
<tr>
<th>User's choice when choosing the type of passenger car</th>
<th>Traditional</th>
<th>Electric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior to Trial Use</td>
<td>39</td>
<td>11</td>
</tr>
<tr>
<td>After Trial Use</td>
<td>32</td>
<td>18</td>
</tr>
</tbody>
</table>

Figure 3 shows the percentage of variability in user preferences when selecting the type of passenger car before and after the trial use depending on the type of power train.

From the data obtained (Figure 3), it follows that the pre-trial priority value is:
- for traditional cars – 78%;
- for electric vehicles – 22%.

The priority value after the introductory use was as follows:
- for traditional cars – 64%;
- for electric vehicles – 36%.

4 Conclusions

The results of this work contain data on the analysis of the variability of user preferences of residents of the northern and arctic regions when choosing the type of passenger cars before and after the introductory use. A survey of a group of 50 residents of the northern and Arctic regions was conducted (Table 1) regarding user preferences when choosing the type of passenger cars. The data reflect the preferences of residents of the northern and arctic regions when choosing the type of passenger cars before and after the trial use, living in urban agglomerations and rural areas. Place of residence of residents of northern and arctic regions regarding the analysis of variability of user preferences when choosing the type of passenger cars before and after the trial use.
cars before and using is a data restriction. The analysis of the variability of user preferences when choosing the type of passenger cars before and after the introductory use showed that the distribution between the two types of the type of passenger cars (traditional or electric) in the preferences of residents of the northern and Arctic regions is distributed as follows: 78% and 22% before trial use; 64% and 36% after trial use. The results of the study of the variability of user preferences when choosing the type of passenger cars may be of interest to manufacturers of various types of passenger cars, and when conducting marketing research in this area.

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