Aspects of increasing energy efficiency in modern cities based on the transition to a new technological way of life for residents

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Abstract. The study analyzed aspects of increasing energy efficiency in modern cities based on the transition to a new technological structure of residents. One of the energy consumers in modern homes are chargers for various devices; as a rule, the number of such devices in a separate living space is >10. Aspects of increasing energy efficiency in modern cities based on the transition to a new technological way of life for residents include the abandonment of more energy-consuming wired chargers and the transition to wireless devices. Data were obtained reflecting indicators of the prospects for the transition to wireless chargers in modern cities. The results of the study may be of interest to charger manufacturing companies and when conducting research in this area. In addition, these studies may be of interest to researchers and design companies conducting work in the development of energy systems for homes of the future.

1 Introduction

One of the energy consumers in modern homes are chargers for various devices; as a rule, the number of such devices in a separate living space is >10. Changing the technological structure of such devices is one of the aspects of increasing energy efficiency in modern cities based on the transition to a new technological way of life for residents. The use and production of various chargers is growing every year. One of the leaders are chargers for smartphones. Wireless chargers use less power and are more energy efficient. The growth of the production of smartphone chargers requires the development of the right strategy for promoting products such as chargers to the market. Taking into account the variability of user preferences when choosing smartphone chargers before and after trial use can directly affect the volume of smartphone chargers produced by the company. At the moment, the demand is based on two types of smartphone chargers (wired and wireless), each of which has its own advantages. The analysis of user preferences when choosing smartphone chargers can change before and after trial use. Measuring the variability of user preferences when choosing smartphone chargers. The pre- and post-trial use is based on the example of two main types of devices (wired and wireless) on the market.
2 Materials and Methods

To study the variability of user preferences when choosing smartphone chargers before and after trial use, a survey of a group of 50 users was conducted (Table 1).

Table 1. Results of surveys of users of laundry detergents used in automatic washing machines (depending on the type of filling container).

<table>
<thead>
<tr>
<th>User's region of residence</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban agglomeration</td>
<td>35</td>
</tr>
<tr>
<td>Countryside</td>
<td>15</td>
</tr>
</tbody>
</table>

The survey was conducted in two groups of users of smartphone chargers living in different types of settlements (Table 1). Taking into account the region of residence of users when analyzing the variability of user preferences when choosing chargers for smartphones is necessary to take into account the difference in preferences of users of chargers for smartphones in the regional context.

When choosing smartphone chargers, all surveyed users were given questionnaires before and after the trial use, including the question: which option of smartphone chargers is preferable:

• wired;
• wireless.

To collect and process data on the variability of user preferences when choosing smartphone chargers, mathematical and software methods proposed in the works [1-17] were considered.

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

Table 2. Experiment matrix for analyzing the variability of user preferences when choosing smartphone chargers.

<table>
<thead>
<tr>
<th>User Choice When Selecting Smartphone Chargers</th>
<th>Wired</th>
<th>Wireless</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 Smartphone Chargers

3.1.1 First series of measurements

Figure 1 provides the results of a survey of users when choosing smartphone chargers before and after trial use, in terms of wireless devices.
Fig. 1. Measurement of the variability of user preferences when choosing smartphone chargers before and after trial use, in terms of wireless devices.

3.1.2 Second series of measurements

The results of a survey of users when choosing smartphone chargers before and after trial use, in terms of wired devices, are presented in Figure 2.

Fig. 2. Measurement of the variability of user preferences when choosing smartphone chargers before and after trial use, in terms of wired devices.

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

Where \( X_1 \ldots X_i \) is the value of the quantitative attribute, \( n \) is the number of observations.
Processing of the results of the user survey when choosing smartphone chargers before and after the introductory use of calculations showed that the distribution of data is Gaussian (for all types of smartphone chargers).

### 3.2 Discussion

The results of the analysis of the variability of user preferences when choosing smartphone chargers before and after trial use provide data that user preferences when choosing smartphone chargers before and after trial use are unevenly distributed between several options (wired, wireless devices) (Table 3).

<table>
<thead>
<tr>
<th>User Choice When Selecting Smartphone Chargers</th>
<th>Wired</th>
<th>Wireless</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior to Trial Use</td>
<td>27</td>
<td>23</td>
</tr>
<tr>
<td>After Trial Use</td>
<td>19</td>
<td>31</td>
</tr>
</tbody>
</table>

Figure 3 shows the percentage of variability in user preferences when choosing smartphone chargers before and after trial use, depending on the type of charger.

![Graph showing percentage of variability in user preferences](image)

**Fig. 3.** Percentage of variability in user preferences when choosing smartphone chargers before and after trial use, for all types of chargers considered.

From the data obtained (Figure 3), it follows that the pre-trial priority value is:
- for wireless devices – 46%;
- 54% for wired devices.

The priority value after the introductory use was as follows:
- for wireless devices – 62%;
- for wired devices – 38%.
4 Conclusions

The results of this work contain data on the analysis of the variability of user preferences in the choice of smartphone chargers before and after trial use. A survey of a group of 50 users (Table 1) of user preferences when choosing smartphone chargers. The data reflects the preferences of users when choosing smartphone chargers before and after trial use, living in urban agglomerations and rural areas. The place of residence of users in relation to the analysis of the variability of user preferences when choosing smartphone chargers before and in use is a data limitation. Analyses of the variability of user preferences when choosing smartphone chargers before and after trial use showed that the distribution between the two types of smartphone chargers (wired and wireless) in the preferences of users are distributed as follows: 54% and 46% before trial use; 38% and 62% after trial use.

The results of the study of the variability of user preferences when choosing smartphone chargers may be of interest to companies manufacturing smartphone chargers, and when conducting market research in this area.

References

2. C. Spearman, Am. J. Psychol. 15, 72–101 (1904)
7. S. Shvetsova, A study of user preferences when choosing applications for smartphones used to order food from supermarkets. E3S Web of Conferences, in press
9. S. Shvetsova, Applications for ordering food: the specifics of choice for installation on computers and laptops. E3S Web of Conferences, in press
14. W.W.C. Gieskes, C. Veth, A. W