Prospects for reducing energy costs during the transition to a new technological structure in modern urban homes

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Abstract. The study analyzed the prospects for reducing energy costs during the transition to a new technological structure in modern urban homes. One of the sources of energy consumption in modern homes are sound reproduction 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 structure of residents include the abandonment of more energy-consuming wired acoustic devices and the transition to wireless devices. Data were obtained reflecting indicators of the prospects for the transition to wireless acoustic devices in modern cities. The results of the study may be of interest to companies producing acoustic devices 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 acoustic systems for residents of modern cities.

1 Introduction

One of the energy consumers in modern homes are various acoustic devices; as a rule, the number of such devices in a separate living space is >10. Changing the technological structure of such acoustic devices is one of the aspects of increasing energy efficiency in modern cities based on the transition to a new technological structure of city residents. The use and production of various acoustic devices is growing every year. Some of the leaders are such acoustic devices as wired and wireless headphones for laptops. Wireless headphones consume less power and are more energy efficient. The growth of the production of wired and wireless headphones for laptops requires the development of the right strategy for promoting products such as wireless headphones to the market. Taking into account the variability of user preferences when choosing wired and wireless headphones for laptops before and after trial use can directly affect the volume of production of wired and wireless headphones for laptops. At the moment, the demand is based on two types of headphones for laptops (wired and wireless), each of which has its own advantages. Analysis of user preferences when choosing wired and wireless headphones for laptops can change before and after trial use. Measuring the variability of user preferences when choosing wired and wireless headphones for laptops can change before and after trial use. 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 wired and wireless headphones for laptops, a survey of a group of 100 users was conducted before and after trial use (Table 1). The survey was conducted in two groups of users of wired and wireless headphones for laptops living in different types of settlements (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>50</td>
</tr>
<tr>
<td>Countryside</td>
<td>50</td>
</tr>
</tbody>
</table>

Table 1.

When analyzing the variability of user preferences when choosing wired and wireless headphones for laptops in the regional context, the difference in preferences of users of wired and wireless headphones for laptops in the regional context.

When choosing wired and wireless headphones for laptops, all surveyed users were given questionnaires before and after the trial use, including the question: which option of wired and wireless headphones for laptops is preferred:

- wireless headphones;
- wired headphones.

To collect and process data on the variability of user preferences when choosing wired and wireless headphones for laptops, mathematical and software methods proposed in [1-18] were considered.

The experiment matrix for analyzing the variability of user preferences when choosing wired and wireless headphones for laptops is as follows (Table 2).

Table 2.

Matrix of an experiment in the analysis of the variability of user preferences when choosing wired and wireless headphones for laptops.

<table>
<thead>
<tr>
<th>User's Choice When Selecting Wired and Wireless Headphones for Laptops</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 Wired and Wireless Headphones for Laptops

3.1.1 First series of measurements

Figure 1 provides the results of a survey of users when choosing wired and wireless headphones for laptops before and after trial use, for wireless headphones.

![Figure 1](image1)

**Fig. 1.** Measurement of the variability of user preferences when choosing wired and wireless headphones for laptops before and after trial use, in terms of wireless headphones.

3.1.2 Second series of measurements

Figure 2 provides the results of a survey of users when choosing wired and wireless headphones for laptops before and after trial use, for wired headphones.

![Figure 2](image2)

**Fig. 2.** Measurement of the variability of user preferences when choosing wired and wireless headphones for laptops before and after trial use, in terms of wired headphones.
The distribution of the arithmetic mean ($M$) in the user survey data when choosing wired and wireless headphones for laptops before and after the introductory use of headphones was estimated according to the formula proposed in [17-20]:

$$M = \frac{X_1 + X_2 + \ldots + X_i}{n}$$  \hspace{1cm} (1)

Where $X_1, X_2, \ldots, X_i$ is the value of the quantitative attribute, $n$ is the number of observations.

Processing of the results of the user survey when choosing wired and wireless headphones for laptops showed that the distribution of data is Gaussian (for all types of wired and wireless headphones for laptops).

3.2 Discussion

The results of the analysis of the variability of user preferences when choosing wired and wireless headphones for laptops before and after trial use provide data that user preferences when choosing wired and wireless headphones for laptops before and after trial use are unevenly distributed between several options (wired headphones and wireless)

Table 3. Variability of user preferences when choosing wired and wireless headphones for laptops before and after trial use

<table>
<thead>
<tr>
<th>User's Choice When Selecting Wired and Wireless Headphones for Laptops</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wired</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>Prior to Trial Use</td>
</tr>
<tr>
<td>After Trial Use</td>
</tr>
</tbody>
</table>

Figure 3 shows the percentage of variability in user preferences when choosing wired and wireless headphones for laptops before and after trial use, depending on the type of headphones.

From the data obtained (Figure 3), it follows that the priority value before the introductory use of the headphones is:

• for wireless headphones – 63%;
• for wired headphones – 37%.
The priority value after the introductory use was as follows:
• for wireless headphones – 69%;
• for wired headphones – 31%.

4 Conclusions

The results of this work contain data on the analysis of the variability of user preferences when choosing wired and wireless headphones for laptops before and after trial use. A survey of a group of 100 users (Table 1) was conducted on user preferences when choosing wired and wireless headphones for laptops. The data reflects user preferences when choosing wired and wireless headphones for laptops before and after trial use, living in metropolitan areas and rural areas. Users' place of residence Regarding the analysis of the variability of user preferences when choosing wired and wireless headphones for laptops before and using is a data limitation. Analysis of the variability of user preferences when choosing wired and wireless headphones for laptops before and after trial use, I showed that the distribution between the two types of headphones for laptops – (wired and wireless headphones) in user preferences is distributed as follows: 37% and 63% before trial use; 31% and 69% after trial use. Results of the Study on the Variability of User Preferences When choosing wired and wireless headphones for laptops, they may be of interest to companies producing wired and wireless headphones for laptops, and when conducting market research in this area.

References

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