Efficiency assessment in transport service provision for the population of Orel city

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Abstract. The article discusses the main methods for quality of passenger traffic assessment, presents the main advantages and disadvantages of these methods. The questionnaire for interviewing passengers was developed, which includes questions about the gender and age of passengers, their social standing, the frequency of passenger transport use and its attractiveness to consumers. The efficiency of city public transport functioning assessment methodology based on the results of a survey of passengers using elements of the "Google Forms" service was also offered in the article.

The quality of urban passenger transport can be assessed using the following methods [17]:
- observation method,
- coupon method,
- assessment by modern methods of collecting and processing information,
- survey methodology for obtaining information.

Information on the number of tickets sold can be obtained using the observation method. Occupancy degree of passenger vehicles is assessed by visual estimation. In this case, the main emphasis is on the compartment occupancy rate and does not take into account the final number of passengers in the vehicle. Thus, the information obtained does not give a real idea of the number of passengers transported per voyage.

When using the coupon method, passengers boarding the vehicle receive a coupon that indicates the stopping point at which the boarding was made. Upon departure, passengers hand over these coupons. The information obtained in this way allows us to estimate the change in passenger traffic on each direction and route. It is quite difficult to use this information for assessing the quality of transportation. In addition, this method is characterized by high labour inputs.

Modern methods of obtaining information are analysis of population mobility by examining its resettlement and hardware-software systems.

During the survey, primary information is collected using an oral or written appeal with questions to a group of people under review. The content of these questions reflects the research problem at the empirical level. At the final stage, the array of responses received is subject to statistical processing. The survey method is the most popular when conducting sociological research, as it has a number of very significant advantages compared to methods of observation and analysis of documents. The main elements of the survey are presented in Figure 1 [17].
The use of survey form (questionnaire) allows you to get more accurate information about the subject of the study. The survey is conducted directly in passenger vehicle, at stopping points, train stations and in families.

The disadvantages of the questionnaire method include the high cost of the work. In addition, if there are a large number of routes in the city and its region, obtaining the full amount of information is rather difficult.

**Figure 1.** Main elements of the survey method

The main stages of survey preparation and conduct:
1. The definition of goals, objectives, subject and object of study.
2. Definition of the general and sample population.
3. Rationale for a questionnaire: a meaningful presentation of the problem in the question wording; rationale for the questionnaire regarding the capabilities of the surveyed population as the source of the information sought.
4. Clarification of the requirements for interviewer on survey conducting.
5. Providing conditions for processing the obtained array of information.
6. Determining the timing of the survey.
7. Preparation of questionnaires.
8. Selection and training of interviewers.
9. Collection and further processing of questionnaires.
10. Report preparation on the study.

Depending on the contact form of the interviewer and the respondent, the following survey methods are distinguished [17]:

a) in-person or indirect (hand-out, mail, press, telephone);
b) individual or group;
c) free or formalized, focused (directed);
d) oral or written;
e) solid or selective;
f) in-home or at work surveys.
As a rule, preference is given to the survey using the personal contact of the questionnaire with the respondent. This allows you to obtain reliable information about the state of the object of study. Depending on weather conditions, it is advisable to use a survey at stopping points in the warm season and a telephone survey in adverse weather conditions. Telephone survey is one of the fastest and most inexpensive survey methods. In many countries (the USA, the UK, France, Germany, Italy) this method often replaces personal and mail interviews. The organization of such interviews is not difficult, and the basis for the formation of a representative sample is the database of telephone subscribers. The main tool used in the study is the questionnaire [17].

The main advantage of a survey is the scale of outreach of various areas of social practice. Using the survey method allows you to obtain information on the issues of interest in the life of modern society. The cognitive capabilities of this method are quite extensive, and the advantage is the high efficiency of the survey of a large number of respondents in the shortest possible time.

There are two main types of surveys: questionnaires, when its conduct is mediated by the application of the questionnaire, and interviews, when it is in the nature of direct communication of the sociologist with the respondent.

Questioning is a method of obtaining primary information about the whole research using written answers of respondents to the system of standardized answers of the questionnaire. Questioning is the most frequently used type of survey when conducting various sociological studies [17].

The questionnaire consists of three main parts: introductory, basic and demographic.

At the first stage, an interviewer addresses respondents indicating the institution conducting the study, the tasks of the study, the role of the respondent in solving the tasks, assurance of the complete anonymity of the respondent’s answers, the way to return the completed questionnaires and the rules for filling in the questionnaire.

The main part consists of a set of questions, the answers to which are used to solve the problems posed in the study. Questionnaire construction is the most complex and responsible task and always starts with simple questions designed to interest respondents and help them get involved in the work. This is followed by questions aimed at solving the main tasks of the study and relating, as a rule, to motives, opinions and assessments. At the end, questions that detail answers to the previous ones are used, as well as control questions requiring individual opinion of the respondents [17].

The demographic part of the questionnaire consists of questions determining the social characteristics of the respondent, gender, age, education, occupation, etc.

When constructing a questionnaire, the following types of questions are used, which vary in form: open-ended, closed, half-closed, and scale [15].

The respondent gives free answers to open-ended questions.

Closed questions contain information about a possible answer. The wording of this question is unbalanced and contributes to the choice of the “right” answer by the respondent. The use of this type of question is often doubtful in a methodological sense, especially when evaluating the effectiveness of transport services for the population [15].

The main difference between alternative and closed questions is the balance of alternatives to the wording of the questions. This balance allows you to minimize the bias of answers in one direction or another, and the proposed answer options are mutually exclusive. When answering such a question, you can choose only one of the options.

When responding to a scaled question, the respondent notes the intensity of a phenomenon or opinion, and requires the answer to be expressed in points or percent.

To conduct the quality assessment of transport services, a survey method using a questionnaire posted on the Internet media sites can be used. Five questions are obligatory [15]:

1. “Indicate your gender”.
2. “Indicate your age”.
3. “Indicate your social affiliation”.
4. “Do you use public transport?”
5. “Under what conditions would you transfer from a personal car to public transport?”

If the answer is “no” to question 4, the respondent is asked to answer the final questionnaire item. The question suggested five answers, but the questionnaires can insert their own ones.

The algorithm for efficiency assessment of the transportation process according to the passengers survey results is shown in Figure 2.

**Stage 1. The study of the main entities of urban passenger transport**

- Consumer research highlighting segmented entities

  - **Passengers**
    - Demographic segmentation
      - gender
      - age
    - Behavioral segmentation
      - travel purpose
      - travel frequency
      - preferences

**Stage 2. Development of the necessary primary documentation**

- Questionnaire construction
  - Block 1. Public transport accessibility and availability
  - Block 2. Performance
  - Block 3. Reliability
  - Block 4. Comfort and convenience

**Stage 3. Sample size determination**

**Stage 4. Researching**

**Stage 5. Assessment of the research results**

**Stage 6. Development of recommendations**

**Figure 2.** The algorithm for efficiency assessment according to the passengers survey results.
Questionnaires, which consist of five parts, should be developed for passengers. At the first stage, there is a study of the main entities of public transport services, at the second - their segmentation. These stages are crucial in the preparation of the questionnaire. The remaining three parts are grouped into blocks and are dedicated to assessing the level of quality of services provided by public passenger transport.

When preparing questionnaires, it is proposed to group questions related to assessing the level of transport infrastructure services quality in several blocks. In this case, it is necessary to use differentiated methods depending on the type of questions:

− Open-ended questions (for example, “Why are you not satisfied with the system of social guarantees (benefits) for city passenger transport?”) allow you to get different answers and contribute to a comprehensive study of the problem;

− Yes/no questions. The respondent answers only with a "yes" or a "no". (For example, “Does the time spent on traveling by public transport suit you?”). These questions should not cause difficulties with the answer and are simple when analyzing the facts;

− Multiple choice. The respondent has several option from which to choose. (“Which form of payment is preferable for you?”) Such questions are convenient when there are alternatives [17].

Online surveys of respondents are the most promising ones. The questionnaire can be composed using the features of the Google Form service.

Google forms is a universal tool included in the Google Marketing Platform, which allows you to conduct a survey and quiz of respondents using the collection of response data in a tabular form. Currently, the use of this platform is the most popular type of survey. At the same time, it becomes possible not only to obtain information about user responses, but also to collect respondents' e-mail addresses and contact numbers for further surveys.

This service is free and synchronizes with Google Doc and Google Drive. The advantage of this platform is that the iframe format loads quickly and automatically adjusts to the user's device. Thanks to the link, you can distribute this profile through social networks, forums or messengers. This allows you to reach the largest number of respondents. The main disadvantage of this method is the ability of the respondent to use internet resources.

At the next stage, the required sample size of the statistical population is determined based on average values. This determines the reliability of the results obtained during the study [18]:

\[ n = \frac{\sigma^2 \cdot t^2}{e^2} , \]

Where \( n \) is the sample size, \( \sigma \) is the standard deviation, \( t \) is confidence level, \( e \) is the desired level of precision.

After determining the required sample size, the questionnaire should be posted on internet platforms of large resources, allowing for a large coverage of respondents.

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