

# Research methods of service quality on public transport

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*Abstract – The set of criteria reflecting the level of satisfaction of passengers in the provided transport services is considered to be indicators of the quality of passenger transportation. Taking into account the stable development of transport, the establishment of complex methods for defining these indicators becomes increasingly relevant. At the same time, nowadays, there is a large number of methods for determining the quality of transportation in road transport, by both domestic and foreign scientists.*

Keywords – quality on public transport, bus, passengers, comfort, traffic safety.

## I. Introduction

Quality of service on urban public transport (UPT) is a very important indicator. It affects a large number of indicators, such as the intensity of population movement, population productivity, various economic aspects, the ability to easily reach from one end of the city to another, and so on. The methodology for assessing and determining the quality of urban passenger transportation services allows you to assess the level of service in a particular city and determine what adjustments need to be made to improve them.

## II. Service quality on public transport

The work of public transportation should be socially effective, which manifests itself as the provision of high-quality transport services. To assess the quality of passenger service, not only quantitative but also qualitative indicators such as: network length, number of rolling stock, number of transported passengers, etc. should be used. A more complete list of characteristics to be present during the analysis of transportation services would look as following [1]:

- traffic safety;
- reliability;
- availability of tariffs;
- waiting time;
- minimum number of changes;
- level of filling of transportation vehicle;
- time enroute;
- microclimate in the cabin;
- comfort of passengers.

Today, there are many different opinions about the quality of urban public transportation. Basing on a large number of criteria, A.V. Shabanov proposed a comprehensive assessment of the level of quality of the functioning of urban passenger transportation. To do this, they formulated the corresponding formula [2]:

$$S_{\text{ооcт}} = S_1^{k_1} \cdot S_2^{k_2} \cdot S_3^{k_3} \cdot S_4^{k_4} \cdot S_5^{k_5} \cdot S_6^{k_6} \quad (1)$$

where  $S_1^{k_1}$  – reliability of movement in accordance with the schedule of movement (travel time);  $S_2^{k_2}$  – accessibility (frequency of public transport movement);  $S_3^{k_3}$  – safety (probability of non-failure work of public transport);  $S_4^{k_4}$  – comfort (travel quality);  $S_5^{k_5}$  – cost indicator (the amount of transport tariff);  $S_6^{k_6}$  – indicator of the level of information support.

According to the research conducted by V. A. Gudkov, the quality of transport services for passengers is estimated using the quality factor ( $K_{\text{я}}$ ), which is determined by the following ratio [3]:

$$K_{\text{я}} = \frac{t_{\text{nep}}^3}{t_{\text{nep}}^{\phi}} \quad (2)$$

where  $t_{\text{nep}}^3$  – time spent on a trip for given theoretically absolute comfortable travel conditions;  $t_{\text{nep}}$  – the actual time spent on a trip in real conditions;  $t_{\text{nep}}^{\phi}$  – the actual time spent on a trip in real conditions.

A. M. Bolshakov in his work suggests to determine the indicator of the quality of transport services of passengers in cities in the following way [4]:

$$K_{\text{н}} = \frac{t_{\text{н}} \cdot y_{\text{н}}}{t_{\phi} \cdot y_{\phi}} \cdot R \quad (3)$$

where  $t_{\text{н}}$  – normative duration of the passenger's trip, min.;  $t_{\phi}$  – actual travel time of the passenger, min.;  $y_{\text{н}}$  – normative factor of filling, which is recommended for traffic within the city (on average it is no more than 0,3, and in peak hours – 0,8);  $y_{\phi}$  – the actual value of the filling factor;  $R$  – indicator of the regularity of the movement.

E. A. Kravchenko in his work evaluates the quality of transport services for passengers using a coefficient that can be determined in the following way [5]:

$$\bar{K}_{\text{н}} = \frac{\sum_i^n K_i \cdot P_i}{\sum_i^n P_i} \quad (4)$$

where  $K_i$  – quality indicator;  $P_i$  – the relative static weight of partial indicators.

Indicators that characterize the quality of passenger transport services according to work are [6]:

- coefficient of transportation vehicle appearance on the line;
- coefficient of filling of the cabin;
- coefficient of time used in duty;
- conveyance speed;
- traffic intensity;
- interval of the motion of transportation vehicle;
- coefficient of regularity of motion;
- service efficiency indicator;
- coefficient of cost efficiency;
- a generalized transport service quality indicator.

At the same time, all these indicators have their normative values for the corresponding routes of movement.

### III. Indicators that represent the quality of service on public transport

With regard to indicators that reflect the quality of passenger service on vehicles, each of them has a definite influence on this value. For example, researchers assume that the time spent by people for the transportation is one of the most important criteria for assessing the quality of transport services of the population [7].

Also, it should be noted that indicators of service quality and regularity of the movement – are interrelated and inherent from each other. This is explained by the fact that when traffic increases, the volume of transportation increases, passengers are distributed more evenly, the possibility of timely payment of travel, etc., is provided. When the regularity of the movement is disrupted there is overfilling of the bus cabin or, conversely, then the route becomes unprofitable. Uneven loading leads to time spent on boarding and landing passengers, which, in turn, creates delays at stops, resulting in disturbed bus mode, reduced speed of traffic and traffic safety, etc. [1, 8].

The level of security of passenger transportation must be considered as a function of the parameters that must be provided to the organizers of transportation. The indicator varies depending on compliance by the carrier with the transport security conditions [2].

The main criteria of comfort are [2]:

- convenient location of passengers (number and location of doors, seats, hand-rail, etc.);
- visibility;
- heating efficiency in winter;
- air conditioning efficiency in the summer;
- lighting;
- possibility of rest on the road;
- informational services (announcements of stops in transport, warning about changing the route, etc.);
- vibration

The main characteristics of the quality of information support are [2]:

- availability;
- reliability;
- speed;
- completeness;
- accuracy.

At the same time, the indicator of the information service is the ratio of the level of information provision of a certain type of transport on the route to the maximum possible level of security on the same transport.

### Conclusion

The functioning of public transportation in a modern city should be, first and foremost, socially effective. To ensure the population with high-quality transportation services, it is necessary that all the quality and comfort indicators highlighted in this work are fulfilled. All of them are very important because their influence impacts

the productivity of society and the functioning of the economy of the country, which provides the vital activity of society. Compliance with all indicators of the quality of services is a fairly important way of regulating the interests of different parties, in particular: carriers, public authorities interested in the priority development of public transportation in the city, and citizens. Since there are a lot of factors that affect the comfort and quality of transportation, so there is a large number of different opinions about the questions which indicators are more important and which methods are better to make calculations. Therefore, there is a need to create a new comprehensive methodology that will take into account everything.

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