EVALUATION OF PASSENGER SATISFACTION WITH PUBLIC TRANSPORT SERVICES

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ABSTRACT

Based on existing domestic and European standards of quality assessment, the article justifies the approaches to improving the work of public transport. The authors' method of analyzing factors, which affect the characteristics of the transport service of the population and the satisfaction of passengers with the services of suburban electric trains and the metro, is demonstrated. The data of the conducted surveys allow to argue a step-by-step scheme of improvement of the expected quality in the quality system, which is achieved through conscious quality, and that in turn is regulated by realized quality. The level of the latter is determined by the impact on operational and infrastructural factors.

Keywords: public transport, suburban electric trains, underground, quality of service, passenger satisfaction.

Background. *The attractiveness of public transport is largely determined by the level of comfort of a trip. Comfort at the same time is ensured not only by the use of new rolling stock, but by organization of traffic, creation of convenient interchange nodes, integration of various modes of transport into a single, securely managed system.*

Providing comfort is a basic tool for improving the quality of transport services, it is considered that in urban conditions, passengers of both personal and public transport should enjoy the movement through the territory of residence, the time of arrival at the destination must be predictable, and the transport itself – as convenient as possible.

For formation of areas for improving the work of public transport, it is necessary to regularly monitor satisfaction of passengers with the quality of the services provided. The authors of the article developed a methodology for analyzing the factors affecting the quality of public transport services and the satisfaction of passengers of suburban electric trains and metro, and a marketing study of Moscow was conducted in this area.

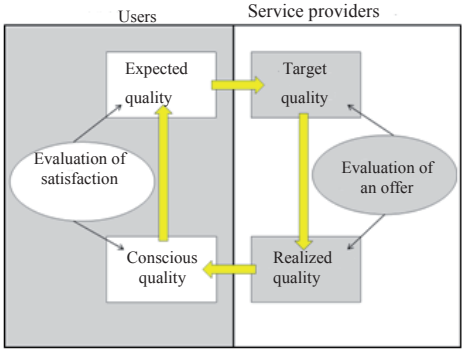
Objective. *The objective of the authors is to consider evaluation of passenger satisfaction with public transport services.*

Methods. *The authors use general scientific and economic methods, comparative analysis, statistical method, graph construction.*

Results.

1.

To begin with, it is worth remembering some of the definitions given in the document of JSC Russian Railways 1.04.001–2007 «Servicing of passengers by conductors of cars of the Federal Passenger Directorate. Requirements for quality of service».



Pic. 1. Quality loop.

Quality of a service is a combination of properties and features of the service provided, characterizing its features, utility, ability to meet the needs of a passenger.

Comfort of a trip is a combination of comfort and coziness during a trip.

Satisfaction of a passenger is perception of a degree of fulfillment of his needs by a passenger.

The European quality assessment standard, adopted in 2002, is based on the so-called «quality loop» methodology (see Pic. 1).

Variables located in rectangles are measurable; the difference between the expected and received services determines the degree of satisfaction of passengers with the quality of transport services.

To assess the level of satisfaction of passengers, it is possible to apply a formula (1), based on the principles of the European quality assessment standard:

$$S = (1 - (\frac{E-P}{10})) \bullet 100\%, \qquad (1)$$

where S is passenger satisfaction index of the quality of service, %;

E is expected quality, from 1 to 10;

P is perceived quality, from 1 to 10.

The indicator obtained in this case has a number of shortcomings. A potential passenger is still waiting for services of a relatively low quality, based on the assumption that public transport is a priori less comfortable in comparison with personal vehicles. Therefore, the indicators of expected and perceived quality will not vary greatly, and, consequently, satisfaction will be high.

For example, according to a survey carried out by authors at suburban railway facilities at the end of 2015, the perceived quality for the parameter «Working time» was estimated at 7,7 out of 10, and the expected quality for the same parameter – by 7,8 out of 10. According to the formula (1), the satisfaction index is 99 %, which means almost complete satisfaction. However, such a result is achieved not at the expense of high indicators of real quality, but due to a small difference between the evaluation of perceived and expected quality. And, here, we emphasize, the indicator of the expected quality is dominant. It should be increased.

The increase in the expected quality is achieved through raising the conscious quality, which is regulated by the realized quality. This statement is supported by the presented step-by-step scheme (Pic. 2).

To improve the realized quality, it is necessary to change the existing parameters of the public transport operation. And it will be fair to divide all the factors considered into two levels:

1) operational factors directly affecting the passenger's assessment of the perceived quality and changing of which does not require significant capital investment;

2) infrastructure factors that limit the range of changes in operational factors: their correction requires significant capital investment.

This division can be visualized (Pic. 3).

Operational factors should include, for example, frequency of trains' departure from a station, cost of travel, current technical condition of rolling stock, convenience of a timetable. Infrastructure factors may include such indicators as the number of main tracks, availability of modern rolling stock, development of the route network, technical equipment of transport-interchange nodes, automation and telemechanics systems, and so on.

Under existing conditions, the impact on infrastructure factors makes sense only if the resources for changing operational factors have already been exhausted.

Obviously, operational factors can be changed without large costs and in minimum time. Naturally, this will cause a positive reaction of passengers and increase the attractiveness of public transport.

2.

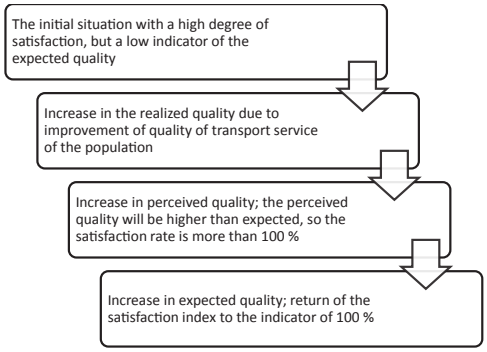
It should be noted that at present the suburban railway transport in certain areas of Moscow node has significant reserves to increase carrying capacity, in contrast to the metro, which runs on the verge of assigned resources, and increase carrying capacity while reducing the load on individual lines is possible only by influence on infrastructure factors. Pic. 4 shows the load of metro lines by comparing the actual density and carrying capacity of each line.

As can be seen from the presented scheme, only two metro lines – Sokolnicheskaya and Kaluzhsko-Rizhskaya – have reserves for attracting additional passenger traffic, but it should be noted that these reserves are negligibly small (up to 10 % of the carrying capacity of the line).

Today, to reduce the load, for example, on Koltsevaya line two redundant branches are being built – the Third transfer loop and the Moscow Central Circle. They will be able to accept part of the passenger traffic from Koltsevaya Line.

It cannot be denied that the systems of suburban railway transport and metro can mutually complement each other. This statement allows us to conclude that the indicator of one of the operational factors of the metro – occupancy of train cars – can be changed due to reorganization of the work of suburban railway transport. Increasing reliability and frequency of suburban electric trains in the city, it is possible to increase the attractiveness of this type of transport for urban residents and thereby to transfer part of the passenger traffic from the metro.

It turns out that the operational factors can be changed by determining the parameters most important for an average passenger that affect his satisfaction. In this case, the determination of factors is possible by collecting and analyzing statistical data.



Pic. 2. A step-by-step scheme for improving the expected quality.

Based on the results of processing the data obtained during the field study, six most important criteria for a passenger were identified (in decreasing order of importance):

1) frequency of trains running: 06:00–10:00;

2) comfortable temperature in the cabin;

3) fare;

4) cleanliness in cars;

5) feeling of personal safety at stations and stopping points;

6) feeling of personal safety in electric trains.

The diagram of the significance of the criteria for a passenger in descending order is shown in Pic. 5.

Also, passengers were asked to evaluate the quality of the suburban railway transport system on the same list of criteria. Based on the results of the processing of the data obtained in the course of the field study, five criteria were identified that were rated by passengers above the others (in descending order):

1) frequency of trains running: 06:00–10:00;

2) presence of ticket-printing machines at stations and stopping points;

3) time spent in transit;

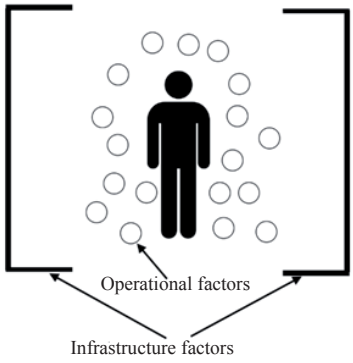
4) frequency of trains running: 15:00–19:00;

5) frequency of trains running: 19:00 and later;

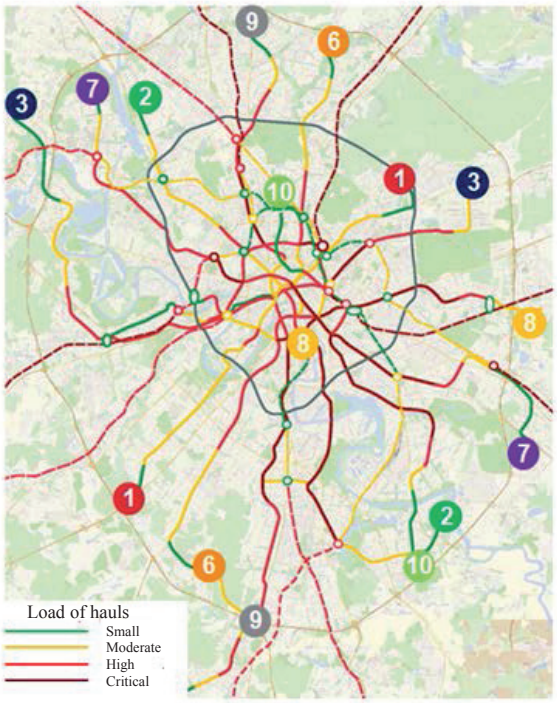
6) check of payment of travel by inspectors.

The diagram of criteria evaluation is shown in Pic. 6.

Passengers of suburban railway transport in Moscow primarily need a high frequency of trains running in the morning peak hours, and this indicator is rated higher than the rest. However, the remaining five important criteria were graded from 51,3 to 40,6 (on a scale of 1 to 100), which is an extremely



Pic. 3. Operational and infrastructure factors.



Pic. 4. Load of metro lines.

Line		Actual density, thous. pass/h	Carrying capacity*, thous. pass/h	Reserve +/ Deficit -, %
1	Sokolnicheskaya	39,2	43,1	+9
2	Zamoskvoretskaya	61,3	52,2	-17
3	Arbatsko-Pokrovskaya	40,2	40,1	0
6	Kaluzhsko-Rizhskaya	48,5	52,2	+7
7	Tagansko-Krasnopresnenskaya	73,7	52,2	-41
8	Kalininskaya	57,3	46,7	-23
9	Serpukhovsko - Timiryazevskaya	64,9	50,5	-29
10	Lyublinskaya	53,9	49,5	-9

*At standard occupancy rate of 4,5 standing passengers per m^2 of the cabin's area.

unsatisfactory indicator of the system performance. In addition, all five criteria relate to the group of operational factors and do not require significant capital investments to change their condition.

To increase passenger satisfaction and attract additional passenger traffic, it is necessary to achieve high quality of services provided, comfort of trips in electric trains, including:

1) to maintain the ventilation and air conditioning systems in the cars of electric trains in good condition;

2) to clean the rolling stock more often and more thoroughly;

3) to carry out measures to change the fares;

4) to strengthen measures to ensure safety of passengers in the cabin of rolling stock, as well as at stations and stopping points.

3.

The implementation of the proposed measures on the suburban railway transport will positively affect the work of the Moscow Metro, most of the lines are overloaded.

In the course of the research conducted by the authors in late 2015, the level of satisfaction of passengers with the work of the metro was determined by certain factors. To measure the quality of services, the SERVQUAL method (service quality), tested in insurance companies, in education and medicine, in the banking sector was used, which, in our opinion, allows us to adapt the methodology for measuring and controlling the quality of transport services.

The factors to be measured are grouped around the following characteristics:

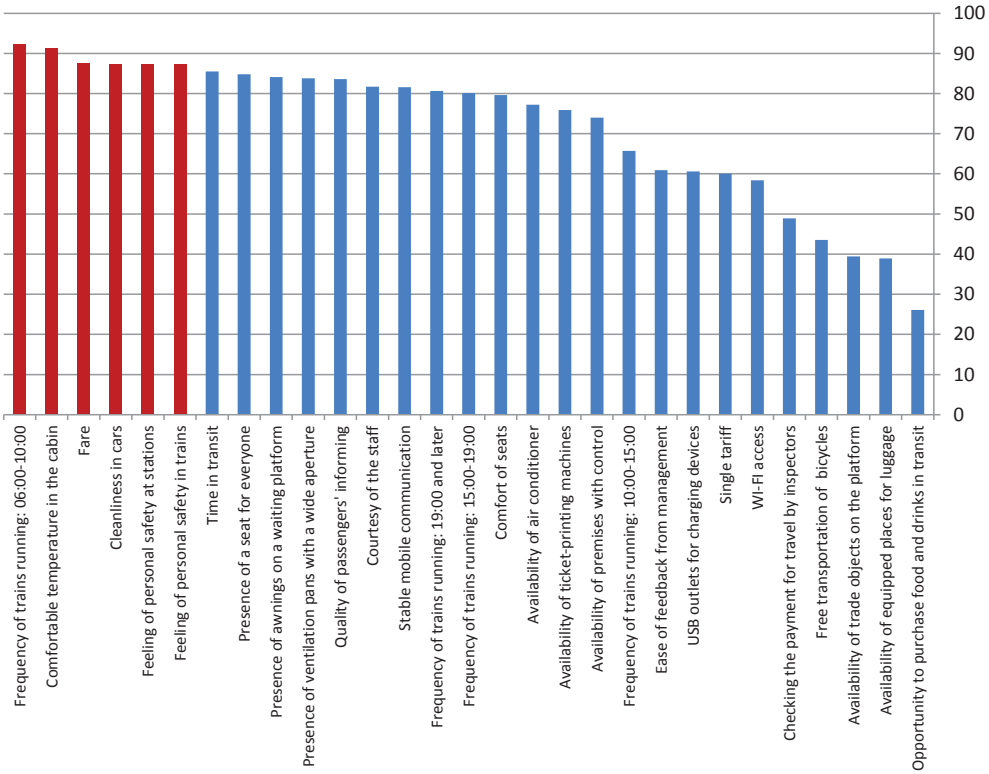
1) general impression,

2) reliability,

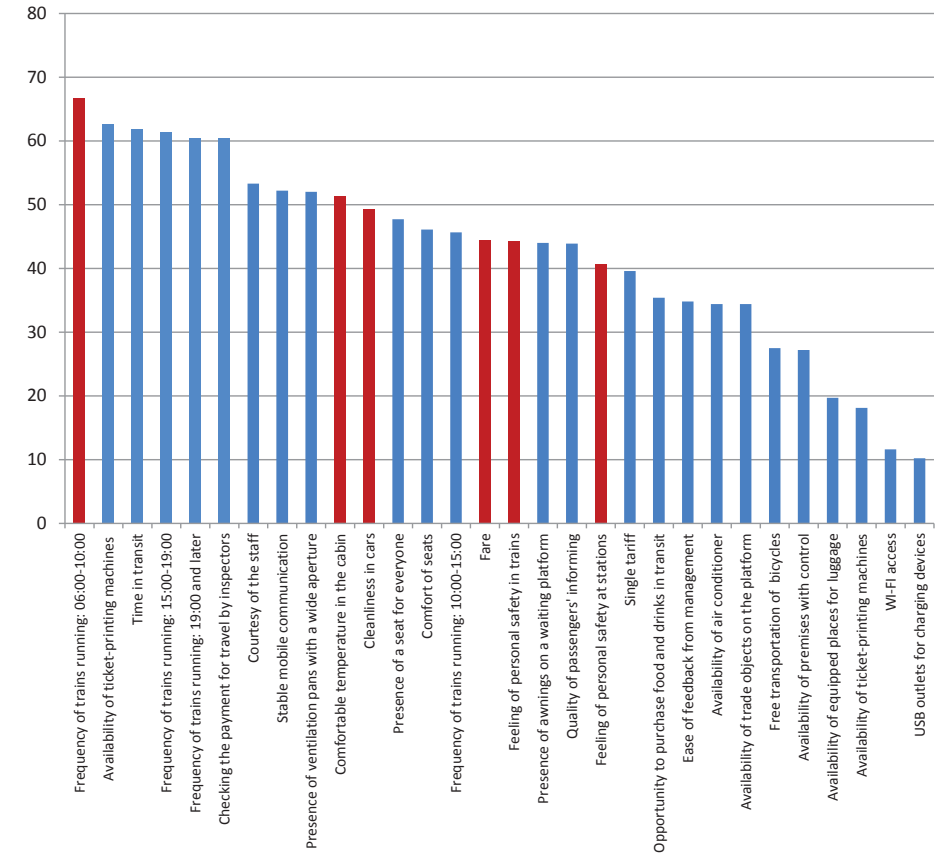
3) calmness,

4) additional parameters.

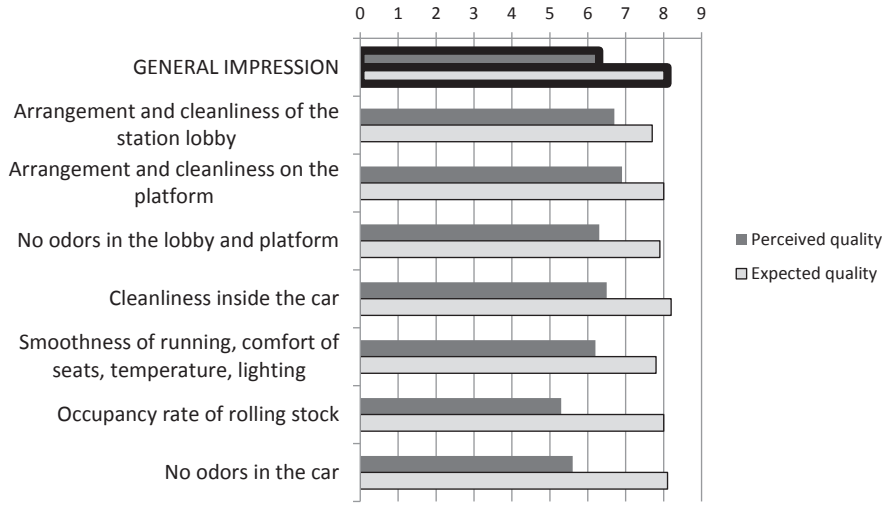
In general, the satisfaction index is highly estimated (87,5 % on average), however, two groups of factors – general impression (index 82 %) and calmness (81 %) require special attention. The results of the evaluation of the factors of these two groups are shown in Pic. 7 and 8.



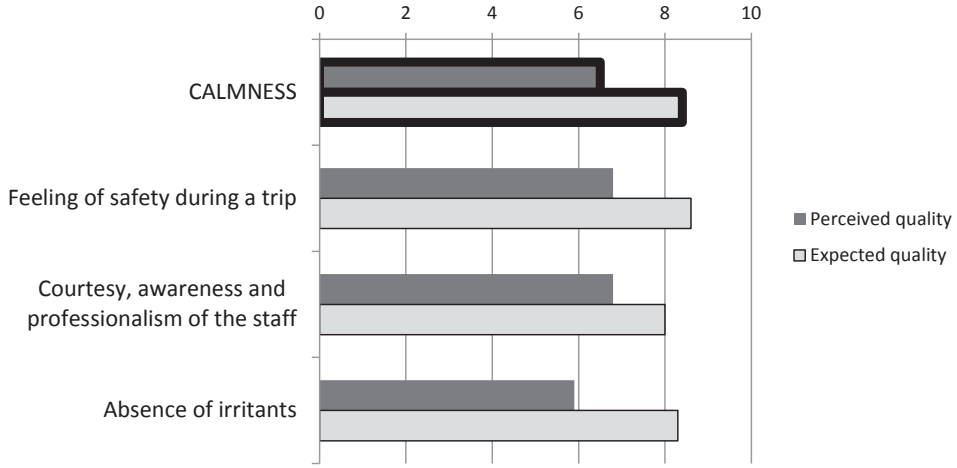
Pic. 5. Significance of criteria for a passenger.



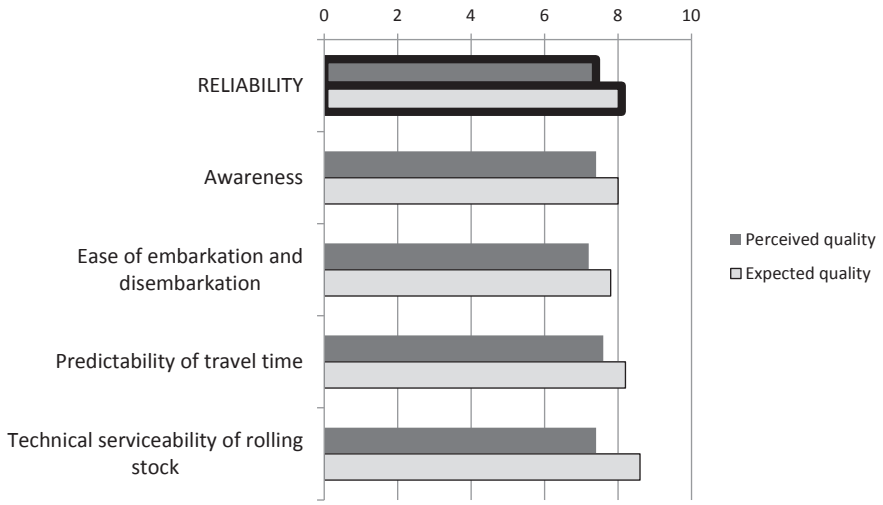
Pic. 6. Evaluation of criteria.



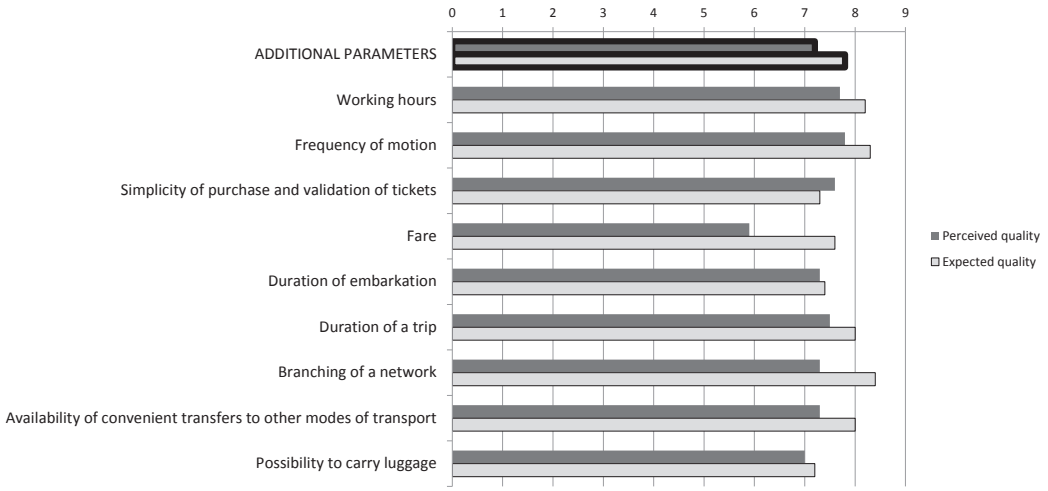
Pic. 7. The diagram of evaluation of expected and perceived quality of the group «General impression».



Pic. 8. Diagram of evaluation of expected and perceived quality of the group «Calmness».



Pic. 9. Diagram of evaluation of expected and perceived quality of the group «Reliability».



Pic. 10. The diagram of evaluation of expected and perceived quality of the group «Other parameters».

The results of assessment of the factors of the other two groups («Reliability» and «Other parameters») are in Pic. 9 and 10.

Based on the data presented, we can distinguish three factors that have the lowest level of satisfaction (in order of increasing index values):

1) occupancy rate of the rolling stock (S = 73 %);

2) absence of unpleasant smells in the train car (S = 75 %);

3) absence of irritating factors (S = 76 %).

The occupancy rate of rolling stock can be regulated, for example, by attracting passenger traffic from the Moscow Metro to suburban and urban rail transport (electric trains running within Moscow).

Two other factors are assigned to the operational group and can be influenced without significant investment. In particular, it is advisable:

1) to clean the rolling stock more often and more thoroughly, especially during the turnover of trains at the final stations;

2) not to allow passengers to travel in dirty clothes and those who are engaged in begging or unauthorized trade.

Conclusion. *Of course, one cannot deny the inevitability of investments in development of suburban railway transport and the Moscow Metro. Currently, the Moscow Central Circle is being put into operation, additional main tracks are being built on the head sections of some directions of the Moscow railway junction, the first sections of the Third transfer loop of Moscow Metro are being prepared for delivery, and the rolling stock is regularly renewed.*

However, the results of the study, which the article acquaints with, showed that at the current stage the increase in the attractiveness of public transport (in particular, suburban railway transport and the Moscow Metro) should be provided mainly through the impact on operational factors, as today there are resources to improve the quality of services provided with minimum costs. And only in those cases when it is already impossible to influence operating factors, it is advisable to resort to modernization of the infrastructure. This is a fundamental moment for the strategy of managing the transport complex of the capital city.

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