

quality criteria; road transport services; competitiveness;  
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## QUALITY CRITERIA WHEN ASSESSING COMPETITIVENESS IN ROAD TRANSPORT SERVICES

**Summary.** The paper presents the criteria of quality that ensures competitiveness of transport services, marked indicators of quality road transport service applied smoothing factor of fluctuations in the demand for automobile transport services as well as selected characteristics of comprehensive quality in road transport services.

## KRYTERIA JAKOŚCI PRZY OCENIE KONKURENCYJNOŚCI USŁUG TRANSPORTU DROGOWEGO

**Streszczenie.** W artykule przedstawiono kryteria jakości, które zapewniają konkurencyjność usług transportowych. Scharakteryzowano stosowany wskaźnik jakości usług transportu drogowego w postaci wygładzonego czynnika wahań popytu na usługi transportu samochodowego, jak również wybrano cechy jakości kompleksowych usług w zakresie transportu drogowego.

### 1. QUALITY CRITERIA FORMING THE COMPETITIVENESS IN ROAD TRANSPORT SERVICES

In recent decades, experience has shown that the extensive development and expansion of new services of road transport is based on the criteria of costs, prices and quality.

The quality of road transport services and its essential properties, are used to quantitatively assess the system of technical and economic indicators, which distinguish them from others of similar purpose, thereby, determining the degree of satisfaction of needs and demand under market conditions.

The quality of road transport services is the ability to meet the needs of a particular customer, which play a crucial role in the formation and assessment of their competitiveness [1]. For each type of car, transport services take into account specific levels of quality, recognize their methods of performing practical tasks to achieve specific goals, such as, timeliness and security of transport operations, safety of cargo, reducing the cost of the transportation process, warranty high-quality transportation of passengers, and extension of spheres of road transport services.

In a research on the criterion for quality of road transport services, we achieved the quality of transport of goods, for example, we estimated the characteristics that determine their suitability to meet the needs of shippers or consignees in the relevant transport [4], using the methods of evaluation of indicators that reflect not only the level of quality and efficiency, but also stimulate proposals for services distinctive from that of their competitors by warranty, urgency, volume, tariffs, delivery technologies, and so on.

In the study of this problem, we attempted to explain the significance of the criterion relating to the quality of services provided to consumers when assessing the competitiveness of services.

For example, the criteria of reliability of movement on time is determined by the movement of the passenger along the route. The basis of a criterion of distance inherent frequency of road transport in a certain period of time. Safety of road transport is expressed by the criterion of reliability, that is, the property of the rolling stock to perform its functions within a specified period of time. Cost assessment criteria characterizes consumer demand on road transport services through the fare amount.

In assessing the competitiveness of road transport services, the following quality criteria [7] should be considered:

- 1) The culture of service of passengers.
- 2) The necessary facilities on the way.
- 3) Speed and timeliness in delivery of goods.
- 4) Safety of goods.
- 5) Expansion of package of services.
- 6) Forwarding service, and so on.

Although, these are very important for the transportation process of quality criteria, in our opinion, they provide only a generalized criterion of the quality of service. For example, the culture of passenger service depends on many components, including: the reputation of the carrier; the condition of streets and roads; throughput; availability and operability of the linear facilities; regulation of traffic; the state of social issues related to concessional and free travel for a significant part of passengers when transporting them within a city, etc. The application, in this case, the average and weighted average estimates and estimates obtained by the survey method, as suggested by the authors [2], do not always give objective results criteria for quality of passenger service. They can be used, but only for minor items that indirectly affect the quality of transportation.

The variety of services and applications for road transport, determines the desirability of the various kinds, types and models of rolling stock needed for a specific, local climate and road conditions.

The following parameters were estimated for the quality of transport service:

- 1) Assessment of suitability of the rolling stock, the main criterion which should be under the type of traffic and services.
- 2) In accordance with established standards, market conditions may include, terms of delivery of separate kinds of the goods depending on the distance of transportation and other conditions of delivery, the regulations on ensuring safety of cargo, etc. [11].
- 3) Qualitative characteristics similar to transportation of subjects of transport activities competitors, which is necessary to study the technologies and methods of transport as well as other subjects of transport activities in the region.
- 4) Activities should be developed to address and implement them according to the requirements of user traffic and services.

In real conditions of the market of transport services, more importantly, may be the comparative characteristics of the quality criterion of road transport services performed by one subject of transport activity with measures of quality that are performed by another entity. It is important to evaluate not only the process of car transport services, but also, additional freight forwarding services provided to the consumer.

Criteria of quality of road transport services, confirm their characteristics, depending not only on operational properties and characteristics of rolling stock, technical-economic indicators when using it, but on the nature of the transport process [10].

For example, the condition of roads and traffic management affects the comfort and safety of traffic, the speed of delivery of cargoes and transportation of passengers, performance, and cost of transportation, that is, criteria describing the quality of transport services.

In determining the level of competitiveness of road transport services, special role is played by consumers. Therefore, all the elements determining the competitiveness of services should be clear to the potential client. For these purposes, some marketing techniques have been proposed in addition to

the known approaches: the tariff policy, the various presentations, ads, messages in the media and so on [4, 5].

## 2. QUALITY PARAMETERS OF ROAD TRANSPORT SERVICES

Market relations in road transport are characterized by the priority development of services and the competitiveness, which depends on numerous quality parameters and extent of their impact on the transportation process.

For example, considering the indicators timeliness of delivery, depending on a summary of their characteristics and dividing them into the following indicators:

- 1) Shipping to meet up with the deadline.
- 2) The regularity of arrival of the goods.
- 3) The urgency of the shipping.

Qualitative indicators of safety of cargo, depending on a summary of their signs can be divided into [9]:

- 1) Lossless.
- 2) Without damage.
- 3) Without loss.
- 4) Without pollution.

Cost indicators associated with the transportation process, are the main component when assessing the quality of transport services. Cost indicators include:

- 1) The unit costs of transporting goods.
- 2) Specific full cost of shipping of the cargo.
- 3) The production costs of loading and unloading operations.
- 4) Transport costs in the cost of production.

The value of certain additional costs arising from the execution of the transportation process, can be determined from the following equations [6]:

- 1) The costs due to the increase in the distances of cargo transportation, RUB:

$$R_1 = \frac{L_{ad} - L_{pd}}{q\gamma_c\beta_e} \left( C_{vc} - \frac{C_{fc}}{V_t} \right) W_Q \quad (1)$$

where:  $L_{pd}$  - planned distance runs with load, km;  $L_{ad}$  - the actual distance runs with load, km;

$W_Q$  - the volume of vehicle production, t;  $C_{vc}$  - variable costs, RUB/km;  $C_{fc}$  - fixed costs, RUB/h;  $q$  - vehicle capacity, t;  $\gamma_c$  - utilization factor of payload static;  $\beta_e$  - the coefficient of using mileage for one round trip;  $V_t$  - average technical speed, m/s.

- 2) The costs due to the mismatch of rolling stock type of cargo and nature of cargo carried, RUB:

$$R_2 = \frac{1}{\beta_e} \left\{ \frac{1}{q'\gamma'_c} \left[ C'_{vc} L_{pd} + \frac{C_{fc}}{V'_t} (L_{pd} + t'_{np} V'_t \beta'_e) \right] - \frac{1}{q\gamma_c} \left[ C_{vc} L_{pd} + \frac{C_{fc}}{V_t} (L_{pd} + t_{np} V_t \beta_e) \right] \right\} W_Q, \quad (2)$$

where:  $t_{np}$  - the idle time for loading and unloading vehicles, h;  $q; \gamma_c; V_t$  - the planned performance;

$q'; \gamma'_c; V'_t$  - the actual performance.

Based on these expressions, we noted that the costs due to the increased transport distance and the mismatch of rolling stock as well as the nature of cargo, are a function of the carrying capacity of the rolling stock, distance, speed, idle time under loading and unloading, utilization of the run of rolling stock.

These factors have a significant impact on the quality of transport services, at the same time, each of these factors is a function of many parameters affecting the level of competitiveness of services.

### 3. MATHEMATICAL TOOLS APPLIED TO SMOOTHEN OUT FLUCTUATIONS IN THE DEMAND FOR ROAD TRANSPORT SERVICES

Over a long period, the quality of road transport services was measured by the regularity of buses. Going by the opinion of authors [3, 5] assessing the level of service provision cannot be limited to one indicator.

In our opinion, this simplified method of assessing quality distorts the real situation in the organization of the motor transport service of the population. It ignores not only the many factors ensuring the quality of road transport services, but also allows you to artificially overestimate or underestimate this figure, especially on city routes. This figure was not amended, so it could be applicable only to long distance and partially on suburban routes [8].

In some conditions, when the gatherings of buses for urban and suburban routes for technical fault and other reasons, in the whole country ranges from 5 to 10 percent, and the reserve rolling stock carriers often do not have the key drivers of service quality, in our opinion, are the rhythm and frequency of bus traffic in a certain time interval. The temporal interval is characterized by variability in peak passenger flows and magically during the day periods on weekdays and weekends.

The quality of road transport services in this case will depend on the smoothing factors which can change the interval, so that passengers do not experience delay while waiting for the bus.

The smoothness of the change in headway can be achieved through active methods of Supervisory control, by replacement of buses from other routes based on capacity, changes in lead times and working hours of drivers, reducing the idle time of the bus for operational reasons, a lunch break and other methods.

For example, from 100 scheduled flights, 5 were disrupted, the regularity of the conditional will be considered as 95%. With this, in our opinion, the high regularity of the movement of buses, frequency of buses to increase in one case 5 times, and the other through the use of the smoothing factors only 1/20 times. Actually, at a high frequency of bus traffic, passengers will assess the quality of transport services in the first case, as unsatisfactory.

Based on this, the smoothing coefficient was proposed as an indicator influencing the improvement of quality of transport services, which is defined for each destination, and the carrier defined separately, for the group of routes and carriers in each prescribed time interval, as follows:

$$K_{sm} = K_{rm} K_{fm}, \quad (3)$$

where:  $K_{rm}$  - coefficient taking into account the range of motion;  $K_{fm}$  - coefficient taking into account the frequency of movement.

$$K_{rm} = \frac{I_n}{I_{fm}} \quad \text{and} \quad K_{fm} = \frac{t_{fm}}{t_n}, \quad (4)$$

in which:  $I_n$  - range of motion in each time interval according to the approved schedule, min.;  $I_{fm}$  - the actual range of motion in each time interval, min.;  $t_{fm}$  - the actual frequency of movement per unit time, flight/time units;  $t_n$  - planned frequency of movement per unit time, flight/time units.

Thus, the quality of the provided transport services is defined by the expression:

$$Y_{\kappa} = \frac{R_{fm}}{R_n} K_{sm}, \quad (5)$$

where:  $R_{fm}$  - the actual number of flights on the route within a given time period;  $R_n$  - the planned number of flights according to the approved schedule on the route within a given time period;  $K_{sm}$  - the coefficient of smoothing.

In our case, the applied synchromarketing allows you to search for the smoothing of fluctuations in the demand for transport services using the mathematical tools of marketing.

We conclude that the main factors of quality of services provided by road transport, both on individual routes and carriers as well as for a group of routes and carriers are: the greatest number of flights made; compliance with the range of motion in a given time period, according to the schedule; compliance with the frequency of movement per unit time.

#### **4. COMPLEX AND INDIVIDUAL CHARACTERISTICS OF THE QUALITY OF ROAD TRANSPORT SERVICES**

In addition to these factors regarding the quality of services in passenger traffic, select a number of complex and single characteristics, the value of which directly or indirectly affect the competitiveness of the services provided by road transport.

The most important in our opinion, are:

- 1) Availability – is achieved by the development of transport networks, the acceptability of the tariffs, the utility of passengers, the availability of rolling stock according to type and capacity.
- 2) Reliability – is achieved by the regularity of communication, frequency of movement per time unit, level and no denial of service, transport safety.
- 3) Convenience – comfort is achieved, with a capacity of service culture.
- 4) Satisfaction – minimum time is used for the trip.

In our opinion, the main indicator and particularly the influencing factors of quality of rendered services at the present stage, characterized by global motorization and a poorly developed road network, is the speed of the communication rolling stock. Its value, do not only depend on the technical characteristics of the rolling stock, but on several factors which characterizes the capacity of the road network and traffic intensity.

The creation and expansion of the network of Express and semi-Express routes, route network optimization through additional engagement of road to public transport will be a major factor in increasing the speed of communications and reduce costs time on the movement.

#### **5. CONCLUSION**

- 1) Investigated quality criteria, influencing the formation and evaluation of competitiveness of services provided by road transport, allows us to identify its specificity: the heterogeneity and hierarchy of the competitive environment. The level of competitiveness of road transport services at any given point in time is determined by the combined effects of several factors. A study and analysis of factors allow us to determine how they contribute to or hinder the achievement of the competitiveness of road transport services.

- 2) Determined cost and other indicators form the basis of a measure of quality of motor transport service.

From the point of view of the passengers, the quality of transport services depend mainly on the total amount of time for the trip. Duration of time for movement in one direction should not exceed 40 minutes in major cities and 30 minutes in the other settlements. Studies show that 43% of the total time spent on trips to cities of Russia on 22 exceed this standard.

Expensive indicators, standards and measures of quality of motor transport service, as well as the proposed overall marketing activities affecting the quality of transportation services, are a guarantee to enhancing their competitiveness.

- 3) Applied synchromarketing allows for smoothing fluctuations in demand for services, with the help of mathematical tools which also help to characterize the quality of the services provided by road transport.
- 4) The study are of great importance in the choice of directions in improving the quality and efficiency of transport services. In particular, the method of calculating the level of transport services on passenger transport allow us to evaluate their quality on the basis of the proposed indicators with the use of a smoothing factor. The costly calculations of indicators of standards of

level of transport service, a measure of the quality and efficiency of transport services and the proposed methods can be used as a basis and taken into account in the development of methodical positions on the main directions of improving the quality and efficiency of transport services in road transport.

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