METHODOLOGICAL FOUNDATIONS OF ASSESSING COMPETITIVENESS IN THE TRANSPORT SECTOR

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Abstract: This article examines the methodological foundations for assessing competitiveness in the transport network. The study analyzes key indicators of transport system efficiency, including labor productivity, freight and passenger transportation efficiency, and transport service volume. Based on expert evaluation and benchmark comparison methods, an integrated approach to assessing regional transport system competitiveness is proposed. The application of Sturges’ rule for indicator normalization and grouping is also substantiated.

Key words: transport network, competitiveness, transport system, efficiency indicators, expert evaluation, normalization, freight transportation, passenger transportation, economic efficiency.

Аннотация: В данной статье исследованы методологические основы оценки конкурентоспособности транспортной сети. Проанализированы основные показатели эффективности транспортной системы, включая производительность труда, эффективность грузовых и пассажирских перевозок, а также объем транспортных услуг. На основе методов экспертной оценки и сравнения с эталонными регионами предложен интегральный подход к оценке конкурентоспособности региональной транспортной системы. Также обосновано применение правила Стерджесса для нормализации и группировки показателей.

Ключевые слова: транспортная сеть, конкурентоспособность, транспортная система, показатели эффективности, экспертная оценка,

нормализация, грузоперевозки, пассажирские перевозки, экономическая эффективность.

The competitiveness of the transport network is one of the important factors of modern economic and social development. A competitive transport system serves to improve interregional communications, increase economic activity and improve the quality of life of the population. A systematic approach is necessary to assess such systems and improve their efficiency, which can be carried out on the basis of specific indicators, taking into account many factors. A systematic approach to indicators when assessing the competitiveness of the transport network is an important tool for improving infrastructure efficiency, analyzing market dynamics and promoting socio-economic development.

The issues of competitiveness in the transport network have been studied in the studies of many foreign scholars. In particular, scholars such as David Boyce and Joseph B. Lemaire studied the number of transport enterprises in assessing competition in transport systems, conducted research on how to divide the market and how to increase competition. They considered the number of transport enterprises as the main tool for measuring market competition.

Scholars such as Peter Nijkamp and Kenneth Button studied the labor resources of transport systems and the efficiency of enterprises. These scholars use the labor force of transport enterprises to measure the competitiveness of enterprises. In their studies, the number and efficiency of workers were studied in terms of the operation and competitiveness of the system.

Scientists such as D.T. Gavrilov and Y.P. Vasiliev analyzed the distance expansion of transport systems and road infrastructure. They considered the impact of infrastructure by studying the routes traveled by the transport system and the

competitiveness of the system. This indicator indicates the efficiency and competitiveness of transport networks.

Scientists such as C.A. Sims and J.F. Kain analyzed the impact of freight transport on competitiveness. This indicator is related to the volume of freight transport and the economic efficiency of the system. They considered the volume of freight transport in transport systems as an indicator of competitiveness and efficiency.

Scientists such as J.R. McNally and D.A. Hensher studied the volume of transport services and their impact. This indicator indicates the efficiency and quality of transport services. An increase in the volume of services is necessary to create competitive systems and to remain in a good position in the market.

Scientists such as J.L. Hellerstein and G.S. Bobinsky studied the volume of passenger traffic and its impact on the transport system. The volume of passenger traffic and its place in the system indicate the development and competitiveness of the transport system. This indicator helps to increase the social and economic importance of transport.

Summarizing the results of the above studies, we believe that it is appropriate to assess the competitiveness of the transport system by the following indicators:

- Number of transport enterprises;
- Number of employees;
- Efficiency indicators;
- Distance traveled;
- Cargo transportation volume;
- Volume of transport services;
- Passenger transportation volume;

These indicators have been systematized and reflected in Table 1. It reflects the main indicators for assessing the competitiveness of the regional transport system, their calculation formulas, names and meanings.

Table 1

A system of indicators for assessing the competitiveness of transport system enterprises[1]

Indicator name	**Formula**	**Essence**
Density of transport enterprises	$Z_k = \frac{N_k}{A}$	The number of transport enterprises per 1 km² of area in the region. Where: N_k- the number of transport enterprises, A - the area of the region (km²).
Labor productivity	$E_h = \frac{H}{N_i}$	N_i – transport sohasidagi ishchilar soni. Average volume of services provided per worker. Where: H – volume of services provided (in billion soums). N_i – number of workers in the transport sector.
Shipping efficiency	$E_y = \frac{V_y}{L}$	The volume of transported cargo per 1 unit of distance traveled. Where: V_y– total volume of transported cargo (tons), L – total distance traveled
Passenger transport efficiency	$E_p = \frac{P}{L}$	The number of passengers transported per 1 unit of distance traveled. Where: P is the number of passengers transported, L is the total distance traveled.
Efficiency of transport enterprises	$E_k = \frac{H}{N_k}$	The average volume of services provided per transport enterprise.

[1] it was formed by the author based on various sources.

		Where: H – volume of services provided (in billion soums), N_k– number of transport enterprises.
Number of transport enterprises' transports per capita	$K = \frac{N_{avto}}{N_{aholi}}$	The number of transport enterprises' transports per capita. Here: N_{avto} - the number of transport enterprises' transports.
Marginal efficiency coefficient by volume of transport services	$b = \frac{\Delta H}{\Delta N_{avto}}$	This is an indicator that represents the average growth in the volume of transport services, with the number of vehicles increasing by one.

The indicators presented in Table 1 allow for a comprehensive assessment of the efficiency and competitiveness of the transport system in the region. The large number of such indicators creates the need to determine the competitiveness of the regional transport system in a single value. This issue can be solved through a methodological solution.

It is known that the reference region is a region with high efficiency. When comparing the competitiveness of the transport system across regions, the ratio of these indicators to the value of the reference region gives the degree of its lagging behind the maximum.

Also, in a methodological approach to competitiveness, it is possible to determine the level of significance of the relative indicator through expert assessment and obtain more accurate competitiveness coefficients of the transport system. To assess the

efficiency of transport enterprises, the scoring method can be implemented as follows, using the weight coefficients determined by the expert assessment method:

$$S = \sum_{i=1}^{n} w_i \cdot \frac{I_i}{I_{\max}} \qquad (1)$$

where: S - the overall score of the transport enterprise; I_i - the value of the indicator; I_{max}- the value of the highest indicator in the region; w_i- the weight coefficient;

Each indicator is normalized to the highest value and a general score is obtained based on its significance level.

It allows assessing the state of transport enterprises in the region relative to the best indicator.

Using (1), it is possible to identify the strengths and weaknesses of the region and develop specific measures for them.

In addition to the above indicators, some relative indicators can also be calculated for the indicators of the regional transport system. They allow for comparison of the region with other regions and assessment of efficiency against benchmark levels (Table 2).

Table 2

Indicators for assessing the competitiveness of the regional transport network

Indicator name	**Formula**	**Essence**
Relative density of transport enterprises	$Z_n = \frac{Z_k}{Z_{k\_o}}$	Comparison of the density of transport enterprises of the region with the reference region Z_{k_o}.
Relative indicator of worker efficiency	$E_{h\_n} = \frac{E_h}{E_{h\_o}}$	Compare the area's labor efficiency with the reference area E_{h_o}.

Relative indicator of freight efficiency	$E_{y\_n} = \frac{E_y}{E_{y\_o}}$	Comparison of transportation efficiency with the reference area E_{y_o}.
Relative indicator of passenger transport efficiency	$E_{p\_n} = \frac{E_p}{E_{p\_o}}$	Comparison of passenger transport efficiency with the reference area E_{p_o}
Relative efficiency of transport enterprises	$E_{k\_n} = \frac{E_k}{E_{k\_o}}$	Compare the efficiency of each enterprise with the reference area E_{k_o}
Relative indicator of the number of vehicles of transport enterprises per capita	$K_{k\_n} = \frac{K_k}{K_{k\_o}}$	Comparison of the number of vehicles of transport enterprises per capita with the reference area K_{k_o}
Relative indicator of the volume of relative services per transport	$S_{k\_n} = \frac{S_k}{S_{k\_o}}$	Comparison of the relative volume of services per transport with the reference areaS_{k_o}
Relative indicator of the marginal efficiency coefficient by volume of transport services	$b_{k\_n} = \frac{b_k}{b_{k\_0}}$	The ratio of the average increase in the volume of transport services to the reference area when the number of vehicles increases by one unit

$Z_{k_o}, E_{h_o}, E_{y_o}, E_{p\_o}$, $E_{k_o}, I_{t_o}, K_{k\_o}, b_{k\_0}$ in Table 2 are the highest coefficients at the reference regional or general level.

The rules of quality management play an important role in implementing quality management, improvement and optimization processes in social, economic, technological and scientific systems, and according to this rule, the number of experts in the group is considered to be from 7 to 14 people. Based on the rule, a group of experts with many years of professional and practical experience in the field can be formed, consisting of 10 people.

The ratings given by experts for each indicator and their average are calculated.

Sturgess' rule can be used to construct a standardized efficiency coefficient scale for the indicators representing the assessed competitiveness. This method is used to calculate the number of groups.

In this method, the number of groups k and the interval width h are determined as follows:

$$k = 1 + \log_2 n \quad (2)$$

$$h = \frac{maksimum\ value - minimum\ value}{k} \quad (3)$$

As a result, it is possible to obtain standardized values for several indicators and multiply and sum them by expert ratings, thereby creating an opportunity to compare the competitiveness of the transport system.

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