ANALYSIS OF TRANSPORT SYSTEM PERFORMANCE INDICATORS

Komilov A. A.

Doctoral Student of Graduate School of Business and Entrepreneurship

Abstract

The main purpose of this study is to comprehensively analyze the performance indicators of the transport system. By evaluating various key performance indicators, it is possible to gain a deeper understanding of the system's operational efficiency, reliability, security, and overall industry performance.

Keywords: transport, efficiency indicators, analysis.

Introduction

The transport system plays a decisive role in the socio-economic development of the country. It serves as a basis for the movement of goods, services and people, promotes trade, strengthens connections and supports economic growth. To ensure the efficient operation of the transport system, it is very important to evaluate and analyze the performance indicators of the sector. This analysis provides valuable insights into the system's strengths, weaknesses, and potential areas for improvement.

The analysis of performance indicators involves a multifaceted approach, taking into account factors such as transport infrastructure, traffic flow, quality of service, energy consumption, environmental impact and economic sustainability.

Literature Review

The main indicators of the transport system have been analyzed in depth by a number of scientists, and below we will consider the scientific works of these scientists.

Minnullina, Minnullin, Kopytova and Larkina, (2020) [1], in their research, propose a set of universal indicators for evaluating the efficiency of transport enterprises.

It is proposed to use the following set of indicators in evaluating the efficiency of transport activities [2]:

1. indicators of financial stability:

- the current ratio of the balance;

- implementation of the given plan for the provision of services;

- the dynamics of income from the provision of services;

2. Indicators of the level of innovative activity of the enterprise:

- expanding (or updating) the list of provided services;

- the existence of a development program for a period of at least three years;

- level of use of modern technologies in service provision

3. Organizational development indicators of the enterprise:

- bringing the average salary of workers of the relevant category to the average salary in the region;

- compliance with the terms of training of employees directly providing transport services;

- level of development of corporate culture;

4. Indicators of the personnel management system:

- staff turnover rate;

- coefficient of improvement of workers' qualifications;

- justified consumer complaints;

Taking into account the indicators listed above, the evaluation of the efficiency of the enterprise is carried out in the following order:
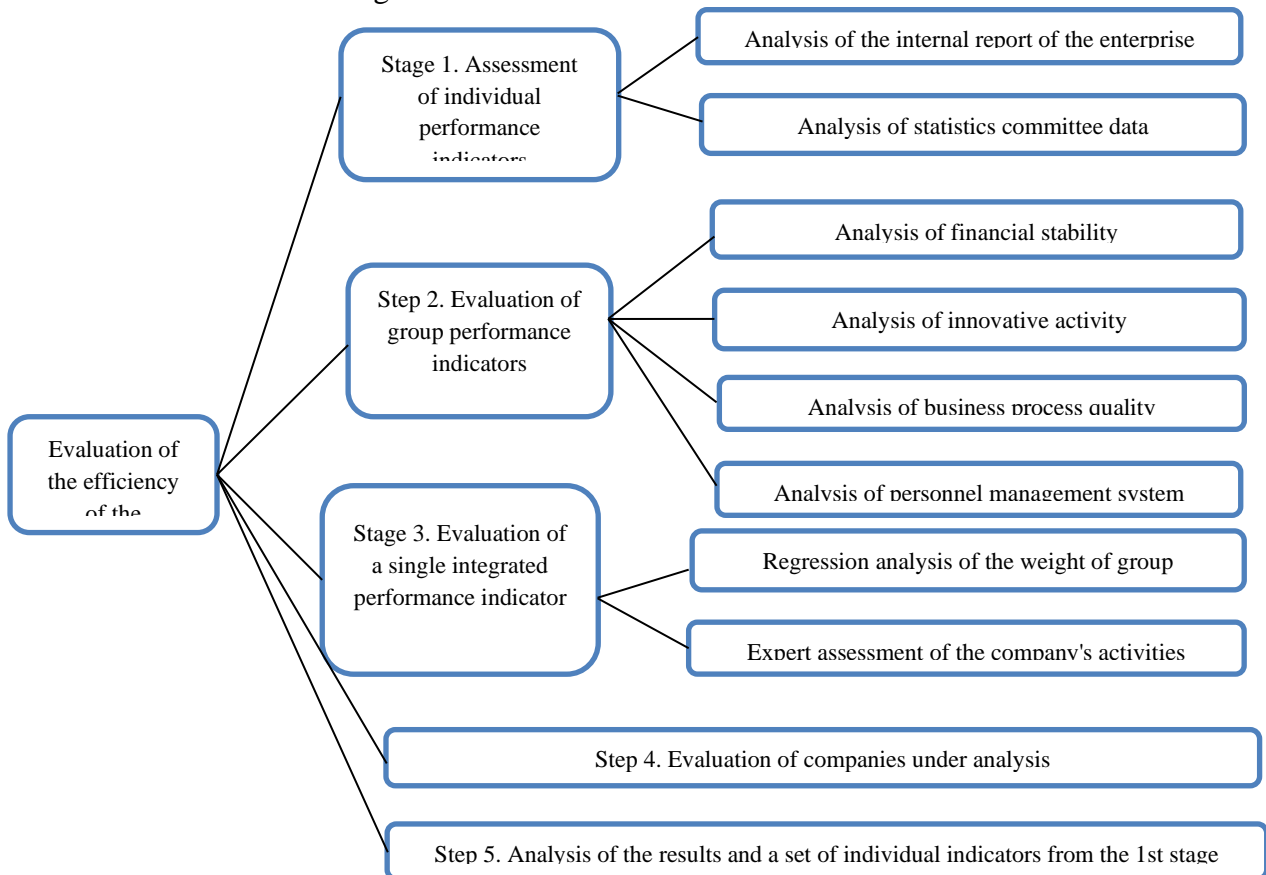
Source: Minnullina, Minnullin, Kopytova va Larkina, (2020) [1]

In the above drawing, the algorithm for evaluating the activity of the transport enterprise in 5 stages is presented. In the first and second stages, individual and group efficiency indicators of the enterprise are determined, respectively. The values of the group indicators are calculated as the arithmetic mean of the sum of the values of the individual indicators of the respective company. Then, the single integrated performance indicators are evaluated. In this case, the weight of each indicator is determined through regression or correlation analysis of the indicators determined at the previous stage. Based on the obtained results, the analyzed enterprises are evaluated.

Adris Pudra (2013) [2], in his scientific work, analyzes the operation of the public transport system in the city. Importance Performance Analysis (IPA) and Customer Satisfaction Index (CSI) methods are used to analyze the performance of public transport services implemented in this scientific work. The main principle of the IPA method is the multiplicative weights of each

respondent's service quality satisfaction and importance levels to obtain the average activity index of each parameter. CSI is a method of determining how important the attributes of a product or service are to general respondents and how satisfied they are with them. Using IPA and CSI methods, average importance rating, average satisfaction rating, parameter weight factor, parameter weight rating are determined. Then, a regression analysis is performed to determine the effect of the level of customer or user satisfaction with the service on the efficiency of the enterprise.

$$Y = \beta X + e$$

X = Level of satisfaction with the service

Y = Enterprise efficiency

e = statistical measurement error

β = Regression weight (unstandardized beta regression coefficient)

In addition, the reliability of the data and results used for regression is checked by conducting a series of tests. Data reliability test - if the arithmetic mean of the data differs from each data by 3 standard deviations, this data is not included in the accounting books. Because extreme values are rarely observed and have a great influence on the average value, and the results are incorrect. A linearity test is a test that determines whether the relationship between variables is linear or otherwise. Goodness of fit test is used to measure the level of agreement between the selected model and the provided data.

The results show that the performance indicators of Makassar city are not satisfied with the public accessibility, affordability and effective integration indicators. The biggest differences are efficiency indicator (64.69), accessibility (66.39) and was in low pollution (67.59) indicators. Based on the CSI value for public transport services in Makassar city is 0.53, which is still considered lower than the standard value of CSI 0.81 - 1.00.

Based on SEM analysis, Y = 0.488 X + e regression results, service satisfaction estimated value is positive and is 0.488, which means that the level of satisfaction of passengers with public transport service in Makassar city has a positive effect on the performance of public transport [2].

Gurjar, Agarwal and Jain (2016) analyze the evaluation of public transport performance based on user opinion. The easiest and most convenient way to adapt to the demands and changes in the market is to study the opinion of customers and analyze it [3]. A 4-step methodology is presented for this. The first step is to determine the most appropriate performance indicators according to the user's opinion to evaluate the comparative performance of the public transport system. In the second stage, these determined indicators are evaluated. In the next step, the relative weights of the main efficiency indicators determined using the Fuzzy AHP method are determined. Finally, a user-perceived performance index (CUPI) is developed. So, based on 3 main criteria according to users' opinion, 6 efficiency indicators are created [3].
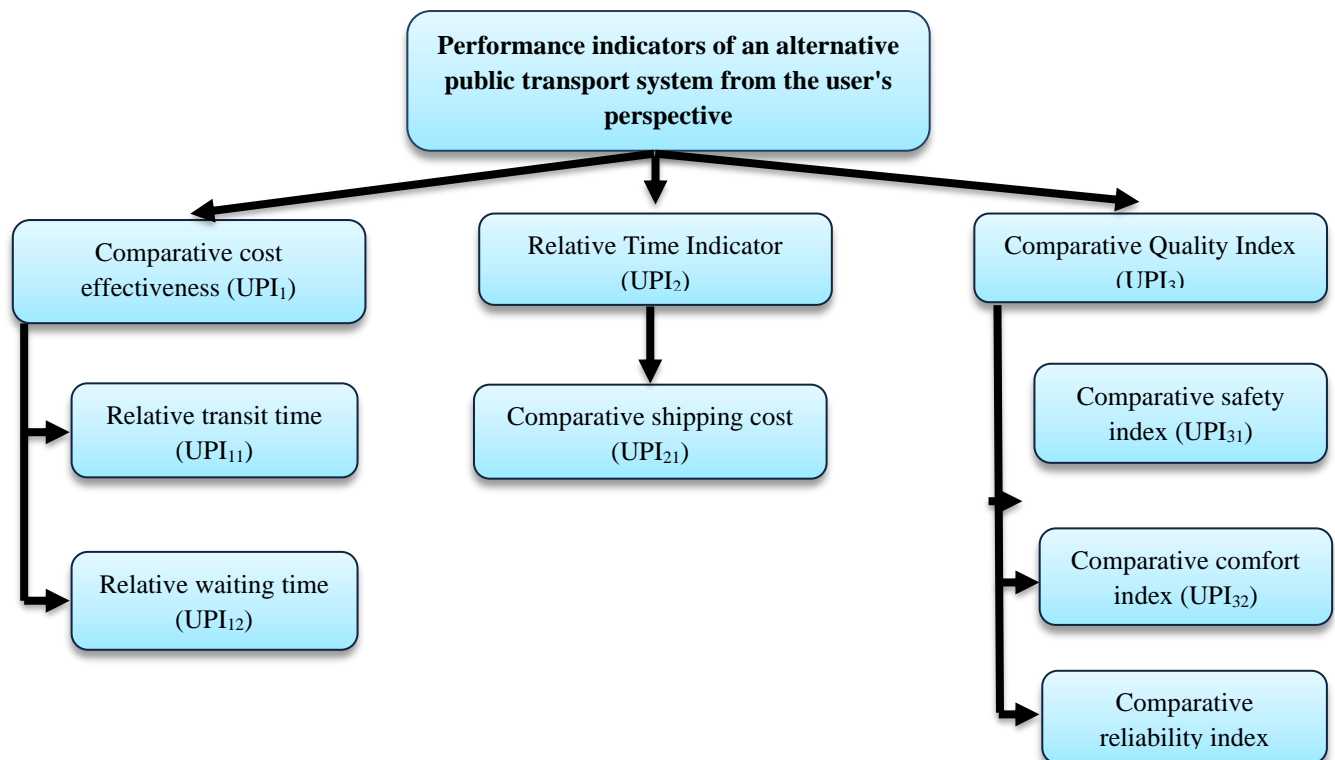
Source: Gurjar, Agarval va Jain (2016) [3].

In the next step, the relative weights of the main performance indicators are determined by the Fuzzy AHP method using the opinion research of passengers and transport experts. The FAHP method is used to calculate the weights of key criteria and key performance indicators. Arithmetic average values are used to coordinate the Fuzzy weights of decision makers. In the sequence presented above, the authors achieve an assessment of the effectiveness of public transport activities.

In addition, the World Bank publishes the Logistics Performance Index (LPI) every 2-5 years. This index evaluates the efficiency of freight transportation in 140 countries of the world. In this case, 6 main efficiency indicators are taken as criteria [4].

1.   Customs score
2.   Infrastructure score
3.   International shipments score
4.   Logistics competence and quality score
5.   Timeliness score
6.   Tracking and tracing score

The evaluation method is carried out by involving experts from countries with limited port and landlocked countries and countries with low, middle and high lifestyles and conducting surveys. The average arithmetical value of the sum of each criterion constitutes the entire logistics efficiency index of the country.

Results

The analyzes of transport system efficiency indicators by several scientists and researchers were considered above. The purpose of analyzing the performance indicators of the transport system is to know how stable the transport system is and how resistant it is to various extreme events and shocks. For this, it is necessary to select performance indicators on a wider scale and analyze them. For example, if the operating efficiency indicators of a transport service company are within the required range, but financially it does not have enough liquid assets to cover short-term debts, this can cause huge problems. Or, while the financial results are good, the quality of service may not satisfy the users. Therefore, when analyzing the activities of transport enterprises, it is appropriate to select performance indicators based on the right criteria and analyze them from a general perspective.

Financial indicators. Financial indicators are one of the most important and main performance indicators from the analysis of the activity of any enterprise. The source of financial indicators is the company's profit and loss, balance sheet and cash flow reports. Financial indicators are also divided into several groups. Here are some key financial metrics:

1. Liquidity indicators. The two main liquidity indicators are: Current ratio and Quick ratio

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current liabilities}}$$

$$Quick\ ratio = \frac{Cash}{Current\ liabilities}$$

The current ratio shows the company's ability to pay short-term or up to one-year obligations. If this indicator is greater than one, it means that the company can pay all its short-term obligations, and vice versa, if this indicator is less than one, it means that the company is having problems paying its short-term obligations.

1. Net Profit Margin: it shows what percentage of a company's revenue is converted into net profit and is a very important financial indicator.

$$\text{Net profit margin} = \frac{R - COGS - E - I - T}{R} * 100$$

R - Revenue

COGS – Cost of Goods Sold

E – administrative and other expenses

I – interest expenses

T – paid taxes

1. *Debt ratio*: This indicator shows how independent the enterprise is. When the ratio is equal to 1 (100%), the financial independence of the enterprise is considered below normal, because the enterprise will have to sell all its existing assets to pay off its existing debts. A company that does not have any assets cannot continue its activities. In enterprises with normal financial independence, this ratio is ideally equal to 0.5 (50%).

$$\text{Debt ratio} = \frac{\text{Total debt}}{\text{Total assets}}$$

Operational indicators:

1.   1. Travel time: This indicator measures the time spent traveling between two points. It helps to evaluate the efficiency of the transportation system in terms of reducing travel time and improving the overall travel experience.

$$\text{Average travel time} = \frac{\textit{Total travel time}}{\textit{Total number of trips}}$$

2.   Reliability: Reliability refers to the consistency and predictability of travel times. It measures how often delays or outages occur and their impact on users. This indicator is very important for evaluating the reliability of the transport system.

$$\text{Variability of travel time} = \frac{\text{Standard deviation of travel time}}{\text{Average travel time}}$$

3.   Accessibility: Accessibility measures the ease with which people can reach their desired destinations on a transportation system. It takes into account factors such as the proximity of vehicles, the availability of transit options, and the connection between different modes of transportation.

$$\text{Connectivity index} = \frac{\text{The number of addresses that can be accessed in a given time}}{\text{Total number of addresses}}$$

4.   Safety: Safety measures are aimed at preventing accidents and injuries in the transportation system. This includes tracking indicators such as accidents, fatalities and injuries per distance travelled.

$$\text{Accident rate} = \frac{\text{Number of accidents}}{\text{Distance traveled or number of vehicles}}$$

5.   Environmental impact: Environmental indicators measure the ecological footprint of a transport system. They measure indicators such as carbon emissions, air pollution levels, noise levels and the system's contribution to sustainable development.

$$\text{Carbon emissions per unit distance} = \frac{\text{Total carbon emissions}}{\textit{Distance traveled}}$$

In addition, it is possible to use the indicators of the logistics efficiency index of the World Bank for the transportation sector of the transport system.

There is another efficiency indicator that cannot be left out. It is necessary to take into account the opinions and requirements of users of transport services, regardless of whether the transport system is a passenger transport or cargo transport sector. The demand for transport system

services is created by users, and the simplest way to adapt to market demand and notice changes in it in time is to communicate with users and improve the quality of service based on their demands and offers. So, as a result of the studies, the performance indicators of the proposed transport activity can be seen more clearly in the following diagram:
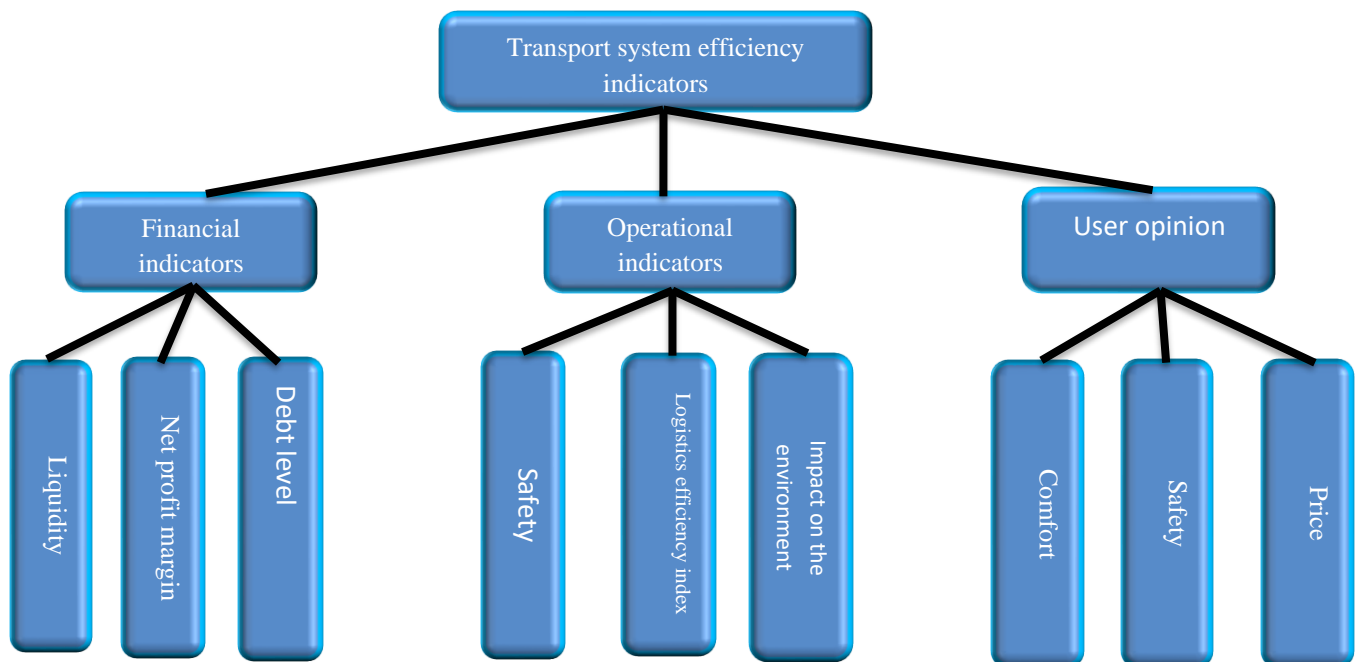
Conclusion

To sum up, in determining the efficiency of transport services, mainly 3 criteria will help to analyze the activities of this sector more broadly and get more accurate results. These are indicators formed on the basis of financial indicators, operational indicators and opinions of users of the transport company.

References

1. Minnullina, Anna & Minnullin, Ruslan & Kopytova, Anna & Larkina, Alla. (2020). Assessment of transport company activities based on calculation of unified integral indicator. IOP Conference Series: Materials Science and Engineering. 918. 012215. 10.1088/1757-899X/918/1/012215.
2. Putra, Adris. (2013). Transportation System Performance Analysis Urban Area Public Transport. 2. 1-15.
3. Jitendra Gurjar and K. Agarwal and K. Jain (2016). Performance evaluation of public transport system from user point of view. International Journal of Advanced Information Science and Technology. DOI:10.15693/ijaist/2016.v5i7.1-11
4. World bank report (2023). Logistics performance index.
5. Išoraitė, Margarita. (2005). Analysis of transport performance indicators. TRANSPORT. 20. 111-116. 10.3846/16484142.2005.9638006.