

Assessment of the Transport-Logistics Efficiency of Business Entities Komoliddin Matkarimov ^{a)}

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Abstract: The present study explores the significance of transport logistics for enterprises, analyzes the opinions of researchers on determining the efficiency of logistics systems, and proposes criteria and indicators for assessing an enterprise's logistics system. Additionally, a general algorithm for evaluating the efficiency of logistics services is suggested.

Keywords: logistics, transport logistics, efficiency, subsystem, indicator, metrics, tactics, strategy, cost.

INTRODUCTION

Determining the efficiency of transport-logistics activities of business entities is one of the key tasks in forming a logistics strategy. The relevance of studying logistics efficiency from both scientific and practical perspectives lies in the development of effective indicators to evaluate the state of logistics operations. Such a set of indicators is essential for creating management mechanisms for the elements of transport-logistics systems for business entities.

The efficiency of a logistics system, in essence, is an indicator (or a group of indicators) used to describe the quality of the logistics system's performance at a given level of logistics costs. From the consumer's perspective, who represents the final link in the logistics chain, efficiency is determined by two key indicators: the quality of service provided and the cost, both of which reflect the logistics expenses [1].

METHODS

The study of the general characteristics and relationships of "transport-logistics efficiency" allows the authors to conclude that it is determined based on the interrelationship between the achieved outcome (the effectiveness of applying the logistics approach) and the resources utilized (logistics costs).

According to L. E. Basovsky, to determine the efficiency of a logistics system as a holistic entity, the logistics costs or profit generated in the supply chain during the movement (transportation) of the material flow can be considered as a universal parameter [2].

A. P. Tyapukhin, however, proposed a fundamentally different approach to determining the efficiency of an enterprise's logistics activities. His approach is based on the ratio of financial results and costs associated with specific material flows resulting from the execution of certain commercial operations by the business entity, and it involves considering the concept of the efficiency of the enterprise's logistics system [3].

In V. I. Margunov's research [4], a methodology for evaluating the logistics system of the retail trade network is presented. According to the author, the concept,

techniques, methods, and principles of research and methodological approaches used to assess the level of development of logistics systems in retail trade networks in different regions of the country should be considered as a comprehensive set. The researcher proposes the following sequence of actions for the methodology of evaluating the logistics system of the retail trade network:

1. The concept of studying the logistics system of the retail trade network.
2. The principles of researching the logistics system of the retail trade network.
3. The methods of researching the logistics system of the retail trade network.
4. A methodological approach to evaluating the logistics system of the retail trade network in the regions of the country.

A. A. Gaydaenko proposes evaluating the efficiency of the logistics system through the lens of economic benefits in individual subsystems and the attainment of a synergetic effect throughout the entire system. In research on assessing logistics efficiency, the most widespread approaches are those based on index evaluations of the level of logistics development within an enterprise. For example, A. A. Gaydaenko suggested evaluating logistics efficiency in a very general and flexible manner—from the perspective of achieving the goals set by the logistics system [5]. In A. A. Kanken's research, the evaluation of logistics efficiency is aimed at determining the degree of utilization of logistics potential by calculating the overall index of logistics infrastructure development [6]. I. M. Baskov also proposed assessing the development of a micrologistics system using the index method. He proposed conducting the evaluation based on a set of marketing-logistics indicators that include four groups of indices: market opportunity growth, flexibility, productivity, reliability, and efficiency [7].

Empirical studies conducted by A. N. Antonova and G. A. Abramova reveal that entrepreneurs often assess the state and development of logistics within an enterprise based on the warehouse space and freight volume, focusing primarily on quantitative indicators. They tend to overlook the economic efficiency of utilizing existing logistics systems. In this context, the authors categorize the indicators related to evaluating the contribution of logistics to company performance as follows: indicators describing the logistics system (space, capacity, throughput, quantity) and indicators describing the performance of the logistics system (efficiency, productivity, reliability, flexibility) [8].

Some researchers have proposed the issue of optimizing the placement of warehouses where goods are stored in order to reduce logistics costs and improve the efficiency of transport logistics [9].

RESULTS AND DISCUSSION

It is proposed by researchers to describe the efficiency, productivity, reliability and flexibility of the logistics system using a number of indicators (Table 1).

Table 1. Evaluation indicators of the logistics system of the enterprise

Evaluation criteria	Indicators
Productivity of logistics system	Number of orders per employee
	The number of logistics operations per employee
	Average time to complete a logistics operation
Reliability of the logistics system	Reliability of delivery
	The possibility of a deficit
	Quality of delivery
Efficiency of logistics system	Turnover of logistics assets
	Use of facilities of logistics facilities
	Profitability of investments involved in logistics infrastructure
	Stock turnover
	Duration of one cycle
	Share of logistics costs in total costs
	Profitability of supply channels
Flexibility of logistics system	Order fulfillment flexibility
	Flexibility of payment for services

It should be noted that in studies conducted by various authors, insufficient attention is paid to the general, partial, specific, and relative characteristics of individual indicators used to assess the efficiency of micrologistics systems. Moreover, the existing methods do not adequately consider the objectivity of accounting for the disproportionality of indices and index groups in integral index analysis, or such analysis is not conducted at all.

In the process of evaluating the efficiency of enterprise logistics, both the indicators that describe the logistics system itself and those that characterize its performance must be considered. Some of these indicators (specific) reflect the efficiency of individual components of logistics activities, while others (general) describe the development of the entire logistics system. The general and specific indicators for evaluating the efficiency of an enterprise's logistics activities are presented in Table 2.

Table 2. General and private indicators of the evaluation of the efficiency of the logistics activity of the enterprise

System of performance indicators of logistics activity	
General indicators	Private indicators
-level of logistics competitiveness; -level of logistics potential; - reimbursement of logistics costs (profitability).	Group of organizational and technological indicators. Level: speed, reliability, productivity, quality, rhythm, turnover.
	Group of infrastructure-object indicators. Level: capacity, throughput, wear, capacity utilization, serviceability.

Groups of specific indicators are tied to the field of activity and specialization of a particular enterprise. At the micro level, logistics efficiency can be characterized by indicators that are difficult to measure precisely, and accordingly, only approximate or relative quantitative assessments can be obtained.

One of the key methodological principles of the logistics concept applied in the operations of enterprises is the use of a systems approach. The essence of the systems approach lies in considering the components of the logistics system as a unified, integrated entity. This approach allows us to view the object under study as a complex of interrelated subsystems, unified by a common purpose and the existence of both external and internal connections, while also ensuring the effective development of the competitive environment [10].

According to researchers, the process of evaluating the efficiency of logistics activities should aim to address four main tasks:

- monitoring logistics operations;
- controlling the process of providing transport and logistics services;
- operational management based on identified trends;
- developing tactical and strategic measures for improving the logistics process in the future.

When developing a system for evaluating the efficiency of logistics activities, it is essential to focus on the future needs of its users. Accordingly, we identify the principles that should form the basis of the system for evaluating the efficiency of logistics activities in enterprises:

1) reliability – the input data must be accessible to everyone, the calculation procedure and its essence should be clear, and widely accepted indicators should be used;

2) comprehensiveness – various aspects of logistics activities must be fully taken into account;

3) practical applicability – the evaluation system should be adapted for use in enterprise operations. The results obtained should form the basis for generating proposals and indicate ways to improve the current situation

4) clarity – graphic tools should be used as widely as possible to enable full understanding of the results

5) accuracy – the results obtained should not allow for ambiguous interpretations

6) universality – the evaluation system should be adaptable to the conditions of different enterprises, while fully accounting for their specific characteristics.

By summarizing the opinions of researchers, the general sequence for evaluating the efficiency of logistics services can be proposed as follows.

Let's consider the steps of the proposed algorithm in detail.

The selection of evaluation objects should be carried out according to the needs of the evaluation. The following logistics subsystems can be considered as evaluation objects:

- supply subsystem
- storage subsystem

- transportation subsystem
- production subsystem
- sales (distribution) subsystem
- information subsystem.

Identifying the main groups of indicators for each selected subsystem. As mentioned earlier, indicators should be divided into general (universal for enterprises in various fields) and specific (characteristic of the unique conditions of the enterprise). Enterprises should use commonly accepted and widely spread indicators, based on which decisions about the efficiency of the enterprise's logistics activities are made.

According to the authors, the development of an evaluation indicators system should be implemented step-by-step:

- 1) formulating the enterprise's strategic goals;
- 2) identifying cause-and-effect relationships between the strategic and tactical goals of the enterprise;
- 3) selecting indicators and determining target values;
- 4) identifying the interrelationship of the indicators with the business processes in the enterprise;
- 5) developing tactical and strategic measures.

The conducted studies allow the authors to determine that the performance indicators of logistics activities can be direct or indirect, absolute or relative. Indirect indicators are mainly associated with financial metrics, such as profitability. Direct indicators are more suitable for analyzing the causes of situations in the logistics system and for making management decisions. These include the following: transportation distance, inventory turnover rate, number of unfulfilled orders, and the number of delivery condition violations [5].

Absolute indicators encompass both individual (e.g., sales volume) and overall logistics activity indicators (balance sheet indicators). The relative indicators of logistics activities can be conditionally divided into comparative indicators (the ratio of parameter values to the total number of objects), interrelated indicators of logistics activities (the interdependence of various quantities), and indices (the ratio of identical quantities, where the denominator uses a base value).

The selection of evaluation indicators is determined by the specific characteristics of building a company's logistics system. Thus, the supply subsystem will have specific indicators for production and commercial enterprises. For service organizations (including transport companies), the role of this component is minimized in relation to other subsystems. Various indicators also characterize the production and transport subsystems. To make the most reasonable choice of evaluation indicators, it is advisable to systematize them according to the specific features of the company's activities. Table 3 provides a classification of the main indicators of the logistics subsystems for production, commercial, and transport companies.

Table 3. Classification of evaluation indicators for assessing the efficiency of logistics subsystems based on the specific characteristics of the company's activities.

logistics subsystems	Manufacturing Enterprises	Trading Enterprises	Transport Enterprises
Supply Subsystem	<ul style="list-style-type: none"> - supply component lead time; - insurance stocks; - order lead time based on supplier's location and transportation features. 	<ul style="list-style-type: none"> - time required to deliver goods to buyers; - delivery time based on ordering processes. 	<ul style="list-style-type: none"> - processing time for orders received; - duration for transporting goods to customers.
Warehouse Subsystem	<ul style="list-style-type: none"> - Inventory turnover rate; - reserve levels for production materials; - storage utilization efficiency. 	<ul style="list-style-type: none"> - Assortment range; - coefficients for stock replenishment cycles. 	<ul style="list-style-type: none"> - Time for loading/unloading in warehouses; - storage turnover rate.
	<ul style="list-style-type: none"> - warehouse turnover; - relative load of the warehouse; - coefficient of uneven loading of the warehouse; - coefficient of utilization of the warehouse's storage capacity; - turnover ratio of products in the warehouse; - productivity of the warehouse. 		
Transport subsystem	<ul style="list-style-type: none"> - transportation costs for a single delivery; - transportation cost coefficient; - delivery rhythm using own transport; - share of transportation costs in the total expenses of the enterprise. 		<ul style="list-style-type: none"> - average relative load of transportation vehicles; - total cost of delivering 1 ton of cargo from the supplier to the recipient.
	<ul style="list-style-type: none"> - asset turnover and asset capacity of transportation vehicles; - depreciation coefficient of transportation vehicles; - profitability of transportation vehicles. 		
Production subsystem	<ul style="list-style-type: none"> - duration of the production cycle; - value of work-in-progress in material costs; - defects coefficient. 	Turnover per square meter of retail space.	Cargo turnover per unit of transport vehicle.
	<ul style="list-style-type: none"> - labor productivity; - growth rate of production costs. 		
Trading subsystem	<ul style="list-style-type: none"> - Level of the sales channel; - Profitability. 		
Information subsystem	<ul style="list-style-type: none"> - Level of information provision; - Speed of document exchange flow; - Availability of innovative technologies, in points. 		

The table provides an approximate list of evaluation indicators, which are recommended to be refined based on the specific conditions of the company, the characteristic issues of the logistics system's operations, as well as environmental factors and their impact on logistics activities.

3. The determination of evaluation (calculation) indicators for a company's logistics activities is carried out using appropriate analytical tools.

4. "Determining the indicators of a company's logistics activities that have qualitative criteria is done using the expert method. The number of such indicators should be limited and should not exceed 30% of the total number of indicators. This helps reduce the level of subjectivity in subsequent evaluations. The advantages of expert methods are that they:

- are relatively convenient in situations where obtaining information about competitors is difficult;
- encompass all factors, including those that are difficult to measure quantitatively;
- are easy to use. A possible drawback of this approach is the uncertainty that may arise in evaluations due to the subjectivity of expert opinions and the level of their competence.

A possible disadvantage of this approach is that some inaccuracies in the assessment occur due to the subjectivity of experts' opinions and their level of competence.

5. Calculation of individual indicators for the specific components (subsystems) of logistics based on the partial indicators of an integral measure. The comprehensive integral indicator should be calculated taking into account the influence degree of each factor on the level of impact on logistics activities.

$$P_j = \sum_{i=1}^n a_{ij} \times k_i \quad (1)$$

here, a_{ij} - is the average score of the i -th element of the logistics subsystems; k_i - is the share of this element in the general indicator of logistics efficiency.

6. Clarification of the criteria for converting the calculated indicators into a point-based scale, taking into account the characteristics of the industry. The application of specific methods for evaluating the efficiency of logistics activities in enterprises depends on situational factors such as the type of enterprise, the sector of activity, the degree of diversification, the specific characteristics of the products, the type of market and competition, and the availability of necessary information.

7. Evaluating the efficiency of an enterprise's logistics activities based on indicators assessing its various components. To comprehensively evaluate the efficiency of an enterprise's logistics activities, it is advisable to implement an approach that reveals its three essential aspects:

- as a result of quantitative measurement;
- as a process of organizing the evaluation of results, analyzing them, and identifying the internal patterns that form the supply of the object;
- as a basis for making management decisions to identify reserves for improving the efficiency of logistics activities.

8. Basing conclusions and recommendations on the results of the assessment.

CONCLUSION

Thus, the proposed methodology for evaluating the efficiency of logistics activities allows for a comprehensive analytical study of various logistics subsystems within the enterprise and the identification of potential reserves for improving efficiency. The algorithm developed for evaluating the efficiency of logistics activities has a comprehensive nature and can be applied in manufacturing, trade, and transportation enterprises.

As a result, it will be possible to optimize resources, reduce the number of auxiliary workers, minimize material losses, improve the efficiency of using production and warehouse space, and reduce the number of injuries in the work process.

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