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EVALUATION OF LOGISTICS SERVICE QUALITY OF INDUSTRIAL ENTERPRISES

The article presents the approaches of various authors to assess the level of logistics service and its quality indicators. It was revealed that universal indicators characterizing logistics services do not currently exist. Therefore, based on the research, a system of indicators of the logistics service quality for industrial enterprises was developed.

Keywords: *logistics system, logistics services, industrial enterprises, quality of logistics services*

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ОЦЕНКА КАЧЕСТВА ЛОГИСТИЧЕСКОГО СЕРВИСА ПРЕДПРИЯТИЙ ПРОМЫШЛЕННОСТИ

Представлены подходы различных авторов к оценке уровня логистического сервиса и показателям его качества. Выявлено, что универсальных показателей, характеризующих логистическое обслуживание, в настоящее время не существует. В связи с этим на основе проведенных исследований была разработана система показателей качества логистического сервиса предприятий промышленности.

Ключевые слова: *логистическая система, логистический сервис, промышленные предприятия, качество логистического сервиса*

The literal translation of «service» is understood as customer service which in turn creates added value for all participants in the supply chain. Many links of logistics systems and logistics intermediaries are service organizations in which services are inextricably linked with the product. Such links include various transport companies, wholesalers and retailers, physical distribution organizations, etc. At the same time, the cost of services can significantly exceed the costs directly on the production [1].

Currently, there is no single definition revealing the essence of the concept of logistics service. Definitions of the essence of the concept of «logistics service» were formulated by Belarusian and foreign authors I. A. Elovoy, S. I. Kachalov, V. V. Dybskaya and A. V. Ivanova, V. I. Sergeev, V. A. Kovalkov, T. N. Skorobogatova, J. R. Stock, D. M. Lambert, Y. S. Yakuninoy, Y. O. Bocharova, Y. V. Butrina, G. L. Brodetsky and etc. Based on the sources studied, it can be said that the logistics service is a set of logistics services that accompany the movement of the logistics flow from the supplier of raw materials to the consumer.

The most complete list is presented in Standard STB 2306–2013 «Logistic services. General requirements and certification procedure» which came into force on November 1, 2013 and establishes the types of logistics services, categories of logistics service providers, general requirements for logistics services providers. In accordance with the standard, logistics services are divided into seven groups depending on the functional area of logistics: procurement (supply),

transport, customs, warehousing, production (intra- and inter-shop, corporate), sales (distribution), information [2]. Based on STB 2306–2013 «Logistic services. General requirements and certification procedure», a logistics service system was developed for enterprises of industry. The proposed logistics service system includes 80 logistics services in seven functional areas of logistics.

The main criterion for assessing the service system from the position of both the provider and the recipient of services is the level of logistics services. The level of logistics service can be regarded as a means of increasing competitiveness, since today the consumer prefers an enterprise that is able to deliver goods by a certain date, in the required quantity, convenient packaging, in accordance with the ordered assortment.

The level of logistics services is a characteristic of the correspondence of the actual values of indicators of the quantity and quality of logistics services to the optimal or theoretically possible values of these indicators. But as V. S. noted Lukinsky and T. G. Shulzhenko «the problem of assessing the level of service remains poorly understood» [3, p. 70].

Currently, there are several approaches to assessing the level of logistics service. So, the level of logistics services can be calculated using the formula:

$$Y = \frac{m}{M} \times 100\ \%,$$

where Y – the level of logistics services; m – quantitative assessment of the actual volume of logistics services rendered; M – quantitative assessment of the theoretically possible volume of logistics services [4].

This calculation is the simplest and most convenient if you need a quick assessment of the level of logistics service but does not provide information about the quality of logistics services. The calculation can be supplemented by evaluating the level of logistics services by comparing the time to complete the actual logistics services provided with the time that would have to be spent if the entire range of logistics services were provided during the same delivery. The calculation can be performed according to the formula:

$$Y = \frac{\sum_{i=1}^{n} t_i}{\sum_{i=1}^{N} t_i} \times 100\ \%,$$

where n and N – respectively actual and theoretically possible (for example, in accordance with STB 2306-2013 «Logistic services. General requirements and certification procedure») the number of services rendered; t_i – time for the provision of the *i-th* logistic service [2].

To assess the level of logistics services, it is necessary to choose «the most significant types of logistics services, the provision of which is associated with significant costs and the absence of significant losses in the market» [5, p. 49]. For a more complete assessment of the level of logistics service it is also necessary to take into account the qualitative characteristics of logistics services, since if there are high ratings for the two approaches presented above to assess the level of logistics services, there may be a lag in its qualitative parameters which are not in the presented approaches.

Despite the importance of the logistics service for the development of the organization's logistics system, there are still no effective ways to evaluate its quality. For the logistics optimization of a service, it is necessary, if possible, to «accurately assess the quality of services using a system of indicators ranked in accordance with their significance for consumers and minimize negative differences between expected consumers and actual values of service quality indicators» [6, p. 71].

V. I. Sergeev suggests evaluating the quality of a logistics service by indicators such as «response speed to an order; quality of order processing; level of readiness for orders; obligatory

deliveries; accuracy of supplies; delivery times; state of supply» [6, p. 268]. A. P. Tyapukhin [7] among the criteria for the quality of logistics services distinguishes the following: the physical environment of the service; the reliability of the service as the possibility of its implementation «on time», as well as the reliability of the management of all logistics flows in the system; responsibility as a guarantee of the performance of the logistics service; completeness as a performance of a service from beginning to end; safety as minimization of logistical risks; the presence of client behavior on the part of the contractor of the logistics service. At the same time, the indicators proposed by this author are of the greatest interest in assessing the quality of the logistics service in the organization's distribution system.

As we can see the universal approach to assessing the level of logistics service quality of the enterprises does not exist, therefore, based on existing approaches and research, the system ofindicators of the logistics service quality for an industrial enterprise has been developed (see table) [8].

Developed system of the logistics services quality indicators for industrial enterprises

Indicator	Definition	Calculation formula
Completeness of logistics service K_1, %	An indicator that reflects the ratio of the number of logistic services provided to the number of potential logistics services	$K_1 = \frac{\mathrm{m}}{\mathrm{M}} \cdot 100\,\%,$ where m – the number of logistic services provided; M – the number of theoretically possible logistics services
Reliability fulfillment of the order, K_2, %	Indicator that reflects the reliability of management of all logistic flows in the system	$K_2 = \frac{\mathrm{O_{cont}}}{\mathrm{O_{comp}}} \cdot 100\,\%,$ where $\mathrm{O_{cont}}$ – the number of orders executed in full compliance with the contract; $\mathrm{O_{comp}}$ – number of completed orders
Flexibility K_3, %	Indicator that reflects the ability to consider the wishes of customers by manufacturers: the ability to change the way the order is delivered, the possibility of obtaining information about the status of the order, etc.	$K_3 = \frac{\mathrm{N_{ch}}}{\mathrm{N_{req}}} \cdot 100\,\%,$ where $\mathrm{N_{ch}}$ – the number of changes made to orders; $\mathrm{N_{req}}$ – the number of customer requests for changes in the order
Reliability K_4, %	The indicator that determines the ability of the system to maintain the ability to work for a certain time	$K_4 = \frac{\mathrm{O_{ex}}}{\mathrm{O_{total}}} \cdot 100\,\%,$ where $\mathrm{O_{ex}}$ – number of orders accepted for execution; $\mathrm{O_{total}}$ – total orders
The share of «ideal orders» K_5, %	The indicator of the number of «ideal orders», i. e., those orders that were delivered to customers according to their bids in the right quantity, at the right time and of ideal quality	$K_5 = \frac{\mathrm{O_{ideal}}}{\mathrm{O_{total}}} \cdot 100\,\%,$ where $\mathrm{O_{ideal}}$ – number of «ideal orders»; $\mathrm{O_{total}}$ – total orders
Ready for order fulfillment K_6, %	An indicator that determines the ability of an enterprise to perform its functions when equipment, personnel is in working condition	$K_6 = \frac{\mathrm{O_{term}}}{\mathrm{O_{comp}}} \cdot 100\,\%,$ where $\mathrm{O_{term}}$ – the number of orders, the terms of which correspond to the terms of the contract; $\mathrm{O_{comp}}$ – number of completed orders

Ending table

Indicator	Definition	Calculation formula
Order fulfillment Ratio K_7, %	Indicator of the volume of materials and products produced in relation to the ordered value	$K_7 = \frac{T_p}{T_o} \cdot 100\,\%$, where T_p – quantity of materials and products ordered and produced, м^3; T_o – total number of ordered materials and products, м^3
No claims K_8, %	Indicator reflecting the number of orders completed without customer complaints about the delivery, quantity, quality of materials and products, disruptions in delivery times, delays in delivery, driver behavior, shipping documents, etc.	$K_8 = 1 - \frac{C_{rec}}{O_{total}} \cdot 100\,\%$, where C_{rec} – number of claims received; O_{total} – total orders

To determine the level of logistics services, it is also necessary to calculate the rating (weight) of each indicator (w_i), where the sum of the weights of the indicators of the quality of the logistics service; i – the index of a specific indicator; n – the number of indicators. The determination of the weights should be carried out by a qualified group of experts from among the specialists and consumers of the enterprise under study. The group should be a representative sample of the total number of professionals and consumers. Comparison of indicators produced by the method of pair (binary) ratios. From the point of view of experts, the more important criterion is assigned the value «1», the less important – «0». After that, the result for each of the indicators is summed up and all amounts are reduced to one denominator, i. e., to the total number of indicators. Thus, we get the weight of each indicator.

When finalizing the results of the examination, in order to determine the degree of agreement between the opinions of experts on the ranking of weight coefficients, it is necessary to calculate the Kendall concordance coefficient (W):

$$W = \frac{S}{\frac{1}{12} \cdot m^2 \cdot (n^3 - n) - m \cdot \sum_{i=1}^{m} T_i},$$

where n – the number of factors; m – the number of experts; S – the sum of the squares of the differences of the ranks (deviations from the average); T_i – correction factor in the estimates of the *i-th* expert.

Moreover $T_i = \frac{1}{12} \cdot \sum_{i=1}^{L_i} (t_l^3 - t_l)$, where L_i – the number of bundles (types of repeating elements) in the estimates of the *i-th* expert, t_l – the number of elements in the *l-th* bunch for the *i-th* expert (number of repeating elements). If there are no related ranks then zero.

The calculation of the logistics services quality indicators is carried out according to the formulas presented in table. After calculating the private indicators K_1–K_8, it is proposed to calculate the integral indicator of the quality level of the logistics service (Q_s) based on the arithmetic average weighted by the following formula, since the average value is calculated in this case using grouped data:

$$Q_s = \sum_{i=1}^{n} w_i \cdot K_i,$$

where K_i – private indicators of the quality of the logistics service; w_i – rating (weight) of each indicator, $\sum_{i=1}^{n} w_i = 1$.

Thus, the presented approach to assessing the quality of logistics services includes determining the quality level of logistics services using developed private indicators (total number – 8) and an integrated indicator based on the arithmetic average weighted using the expert method and the pair comparison method.

The proposed quality indicators of the logistics service can be used as components of assessing the effectiveness of the micro-logistics system of an industrial enterprise. In addition, the developed approach for assessing the quality of logistics services can be used separately, outside the assessment of the logistics system of an industrial enterprise.

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ЛОГИСТИКА ТОРГОВЛИ И ИНВЕСТИЦИОННОГО СОТРУДНИЧЕСТВА БЕЛАРУСИ И КИТАЯ

Рассматриваются логистические аспекты торгово-экономического и инвестиционного сотрудничества Беларуси и Китая. Подчеркивается несбалансированность торговых отношений и предлагаются мероприятия по их выравниванию. Инвестиционное сотрудничество также развивается с определенными недостатками, связанными с наращиванием внешнего долга Беларуси.

Ключевые слова: *логистика, торговля, экспорт, импорт, сальдо баланса, товарооборот, образование, транспортный коридор, грузы, перевозки, транспорт, транспортные услуги*