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Article

The Problem of Selecting a Supplier for Cargo Delivery in Transport Logistics

Kamalov Sherzodbek Sabirovich*[1]

1. Assistant of the "Automotive and Transport" department, Andijan State Technical Institute, (Andijan city)
*Correspondence: kamalovsherzodbek1986@gmail.com

Abstract: This article investigates the problem of selecting a supplier for cargo delivery in transport logistics based on the criterion of minimizing total logistics costs. The aim of the study is to identify the most economically efficient supplier among three potential suppliers, A, B, and C, offering products of identical quality. The suppliers were evaluated according to transportation costs and unloading costs. The results of the study demonstrate that, in addition to transportation costs, loading and unloading technologies play a significant role in supplier selection within transport logistics. The findings highlight the importance of a comprehensive assessment of logistics costs to improve supply chain efficiency and support effective decision-making.

Keywords: Transport logistics, supplier selection, logistics costs, transportation costs, unloading costs, supply chain, logistics efficiency, cost minimization.

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Introduction

The development of a country's economy largely depends on the rapid and efficient movement of goods and services into global markets through convenient methods. The use of modern technological advancements in transport systems for cargo delivery has already proven its economic efficiency in international practice.

In a market economy, the effectiveness of enterprises largely depends on the proper organization of the logistics system. In particular, the selection of a supplier is considered a key element of the supply chain. An incorrect supplier selection may lead to increased transportation costs, delays in production processes, and a decrease in the company's profitability [1].

In transport logistics, supplier selection is based on several criteria, including product quality, distance, transportation costs, loading and unloading technologies, and service speed. In this study, it is assumed that the product quality is identical across all suppliers, and the supplier selection is carried out based on the criterion of minimizing total logistics costs.

The aim of the study is to identify the most economically efficient option among three potential suppliers and to evaluate opportunities for optimizing logistics costs [2].

Literature Review

The issues of supplier selection in transport logistics and the management of material flows are considered one of the key research areas in logistics science. A significant number of studies have been conducted by both local and international researchers in this field. Filonov, Kovalenko, and Dashchinskaya studied the mechanisms of formation and movement of resource flows in logistics systems and emphasized that optimizing transportation costs is one of the main factors for improving enterprise efficiency [3].

Gadjinskiy developed both theoretical and practical approaches to logistics system management, including supplier selection, reduction of transportation costs, and

improvement of supply chain efficiency. The author recommends using the total cost criterion in logistics decision-making [4,5]. Smehov and Molokovich described methods for organizing cargo transportation processes, evaluating transportation tariffs, and assessing the economic efficiency of loading and unloading operations. Their research shows that transportation and terminal operations constitute the main share of logistics costs [6,7]. Nerush, Kuzbojyev, and Tinkov justified the need for a comprehensive approach to logistics system management, stating that optimal logistics solutions can be achieved through the integrated analysis of transportation, warehousing, and loading/unloading costs [8,9].

Among local researchers, Sh.S. Kamalov studied the management of material and information flows in transport logistics systems, the use of information technologies in logistics processes, and routing problems. The author demonstrated that optimization of logistics operations can reduce transportation costs and improve service quality [10,11,12]. Karimov developed scientific and practical recommendations for organizing freight transportation in automotive logistics, efficient use of transport vehicles, and reducing logistics costs [13].

Although the above studies extensively cover logistics system optimization, the problem of selecting one supplier among several companies offering identical-quality products based on the criterion of minimizing total logistics costs has not been sufficiently addressed through practical examples.

Methods

The study employed both theoretical and practical methods of scientific inquiry. Specifically, the following approaches were used:

• Analysis and synthesis methods were applied to examine the factors influencing supplier selection in transport logistics and to evaluate their impact on total logistics costs.
• The comparison method was used to analyze and compare transportation and unloading costs of companies A, B, and C.
• The economic-mathematical calculation method was applied to determine transportation costs, unloading costs, and total logistics costs.
• The cost minimization method was used to select the most economically efficient supplier.
• The tabular method was employed to systematize and analyze the calculated results.
• Logical analysis was applied to evaluate the economic efficiency of mechanized and manual unloading operations.

The methodological basis of the study is grounded in the scientific works of local and international scholars in the fields of logistics system management, transportation cost optimization, and efficient supply chain organization. The study adopts the total logistics cost minimization criterion as the main evaluation approach [14,15].

Problem Statement

Consider a situation where a company receives identical-quality products from three different suppliers, A, B, and C. A decision must be made regarding the selection of the most suitable supplier. The characteristics of the suppliers are as follows:

- Distance from the company: A – 236 km, B – 295 km, C – 221 km;
- Unloading method: A and C – mechanized, B – manual;
- Unloading time: mechanized unloading – 1 hour 30 minutes; manual unloading – 4 hours 30 minutes;
- Transportation tariff: up to 200 km – 0.9 thousand sum/km; 200–300 km – 0.8 thousand sum/km;
- Worker hourly wage rate for unloading – 450 sum per hour.

Solution to the Problem

The supplier is selected based on the criterion of minimizing total logistics costs, since the product quality is identical across all suppliers and no additional differentiating factors are considered. Therefore, only transportation costs and unloading costs are taken into account. Transportation costs are calculated as the product of the transportation tariff and the distance to the supplier:

A: 0.8 thousand sum/km × 236 km = 188,800 sum

B: 0.8 thousand sum/km × 295 km = 236,000 sum
C: 0.8 thousand sum/km × 221 km = 176,800 sum

Unloading costs are calculated as the product of unloading time and the worker's hourly wage rate:

A: 1.5 hours × 450 sum/hour = 675 sum
B: 4.5 hours × 450 sum/hour = 2,025 sum
C: 1.5 hours × 450 sum/hour = 675 sum

The results of the calculations are presented in Table 1.

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Mezon	**A**	**B**	**C**
Transportation costs, sum.	188,800	236 000	176,800
Unloading costs, sum.	675	2,025	675
Total costs, sum.	**189,475**	**238,025**	**177,475**

As shown in the table, the minimum total logistics cost corresponds to supplier C. However, it can be noted that switching to mechanized unloading and cooperating with supplier B could potentially reduce overall costs in alternative operational conditions.

According to the calculation results, the lowest total cost is observed for supplier C, amounting to 177,475 sums. The total cost for supplier A is 189,475 sum, while supplier B has the highest total cost at 238,025 sum [16].

Discussion

The obtained results demonstrate that in transport logistics, a comprehensive evaluation of total logistics costs plays a crucial role in supplier selection. Based on the performed calculations, supplier C was identified as the most economically efficient option with a total cost of 177,475 sum. This result is mainly explained by its relatively shorter distance to the enterprise and the use of mechanized unloading operations.

Although supplier A also uses mechanized unloading, its longer transportation distance leads to higher transportation costs. As a result, its total logistics cost amounts to 189,475 sum, which is 12,000 sum higher than that of supplier C.

The results for supplier B indicate the combined influence of transportation distance and unloading technology on total logistics costs. In this case, transportation costs reached 236,000 sum, while unloading costs were 2,025 sum, resulting in a total cost of 238,025 sum, which is the highest among the analyzed alternatives.

The findings show that although transportation costs form the largest share of total logistics costs, the method of loading and unloading operations also significantly affects overall economic efficiency. In particular, mechanized unloading reduces labor costs, shortens service time, and increases the efficiency of logistics processes.

Thus, supplier selection should not be based solely on transportation distance or tariff rates. Decision-making must consider transportation costs, loading and unloading technologies, and operational efficiency in an integrated manner. This approach enables enterprises to minimize logistics costs and improve supply chain performance [17,18].

Therefore, in logistics processes, not only transportation distance but also loading and unloading technologies are important economic factors. Mechanized methods increase labor productivity, save time, and reduce total logistics costs.

Conclusion

Based on the obtained results, under the current conditions and according to the total cost minimization criterion, supplier C was identified as the most optimal supplier. Its total logistics cost was 177,475 sum.

At the same time, supplier B represents the most favorable option in terms of transportation costs. If a mechanized unloading system is implemented, its total logistics cost could be reduced to 176,175 sum, making it the most efficient supplier under improved operational conditions.

Thus, in transport logistics, supplier selection should not be based solely on distance and transportation tariffs. A comprehensive assessment of loading and unloading technologies is also essential. The mechanization of logistics operations enables enterprises

to reduce costs, save time, and enhance competitiveness.

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