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Logistic system: costs, tools and perspectives

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Abstract

The article focuses on the growing role and importance of logistics in economic systems. The concept of «logistic system» is investigated. The basic structural components of the logistic system, their interrelationships and functions are outlined. The article presents different approaches to defining the concept of «logistic costs» and analyzes different types of logistic costs. Additionally, the article reveals the factors that influence the formation of logistic costs and suggests the ways to minimize the costs of logistic activities. The expediency of using modern logistic tools, such as automation, digitization and artificial intelligence, and the introduction of new technologies in the logistic activities of enterprises is also substantiated. The article outlines the trends and prospects for the development of national logistic systems and proposes the measures aimed at improving the logistic activities of enterprises.

Keywords: logistics; logistic activity; logistic systems; logistic chains; logistic costs; classification of logistic costs; logistic process; logistic tools; Blockchain technologies in logistics; anticipatory logistics; reverse logistics.

1. Introduction

Logistics plays a crucial role in ensuring the smooth flow of goods and services between suppliers, manufacturers, distributors, and customers. As global trade expands and supply chains become more complex, the need for efficient and effective logistics systems has become increasingly important. To achieve integration in logistics systems, a set of methods and indicators

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is needed to evaluate its effectiveness. In this context, it is necessary to provide methods for accounting for logistics costs. Additionally, logistics costs can represent a significant portion of a company's overall expenses, which has led to a growing interest in finding ways to optimize logistics processes and reduce costs.

One key challenge facing logistics systems is the ever-increasing pressure to reduce costs while maintaining high levels of service. This requires enterprises to constantly look for ways to improve their processes, increase efficiency, and reduce waste. One approach is to implement new technologies and tools, such as advanced analytics, automation, and artificial intelligence. These tools can help enterprises better understand their operations and identify areas for improvement.

Logistics systems play a critical role in the success of businesses today. As supply chains become increasingly complex and global trade continues to expand, it is essential for enterprises to invest in efficient and effective logistics systems. This requires a holistic approach that considers costs, tools, perspectives, sustainability, and collaboration. By adopting best practices and embracing new technologies and approaches, enterprises can optimize their logistics operations, reduce costs, and improve service levels, ultimately driving business success.

2. Literature review

The issues of formation, evaluation and development of logistic systems are presented in the studies of the following foreign and domestic scientists: J.Bowersox, M.Christopher, D.Lambert, D.Stock, D.Waters, S.Baranovskyi, R.Ivut, A.Kosovsky, S.Kugan, O.Molokovych, I.Poleshchuk, V.Banko, T.Kolodizheva, S.M. Naglovsky and others.

For the effective organization of logistic activities, it is necessary to analyze individual types of costs in order to optimize them. Therefore, the concept of total costs developed by H.Lewis, J.Culliton and J.Steele became the basis for the development of logistics. The scientists S.Dimarchuk, E.Rudnichenko, N.Havlovska, M.Oklander, O.Bilousov, D.Stakhanov, O.Hajinsky and others were also solving the problems of reducing of costs for logistic operations in logistic systems.

National and foreign scientists M.Christopher, L.Mirotin, O.Moroz, Yu.Ponomarev, D.Waters, L.Frolov and others contributed to the improvement of the efficiency of logistic systems.

The study of the scientific work of the above-mentioned authors proves the ambiguity of views on the construction of productive logistic systems, the reduction of logistic costs, the search for effective logistic tools, which actualizes further research in these directions.

3. The identification of previously unresolved issues and the formulation of research hypotheses

The lack of unambiguous comprehensive studies on the construction of modern efficient logistic systems became the reason for this study and determined its purpose and tasks.

The purpose of the article is to substantiate theoretical and methodical approaches and develop practical recommendations for construction of effective logistic systems, minimizing logistic costs in them, and finding effective logistic tools that will provide prospects for the development of national logistics.

4. Research methodology and methods

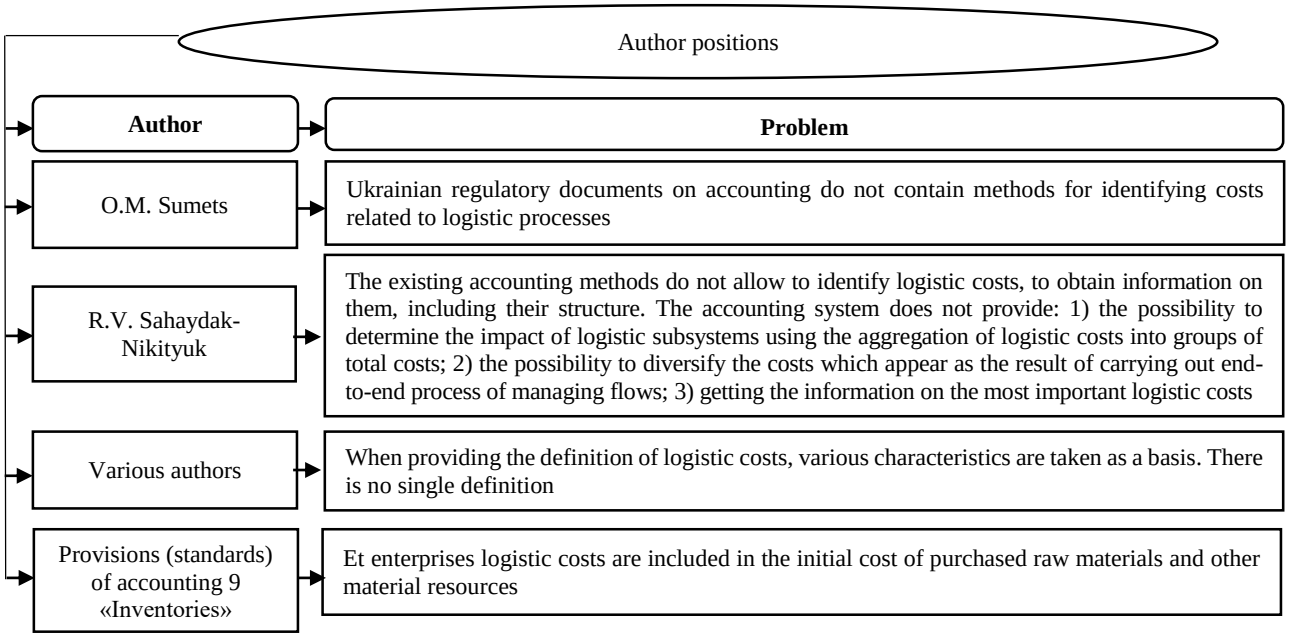
The article uses the systematic approach and a set of general scientific and special methods: systematization and generalization of theoretical and experimental data of economic and special literature on the topic of research, scientific abstraction, analysis, synthesis, logical, statistical, sociological, tabular, etc. and a significant cognitive toolkit.

5. Main results

Promotion of manufactured products to sales markets is a rather complex and financially intensive process. It requires significant resource expenditures. At the same time, the composition of resources is characterized by a different structure not only in terms of different branches of the national economy, but also for each individual business entity of the same type of direction. In view of this, there is a need to solve the problem of classification of expenses in scientific researches of accounting and analytical nature and corresponding practical activities. The application of the latter is classically aimed at generalizing and simplifying assessment, accounting, analysis, etc.

Considering the essential role of classification to simplify accounting work and conducting analysis, it is important to approach its implementation carefully. If to mean logistics, it is worth paying attention to the obstacles that exist in terms of distinguishing costs and their identification. Certain problematic aspects in this regard are summarized in fig. 1.

The lack of a clear position regarding the composition of logistic costs should be considered another, no less important problem and an obstacle to their rational accounting in addition to those indicated in fig. 1. From the point of view of semantics, the phrases «costs for logistics» and «logistic costs» can be considered completely different concepts.



Source: Author's generalization

Fig. 1. The main problems associated with the accounting of logistic costs [1]

In the first case, the composition of costs should include both organizational costs and costs for maintenance of logistical structural divisions, etc. In the second – the costs that are included in the cost of goods and material values (GMV). Costs for logistics, more correctly called «costs for organization of logistic activities» that are related to the formation of the relevant unit of the enterprise, cannot be rationally included in the cost of GMV (products, services) because there are currently no legislative mechanisms and rules for their distribution. This case is not about the costs for formation of logistic centers, which can be a separate economic entity. Instead, those services (work) that are performed by both of these organizational forms should be included in the cost of the product they relate to. In this research, these concepts are considered from exactly this position.

The recognition of a number of other problems, in particular, related to the identification and understanding of the logistic process itself (not to mention the approach to establishing the definition of the concept of «logistic activity»), as well as the types and composition of the costs themselves, is justified.

Thus, M.Reta quite rightly claims that from the point of view of distinguishing and summarizing the information about logistic costs for the purposes of the accounting process of the enterprise, it is possible to use different classification features:

- by economic elements (labor and use of production factors costs, financial costs);
- by functional areas (supply costs, production support costs, distribution and sales costs);
- by time periods (day, week, quarter, year, six months);
- by participation in the logistics process (costs for logistics and costs for ensuring logistic business processes);
- by business process participants (suppliers, enterprise divisions, consumers);
- by relation to the logistic system (external and internal);
- by the nature of logistic operations (direct and indirect) [6, p. 157].

Undoubtedly, the approach proposed by the above-mentioned author has a rational grain at its core, especially taking into account the fact that logistics as a process includes a number of components. In addition, as V.Kolodiychuk rightly claims, logistics can be defined by considering the structural and functional interrelationships of its component flows: material, informational, financial and service [4, p. 99].

In a similar way, it is expedient to distinguish expenses, namely as expenses: for materials, for the search for information (suppliers, consumers, carriers, etc.), service, etc. At the same time, separated, for example, according to the functional areas or structural-functional connections, expenses can be detailed by items that are important from the management point of view and should be the subject to control due to the importance of their influence on the final results of the business entity.

The choice of the level of detailing should depend on the approach chosen by the enterprise, because to ensure effective management at some entities, it is enough to control the total amount of costs of logistics (or logistic costs) or 2–3 of their items. And for others, it is advisable to pay attention to a wider range of expenditure items. So the composition can be either minimal or maximal. In the second case, the list of expenses may include, in particular, expenses for materials (including those by type), labor payment with accruals, energy carriers, advertising, etc. When choosing the level of detailing, one should be guided by the principle of expediency, i.e. to take into account the ratio of costs incurred in connection with such detailing (for wages of employees, for technical support) and the obtained result. If detailing the composition of costs and their accounting display require more costs, then it is inexpedient [1].

Logistics costs average 10–15 % of the company's budget. The share of expenses may increase if the processes are set up inefficiently. Therefore, one of the first steps towards saving the budget is the optimization and automation of the logistics

system. Logistics optimization is the process of finding and implementing solutions that will allow logistic operations to be performed faster and with lower costs.

In the conditions of resource scarcity and modern restrictions on the implementation of activities, in particular quarantine restrictions, it is important to optimize activities as much as possible in order to be not only competitive on the market, but also to have economic preferences and benefits in an unstable global economy. In this regard, the issue of improving logistics and directing it to achieve better results of operation and rational use of funds is relevant and, at the same time, complicated by the lack of quality logistic practices in most Ukrainian entities, especially small and medium-sized businesses. In recent years, this situation has significantly improved, but there is a need to strengthen the sectoral focus and to develop methodical recommendations with a narrower focus than is available on our national practice.

Argumentation and results of research into the possibilities of using positive logistics experience to form a more effective management system quite often form competitive advantages for entities which focus on such issues [3].

Digitalization in modern logistics is one of the most effective tools that allows for economically effective promotion of the product to the final consumer. At the same time, operational analysis, route optimization and risk management make it possible to avoid a number of problems associated with achieving the best performance of the business entity that uses logistics approaches in its management.

In general, artificial intelligence and data analysis, which are used in modern conditions to coordinate the available capabilities of the enterprise for the proper functioning of all its links in a single chain, logistic tools are the most common. In recent years, application of artificial intelligence and data analytics have been identified as predictive logistics.

The main tools of such logistics, as already mentioned, are data analysis and forecasting further directions of development based on its results. It this case, data of not only the business entity itself, but also of the market and competitors in general are selected for analysis. That is, internal and external information (micro, macro environment) is analyzed and demand is forecasted on its basis. One of the well-known methods for this purpose is the analysis of big data, which enables sufficiently accurate forecasting. But in addition to this, it is important to make maximum use of other tools and technologies (real-time communication, artificial intelligence, etc.). It is wireless communication in modern conditions that is becoming the most popular requirement for the development of logistics. The tracking of assets by reading their codes with various sensors and devices at various points in the logistics chain is also becoming more common.

The application of Blockchain technology is promising enough from the point of view of the existing potential for logistics purposes. It significantly improves logistics processes and ensures not only their efficiency, but energy efficiency as well.

In a general sense, Blockchain, is a distributed database that allows users to track and sell almost anything. From the very beginning, it was designed for use in transactions with the digital currency Bitcoin. This technology allows users from anywhere to add records to the system, contributing to the common information route. While anyone can add an entry to the blockchain, no one can change or delete the existing information, making it permanent and reliable.

An important aspect of Blockchain's benefits is that it is best used when the entire logistic value chain is involved in data exchange and review. With low barriers to implementation, Blockchain can be easily adopted by stakeholders in all logistics networks. Blockchain can also be considered as a permanent and secure digital ledger of transactions managed by a distributed network of computers, which provides a permanent record of information to a specific set of users. Each transaction or block is written sequentially in the register. A consolidated transaction report includes a progressive series of «blocks» that make up a «chain». Each block or print of transactions is verified by a cryptographically authorized set of participants, making information damage impossible.

Blockchain is exploring more and more industries today. Entrepreneurs are trying to use Blockchain technology in various areas of their activities. The main advantage of blockchain is its transparency and ability to optimize digital information. Understanding the possibilities of Blockchain, many startups are launching the use this promising technology even in areas that have nothing to do with cryptocurrencies and finance. This technology can be useful in many ways. First of all, Blockchain offers many solutions for those who want to improve security and make transactions with digital data more transparent, as well as to find comprehensive solutions for companies that want to work more economically, more organized and more efficiently. This technology allows companies to use proven smart contracts that automate the entire purchase process, saving time and money. Distributed and decentralized registries also reduce the number of problems and clerical errors.

Today, Blockchain is a multi-functional and multi-level information technology designed for reliable accounting of various assets. Potentially, this technology covers all spheres of economic activity without exception and has many areas of application including logistics, finance, economics and calculations, operations with tangible and intangible assets. The implementation of Blockchain technology in any sphere of business involves the acceptance of a completely transparent and reliable information platform, which will be used by the participants of this or that process [2].

The field of logistics includes many parties: manufacturers, customers, suppliers, auditors and others. Blockchain technology offers benefits for all participants in this chain. Although operational processes can be profitable, shipping companies and retailers lose a significant portion of revenue due to inefficient practices, unnecessary brokerage costs, theft, cyber-attacks and food products spoilage. Mislabeled, incorrectly shipped, or stolen cargo alone causes enormous losses every year.

The best way Blockchain can help logistics is to eliminate its inefficiencies. Right now, almost every element of the logistic chain has multiple execution options to work with. Brokers, shippers, and other participants must focus on efficiency rather than getting bogged down in choosing the best way for sales. In addition, there was always a lot of documentation that needed to be processed. Documentation makes an already slow end-to-end transportation even more inefficient. In fact, it is the lack of a single source of true information and complex processes that nullify the entire logistic process. There is a need for a decentralized organization that can process all transactions and also act as a hub to review and improve the entire process.

Blockchain makes logistics more efficient and transparent. Blockchain's ability to act as a ledger makes it an ideal technology for simplifying shipment tracking, global contracting and payment processing in the logistic industry. This allows customers to track the product and its entire production chain. Auditors can easily confirm or verify any transactions. The information stored in the blockchain cannot be changed by any third party, which makes this technology more secure than any existing solution today. The technology can help program a fragmented and complex process so that both the supply chain and logistics themselves become more efficient. For this, Blockchain should act as the basis of the logistic network. It will handle everything, including providing funds to record transactions, creating an efficient and transparent system, and tracking assets with all the necessary documentation. Since Blockchain is digital in nature, documentation must be done online, giving anyone access to the data from any location. With its help, companies can make their supply chain more secure and improve the flow of transactions. Each product receives a special tag that allows companies to secure their supply chains with just a few mouse clicks [7].

In addition to the above, it should be noted that since the inception of e-commerce, as it is today, it is developing at a very fast pace, that creates problems for the enterprise, which are largely related to the increase in data processing and, in general, the amount of information processing required to determine, for example, a customer's profile and personality or to predict what the customer will want to buy in the near future.

The response to these new challenges and tasks, in our opinion, could be anticipatory logistics, which could support processes such as demand forecasting through extensive analysis of data on sales trends, market, analysis of data on competitor activities and monitoring of information onlocal and global economic environment. Anticipatory logistics is based on the ability of modern equipment to process and analyze large data sets and to use artificial intelligence.

Anticipatory logistics today offers a completely different functioning of the logistic chain than the classical or modern approaches to enterprise management known to us today do. Although it is not yet widely used at this stage, attempts to successfully apply it already exist.

As Marcin Sugak, an Ericsson expert, rightly notes, «anticipatory logistics should not be perceived simply as frugal, cost-optimized and on-time delivery of goods. A truly forward-thinking logistic flow must take into account significant global changes in both consumption and shipping habits. The implementation of such a logistic system will require the market to change its approach and be more open to cooperation between competitors» [16].

It should also be noted that in modern market conditions of business, which are characterized by a rapid increase in production volumes, expansion of the range of manufactured products and their quality characteristics, the application of effective approaches for promotion and sale of goods, as well as for successful functioning and improvement of the overall efficiency of the enterprise in general, reverse logistics plays an important role, and today it is one of the most likely and, at the same time, completely underestimated areas of management in the enterprise.

In the conditions of globalization and active development of various types of production, it is reasonably suggested to form closed logistic chains. In other words, the logistic process must include such an element (sub-process) as the reversal of materials remaining after the use (failure) of products sold to consumers. In developed countries, such systems have a fairly high level of distribution. In general, a closed logistic system includes raw materials, production, distribution, return. Such a scheme is presented in the work of K.Govindan, H.Soleiman and D.Kannan (Fig. 2).

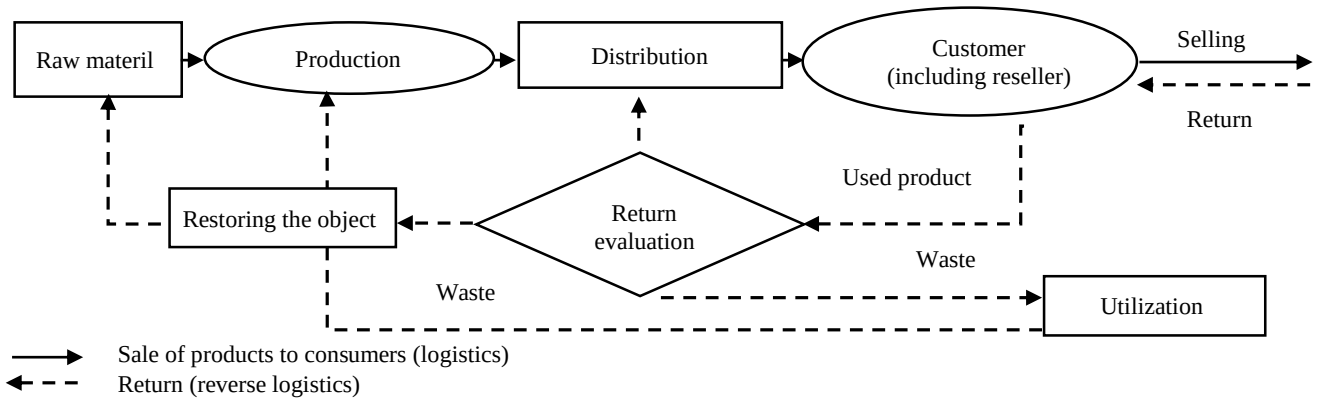


Fig. 2. General type of logistics / reverse logistics [15, p. 604]

Initiating reversal requires implementation of a number of measures related to both informing end final consumers about the possibility of returning the product (part of it) and organizing its reception. Developed European countries, depending on the type of material for reception, use either trading firms (reception of return containers), or special reception points or their own reception points (for reception of old and unusable products). At the same time, a certain system of their evaluation is being developed, as well as approaches to the return of funds. Usually, consumers get the opportunity to take a new product by paying for it an amount equal to the difference between its value and the amount at which the returned products were evaluated.

As for the costs of reversal, they relate to design and planning, surveying (to identify the need for reversal), development of an evaluation system and organization of process coordination, feasibility and perspective studies, production planning and inventory management, formation of a conceptual and analytical structure, analysis of results, etc. The execution of all kinds of the above-mentioned work requires financial, material and labor expenses. In this context, in order to achieve the effectiveness

of their implementation, it is necessary to conduct a preliminary assessment. Usually, economic entities, especially domestic ones, and their management are inclined to think that the reverse is unprofitable. In this regard, it is poorly developed in Ukraine. However, analytical substantiation of expediency or inappropriateness in modern conditions can be quickly calculated thanks to the use of technical capabilities of modern computer technology and its software. In addition, many of the above-mentioned pieces of work can also be performed using modern information technologies, especially in issues related to record keeping, preliminary calculations and analysis. It will not require significant costs, especially if their own specialists will be involved in the performance of such a task.

At the same time, theoretical provisions must be developed for them, coordinated with the possibilities of technical implementation of the assigned tasks. To achieve the maximum effect, one should also have the technique that should be used to choose the most suitable software products, to develop scientific research in the field of simplifying algorithms for accounting calculations, in particular based on the use of theoretical and numerical grounding, as well as to explore the possibilities of using asymmetric algorithms to form an information protection system [12, p. 8].

The development of modern innovative cost optimization principles for logistic activities in general and the reverse logistic chain in particular, as well as the activity management system as a whole, in conditions of instability and growing competition, is almost the only way to ensure the proper position of the business entity on the market. Actually, from this point of view, reverse logistics can be considered an effective component of the management system of supply processes at the enterprise in conditions of limited resources, since it ensures obtaining a certain part of raw materials at lower prices. At the same time, it should be noted that their use in connection with the available modern production technologies does not have a negative impact on the quality of the newly created product.

6. Concluding remarks

Theoretical analysis and substantiation of the formation of an effective logistic system, which is based on taking into account the existing problems related to the coordination of the interaction of various services and subjects, is an actual and sufficiently demanded direction of the research. Argumentation of the expediency of the need for such developments is: incomplete coverage of all processes taking place at enterprises by the logistic tools; low level of efficiency of economic entities; lack of scientific and practical developments on logistic problems in them; increased tension in providing of resources the appropriate composition for the needs of the activity; availability of improvement and optimization reserves in this field.

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