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In 2020, the International Center for Periodicals (ISSN International Center, Paris) included the Electronic Scientific and Practical Edition "Intellectualization of logistics and Supply Chain Management" in the international register of periodicals and provided it with a numerical code of international identification: ISSN 2708-3195 (Online).

Recommended for dissemination on the Internet by the Academic Council of the Department of Logistics NAU (No. 7 of February 26, 2020). Released 6 times a year. Editions references are required. The view of the editorial board does not always coincide with that of the authors.

Electronic scientifically and practical journal "Intellectualization of logistics and Supply Chain Management" included in the list of scientific publications of Ukraine in the field of economic sciences (category "B"): ***Order of the Ministry of Education and Culture of Ukraine dated October 10, 2022 No. 894 (Appendix 2)***

Field of science: Economic.

Specialties: 051 – Economics; 073 – Management

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MODERN METHODS FOR ASSESSING THE EFFICIENCY OF LOGISTICS PROCESSES IN A COMPANY

Irina Suvorova, Sergey Basanets, Oksana Pozniak, Vladimir Davydenko. "Modern Methods of Evaluating the Efficiency of Logistics Processes in a Company". The article discusses modern methods of assessing the efficiency of logistics processes, which are one of the most important components of the successful functioning of any company, especially in today's fierce competition and globalization. The article assesses the efficiency of logistics processes, which are an integral part of the company's strategic management and allow ensuring its stable development. The analysis of modern methods for assessing the efficiency of logistics processes in a company has allowed to identify three important tools, such as: data envelopment analysis (DEA),

ABC analysis and cost analysis and control method. It is proved that the DEA method can be applied to a wide range of logistics systems, regardless of their complexity and specificity. In addition, DEA allows to identify factors that limit efficiency and develops recommendations for its improvement. The value of ABC analysis is highlighted, which lies in the potential to increase sales volumes by improving the availability of goods that are most valued by customers. An assessment of the efficiency of logistics processes in a company using ABC analysis is proposed. The importance of such a method as cost analysis and control is analyzed. Thanks to a detailed analysis and control of costs, it is possible to identify bottlenecks in the logistics chain, optimize delivery routes, reduce storage costs and increase the efficiency of vehicle use. The author proposes the key stages of the logistics cost analysis based on the "Five Steps" system. It is proved that the joint use of the proposed methods creates synergy, allowing for a deeper and more accurate analysis than when each of them is applied separately. The methods we have studied complement each other, providing company managers with tools for comprehensive analysis and evaluation of logistics efficiency.

Keywords*: evaluation methods, logistics processes, logistics systems, DEA method, ABC analysis, cost analysis and control method*

Ірина Суворова, Сергій Басанець, Оксана Позняк, Володимир Давиденко. «Сучасні методи оцінки ефективності логістичних процесів в компанії». *В статті розглянуто сучасні методи оцінки ефективності логістичних процесів, які є однією з найважливіших складових успішного функціонування будь-якої компанії, особливо в сучасних умовах жорсткої конкуренції та глобалізації. Надана оцінка ефективності логістичних процесів, які виступають невід'ємною частиною стратегічного управління компанією і дозволяють забезпечити її стабільний розвиток. Проведений аналіз сучасних методів оцінки ефективності логістичних процесів в компанії дозволив виділити три важливі інструменти такі, як: метод аналізу обробки даних (DEA), аналіз ABC та метод аналізу і контролю витрат. Доведено, що метод DEA може бути застосований до широкого спектра логістичних систем, незалежно від їхньої складності та специфіки. Крім того, DEA дозволяє ідентифікувати фактори, які обмежують ефективність, та розробляє рекомендації щодо її підвищення. Виокремлена цінність ABC аналізу, яка полягає в потенціалі збільшення обсягів продажів завдяки покращенню доступності товарів, які найбільше цінуються клієнтами. Запропонована оцінка ефективності логістичних процесів в компанії за допомогою ABC аналізу. Проаналізована важливість такого методу, як аналіз і контроль витрат. Завдяки детальному аналізу і контроль витрат можливо виявити «вузькі місця» в логістичному ланцюгу, оптимізувати маршрути доставки, знизити витрати на зберігання та підвищити ефективність використання транспортних засобів. Запропоновано ключові етапи проведення аналізу логістичних витрат, які опираються на систему «П'ять кроків». Доведено, що спільне використання запропонованих методів створює синергію, дозволяючи отримати більш глибокий і точний аналіз, ніж при застосуванні кожного з них окремо. Досліджені нами методи доповнюють один одного, надаючи менеджерам компанії інструменти для комплексного аналізу і оцінки ефективності логістики.*

Ключові слова: *методи оцінки, логістичні процеси, логістичні системи, метод DEA, ABC аналіз, метод аналізу і контролю витрат.*

Introduction. In today's dynamic and changing business environment, where customers demand higher and higher levels of service and competition is constantly growing, assessing the efficiency of logistics processes is becoming a strategic priority for any company. Innovative technologies, such as artificial intelligence and the Internet of Things, open up great opportunities for logistics optimization, but at the same time complicate the process of supply chain management. Therefore, an objective assessment of the efficiency of logistics processes in a company is a key factor in

making informed management decisions. Modern methods of assessing the efficiency of logistics processes are one of the most important components of the successful functioning of any company, especially in today's fierce competition and globalization. Therefore, the relevance of this topic is due to several factors, such as growing consumer demands, complexity of supply chains, innovative technological changes, increasing competition, adaptation to market conditions, etc.

Thus, the relevance of methods for assessing the efficiency of logistics processes is that they allow companies to: improve the quality of customer service, optimize logistics costs, increase delivery speed and strengthen competitive positions in the market. Therefore, the evaluation of the efficiency of logistics processes is an integral part of the company's strategic management and helps to ensure its stable development.

Analysis of the latest research and publications. Modern research offers a wide range of methods for assessing the efficiency of logistics processes. Among the most popular are the following: Data Envelopment Analysis (DEA), it allows comparing the efficiency of different logistics units without the need to establish preliminary production functions [1]. Balance Scorecard (BSC), the proposed system provides a comprehensive assessment from different perspectives: financial, customer, internal processes, and learning and growth [2, 3]. The focus is on big data and machine learning [4, 5]. Scientific studies have examined data mining methods and their application in business intelligence, including logistics, and have investigated the "whip effect" using data mining methods to reduce it. Traditional visualization tools, such as spider charts and Z-charts, although popular, reach their limits when evaluating complex logistics systems and this stimulates the search for new, more powerful methods of analyzing multidimensional data [6].

Objectives statement. The problem of evaluating the efficiency of logistics processes is multi-dimensional. Although the ratio

between input and output resources can provide some efficiency insight, they are not able to fully reflect the complexity of logistics systems. For an adequate assessment, it is necessary to consider a wide range of indicators and their interaction. This requires the use of more sophisticated mathematical models, statistical methods, and the study of innovative approaches to assessing the efficiency of logistics processes in a company. Therefore, the problem of choosing the optimal methods for evaluating the efficiency of logistics processes in a company is extremely important and relevant.

Basic material and results. Historically, simple ratios have been widely used to assess the efficiency of logistics processes. However, as logistics systems have become more complex and the requirements for their efficiency have increased, it has become clear that this is not enough. Modern research is increasingly focused on the development of multidimensional models and tools that allow for a more accurate assessment of supply chain efficiency.

Research in the field of logistics confirms that in order to adequately assess the efficiency of supply chains, it is necessary to abandon simplified models based on individual indicators. The multifactor approach allows to take into account a variety of factors that affect the efficiency of logistics operations, such as product type, geographical features, technological characteristics, etc. This contributes to a more objective assessment and development of effective strategies for managing logistics processes [7, 8].

The data envelopment analysis (DEA) method has become an indispensable tool for assessing the effectiveness of various organizations and processes in recent decades. Its versatility and flexibility allow DEA to be applied in many industries, from manufacturing to services. Bell and Morey demonstrated how DEA can be used to compare the performance of different companies in the same industry, allowing to identify best practices and identify areas for

The electronic scientifically and practical journal
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improvement. Barr and Seiford have shown that DEA can be an effective tool for assessing the efficiency of bank branches and other financial institutions. Ampilogov used DEA to assess the risk of bankruptcy of companies, which allows to detect financial problems at early stages.

DEA is widely used to evaluate the efficiency of internal departments of companies, optimize resources and improve overall efficiency. DEA helps to improve the BSC methodology, allowing for a more objective assessment of the achievement of strategic goals. DEA can be used to select the best alternatives in projects, evaluate the effectiveness of various approaches, and manage risks.

One of the most prominent features of the data envelopment analysis (DEA) method is the use of the concept of the "effective frontier". The idea is that the proposed method is illustrated in the form of a graph, where the X-axis represents costs and the Y-axis represents the company's performance. The efficient frontier is a line that delimits the area of possible combinations of costs and results. Companies located on this line are considered efficient because they achieve maximum results for a given cost. A special feature of DEA is its ability to evaluate the relative efficiency of facilities without the need to establish prior production functions. This means that DEA can be applied to a wide range of logistics systems, regardless of their complexity and specifics. In addition, DEA allows to identify factors that limit efficiency and develops recommendations for its improvement [6,8].

The DEA method is a powerful tool for assessing the relative efficiency of different organizational units. The origins of this method date back to the scientific works of Farrell, who introduced the concept of technical efficiency, which implies achieving maximum output at minimum cost.

First, a set of inputs (e.g., employees, equipment, materials) and outputs (products, profits, quality of services) is determined that characterize the activities of each unit. Using mathematical programming, the so-called "efficient frontier" is built. This is a conditional line that unites the most efficient units, i.e. those that achieve maximum results at minimum costs. Each unit is compared to the efficient frontier. If the unit is on the line, it is considered efficient. If it falls below the limit, it is considered inefficient, and the degree of inefficiency is determined.

The basic DEA model developed by Charnes, Cooper, and Rhodes is often referred to as the CCR model. It is based on the assumption of constant returns to scale, i.e., an increase in all inputs by a certain number of times leads to a proportional increase in outputs. The CCR model allows you to determine whether a unit is efficient, and if not, how much it deviates from the efficient limit [8].

Another method of assessing the efficiency of logistics processes in a company is ABC analysis. ABC is an inventory management technique that determines the value of inventory based on its importance to the business. Thanks to the insights provided by this analytical approach, we can identify important opportunities to optimize inventory levels in the company [9].

ABC analysis is a powerful tool that allows supply chain management teams to reduce operating costs and free up financial resources that are frozen in current assets. However, its true value lies in the potential to increase sales by improving the availability of the products that customers value most. In other words, companies that effectively use this method can not only optimize their costs but also stimulate sales growth. However, there is a logical contradiction in the conclusion that companies that take advantage of this approach work less efficiently and effectively. On the contrary, a qualitative ABC analysis is one of the key tools for improving the efficiency of an enterprise.

The name «ABC» suggests that you have only 3 classes. But if you want, you can distinguish 10 classes. However, this can make the data a bit more difficult to interpret [9].

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If we assume that category A items account for 70% of the company's profit, category B items account for 20%, and category C items account for 10%. The graph (Fig. 1) clearly shows that 70% of the items generate only 10% of the company's profit. Often, these category C items require careful consideration due to their volatility and difficulties in properly forecasting future demand [9].
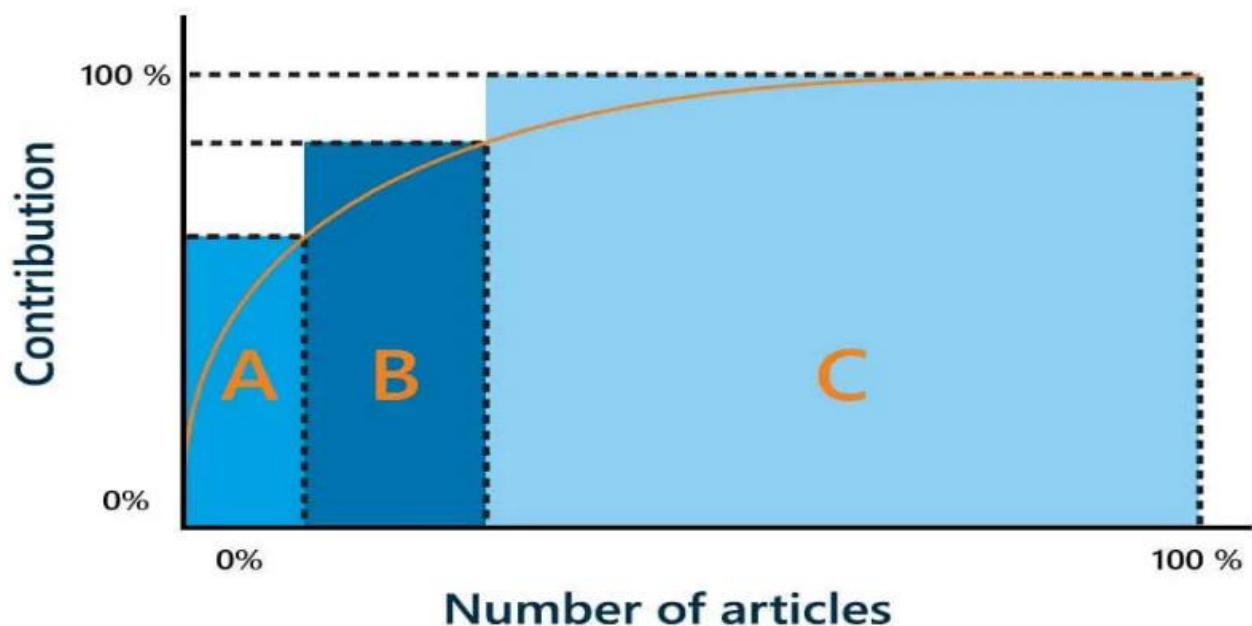
Figure 1 – Graph of the distribution of articles by ABC

ABC analysis allows to categorization of goods according to their importance to the business. However, given the critical role of category A goods, they need to be given maximum attention and resources. These are the products that provide the bulk of the company's profits and require special control over inventory and supply.

Companies need to categorize their products. This is because when a company offers a large assortment, it is easy to get distracted by products that offer a very low contribution to the company's profits. The main reason is that these positions often exhibit high volatility and are therefore difficult to manage. The overall goal of ABC analysis is to logically structure the product mix and prioritize it. As a result, the company should benefit from greater focus. By categorizing products based on their strategic importance to the business, company managers can ensure that they spend their time and invest in effective projects.

The main advantages of assessing the efficiency of logistics processes in a company using ABC analysis are shown in Fig. 2.

Thus, ABC analysis helps to determine which products in the overall assortment bring the most profit and require more attention, and which can be eliminated from the product range. First and foremost, it should be used for various optimization initiatives aimed at saving money, improving service, and increasing the company's profitability.

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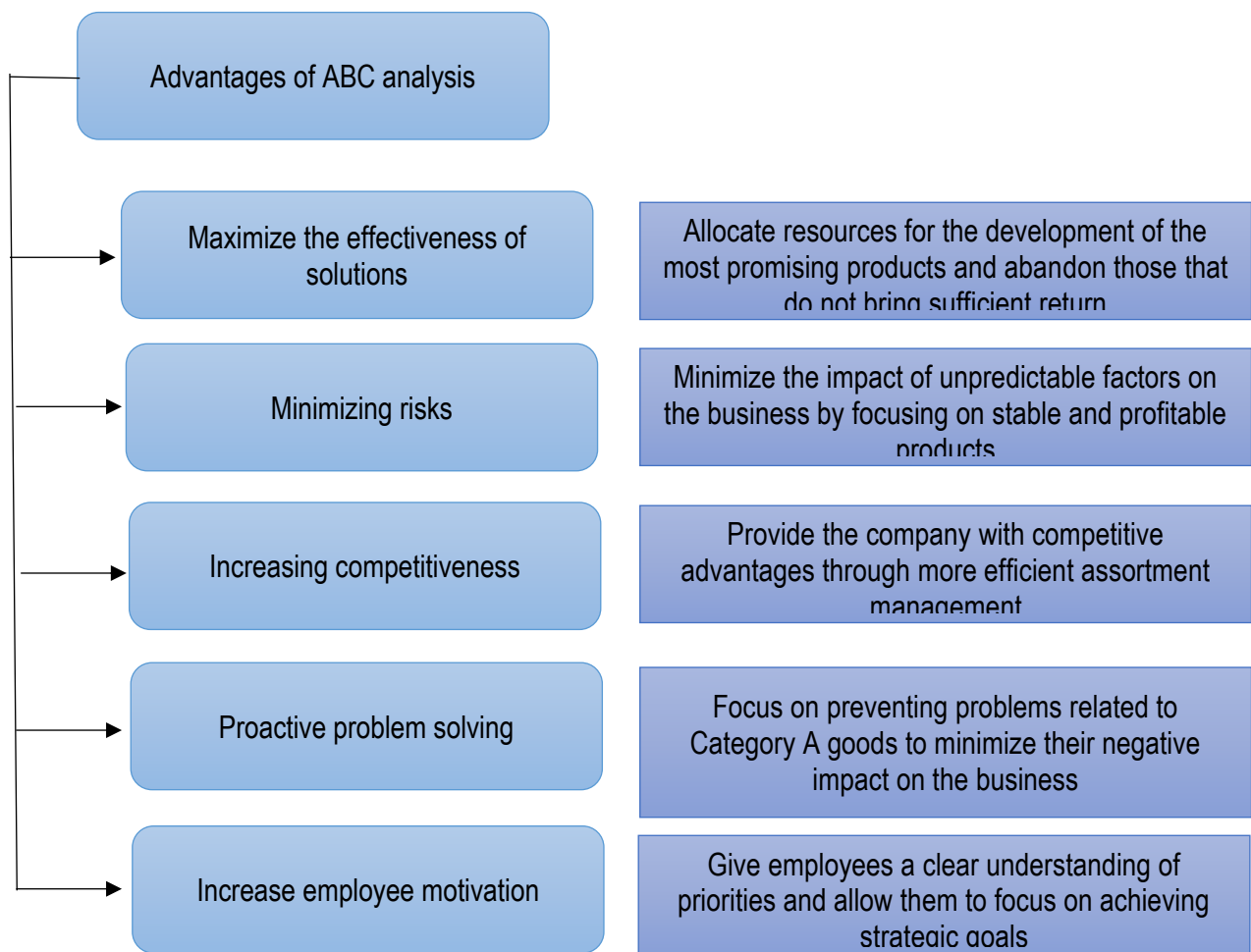
Figure 2 – Evaluating the efficiency of logistics processes in a company using ABC analysis

Thus, ABC analysis helps to determine which products in the overall assortment bring the most profit and require more attention, and which can be excluded from the product range. First of all, this should be used for various optimization initiatives aimed at saving money, improving service, and increasing the company's profitability.

Also, cost analysis and control are an important method for assessing the efficiency of logistics processes in a company. Logistics is an integral part of any business, affecting the cost of products, delivery speed and customer satisfaction. However, the effective management of logistics processes is often complicated by a large number of variable factors, such as sales growth, changing customer requirements, geographical distribution of warehouses, etc. All this leads to an increase in logistics costs, which can reach a significant share of the company's total expenses. That is why analyzing and controlling logistics costs is one of the most important tasks for any logistics manager. A detailed analysis can help identify bottlenecks in the supply chain, optimize delivery routes, reduce storage costs, and increase the efficiency of vehicle use [10]. The key stages of the logistics cost analysis are shown in Fig. 3.

Thus, for a comprehensive analysis and control of logistics costs, we propose to use the Five Steps system:

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Cost analysis and control

1 step
Identification of cost drivers

What factors determine the company's logistics costs and how they affect profitability

Step 2
Use the standard calculation method

Using a standardized costing method that allows you to compare actual costs with planned or budgeted costs

Step 3
Implement a cost allocation system

Implementation of a cost allocation system that allows you to allocate total logistics costs to different products, customers, or channels

Step 4
Systematic comparison and review of current expenses

Improving the analysis and control of logistics costs through regular and systematic benchmarking and cost review

Step 5
Involve stakeholders

Involvement of stakeholders such as suppliers, customers, employees and partners

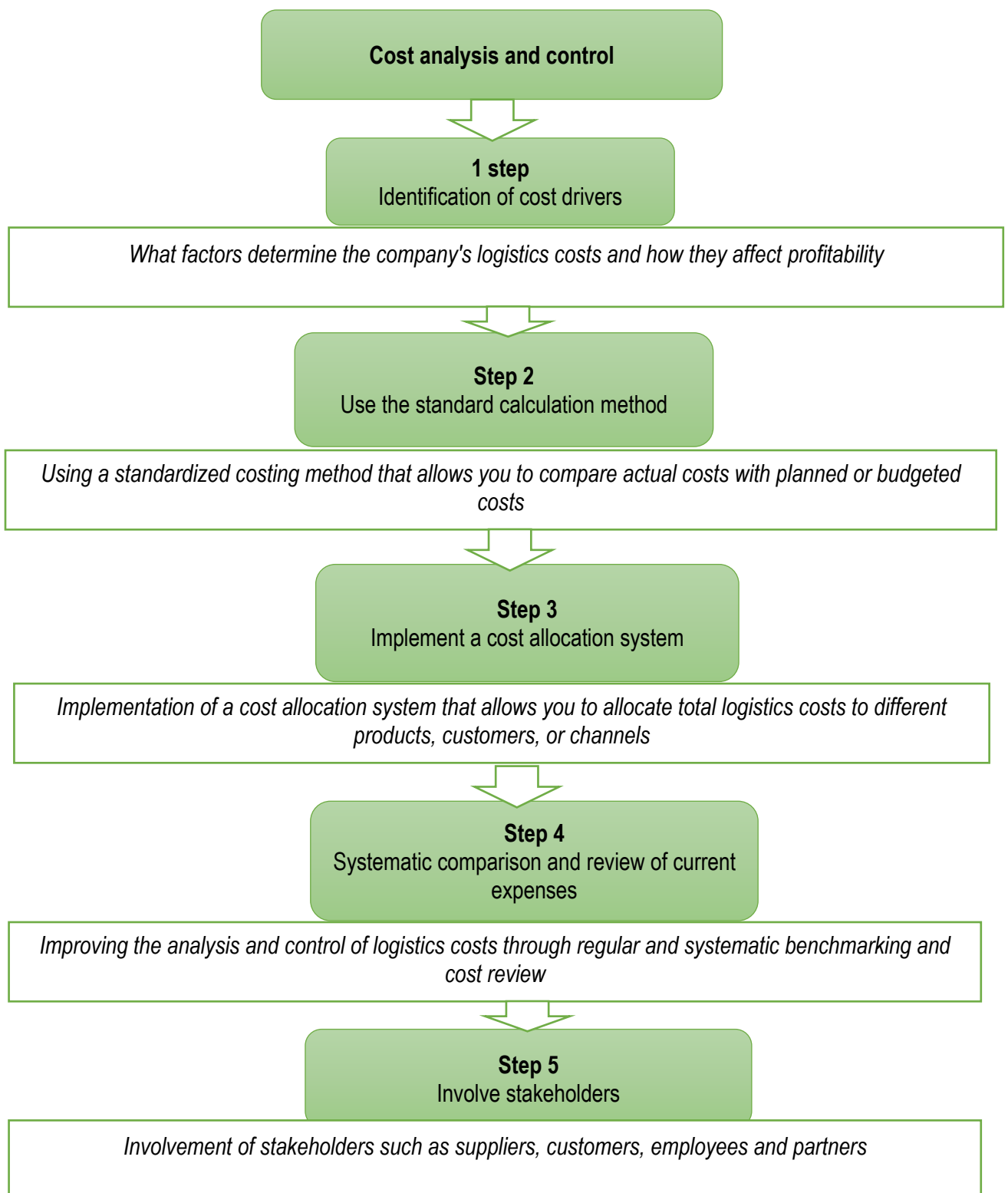Figure 3 – Key stages of logistics cost analysis

- Identification of cost drivers. The first step to improving the analysis and control of logistics costs is to understand what factors drive the company's logistics costs and how they affect profitability. Every company strives to achieve maximum profitability at minimum costs. Logistics, as one of the key elements of business, has a significant impact

on financial results. Understanding the factors that shape logistics costs allows a company not only to reduce costs but also to improve the quality of customer service, which is one of the most important success factors in modern business. By analyzing cost factors, we can identify hidden reserves for cost reduction, optimize logistics processes, and increase the efficiency of companies.

- Use a standardized costing method. The second step to improve the analysis and control of logistics costs is to use a standard costing method that allows you to compare actual costs with planned or budgeted costs. Standard costing is a powerful tool that allows you to turn a huge amount of logistics data into understandable and actionable information. By comparing actual costs with standard costs, companies can identify inefficiencies, evaluate the effectiveness of various logistics initiatives, and make informed decisions to improve their operations. This will help companies not only reduce costs, but also improve the quality of customer service, which is one of the most important success factors in modern business.

- Implement a cost allocation system. The third step to improving the analysis and control of logistics costs is to implement a cost allocation system that allows you to distribute total logistics costs across different products, customers, or channels. To make informed business development decisions, you need to have detailed cost information. A cost allocation system is a tool that allows you to allocate total logistics costs to individual products, customers, or distribution channels. This allows company managers to understand which business segments are the most profitable and which require additional investment. With this information, it is possible to optimize pricing, marketing campaigns, and logistics processes, which ultimately leads to increased profitability.

- Systematic comparison and review of current costs. The fourth step to improving the analysis and control of logistics costs is to regularly and systematically benchmark and review costs. To remain competitive in the market, companies must constantly look for ways to reduce costs and increase efficiency. Regular benchmarking of logistics costs is one of the most effective ways to achieve this goal. By comparing your costs with those of your competitors, you can identify inefficiencies, evaluate the effectiveness of various logistics initiatives, and make informed management decisions.

- Stakeholder engagement. The fifth and final step to improving the analysis and control of logistics costs is to involve stakeholders, such as suppliers, customers, employees, and partners. Cooperation is the key to success in any business. Involving stakeholders in the process of optimizing logistics costs is not just a recommendation, but a necessity. Working together with suppliers, customers, and employees allows company managers to identify new opportunities to reduce costs, improve the efficiency of logistics processes, and build long-term relationships with partners. This allows not only to achieve short-term goals, but also to create a sustainable and competitive business model.

Conclusions. Efficient logistics is one of the key success factors for modern business. Therefore, evaluating the efficiency of logistics processes is an integral part of the company's strategic management and ensures its stable development.

The analysis of modern methods for assessing the efficiency of logistics processes in the company allowed us to identify three important tools, such as the data envelopment analysis (DEA) method, ABC analysis, and the cost analysis and control method. The joint use of these methods creates synergy, allowing for a deeper and more accurate analysis than when each of them is applied separately. Therefore, the methods we offer complement each other, providing company managers with tools for comprehensive analysis and evaluation of logistics efficiency.

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