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The Management of Logistics Costs in Polish Manufacturing Enterprises: Evidence from a Survey Study

Abstract

Research background and purpose: Effective enterprise management depends, among other factors, on access to comprehensive and reliable data on incurred costs. This is particularly relevant for manufacturing enterprises, where logistics processes play a key role. In such organisations, it is justified to distinguish logistics costs as a separate cost category within their cost accounting systems. Against this backdrop, the objective of this article is to identify the practices adopted by manufacturing enterprises in eastern Poland with regard to the recognition, recording, and calculation of logistics costs and to assess the extent to which this information is used in both operational and strategic management.

Design/methodology/approach: To achieve the objective of this study, a survey was designed and conducted among 266 manufacturing enterprises based in Eastern Poland. The research employed the Computer-Assisted Web Interview (CAWI) method. The questionnaire consisted of 24 questions, divided into three thematic areas: (1) enterprise characteristics – 6 questions; (2) organisation and methods of cost accounting – 4 questions; and (3) logistics costs – 14 questions. The data were analysed using descriptive and statistical methods, including the distribution of responses, identification of the most commonly applied logistics cost accounting practices, and exploration of relationships between selected variables (e.g. enterprise size and the use of activity-based costing).

Findings: The main conclusion drawn from the survey responses is that logistics costs in manufacturing enterprises in Eastern Poland remain an undervalued cost category, despite their significance in effective enterprise management. Although a modest advancement in the development of logistics cost accounting within the overall cost structure of enterprises can be observed, this area remains relatively underdeveloped. Particularly concerning is the finding that some respondents demonstrated no understanding of what logistics costs entail or questioned the rationale for distinguishing them within their organisation's cost structure.

Value added and limitations: The results of the conducted study undoubtedly contribute to the existing body of literature on the analysis, recording, and allocation of logistics costs in enterprises, as well as their usefulness for effective cost management. A comparison of current findings with previous research indicates an increased recognition of logistics costs as a distinct category within the cost accounting systems of manufacturing enterprises. Accordingly, this study helps update the current state of knowledge regarding this category of costs.

Keywords: *logistics costs; logistics cost accounting; manufacturing enterprises*

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1. Introduction

Contemporary manufacturing enterprises operate under conditions of dynamic economic change, increasing supply chain complexity, intensifying competition, and rising customer expectations regarding quality, speed, and reliability of service. One of the key areas influencing both operational efficiency and competitive advantage is logistics. Its importance is steadily growing, not only with respect to the execution of procurement, production, and distribution processes, but also as a critical factor shaping the overall cost structure of business operations.

In both the academic literature and business practice, increasing attention has been paid over the past decades to the share of logistics costs in the overall operating expenses of firms. Studies indicate that these costs may account for anywhere from as little as a few, or as much as several dozen, percent of a company's total costs, depending on the industry, enterprise size, and the chosen cost calculation method (Bartczak, 2015; Ślusarczyk, 2014b). This issue is particularly significant for small and medium-sized enterprises (SMEs), where logistics costs may represent up to 40% of total operating expenses (Ślusarczyk & Kot, 2013; Plekan et al., 2023), making them a critical factor detemining profitability and growth potential.

The significance of logistics in cost terms is not limited to the operational level alone. It is increasingly viewed from a strategic perspective, as a source of potential savings, opportunities for supply chain optimisation, and enhanced organisational flexibility. Logistics costs are no longer seen as merely supporting expenses; they are becoming a strategic determinant of competitiveness. This is particularly relevant for manufacturing enterprises, where the scale and complexity of material, raw material, and finished goods flows require a systemic approach to the planning, monitoring, and assessment of cost efficiency in logistics operations. Effective management of these costs has become an essential component of overall organisational management, as they directly influence financial performance, customer service quality, and market competitiveness (Bartczak, 2015; Kołodziej-Hajdo, 2013; Zavytiy et al., 2019). In light of the above, a key question arises: how do enterprises identify and manage logistics costs in practice?

Existing empirical research reveals a shortage of analyses focusing on the practical aspects of identifying, recording, and managing logistics costs in Polish manufacturing enterprises. To date, studies have mainly focused on selected components of logistics systems or have adopted a predominantly theoretical perspective. There is a noticeable lack of comprehensive approaches that address the identification of logistics costs, their registration in accounting systems, and the use of the resulting information in management processes. This issue may be particularly significant for enterprises operating in less developed regions of Poland, where the level of digitalisation and access to advanced analytical tools remains limited.

Despite the growing interest in logistics costs—both from theoretical and practical standpoints—relatively few empirical studies have focused on a comprehensive analysis of the processes involved in identifying, recording, and managing these costs in Polish manufacturing enterprises. Existing studies often concentrate on selected aspects, such as cost classification, accounting-based cost calculation, or the potential application of modern IT tools. However, there is a lack of research that addresses the entire cost information processing chain—from initial identification, through integration into accounting systems, to their application in managerial decision-making. This issue may be particularly relevant for enterprises located in less industrialised regions, where access to specialised human resources and advanced technological solutions is limited, potentially affecting the scope and quality of cost-related analysis.

The aim of this article is to identify the practices adopted in manufacturing enterprises in Eastern Poland in the recognition, recording, and calculation of logistics costs, as well as to assess the extent to which this data is used in both operational and strategic management. The study seeks to address the following research questions: (1) What practices are used in the identification and recording of logistics costs? (2) What costing methods are applied? (3) To what extent is cost information used in decision-making processes? (4) How are cost efficiency indicators applied and monitored? (5) What is the perceived share of logistics costs in total operating expenses?

The implementation of the research objective, along with the associated research questions, required the design and implementation of an original survey study. The research was carried out between 15 May and 6 June 2025 among enterprises classified under Section C – Manufacturing (PKD 2025), operating in the Podlaskie, Lublin, Świętokrzyskie, and Subcarpathian voivodeships. The selection of these regions—defined as part of „Eastern Poland"—enables an analysis of practices in a macro-region considered to be economically less developed compared to other parts of the country. According to data from Statistics Poland (GUS), GDP per capita in the Eastern Poland voivodeships is approximately 22–30% lower than the national average, and these regions consistently occupy the bottom five positions in regional GDP rankings (GUS, 2024). These voivodeships also constitute the least industrialised areas in Poland (Bal-Domańska & Stańczyk, 2017). The article consists of five sections: introduction, literature review, research methodology, presentation and discussion of results, and final conclusions.

2. Literature review

The academic literature emphasises that defining and delineating logistics costs is a complex task. S. Kowalska, J. Rubik, and W. Skibińska note that the difficulty begins with the terminology itself. Both "logistics costs" (logistikkosten) and "logistic costs" (logistische Kosten) appear in the literature, often used interchangeably. The authors

align with scholars such as A. Weelik, J. Twaróg, and A. Karmańska in arguing that the term "logistics costs" does not breach formal cost accounting principles; rather than constituting a new category of costs, it simply extends the cost accounting framework to include a new structure of recording. In contrast, the term "logistic costs" implies the creation of a distinct cost category (Kowalska et al., 2020).

Depending on the academic school, country, or industry context, logistics costs are defined in diverse—and at times contradictory—ways (Shevchenko, 2024). Biernacki (2018) notes that the absence of a unified definition of logistics costs leads to discrepancies in their interpretation and scope. This lack of consensus can result in costly errors in organisational decision-making. Zwierzyński (2018) observes that logistics costs are often linked to various organisational functions, making it difficult to assign them accurately or to manage them effectively. The complexity stems from the interdependencies among these costs, which hinder the ability to distinguish logistics-related expenditures from other operational expenses.

Depending on the business model—whether manufacturing, trade, or e-commerce—the scope of logistics activities and the associated costs may vary considerably, which in turn affects how these costs are defined. Stępień et al. (2016) highlight that logistics costs can fluctuate due to a range of factors, including company size, sector, and the cost measurement methods employed, all of which contribute to inconsistencies in defining what exactly constitutes logistics costs. Furthermore, the definition may differ depending on the analytical context—for instance, in project-specific analyses versus enterprise-wide evaluations—which makes it even more difficult to establish a single, universally accepted definition (Engblom et al., 2012).

For the purposes of this article, logistics costs are defined as the monetary expression of an enterprise's resource consumption—including human labour, as well as tools, equipment, and materials—resulting from the planning, execution, and control of non-technological processes involving the movement of physical goods across time and space, both within the organisation and between entities. These costs also encompass financial outlays and other negative effects arising from extraordinary events associated with the flow of goods and inventory maintenance. Kes (2018) notes that one approach to defining logistics costs is to list the individual components that constitute this cost category. However, even this method lacks consensus. Various studies and authors identify different elements as part of logistics costs, thereby adding to the conceptual ambiguity (Engblom et al., 2012; Ślusarczyk, 2014a). These costs may be narrowly defined to include only transportation and warehousing, or broadly understood to also cover planning, order handling, IT services, inventory holding, and so on. Divergences in both theoretical and practical approaches to categorising logistics costs also vary depending on the academic tradition, country, or industry context (Shevchenko, 2024).

Given the scope of this study, which concerns Polish manufacturing enterprises, it is justified to focus on the classifications of logistics costs found in the Polish academic literature. The typical components include transportation costs, warehousing expenses, inventory holding costs, and the costs related to logistics administration (Ślusarczyk, 2014b).

Other authors expand this classification to include opportunity costs related to capital, risk-related costs, and the costs of lost sales opportunities, particularly as components of inventory holding costs (Kowalska et al., 2020). Another example is the distinction between direct and indirect costs. Direct costs refer to expenditures on transport, warehousing, inventory, and communication, whereas indirect costs include, among others, expenses related to warehouse rental and executive salaries (Bartczak, 2015; Biernacki, 2018). Logistics costs may also be categorised as fixed or variable (Biernacki, 2018; St?pień et al., 2016). Fixed costs include, for example, insurance and depreciation of transport equipment and warehouses, while variable costs may comprise the consumption of materials and fuels (Bartczak, 2015).

Other classifications distinguish between tangible costs—those related to the physical flow of goods, such as raw materials and finished products—and intangible costs, which include labour costs, taxes, and the cost of capital engagement (Bartczak, 2015; Biernacki, 2018). This classification aligns with the typological division of logistics costs into depreciation, consumption of materials, fuel and energy, and third-party services (considered tangible costs), as well as labour costs, taxes and fees, other expenses (intangible costs), and finally costs and losses that directly affect the financial result (Kowalska et al., 2020). Logistics costs may also be categorised as planned costs—covering anticipated expenditures on transport and inventory management—and unplanned costs arising from unexpected events, such as excess inventory or incorrect deliveries (Kes, 2018; Sadowska & Lulek, 2015). These costs are also classified according to the phases of material flow: procurement, production, and distribution (Zwierzyński, 2018).

Another approach suggests that logistics costs should be identified based on the stage at which they arise within the production cycle of the enterprise. This includes, among others: the procurement of materials, semi-finished goods, and other resources from external suppliers; internal and external transport of raw materials and finished products; planning of the production process with consideration for the intensity of material flows; storage of materials, intermediate products, finished goods, and waste; as well as the distribution of finished products to end customers (Biernacki, 2018).

Logistics costs can also be classified based on the nature and purpose of the expenditures incurred. A common distinction is made between operational costs—regular outlays directly related to the scale and intensity of a company's activities—and strategic costs, which are one-off expenses that do not stem from the current

level of business operations but have implications for long-term planning (Biernacki, 2018). The aforementioned classifications highlight the complexity and diversity of logistics costs, which can be divided in various ways depending on the author's perspective and the specific operational context. Given the lack of a standardised definition of these costs, enterprises may encounter difficulties in their recording and classification (Kravets, 2024; Ślusarczyk, 2014b). Traditional accounting systems do not provide adequate transparency with regard to logistics costs, which may result in suboptimal managerial and optimisation decisions. This stems from the arbitrary allocation of indirect costs, which often obscures the actual distribution of logistics expenditures assigned to specific cost objects such as products or services (Krajnc et al., 2012).

Difficulties in identifying logistics costs have a significant impact on their accounting treatment. Recording logistics costs involves recognising transactions related to these costs in appropriately designated accounting accounts. Since synthetic accounts do not allow for the direct inclusion of logistics costs, it is necessary to register them using analytical accounts (Ślusarczyk, 2014b). G. Zimoń also argues that maintaining a detailed record of logistics costs requires the use of analytical accounts, which enables more accurate tracking and control of these expenses (Zimon, 2016). S. Smyk emphasises that current regulations do not mandate the separate identification of logistics costs within corporate cost accounting, which hinders their analysis and accurate estimation (Smyk, 2021).

In this context, the importance of modern IT tools that support the recording and control of logistics costs is steadily increasing. ERP and TMS systems significantly enhance the processes of cost registration and oversight by enabling data integration, process automation, and real-time expenditure monitoring, all of which contribute to improved logistics management efficiency (Seni & Tsaruk, 2024). At the same time, research indicates that modern IT systems—including solutions based on project accounting—substantially improve the capacity to collect, record, and analyse logistics costs, facilitating their precise tracking and supporting managerial decision-making processes (Tu & Wang, 2011).

The literature identifies various methods for calculating and allocating logistics costs. Traditional full costing approaches often fail to provide precise identification of logistics costs, as these are typically embedded within broader categories of indirect costs (Kowalska et al., 2020; Krajnc et al., 2012). In response to these limitations, activity-based costing (ABC) has gained increasing popularity, as it enables the assignment of costs to specific logistics activities and processes (Krajnc et al., 2012; Smyk, 2021). This approach makes it possible to identify cost-intensive areas and implement appropriate optimisation measures. Z. Bokor demonstrated that detailed insights into logistics costs obtained through ABC significantly improve the management of logistics functions in manufacturing enterprises (Bokor, 2012).

An alternative method is process costing, which is particularly applicable in enterprises with standardised and repetitive operations, as it allows for the assignment of costs to individual production units (Biernacki, 2018). In recent years, the concept of time-driven activity-based costing (TDABC) has also gained traction. This approach enables a more accurate reflection of resource utilisation efficiency and offers better alignment with the actual needs of production processes. Moreover, TDABC is characterised by simpler implementation, lower deployment costs, and greater flexibility in model updates compared to traditional ABC, making it especially useful for the analysis and management of logistics costs (Deng et al., 2017).

The methods outlined above contribute to improved transparency and control over logistics costs, which is essential for the accurate calculation of product costs. The literature also highlights the potential for integrating simulation techniques with accounting systems. Grobis and Ihlenfeldt (2024) developed a cost module within a simulation environment that enables real-time allocation of both direct and indirect costs, thereby supporting the design and optimisation of production and logistics processes.

The growing importance of logistics costs as a component of total operating expenses compels enterprises to incorporate them into both strategic and operational decision-making processes. As shown in empirical research, precise analysis of logistics costs is essential for optimising supply chain structure, selecting appropriate transport modes, determining inventory levels, and evaluating supplier performance (Biernacki, 2018; Engblom et al., 2012).

Despite the domestic scope of this study, analyses of foreign enterprises provide valuable references and examples of best practices in logistics cost management, which—when appropriately contextualised—can also be adapted by Polish companies. Škerlič and Sokolovskij (2019) developed a logistics cost management model covering the entire product life cycle, enabling cost planning already at the product design stage, which contributes to long-term cost reduction. Fu and Shuai (2015), in turn, proposed a system dynamics-based model consisting of three subsystems—ordering, inventory, and transport—combined with optimisation tactics such as joint distribution or shortage reduction.

Chua et al. (2025) found that Malaysian SMEs limit the calculation of logistics costs mainly to transportation, neglecting other important components. In response to these shortcomings, the authors recommend best practices such as outsourcing logistics functions, using smaller vehicles instead of trucks, and employing qualified logistics specialists to improve cost efficiency. In a study of the automotive industry, Porporato (2016) emphasised the importance of identifying key cost drivers, monitoring deviations from operational plans, and defining performance indicators (KPIs). Similar conclusions were drawn by Zakariah and Pyeman (2013), who pointed to the need for a unified definition of logistics costs and improved data transparency.

Khanh et al. (2024), in their analysis of the electronics sector in Vietnam, highlighted the role of integrated inbound and outbound logistics management in enhancing operational efficiency. Campos-García et al. (2011), meanwhile, classified logistics practices into five key operational areas and demonstrated that advanced solutions—despite their higher costs—are essential for operating effectively within global supply chains.

International case studies also underscore the growing role of modern tools for logistics cost accounting and reporting, including information systems, cost audits, simulations, and contractual clauses (Campos García et al., 2011; Fu & Shuai, 2015; Porporato, 2016). Although developed in different institutional and market environments, these experiences may serve as a source of inspiration for Polish industrial enterprises.

Building on these insights, comprehensive information on logistics costs plays a crucial role in decision-making processes. It serves as a foundation for planning and control systems, forms an integral part of management reporting, and—through costing procedures—can be used to value production or services provided (Kes, 2018; Lisowska et al., 2022). Ślusarczyk and Kot (2013) argue that reducing logistics costs can significantly enhance a company's competitiveness, provided that the quality of accounting and analytical data is ensured, which, in the longer term, supports the achievement of strategic objectives.

3. Methods

Achieving the objective of this article necessitated the collection of comprehensive information pertaining to the analysis, recording, accounting, and reporting of logistics costs within Polish enterprises. Consequently, between 15 May and 6 June 2025, - a survey study was conducted focusing on the identification of logistics costs as a distinct component within the cost accounting systems of manufacturing enterprises operating in Poland.

The study was conducted using the Computer-Assisted Web Interview (CAWI) method, a computer-supported survey technique. The questionnaire comprised a total of 24 questions, which were categorised into three primary sections: (1) characteristics of the surveyed enterprise – 6 questions, (2) organisation and applied cost accounting methods – 4 questions, and (3) logistics costs – 14 questions. The survey included closed-ended questions with single- and multiple-choice options, as well as open-ended questions. The questions addressed, among other aspects, the legal form and size of the enterprise, its business profile (according to the Polish Classification of Activities – PKD), employment structure, existence of a dedicated logistics department, the cost accounting systems used (e.g., full costing, variable costing, activity-based costing), methods of recording logistics costs, components of logistics costs (such as transport, warehousing, and inventory management), IT support systems (ERP, WMS, TMS),

logistics cost calculation methods, and the utilisation of cost reports in decision-making processes.

A total of 266 enterprises from Eastern Poland—specifically from the Podlaskie, Lublin, Świętokrzyskie, and Subcarpathian voivodeships—were invited to participate in the study. The selection of the research sample was determined by the specific nature of the issue under investigation. The enterprises included in the survey were chosen based on their classification under Section C: Manufacturing of the Polish Classification of Activities (PKD) 2007. Given that both the invitation and the survey itself were conducted online, an additional criterion for sample selection was the possession of a valid email address by the enterprise. The collected data were subjected to descriptive and statistical analysis, which included, among other aspects, the distribution of responses, identification of the most commonly applied practices in recording logistics costs, and examination of relationships between selected variables (e.g., company size and the application of activity-based costing).

4. Results

The conducted research involved a total of 266 manufacturing enterprises from the Eastern Poland region, of which 126 provided complete responses, forming the basis for the analysis of the investigated issue and subsequent conclusions (see Figure 1).

Figure 1. **Voivodeships of Eastern Poland covered by the study**

Source: own study

As shown in Figure 1, the study encompassed five voivodeships of Eastern Poland: Warmińsko-Mazurskie, Podlaskie, Lubelskie, Świętokrzyskie, and Podkarpackie. The sample was dominated by entities classified as small and medium-sized enterprises (SMEs), primarily operating in the following sectors: food industry (35%), machinery manufacturing (25%), and chemical industry (15%) (see Figure 2).

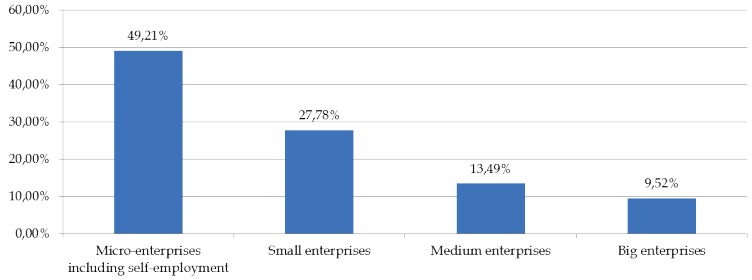

Figure 2. **Structure of the surveyed enterprises according to the number of employees**

Source: own study

From the perspective of organisational and legal forms, the largest groups among the surveyed entities were sole proprietorships and limited liability companies. In terms of geographic location, the majority of respondents conducted their operations in the Świętokrzyskie voivodeship (approximately 37%), followed by the Subcarpathian voivodeship (over 23%) and the Lublin voivodeship (over 17%).

The survey questionnaire was divided into two key areas: the characteristics of the cost accounting system employed by the surveyed entities and the identification of logistics costs as a distinct component within the cost accounting system. The research findings indicate that a clear majority of enterprises operate a traditional full costing system (see Figure 3).

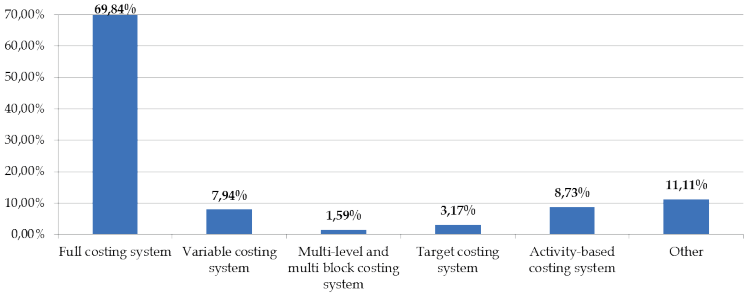

Figure 3. **Cost Accounting Systems Used in the Surveyed Enterprises**

Source: own study

The use of this costing system is typical in business practice, as it is mandated by the provisions of the Accounting Act of 29 September 1994. At this stage of analysis, this may suggest that these enterprises do not record any additional cost information, such as logistics costs, in their accounting systems. The second most widely applied costing system is activity-based costing (ABC), which is used by nearly 9% of respondents. Despite its well-established position in both the literature and the business practices of European countries and beyond, ABC still does not enjoy widespread popularity in Poland. In the identification of logistics costs, this method could prove extremely useful, as it is characterised by a high degree of precision in assigning costs to logistic processes. Activity-based costing assumes that it is not the product but the processes and activities carried out within the enterprise that are the primary drivers of costs (Mikki & Sharma, 2022). The level of sophistication involved in unit cost calculation procedures—first allocating resource costs to activities and then assigning activity costs to cost objects—would be highly suitable for the surveyed enterprises.

A significant portion of responses, amounting to 11%, fell under the category of "other," which includes, among others, the tax revenue and expense ledger and lump-sum tax on recorded revenues. However, there were instances where respondents were either unaware of or unable to specify the costing system used in their enterprises. Insufficient knowledge regarding the costing system applied may also result from the fact that in nearly 44% of the surveyed enterprises, the entire accounting system is managed externally by a third-party firm.

As previously mentioned, the second part of the questionnaire focused on the knowledge, identification, and accounting of logistics costs as a separate category within the cost accounting system. Unfortunately, more than 50% of respondents do not distinguish logistics costs as a separate cost category at all, while over 26% do so only partially (see Figure 4).

The analysis also reveals that only 38% of the surveyed companies have a dedicated logistics department, whereas 62% perform logistics functions within other departments, primarily production and procurement. Approximately 90% of the surveyed entities do not have a formal definition of logistics costs, and only 41% systematically record logistics costs, indicating significant underestimation of this cost category in practice. Regarding the structure of logistics costs, the dominant items are transport, packaging, warehousing, and order processing costs (see Figure 5).

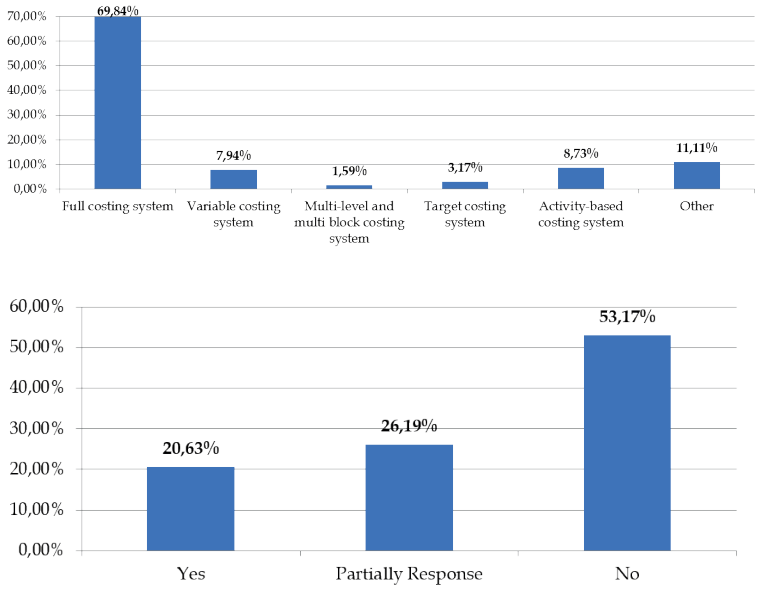

Figure 4. **Logistics Costs as a Distinct Component of the Cost Accounting System**

Source: own study

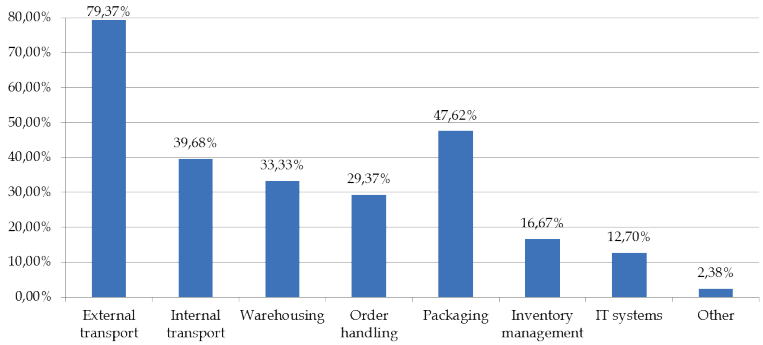

Figure 5. **Components of Logistics Cost Accounting**

Source: own study

Costs related to IT systems and inventory management, which arise from a lack of integration in logistics activities, are identified significantly less frequently. Enterprises rarely use analytical tools that enable segmentation of these costs (e.g., by phases such as procurement, production, and distribution). Only 17% of the surveyed enterprises reported using ERP-class systems, while 10% indicated the use of warehouse management systems (WMS) and transport management systems (TMS) for logistics cost management. This constitutes a limiting factor for the accuracy of analyses and restricts the ability for real-time monitoring and reporting. The vast majority of respondents do not report logistics cost data at all (see Figure 6).

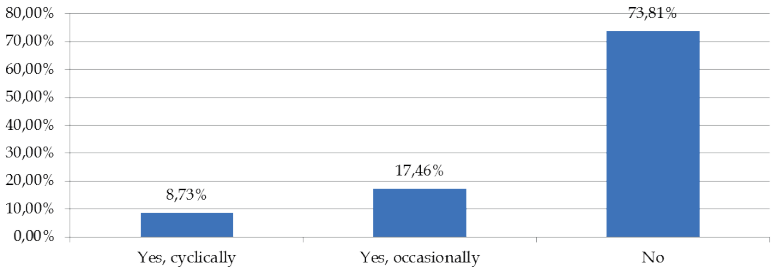

Figure 6. **The structure of creating logistics cost reports in the surveyed enterprises**

Source: own study

As shown in Figure 6, nearly 74% of the surveyed entities do not report logistics costs at all, while only 26% do so either periodically or occasionally. From the perspective of effective cost management in enterprises where logistics costs constitute a significant portion of total expenses, the absence of such documentation makes it impossible to conduct rational financial management. These reports provide a detailed analysis of expenditures related to supply chain management. The information obtained from these reports allows for the identification of areas within logistics operations where costs can be pinpointed, optimised, and managed more effectively.

The preparation of logistics cost reports brings numerous benefits, including, among others:

- optimisation of costs, i.e. identifying areas where costs are excessively high and actions are required to reduce them,
- increased operational efficiency through the streamlining of logistics processes and elimination of unnecessary expenses,
- improvement of profitability, achievable through the rationalisation of logistics costs,

- better planning and forecasting of costs in both the short- and long-term,
- support in the decision-making process.

Respondents who prepare logistics cost reports most frequently use the obtained data for cost optimisation (more than 22% of respondents indicated this purpose), followed by efficiency analysis (approximately 13%) and budget planning (over 9%).

In effective logistics cost management, a key role is played by indicators that enable the analysis and assessment of the level and structure of costs related to such logistics processes as warehousing, transportation, and inventory management. This allows enterprises to identify those areas of their operations where logistics costs are high and require optimisation.

The most commonly used indicators of logistics process efficiency, as identified in the literature, include (Piechota, 2007; Stuzhnyi, 2025):

- in warehousing processes:
  – unit cost of storage,
  – unit cost of goods receipt and dispatch,
  – inventory turnover ratio,
- in transport processes:
  – unit transport cost,
  – unit transport cost per product unit,
- in inventory management processes: ?
  – inventory holding cost, ?
  – cost of stockouts.

The findings show that only a small proportion of the surveyed enterprises systematically monitor logistics cost efficiency using quantitative indicators. When asked whether such performance indicators are used, only 9.52% of respondents answered affirmatively, while 76.19% declared they do not use them, and 14.29% were unsure. Among those who declared using indicators, only 6.35% of the total sample provided meaningful and specific examples. These included: logistics costs in relation to revenues or operating costs, cost of transportation per product unit, cost per order fulfilled, OTIF (On-Time In-Full), storage costs in external warehouses (expressed per unit/day), inventory holding costs, fuel consumption, amortisation of transport equipment, and total logistics cost per delivery. The responses demonstrate a wide variety in the understanding and application of logistics performance metrics—ranging from precise KPIs to general cost categories or unclear statements. This confirms the very limited and inconsistent use of performance measurement tools in logistics cost management, which may be related to the lack of detailed cost data or dedicated systems.

Indicator-based analysis of logistics processes is crucial for establishing an appropriate balance between the level of service provided and the level and structure of the associated costs. Therefore, knowledge of logistics costs is essential for effective cost management.

Unfortunately, it is concerning that the majority of respondents participating in the study do not possess sufficient knowledge about this category of costs. Moreover, they are often unaware of how significantly these costs can affect the operating performance of their enterprises.

The analysis of the collected data also enabled the identification of significant relationships, for instance, between the size of the surveyed enterprise and the adoption of the activity-based costing (ABC) system, as well as between the presence of a dedicated logistics department and the recording of logistics costs. The data indicate that larger enterprises are more likely to implement activity-based costing. Among large enterprises employing over 250 employees, 60% apply the ABC method, whereas among microenterprises with 1 to 9 employees, this percentage is only 15%. Medium and small enterprises fall in between, with 45% and 25%, respectively, adopting the activity-based costing approach. This observed distribution is undoubtedly influenced by the fact that implementing ABC is a complex and time-consuming process, requiring a competent implementation team. The costs associated with deploying this system in an enterprise are also considerable. Consequently, in most cases, it is primarily large enterprises that decide to adopt the ABC concept as an alternative cost accounting system. Small and medium-sized enterprises tend to retain traditional costing systems, such as full costing or variable costing.

A similar relationship can be observed between the size of enterprises and the methods they use for calculating logistics costs. Only 18% of respondents declared that they regularly calculate logistics costs, while 82% do not use such methods at all or do so only occasionally. The importance of the level and structure of logistics costs – including storage, distribution, and transportation – is particularly recognised by large enterprises, which belong to the group of companies that systematically apply unit cost calculation methods. In contrast, small and medium-sized enterprises use such methods to a much lesser extent and with significantly lower frequency.

It is worth emphasising that the approach to logistics cost management differs depending on the type of enterprise – including its size, industry, and business profile. In this study, the focus was placed on manufacturing enterprises, based on the assumption that such entities, due to the nature of their operations, would be more likely to treat logistics costs as a distinct cost category. However, the results showed that in practice, only large enterprises (employing more than 250 people) clearly perceive the benefits of separating logistics costs within their cost accounting systems. A concerning observation is that small and medium-sized enterprises often fail to consider these costs in their decision-making processes. The vast majority of respondents from this group, when asked whether information on the level and structure of logistics costs is taken into account in strategic decisions, answered „no" or „partially."

Another identified relationship concerns the presence of a dedicated logistics department within the surveyed enterprises and the recording of logistics costs. It turns

out that enterprises with a separate logistics department are significantly more likely to maintain records of logistics costs. Among enterprises with such a department, 75% record logistics costs, whereas among entities without a dedicated logistics department, this figure is only 30%. In enterprises with a complex organisational structure, costs are often recorded according to their points of origin, i.e., so-called cost centres (MPKs). This greatly facilitates the rational management of incurred costs and enables effective cost control. Therefore, an enterprise in which the logistics department functions as a distinct unit within the organisational structure systematically records and accounts for costs related to the execution of logistics processes.

The above relationships suggest that organisational structure and enterprise size have a significant impact on the sophistication of applied costing methods and systems, as well as on the practices of recording logistics costs as a distinct cost category.

The research conducted indicates that logistics costs in manufacturing enterprises in Eastern Poland remain an underestimated category, despite their role and importance in effective enterprise management. Although, compared to studies by Ślusarczyk (2014b) and Ślusarczyk and Kot (2013), a slight progress can be observed in the development of logistics cost recording within the cost structure of enterprises, it still remains a relatively underdeveloped cost category.

5. Discussion

Studies conducted in Poland in 2011 and 2013 revealed that the core issue lies in the complexity of identifying and classifying logistics costs, which hampers the accurate capture of all expenses related to logistics. For instance, these studies highlighted that Poland lacks regular and comprehensive analyses of logistics costs, while traditional accounting methods are often outdated and inadequate for meeting modern logistics requirements (Ślusarczyk, 2014b; Ślusarczyk & Kot, 2013).

According to the literature, traditional cost accounting systems tend to obscure logistics costs, which are often classified as general indirect expenses. This practice hampers their precise tracking and effective management. For example, the report „Measurement of Logistics Costs in Enterprises" emphasises that many companies struggle with the accurate identification and classification of logistics costs. A significant limitation is the absence of formalised classification systems and reliable source documentation (Ślusarczyk, 2014a).

A potential solution to the aforementioned difficulties in the identification and recording of logistics costs could be the implementation of activity-based costing (ABC). The implementation process should begin with the identification of enterprise resources, followed by the development of an activity dictionary. This dictionary would encompass all elementary activities and processes carried out within the entire enterprise or its designated parts, in this case, the logistics department. It is important to note that this

concept can be applied both to the specific operations of the entire enterprise as well as to its individual departments. Such an approach would undoubtedly address many of the challenges enterprises face in identifying this cost category. Subsequently, dependency maps between resources and activities (i.e., resource-activity matrix) and between activities and cost objects (i.e., activity-cost object matrix) should be developed. These tools would enable precise allocation of the costs of consumed resources to performed activities and cost objects.

The conducted research confirms a low level of advancement in logistics cost accounting among the surveyed enterprises, as well as its limited integration with operational management systems. The results also indicate that enterprises possess a limited understanding of the usefulness of logistics cost accounting for effective cost management. Consequently, there is a need to intensify educational and advisory efforts regarding modern cost accounting methods and the implementation of IT systems supporting logistics cost management. Additionally, the development of sector-specific standards for the classification of logistics costs could prove highly beneficial in the identification of logistics costs, facilitating benchmarking and improving the quality of data used in decision-making processes.The limited and inconsistent use of logistics KPIs revealed in the study appears to be closely related to the lack of reliable cost data. In many surveyed enterprises, logistics costs are either not recorded at all or only partially, and there is no standardised definition of what constitutes logistics costs. Under such conditions, it becomes difficult to apply specific performance indicators that require clear and structured cost data. This confirms that the implementation of KPI-based performance measurement depends on the maturity of logistics cost accounting systems.

A limitation of the study is the lack of data on production volume and financial indicators. Company size was determined based on the number of employees (in line with EU classification). We deliberately avoided asking for financial data due to the expected low response rate. This may limit the ability to compare logistics cost accounting practices across enterprises of different economic scales.

6. Conclusions

The results of the conducted research indicate that logistics cost management in manufacturing enterprises in Eastern Poland remains at a relatively low level of sophistication. Despite the acknowledged growing importance of logistics costs within the structure of operating expenses, many enterprises neither systematically record these costs nor employ advanced management accounting methods. One of the reasons for this situation may be a lack of sufficient knowledge regarding the usefulness of logistics costs for effective cost management or resistance to changes that are not mandatory within the accounting system. Nevertheless, a comparison of the obtained data with findings from

previous studies allows us to conclude that the role and significance of treating logistics costs as a distinct cost category within the cost accounting systems of manufacturing enterprises have increased in recent times.

The analysis of the research results enabled the identification of clear differences in approaches to logistics cost accounting depending on the size of the enterprise and the presence of a dedicated logistics department. Larger enterprises, as well as those with distinct logistics departments, demonstrate a greater propensity to implement analytical tools and maintain detailed cost records. Therefore, it is recommended to promote the advantages of alternative management accounting tools, such as activity-based costing, particularly within the SME sector; to implement ERP, TMS, and WMS systems even in simplified forms; to develop sector-specific guidelines for the classification of logistics costs; and to strengthen the competencies of management personnel in the area of logistics cost control.

Additionally, future studies could investigate the relationship between the implementation of logistics cost accounting practices and their measurable outcomes, such as return on investment (ROI), cost reductions, or operational performance improvements. Such research would help assess the actual effectiveness of advanced logistics cost management tools in practice and further support evidence-based recommendations for their adoption.

Undertaking these measures can significantly contribute to improving the cost efficiency of enterprises and strengthening their competitiveness in the long term.

Authors' contribution

D.M.-B., **P.Z.**: article conception, theoretical content of the article, analysis and interpretation of results, research methods applied, conducting the research, data collection, draft manuscript preparation

Declaration of Generative AI and AI-assisted technologies in the writing process

While preparing this work, the authors did not use any tool/service.

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