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# ECONOMIC LOGIC AND CONCEPTUAL FOUNDATIONS FOR THE IDENTIFICATION AND IMPLEMENTATION OF A METHODOLOGY FOR MANAGEMENT ACCOUNTING OF ENTERPRISE LOGISTICS COSTS

## ABSTRACT

This study provides a scientific and applied substantiation of the economic logic and conceptual foundations for developing a comprehensive methodology of management accounting for enterprise logistics costs (LCs). The proposed approach encompasses the identification, structuring, and allocation of LCs across responsibility centers (RCs), as well as the implementation of organizational, methodological, and digital tools aimed at improving the efficiency of logistics process management. The main findings, obtained through the application of induction and deduction, analysis and synthesis, structural-functional analysis, system modeling, comparative analysis, abstraction, and generalization, have enabled the development of a conceptual framework explaining the impact of logistics cost accounting systems on supply chain management efficiency and the accuracy of product cost calculation.

The proposed methodological approach includes three key components. First, the formation of an accounting system for LCs based on RCs, using analytical accounts and sub-accounts, which ensures cost transparency and facilitates control over budget deviations. Second, the implementation of digital tools, including enterprise resource planning (ERP), transportation management systems (TMS), and warehouse management systems (WMS), to automate accounting procedures and enhance the timeliness of managerial decision-making. Third, the development of coding and identification schemes for LCs enables resource optimization, improved cost forecasting accuracy, and more effective interaction between enterprise units. The results highlight the critical importance of increasing the accuracy of accounting and control of LCs, optimizing resource allocation, and improving cross-level managerial coordination. Particular emphasis is placed on the significant impact of accounting systems on management effectiveness, as well as on the economic stability and resilience of enterprises. The practical value of the study lies in the development of an integrated approach to management accounting for LCs, aimed at strengthening financial discipline, improving resource utilization efficiency, and ensuring the sustainable development of enterprises in a dynamic market environment.

**Keywords:** management accounting, logistics costs, logistics processes, responsibility centers, cost optimization, digital technologies, IT support, analytics, forecasting, enterprise management system

**JEL Classification:** M41, D24

## INTRODUCTION

In the context of dynamic and highly unpredictable economic changes, the effective management of LCs has become a strategic priority for enterprises. The growing interest of management in LC-related information is driven by the increasing share of logistics costs in the overall cost structure of enterprises, as well as by the need for their optimization and reduction. Since LCs significantly influence the final cost of products and services, their efficient management is a critical component in building an effective enterprise management system. Achieving this objective requires the implementation of

advanced methodological tools that not only account for traditional logistics expenses—such as transportation, warehousing, and packaging – but also integrate modern scientific and practical developments for cost forecasting and route optimization.

The continuous accumulation and analysis of information on LCs enable enterprise managers not only to assess the current state of business processes but also to effectively plan future financial results, justify investment decisions, and mitigate risks associated with delivery delays or budget overruns. The adoption of such an approach contributes to achieving key economic outcomes, including the optimization of resource utilization, improvement of logistics operations efficiency, and reduction of costs related to transportation, storage, packaging, and customs clearance.

However, it should be noted that LC management is a complex process requiring continuous, detailed accounting and control. The application of modern tools allows managers not only to monitor current costs but also to forecast future expenditures, evaluate the effectiveness of management practices, and identify opportunities for optimization. This necessity arises from the need for accurate and timely information that enables management to respond promptly to emerging challenges. Therefore, the accounting of LCs must be integrated into the overall enterprise management system, ensuring transparency of logistics operations at all stages – from suppliers to final consumers. At the same time, in a highly dynamic market environment characterized by constantly changing requirements for delivery speed, cost, and quality, enterprises must continuously adjust their strategic objectives and, consequently, their approaches to LC accounting.

It is essential for the accounting system to be flexible and capable of rapidly adapting to evolving business goals. This requires the transformation of internal accounting structures related to LCs and the establishment of dedicated units responsible for addressing specific management tasks. Such an approach enables not only the precise identification of costs associated with each stage of the logistics chain but also enhances the accountability of managers and employees responsible for the efficient use of logistics resources. In this context, the creation of responsibility centers (RCs) – including transport services, warehouses, procurement departments, production units, and distribution and sales divisions – is of particular importance.

Notably, organizing LC accounting based on RCs allows for a detailed analysis of costs across individual units, thereby facilitating performance evaluation, identification of inefficiencies, and timely implementation of cost optimization measures. Furthermore, this approach supports the development of a logistics cost budgeting system, enabling the forecasting of future expenditures and the planning of cost-reduction initiatives. Ultimately, management accounting of LCs based on RCs serves as an effective tool for enhancing enterprise logistics performance by ensuring cost transparency, strengthening financial discipline, and supporting informed managerial decision-making.

## LITERATURE REVIEW

The development of logistics and supply chain management remains one of the key determinants of enterprise competitiveness in the global economy. In the context of digital transformation, increasing market volatility, the transition toward circular economy models, and growing requirements for business sustainability, the role of LSPs and integrative practices has significantly intensified. At the same time, globalization, digitalization, and the increasing complexity of the business environment are driving the transformation of logistics systems and supply chains. Consequently, there is a growing need to update the methodological foundations for organizing and regulating logistics processes, as well as to enhance the analytical capabilities of management accounting for LCs.

The transformation of logistics management and the strategic role of logistics have been extensively examined in prior research. Ballou (2007) emphasizes that logistics serves as a source of competitive advantage through the integration of processes, information flows, and managerial decisions. Expanding on this perspective, Christopher and Holweg (2017) introduce the concept of Supply Chain 2.0, which focuses on risk minimization in volatile business environments. Similarly, Seo et al. (2014) demonstrate that alignment among supply chain elements is a critical factor in improving overall efficiency. In this context, Mishra et al. (2019) explore risk management from a resource-based perspective, while Kayvanfar et al. (2018) and Yan et al. (2019) propose mathematical and managerial approaches to optimizing multi-echelon supply chains.

Another important research stream focuses on the interaction between enterprises and logistics service providers. Alkaabi (2024) highlights that the needs of small and large enterprises in cooperating with LSPs differ significantly, thereby influencing outsourcing strategies. Soinio et al. (2012) emphasize the role of value creation mechanisms as tools for enhancing collaboration among supply chain participants. Furthermore, Creazza et al. (2024) underline the importance of establishing

stable relationships between shippers and logistics providers, particularly for small and medium-sized enterprises. Complementing these findings, Capobianco (2023) explores the evolution of logistics service business models based on digital platforms.

Research in reverse logistics also underscores its growing importance in enhancing supply chain efficiency and innovation. Bernon et al. (2011) provide an updated conceptual framework for retail reverse logistics, establishing a foundation for further studies. Shaik and Abdul-Kader (2012) justify the application of performance measurement methods for reverse flows. In this context, Paula et al. (2020) demonstrates that collaboration and trust among supply chain participants foster innovation in reverse logistics. The economic significance of sustainable practices is further supported by Ortas et al. (2014), who empirically confirm the positive impact of sustainable supply chains on firm performance. Moreover, Wu and Wang (2024) conceptualize logistics within the circular economy as an adaptive and coordinated system that simultaneously supports innovation and environmental sustainability.

Studies on digital transformation and the development of Logistics 4.0 indicate a gradual shift from traditional logistics models toward integrated digital ecosystems. Da Mota Pedrosa et al. (2015) interpret innovation as a result of micro-level interactions among logistics stakeholders. Rohani et al. (2022) and Tiwari (2021) demonstrate that digital technologies, such as the Internet of Things (IoT), augmented and virtual reality (AR/VR), and Big Data, substantially reshape decision-making processes and the optimization of logistics operations.

From the perspective of management accounting, Dallasega et al. (2022) propose a maturity measurement model for Logistics 4.0, validated by international empirical evidence, while Kutsyk et al. (2022) emphasize the necessity of strengthening IT support, highlighting the practical relevance of digital technologies in logistics planning. In a broader context, Nicoletti and Appolloni (2025) examine an ecosystem-based approach to managing logistics costs using fifth-party logistics (5PL) technologies, which rely on artificial intelligence and integrated information-analytical platforms to combine logistics, data analytics, and resource management within a unified digital system.

Other scholars focus on the in-depth analysis of business processes, their reengineering, and the provision of economic security in the logistics domain. Kutsyk and Moiseenko (2019) substantiate the role of regulatory mechanisms of business responsibility in improving corporate governance quality. Building on this, Ilyash et al. (2021) highlight the relationship between technological development and economic security, forming the basis for effective macro-logistics strategies. At the same time, Li and Nazif (2022) detail modern approaches to logistics business process reengineering, integrating digital transformation tools with Lean and Agile principles.

A significant body of research is also devoted to the financial and economic aspects of logistics systems across industries. Studies by Boiko et al. (2024), Dmytryk et al. (2024), Kunytska-Iliash (2023), Vasylytsiv et al. (2022), Ilyash et al. (2021), Rohoznyi et al. (2021), and Kutsyk et al. (2016) provide insights into improving efficiency, financial stability, and economic security in the context of modern logistics system development.

With regard to cost optimization and the accounting-analytical support of logistics systems, the literature offers a comprehensive set of approaches. Vitasek (2016) proposes strategic outsourcing models that enhance the efficiency of logistics relationships and ensure transparency of LCs. Wouters et al. (2016) analyze cost management methods in product development, emphasizing their importance for production logistics.

In addition, several studies address decision-making tools in complex logistics systems. Rong et al. (2025) and Shamsuddoha (2015) develop decision-making models for multi-echelon supply chains, improving the robustness of cost management under conditions of uncertainty and multi-factor complexity. Practical approaches to cost optimization are further explored by Chorna et al. (2023), while Yaremko (2024) emphasizes cost classification as a fundamental prerequisite for effective accounting and control of logistics activities, proposing analytical tools for assessing financial security and the impact of digitalization.

In summary, existing research provides a comprehensive understanding of logistics system development, supply chain management, and the accounting-analytical support of logistics activities. However, several important aspects remain insufficiently systematized and require further scientific and applied elaboration. These include the integration of accounting policies for logistics cost regulation into the overall enterprise management system, the development of a unified and comprehensive system of management accounting for LCs, the systematization of IT tools within the context of management accounting and the identification of mechanisms for their practical integration, the establishment of standardized approaches to coding logistics cost accounts, and the improvement of accounting procedures for the identification, recording, and allocation of LCs across responsibility centers and hierarchical levels.

Effective information support for logistics operations necessitates the proper organization of management accounting for LCs. A key challenge in developing an accounting policy for regulating logistics processes is the integration of cost-related information within a unified accounting system that serves users with differing informational needs. To address this issue, enterprises should establish a dedicated subsystem for LC accounting based on regulatory, reference, and analytical data frameworks, enabling flexibility in selecting accounting and control tools. This involves the creation of a specialized structural unit within the accounting system, namely RC, whose primary function is to ensure accurate, timely, and user-oriented recording of LCs.

In addition, effective regulation of information flows within the management accounting system for LCs requires the development of an appropriate organizational and methodological framework. Given that such accounting practices remain insufficiently regulated at the legislative level in Ukraine, enterprises must independently design their own systems by defining policies for logistics process development and establishing methodological support for LC accounting through internal guidelines. These documents should be mandatory for enterprises actively engaged in logistics activities, as they ensure both the internal consistency of accounting procedures and the clear regulation of management processes at all stages, including cost planning, recording, and control.

## AIMS AND OBJECTIVES

The aim of this study is to substantiate the economic logic and conceptual foundations for developing a comprehensive methodology of management accounting for LCs at the enterprise level. This methodology involves the identification, structuring, and allocation of LCs across RCs, as well as the implementation of organizational, methodological, and digital tools to enhance the efficiency of logistics process management and support managerial decision-making.

To achieve this aim, the following objectives are defined:

1. To systematise logistics costs by key business processes and accounting objects with a view to developing an original classification of logistics costs, tailored to the needs of the enterprise's management accounting.
2. To develop a model for organising the management accounting of logistics costs based on responsibility centres, defining the functions, powers and mechanisms for controlling costs at various levels of management.
3. To establish a system for coding and analytically recording logistics costs within management accounting by introducing sub-account 239 'Logistics Costs' and third- and fourth-level accounts.
4. To develop a scheme for organising document flow and the identification of logistics costs, ensuring the regulation of the movement of source documents and increasing the transparency of information flows between responsibility centres.
5. To establish the digital architecture for the management accounting of logistics costs, utilising ERP, TMS and WMS systems, API interfaces, IoT and other information and analytical tools to automate accounting processes and support management decision-making.

## METHODS

The purpose of an accounting policy is to establish a coherent, structured, and consistent system of information and analytical support that facilitates reliable reporting, effective managerial decision-making, and the resolution of various organizational and economic tasks. In this context, the development of management accounting for LCs requires a well-defined methodology for the accumulation, processing, and utilization of information. Such a methodology forms the foundation of an effective accounting system capable of ensuring high-quality cost regulation across all stages of logistics processes, from procurement to final delivery to the end consumer.

In particular, the methods of induction and deduction were used to establish the theoretical and methodological foundations for forming the enterprise accounting policy in the field of management accounting for LCs. This approach is justified by the need to generate relevant accounting and analytical information for managerial purposes, given that LCs cover a wide range of operational processes and must be clearly identified within the accounting system. In this context, the study substantiates the necessity of distinguishing LCs through the use of analytical accounts, sub-accounts, and RCs, which enhances the transparency of accounting procedures, improves the accuracy of cost calculation, and strengthens cost control across logistics processes.

Further development of the research required the application of analysis and synthesis methods. These methods were used to structure LCs according to key business processes, including transportation, warehousing, inventory management, and information logistics, as well as according to accounting objects and RCs. This systematization enables the formation of a structured analytical database necessary for the accurate allocation of costs to cost carriers and points of origin. From a practical perspective, this approach improves the accuracy of both production and full cost calculation and enhances the control function of accounting through detailed cost tracking across logistics operations and organizational units.

A structural-functional approach was also employed to examine the management accounting system for LCs as an integrated organizational and economic framework rather than a set of isolated elements. The analysis focused on the interrelationships between accounting procedures, budgeting processes, internal management reporting, and responsibility mechanisms within logistics units. This perspective allows management accounting to be reconsidered not merely as a tool for recording costs but as a functional basis for managerial decision-making. At the same time, particular attention was given to practical aspects, including the organization of primary document flows, the establishment of clear procedures for their circulation, and the assignment of responsibility for cost formation and control within specific RCs. In practical terms, this contributes to improving the timeliness and analytical quality of accounting information and strengthens control over deviations between actual and planned costs, ultimately enhancing the efficiency of logistics management.

A system approach played a decisive role in developing the methodology for improving management accounting for LCs. Within this framework, the accounting system is viewed as an integrated structure of interrelated elements, including organizational arrangements, the chart of accounts, budgeting mechanisms, and information technologies for data processing. The practical value of this approach lies in the possibility of introducing a specialized sub-account for LCs, detailing analytical accounts by types of activities and RCs, and establishing procedures for monitoring deviations between actual and planned costs. Such an organization of accounting ensures timely and accurate information for managerial decision-making, increases transparency of financial flows, and facilitates effective coordination of logistics processes.

To assess the potential of digitalization in accounting processes, comparative analysis was applied. This method enabled the evaluation of the functional capabilities of enterprise resource planning (ERP), transportation management systems (TMS), and warehouse management systems (WMS) in terms of automating accounting records, generating management reports, and controlling costs in real time. This approach made it possible to identify effective tools for integrating logistics and accounting data, optimizing information processing, and enhancing the timeliness of managerial decisions. In addition, the analysis provided practical recommendations for selecting digital modules that support detailed cost accounting by RCs and types of logistics operations, thereby ensuring accurate representation of actual resource consumption in internal reporting.

Methods of abstraction and generalization were used to develop a system for coding accounting accounts and to design schemes for the identification and allocation of LCs. This methodological approach allowed for the identification of key principles for structuring accounting data, taking into account the specifics of analytical accounting and the requirements of internal reporting. The results were adapted to practical accounting tasks, particularly in terms of improving cost transparency and enhancing the level of analytical detail across RCs. In addition, graphical models were employed to illustrate the logic of accounting operations, facilitating the practical implementation of the proposed solutions and enabling managers to monitor resource flows in logistics processes more effectively.

A key feature of the study is the conceptual and methodological nature of the authors' proposals, on the basis of which an integrated approach to the organisation of management accounting for an enterprise's logistics costs has been developed. However, in the initial stages of addressing this well-argued methodological problem, there are no plans to conduct quantitative empirical testing or statistical verification of the proposed model's effectiveness on a sample of enterprises. The research findings should be regarded as a conceptual and methodological basis for further practical testing and adaptation to the operating conditions of specific business entities. Empirical testing of this approach can be carried out through case studies, enterprise surveys, and a comparative analysis of performance indicators before and after the implementation of the proposed organisational and methodological solutions.

## RESULTS

The accounting policy for regulating LCs based on RCs should rely on a well-founded methodological framework and comply with fundamental organizational and economic principles of managerial decision-making and implementation (Figure 1). The conceptual foundations of management accounting for LCs should focus on organizational structure, regulatory mechanisms, and the definition of responsibilities and authority within RCs. From a methodological perspective, enterprises are required to develop internal regulatory documents, including guidelines for establishing RCs for LCs, instructions for

LC accounting, and procedures for budgeting logistics costs. At the same time, improving the organization of management accounting for LCs requires formal regulation of RC activities in line with logistics budgeting tasks, including the development of document flow schedules, the determination of budgeting frequency, and the design of standardized budget formats.

From the standpoint of information and methodological support, it is essential to develop a system of accounts for recording LCs at different stages of logistics processes. Such a system ensures the accuracy and transparency of cost accounting within RCs and creates opportunities for effective cost analysis and management at each organizational level. To enhance the efficiency of this accounting framework, it is also necessary to apply modern information technologies, which enable the automation of accounting and analytical processes, reduce the likelihood of errors, and improve the timeliness of information for optimizing logistics operations.

In addition to the development of a working chart of accounts for management accounting of logistics costs (LCs), it is essential for enterprise management to apply methodological guidelines for organizing cost accounting at each stage of logistics processes and for allocating these costs among responsible units in accordance with established methods. This ensures the accurate recording and effective control of LCs. Furthermore, enterprises should implement methodological instructions for budgeting based on planned logistics service costs.

At the same time, approaches to the organization of management accounting for LCs should be revised and expanded. These approaches should include the following key components:

1. The establishment of dedicated units, such as warehouses, transport departments, and other logistics divisions, operating as independent entities with clearly defined objectives, budgets, and performance evaluation criteria, and responsible for managing logistics operations.
2. The implementation of a budgeting system for LCs, including the development of operational budgets, capital budgets, and flexible budgets to adjust costs in response to unforeseen circumstances.
3. The development and implementation of a structured document flow system for LC-related documentation, covering all stages from creation to archiving, aimed at reducing processing time, improving approval procedures, enhancing interdepartmental coordination, and clearly defining responsibilities at each stage of logistics processes.
4. The implementation of digital technologies for LC management, with the capability to integrate with other accounting and regulatory systems, ensuring efficient processing of large volumes of data, convenient access to reporting, flexible budgeting and cost monitoring, and compliance with current regulatory requirements and international accounting standards.

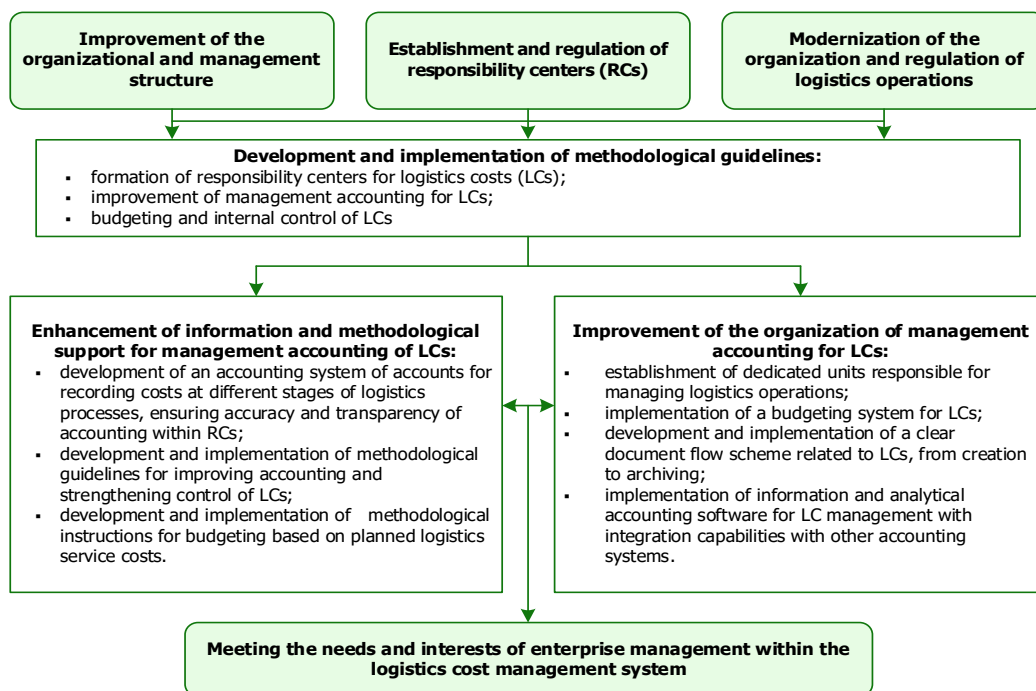
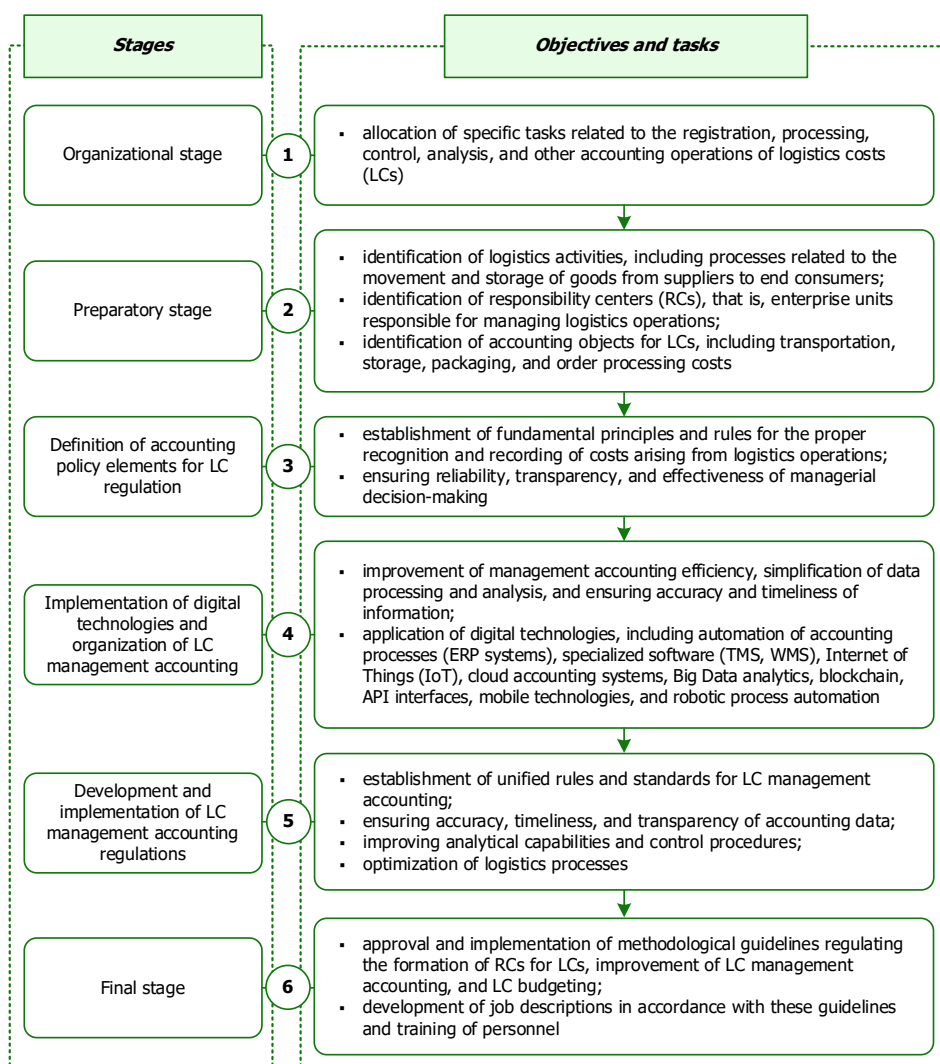


Figure 1. Conceptual foundations of accounting policy for logistics cost regulation in enterprises.

Based on the above considerations, a comprehensive methodological framework for improving the system of management accounting for LCs can be developed. This framework is structured according to the key stages of managerial decision-making, including the organizational stage, the preparatory stage, the stage of defining accounting policy elements for LC regulation, the stage of implementing digital technologies and organizing LC management accounting, the stage of developing and implementing regulatory procedures for LC accounting, and the final stage. At each of these stages, enterprise management is required to follow a set of methodological provisions, including internal guidelines, instructions, and operational plans (Figure 2).

To establish an effective system of management accounting for logistics costs (LCs), it is essential to ensure their clear separation from the total cost structure of the enterprise. First, LCs should be systematically classified according to the main logistics processes. These include transportation costs, such as vehicle maintenance and repair, insurance, fuel, drivers' wages, and customs duties and charges; warehousing costs, including utilities, warehouse rent, and security and insurance expenses; inventory management costs, such as inventory write-downs and audit-related expenses; and information logistics costs, including communication technologies, IT support, and the automation of logistics processes.



**Figure 2. Methodology for improving management accounting of logistics costs in enterprises.**

On the one hand, it is necessary to avoid mixing LCs with overhead or administrative costs, as this may lead to inaccuracies in both financial and management accounting. A clear distinction of costs not only improves control over logistics processes but also ensures transparent product and service cost calculation. On the other hand, existing accounting and control systems at many enterprises do not provide for the use of dedicated accounts or sub-accounts for LCs. As a result, these costs are often dispersed across general production, administrative, or other expense categories, which complicates their analysis and regulation. This creates a practical need for the explicit identification and separation of LCs within the overall cost structure.

To address this issue, the study proposes the implementation of a coding system for accounting accounts related to LCs, supported by the full automation of accounting operations through appropriate modifications in IT systems. In particular, it is necessary to develop a unified coding standard that ensures the identification of each LC item. At the same time, accounts should be structured across multiple levels, allowing LCs to be analyzed by specific organizational units, logistics processes, and even individual products or services. This approach enhances analytical capabilities and supports more precise cost allocation and control.

The experience of enterprises that have successfully integrated into the global market confirms the importance of automating management accounting for LCs through the use of digital technologies (Table 1). In particular, the *ERP system* acts as a central integration platform, ensuring the collection, processing, and presentation of information within the management accounting system. Data relating to logistics operations is automatically converted into entries in sub-account 239 "Logistics costs" and the corresponding third- and fourth-level analytical accounts. Consequently, the company's management can ensure a full breakdown of costs by source, logistics processes and centres of responsibility.

The *TMS system* facilitates the collection and transmission of information regarding transport costs, routes, the utilisation of transport resources and the execution of logistics operations. The data obtained is integrated into the ERP environment via API interfaces and automatically allocated to the relevant responsibility centres.

The *WMS system* identifies costs associated with warehouse operations, including storage costs, internal stock movement, packaging and order fulfilment. This information is used to automatically generate source documents and internal reports.

*IoT and mobile technologies* enable the rapid collection of primary information in real time through the use of sensors, GPS monitoring, mobile devices and electronic identification methods. The data obtained forms the basis for digital document management and minimises the risks associated with manual data entry.

*API interfaces* act as an integration mechanism between individual digital systems, ensuring the continuity of information flows between logistics processes, source documents and the management accounting system.

In the proposed model, *Big Data and Blockchain tools* perform a supporting analytical and control function. Big Data is used to forecast logistics costs and identify patterns and deviations in the cost structure, whilst Blockchain ensures greater transparency, data protection and verification of the authenticity of source documentation.

**Table 1. IT support for automating management accounting of logistics costs in enterprises.**

| IT tools                                 | Purpose  | Advantages   | Limitations  |
|--|--|--|--|
| Enterprise Resource Planning (ERP)       | Improving the efficiency of processing accounting information on logistics costs (LCs) and enabling real-time cost control | <ul style="list-style-type: none"> <li>integration of all logistics processes into a unified accounting and control system;</li> <li>automation of LC management accounting;</li> <li>improved analytics and forecasting of LCs</li> </ul> | <ul style="list-style-type: none"> <li>high implementation and maintenance costs;</li> <li>complexity of customization and adaptation to enterprise-specific conditions</li> </ul> |
| Transportation Management System (TMS)   | Optimization of transportation processes and improvement of monitoring and accounting of transport costs                   | <ul style="list-style-type: none"> <li>optimization of logistics routes and transportation costs;</li> <li>improved transport management;</li> <li>real-time monitoring of LCs</li> </ul>  | <ul style="list-style-type: none"> <li>need for integration with external digital systems;</li> <li>high requirements for technical infrastructure</li> </ul>                      |
| Warehouse Management System (WMS)        | Ensuring accurate accounting of costs related to transportation, storage, and packaging                                    | <ul style="list-style-type: none"> <li>improved accuracy of warehouse accounting;</li> <li>automation of receiving, storage, and shipping processes;</li> <li>reduction of warehousing costs</li> </ul>                                    | <ul style="list-style-type: none"> <li>complexity of implementation in large warehouses;</li> <li>requirement for highly qualified personnel</li> </ul>                            |
| Internet of Things (IoT)                 | Real-time data collection on the status and trends of logistics processes  | <ul style="list-style-type: none"> <li>remote monitoring of logistics operations;</li> <li>real-time control of temperature, humidity, and other parameters;</li> <li>improved supply chain efficiency</li> </ul>                          | <ul style="list-style-type: none"> <li>significant investment in equipment and infrastructure;</li> <li>vulnerability to cybersecurity threats</li> </ul>                          |
| Application Programming Interfaces (API) | Ensuring seamless data exchange between accounting and information systems   | <ul style="list-style-type: none"> <li>integration of LC management accounting with digital platforms and services;</li> <li>increased speed of information exchange;</li> <li>reduction of manual data entry</li> </ul>                   | <ul style="list-style-type: none"> <li>high cybersecurity requirements;</li> <li>potential compatibility issues between different IT systems</li> </ul>                            |
| Big Data analytics                       | Optimization of logistics costs and resource utilization   | <ul style="list-style-type: none"> <li>identification of hidden patterns in logistics processes;</li> <li>improved forecasting accuracy;</li> <li>enhanced efficiency of warehouse and transport operations</li> </ul>                     | <ul style="list-style-type: none"> <li>high requirements for computing power and data storage;</li> <li>need for qualified data analysts</li> </ul>                                |
| Blockchain                               | Ensuring transparency, security, and reliability of logistics information  | <ul style="list-style-type: none"> <li>prevention of fraud and data manipulation;</li> <li>increased trust among supply chain participants;</li> <li>secure and immutable data storage</li> </ul>  | <ul style="list-style-type: none"> <li>high implementation costs;</li> <li>limited availability of qualified specialists</li> </ul>  |
| Mobile technologies                      | Increasing flexibility and responsiveness of LC management accounting  | <ul style="list-style-type: none"> <li>remote management of logistics operations;</li> <li>improved communication within logistics units;</li> <li>faster decision-making</li> </ul>   | <ul style="list-style-type: none"> <li>dependence on a stable internet connection and advanced equipment;</li> <li>risks of data loss due to cyberattacks</li> </ul>               |

Despite these advantages, the risks associated with the digitalization of logistics operations should also be considered. These include increased costs for technical and technological infrastructure, dependence on a limited pool of qualified specialists, and a high level of vulnerability to cybersecurity threats.

At the same time, the implementation of IT solutions must be aligned with the fundamental principles of accounting in order to ensure effective resource optimization and improved management of logistics operations. In this context, the study proposes the introduction of a dedicated sub-account, 239 "Logistics Activity Costs", within Account 23 "Production" (according to the Ukrainian chart of accounts). This sub-account should be supported by analytical accounts of the third and fourth levels, enabling the formation of a structured cost system across different logistics activities and responsibility centers (RCs) (Figure 3).

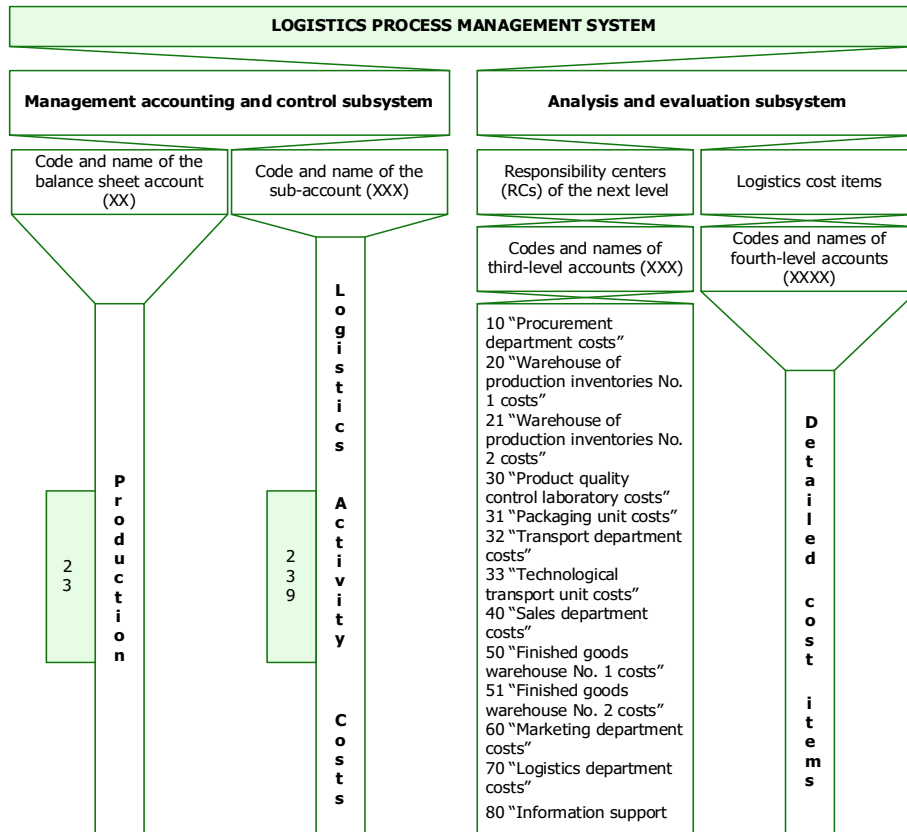


Figure 3. Coding System of Accounting Accounts for Regulating Logistics Costs in Enterprises. (Source: developed by the author)

A number of key advantages of sub-account 239 should be highlighted, primarily its ability to clearly isolate logistics costs (LCs). This ensures transparency of accounting information and enables the precise identification of the share of LCs within the overall cost structure of products or services. In addition, the use of this sub-account facilitates effective control of logistics operations through the application of third- and fourth-level analytical accounts. This allows for detailed cost tracking across different stages of logistics processes, responsibility centers (RCs), and accounting objects, including transportation, warehousing, packaging, and related activities.

Such differentiation of LCs enables the timely and efficient generation of analytical reports, significantly simplifying cost calculation procedures and allowing enterprises to respond promptly to changes in cost structures. Another important advantage is the improvement of budgeting and planning processes, as the proposed approach makes it possible to accurately determine which costs are associated with specific logistics operations. As a result, the quality of LC forecasting and performance monitoring is substantially enhanced.

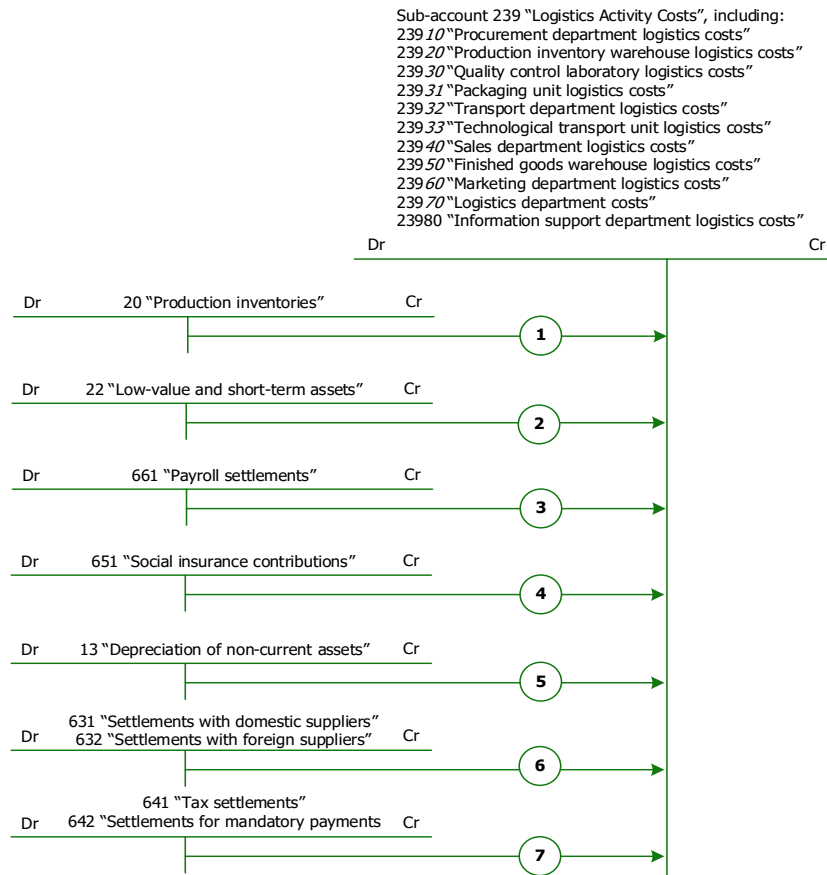
It should be noted that the proposed use of sub-account 239 "Logistics Costs" does not require any amendments to the current regulatory Chart of Accounts for enterprises, institutions and organisations, and does not conflict with the provisions of national accounting standards. The proposed sub-account is regarded as an internal analytical tool for management accounting, which is established within the enterprise's working chart of accounts in accordance with its information needs.

In accordance with the current regulatory approach, financial accounting is geared towards producing standardised information for external users and preparing financial statements, whilst management accounting is aimed at providing internal users with detailed information for planning, monitoring and management decision-making. In this regard, the proposed sub-account 239 is not regarded as a separate element of statutory financial statements, but is used exclusively to provide detailed information on logistics costs within the internal management accounting system.

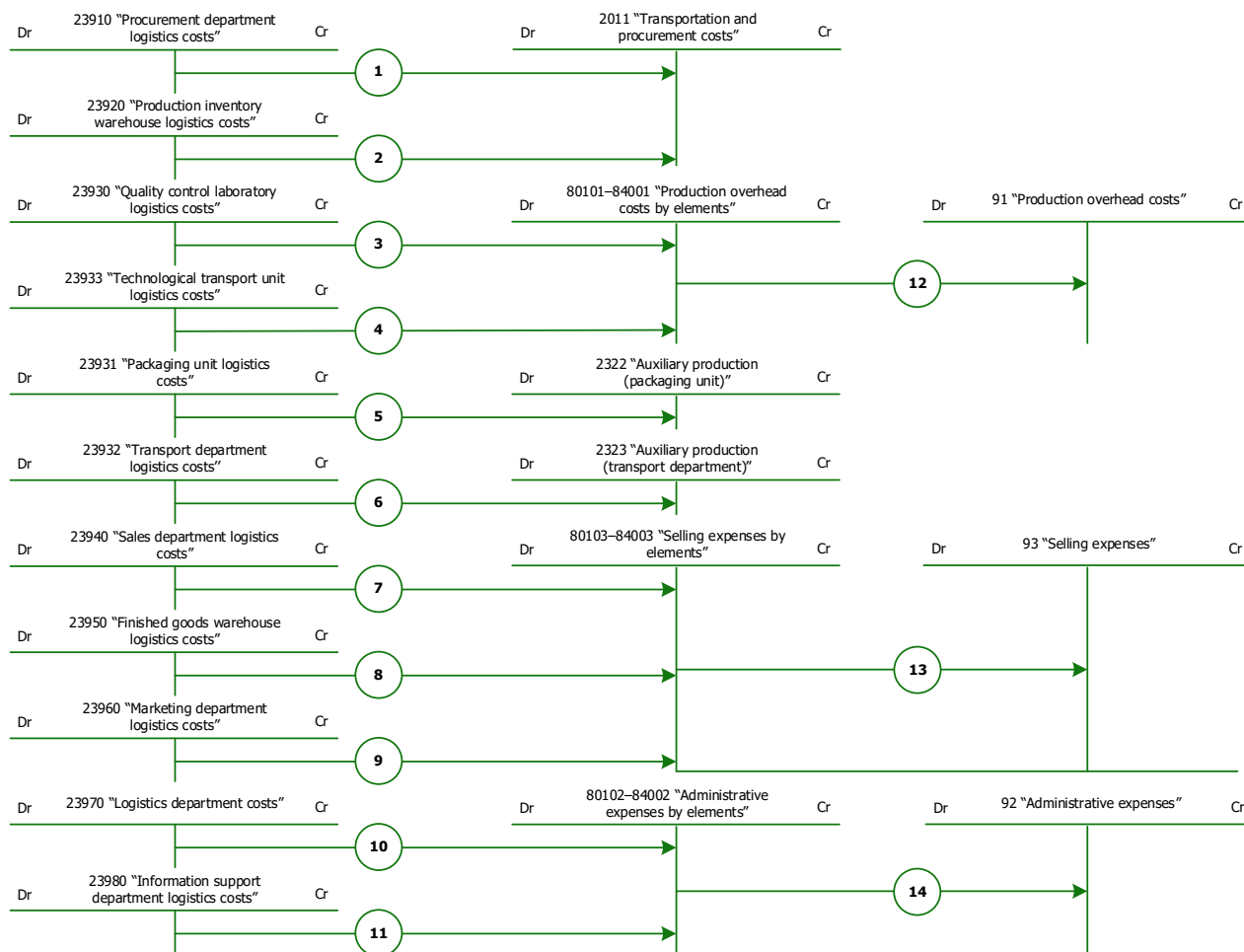
In practical terms, sub-account 239 functions as an analytical tool for breaking down costs, through which information on logistics costs is accumulated and subsequently allocated to responsibility centres, types of logistics processes and cost objects. At the same time, the consolidation of information for the purposes of financial accounting and the preparation of financial statements is carried out strictly in accordance with the requirements of national accounting standards, without deviating from the established structure of synthetic accounts.

Furthermore, third- and fourth-level analytical accounts provide the ability to identify precisely where LCs arise, whether at the level of departments, operational units, or specific products. This significantly strengthens cost control at each level of logistics activity. To implement this approach effectively, enterprises are encouraged to improve the schemes of management accounting for LCs presented in Figures 4 and 5. The development and implementation of such schemes, based on multi-level analytical accounts, should be considered a key step toward ensuring the accuracy, transparency, and overall effectiveness of management accounting for logistics costs.

It should be emphasized that organizing management accounting for logistics costs (LCs) based on responsibility centers (RCs) not only improves the quality of cost control but also creates a foundation for operational and tactical decision-making, thereby enhancing the overall efficiency of enterprise logistics. Clearly defined responsibilities for managers, combined with their ability to respond promptly to cost fluctuations, contribute to a significant reduction in unnecessary expenditures and more efficient resource utilization. Accordingly, the accounting system should ensure that managers of RCs are assigned clearly defined roles and authorities, enabling them to make independent and timely decisions.



**Figure 4. Scheme for identifying logistics costs in the management accounting system by second-level responsibility centers.** Note: Cost identification operations: (1) costs by structural units; (2) costs related to low-value and short-term assets by structural units; (3) wages, bonuses, and other personnel-related payments within structural units; (4) social contributions and other insurance-related expenses within structural units; (5) depreciation (amortization) of non-current assets within structural units; (6) costs of services provided by external organizations within structural units; (7) land tax, property tax, and other mandatory payments within structural units. (Source: developed by the author)



**Figure 5. Scheme for recording and allocation of logistics costs in the management accounting system by second-level responsibility centers.** Note: Cost allocation operations: (1) procurement department; (2) production inventory warehouses; (3) product quality control laboratory; (4) technological transport unit; (5) packaging unit; (6) transport department; (7) sales department; (8) finished goods warehouses; (9) marketing department; (10) logistics department; (11) information support department; (12–14) class 8 accounts used to accumulate primary costs for their subsequent allocation to operating expenses. (Source: developed by the author)

## DISCUSSION

The findings of this study demonstrate that the implementation of a management accounting system for LCs, based on centralized subsystems and digital technologies, significantly enhances the efficiency of logistics management at the enterprise level. In particular, the establishment of accounting subsystems structured around RCs, combined with the application of account coding methodologies, ensures the accuracy, transparency, and timeliness of information required for effective managerial decision-making.

The results obtained are consistent with prior research in the fields of management accounting and logistics. Studies by Rong et al. (2025), Creazza et al. (2024), and Ballou (2007) emphasize the critical role of structured accounting systems and financial control mechanisms in optimizing LCs and improving operational efficiency. Furthermore, the findings support the conclusions of Nicoletti and Appolloni (2025), Dallasega et al. (2022), and Rohani et al. (2022) regarding the importance of digital platforms and enterprise resource planning systems for integrating accounting data and facilitating timely managerial decisions.

At the same time, several specific features characteristic of Ukrainian enterprises have been identified. Despite the existing potential for automating LC accounting, the actual adoption of digital technologies remains limited. A considerable number of enterprises still rely on manual or partially automated approaches, which complicates cost control and reduces the effectiveness of logistics performance analysis. These observations are consistent with the findings of Yaremko (2024) and Chorna et al. (2023), who note that economies in transition tend to lag behind developed markets in the implementation of comprehensive management accounting systems.

An important implication of this study is that a systematic approach to management accounting for LCs requires the integration of three key elements: organizational structure, represented by responsibility centers; methodological support, including charts of accounts, internal guidelines, and accounting procedures; and modern digital technologies, such as enterprise resource planning (ERP), transportation management systems (TMS), warehouse management systems (WMS), Internet of Things (IoT), Big Data analytics, and blockchain. In contrast to earlier studies (Alkaabi, 2024; Capobianco, 2023; Tiwari, 2021), this research demonstrates that without the integration of these elements, LC accounting remains fragmented, thereby limiting the potential for resource optimization and reducing enterprise competitiveness.

It is worth noting a number of conceptual differences in the author's methodology for improving the management accounting of an enterprise's logistics costs. Most scientific and applied studies focus primarily on individual components of logistics cost management. In particular, Ballou (2007), Christopher and Holweg (2017), Vitasek (2016) and Dallasega et al. (2022) examine specific aspects of logistics management, digitalisation or business process integration, but do not formulate a comprehensive accounting and analytical framework that would combine the classification of logistics costs, responsibility centres, a chart of accounts, document flow regulations and digital infrastructure within a single management mechanism. In contrast, the methodology proposed by the authors is based on the integration of the organisational, methodological and information-technology levels of logistics cost management. Its key feature lies in combining the proposed system for coding logistics costs, based on sub-account 239 'Logistics Costs', with a multi-level structure of responsibility centres and digital modules for the automation of management accounting. Consequently, the company's management is able not only to accumulate information but also to create the conditions for the prompt monitoring of variances, the preparation of internal reports, and the support of the management decision-making process in real time.

Furthermore, the practical benefits of the proposed approach are evident in the increased transparency of the cost structure, the provision of detailed information on where costs arise, a reduction in the time taken to process accounting data, and an improvement in the quality of budgetary control. An additional benefit is the ability to scale the model according to the organisation's structure and its level of digital maturity.

Certain limitations of this study create opportunities for further research and practical development. Firstly, the findings of this study are consistent with the conclusions of Kayvanfar et al. (2018) and Vitasek (2016), which highlight the specific nature of implementing management accounting for logistics costs in enterprises of various sizes. At the same time, the effectiveness of the proposed methodology is purely conceptual and requires further empirical testing and adaptation to different organisational structures. Second, although this study covers a broad range of IT tools for automating LC management accounting, its findings align only partially with the conclusions of Mishra et al. (2019) and Christopher and Holweg (2017), who emphasize the need for deeper analysis of the impact of digital solutions on economic performance and operational efficiency. This suggests the need for more comprehensive comparative studies and the development of advanced data analytics frameworks.

Third, the increasing integration of digital technologies into management accounting processes necessitates further experimental research, as also noted by Wu and Wang (2024), to assess the impact of digital solutions on managerial decision-making and the optimization of logistics processes. In particular, future research should consider the role of human capital and other resource components in determining the readiness of enterprises to adapt to ongoing technological transformations.

A key limitation of the proposed methodology is the need to adapt it to sector-specific characteristics, the size of the enterprise, and the level of development of the information and communications infrastructure. For small businesses, the practical application of comprehensive ERP, TMS or WMS solutions may be limited due to high financial costs and a shortage of specialised staff. Furthermore, the effectiveness of the proposed approach depends to a large extent on the quality of internal regulations, the organisation of document flow and the readiness of staff to work in a digital transformation environment.

The practical application of the proposed methodology is most effective when the organisational, accounting and digital components of the management system are fully integrated. Provided there is an adequate level of information and technology support, its implementation helps to improve the quality of accounting and control procedures and the effectiveness of the management of the enterprise's operations.

## CONCLUSIONS

This study has established that the system of management accounting for LCs in Ukrainian enterprises is currently undergoing active development, yet its implementation remains incomplete and insufficiently systematic. Although some enterprises apply analytical accounts, sub-accounts, and RCs, most management accounting practices lack sufficient detail and are not fully integrated with digital management tools. Empirical observations indicate that cost transparency, control over budget deviations, and the accuracy of cost calculation largely depend on the organization of accounting based on RCs and the level of integration of enterprise resource planning (ERP), transportation management systems (TMS), and warehouse management systems (WMS). At the same time, the potential for improving accounting practices lies in the formalization of cost coding schemes, the development of procedures for identifying and allocating LCs, and the implementation of digital platforms for real-time data collection and processing.

The results of the study indicate that the key drivers of improving the effectiveness of management accounting for LCs include the systematic classification of costs according to core business processes, their detailed representation within RCs, and the adoption of modern information and analytical tools and automated modules for monitoring actual and planned performance indicators. Equally important are the development of internal accounting culture, the enhancement of personnel qualifications, and the optimization of information exchange processes among enterprise units.

A necessary condition for improving LC management efficiency is the adoption of an integrated approach that combines the alignment of accounting and analytical systems, the automation of accounting processes, the refinement of budgeting procedures, and the application of forecasting and resource planning methods. The implementation of such an approach ensures the transparency of logistics operations, strengthens control over resource utilization, supports cost optimization, and facilitates well-informed managerial decision-making.

Future research should focus on the integration of management accounting for LCs with digital platforms and business analytics systems, the implementation of which can significantly enhance forecasting accuracy and managerial effectiveness at all levels of enterprise management. In addition, further studies should explore the conditions required for the comprehensive adoption of automated cost control models based on artificial intelligence and machine learning technologies, which would enable enterprises to better account for market dynamics and industry-specific characteristics.

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## ADDITIONAL INFORMATION

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### AUTHOR CONTRIBUTIONS

*All authors have contributed equally.*

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### CONFLICT OF INTEREST

*The Authors declare that there is no conflict of interest.*

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## ЕКОНОМІЧНА ЛОГІКА ТА КОНЦЕПТУАЛЬНІ ЗАСАДИ ІДЕНТИФІКАЦІЇ Й УПРОВАДЖЕННЯ МЕТОДОЛОГІЇ УПРАВЛІНСЬКОГО ОБЛІКУ ЛОГІСТИЧНИХ ВИТРАТ ПІДПРИЄМСТВА

У статті здійснено науково-прикладне обґрунтування економічної логіки та концептуальних засад розробки комплексної методології управлінського обліку логістичних витрат підприємства, що передбачає їх ідентифікацію, структурування, відображення за центрами відповідальності й упровадження організаційно-методичних і цифрових інструментів для підвищення ефективності управління логістичними процесами. Основні результати дослідження, отримані за допомогою методів індукції та дедукції, аналізу та синтезу, структурно-функціонального аналізу, системного моделювання, порівняльного аналізу, абстрагування та узагальнення, дозволили сформулювати концепцію впливу системи обліку логістичних витрат на ефективність управління ланцюгами постачання й точність калькулювання собівартості продукції.

Запропонований авторський підхід передбачає: по-перше, формування системи обліку логістичних витрат за центрами відповідальності із застосуванням аналітичних рахунків і субрахунків, що забезпечує прозорість витрат і контроль за бюджетними відхиленнями; по-друге, впровадження цифрових інструментів (ERP-, TMS-, WMS-системи) для автоматизації облікових процедур і підвищення оперативності управлінських рішень; по-третє, розробку схем кодування та ідентифікації логістичних витрат, що дозволяє оптимізувати ресурси, покращити якість прогнозування витрат і підвищити ефективність взаємодії між підрозділами підприємства. Отримані результати свідчать про важливість підвищення точності обліку та контролю логістичних витрат, оптимізації ресурсного забезпечення й покращення міжрівневої взаємодії менеджменту підприємства. Акцентовано на значному впливі системи обліку на ефективність менеджменту й економічну стабільність і стійкість підприємства. Практична цінність дослідження полягає у створенні комплексного підходу до управлінського обліку логістичних витрат задля підвищення фінансової дисципліни, ефективності використання ресурсів та стабільності й стійкості розвитку підприємств у динамічному ринковому середовищі.

**Ключові слова:** управлінський облік, логістичні витрати, логістичні процеси, центри відповідальності, оптимізація витрат, цифрові технології, IT-забезпечення, аналітика, прогнозування, система управління підприємством

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