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## Logistics Costs As an Object of Management in the Accounting and Analytical System of an Enterprise

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**Abstract.** *The article studies the conceptual content, nature and essence of logistics costs as an object of management in the accounting and analytical system of enterprise. It is determined that the subject of study and research of logistics is a complex purposeful flow process that combines material, financial, information, commodity, labour, human and other flows. In many domestic scientific publications on logistics, material and related information and financial flows are called logistics flows. The article substantiates the need to identify the cost flow in the study of logistics costs, which is proposed to be understood as a part of the working capital / fixed capital in monetary terms, formed because of the impact of operations for the purpose of transformation, movement of elements of material, information and financial flows, attributed to a certain time interval. The introduction and substantiation of a new object of study – the cost flow as a source of logistics costs, accompanying material, financial, and information flows, is more practical in nature, the study of its spatial, quantitative, and temporal parameters in real time is the most effective source of information for logistics management, which performs the functions of ensuring and controlling the process of implementing the logistics management approach. The very understanding of the essence of logistics costs is interconnected with the scientific and practical vision of logistics. There are many multidirectional and often contradictory definitions, the main ones of which consider logistics as an economic process, as a sphere and functions of management and as a science. It is proved that the importance of each element of the classification of logistics costs is different for enterprises of different industries. The generalised classification should allow combining important aspects from the point of view of organisation of the management process, namely: allocating logistics costs for the three main phases of movement of material flows (procurement, production, sales), determining the areas of expenditure (costs of storage, transportation, sales and costs associated with maintenance of logistics infrastructure), grouping costs by business processes and participants of business processes.*

**Keywords:** *logistics, costs, logistics costs, logistics system, logistics management, cost flow, logistics flow.*

**JEL Classification:** *C61, G30, G32, L23, L81, L91*

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### 1 Introduction

The effectiveness of managing flow processes in a digital market economy is largely determined by the level of costs for transforming and moving flow elements. In today's environment, the concept of logistics is becoming increasingly widely used, which is seen as an effective motivated approach to management, as well as a scientific tool for the rational management of flow processes, which helps to reduce costs. The main economic idea is to think in terms of total costs.

The highest form of implementation of the logistics approach in the activities of existing business structures, its final stage is the creation

of a logistics system. Regardless of the priority of directions and main tasks of implementing the logistics approach, management should pay sufficient attention to the problem of expediency and efficiency of transformations. The traditional ratio of results and costs associated with their achievement is presented here in a new light. The most common scientific approach to date defines logistics costs as the cost of logistics operations. And the main criterion for assessing the functioning of the logistics system is the total logistics costs. However, in this case, the costs in the presented interpretation do not differ significantly from the costs in a traditional business

system. There is a need for an in-depth study of this concept: the essence of logistics costs, principles and methods of their formation, accounting, as well as possible ways to minimise their value.

The purpose of the article is to conceptualise the essence and nature of logistics costs as an object of management in the accounting and analytical system of an enterprise. Achievement of this goal is based on the following tasks:

- To decompose the logistics flows of an enterprise as of logistics costs centres;
- to substantiate the essence, structure, composition and peculiarities of assessing logistics costs at different stages of the logistics process.

The methodological basis of the study was an integrated comprehensive approach to problem solving. In addition to general scientific methods (analysis, synthesis, generalisation, etc.), special methods of scientific knowledge were used, including comparison, structural and logical ordering, strategic analysis, critical evaluation, comparative analysis, and systematicity.

## 2 Decomposition of Enterprise Logistics Flows as Logistics Costs Centres

The subject of study and research of logistics is a complex purposeful flow process that combines material, financial, information, commodity, labour, human and other flows. In many scientific publications on logistics, material and related information and financial flows are called logistics flows (Bilyk, Zamohylnyi & Lapida, 2024; Kravets, 2024; Tytenko, Bohdan, & Muravskiy, 2018; Yakymenko, 2019 etc.). Among domestic scientists there are supporters of a different approach (Donskyi & Hladun, 2023), who believe that logistics material and other flows arise only after the impact on them of a scientific instrument of logistics in order to rationalise (optimise) management, increase efficiency by reducing the cost of transformation, movement of flow elements, increase the level of satisfaction of end users of products, goods, services or as a result of the introduction of a logistics approach. The study of the parameters of flow processes, the nature of their interaction, and changes in time is necessary to create an effective organisation of current production for both traditional economic structures and logistics systems. A flow is a set of objects perceived as a single whole, existing as a process over a certain time interval and measured in absolute units over a certain period.

Some scholars offer the following view of flow from the logistics point of view: "an economic value that characterises a system of structurally interrelated elements that are perceived as a whole

and are subject to dynamic changes over a certain period of time" (Fomina & Avhustova, 2019). In other words, a flow is a controlled subsystem.

The characteristics of a flow are its parameters, which describe the number of objects available at a particular moment in time and are measured in absolute units. The spatial dimension of the flow is described by such categories as the trajectory of the flow path, the start and end points of the flow, intermediate points, the length of the path, or the measure of the trajectory. Finally, the quantitative dimension is described by a category such as volume.

Within a micro-, macro-, and meso-logistics system, flows are interconnected and interdependent. Material flows can be the result of information flows, for example, the drafting of contracts or the negotiation of sales transactions. The financial flow serves as the basis for the emergence of material and information flows, as well as their stimulant.

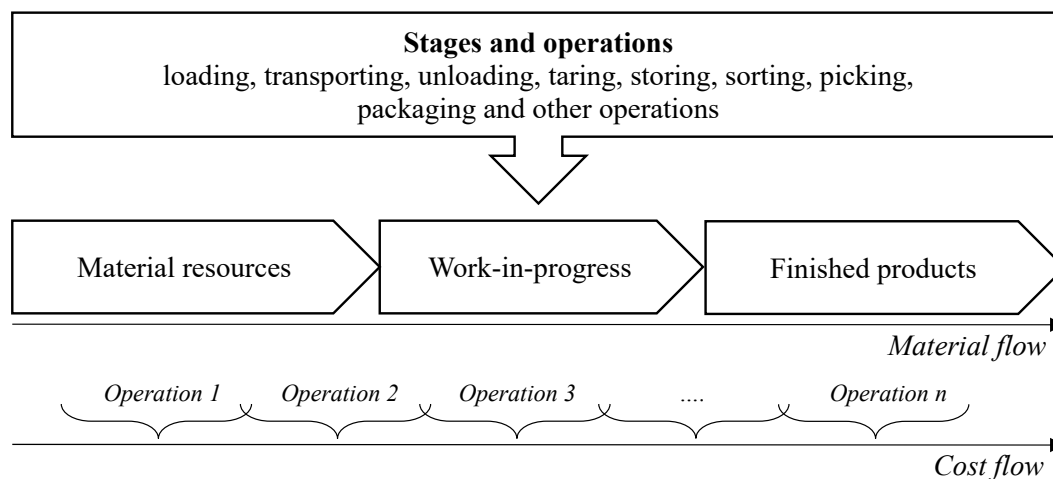
The study creates prerequisites and opportunities for introducing a new object of study – the cost flow. The cost flow is proposed to be understood as a part of the working capital / fixed capital in monetary terms, formed because of the impact of operations with the aim of transforming, moving elements of material, information and financial flows, attributed to a certain time interval.

Elements of the cost flow include both current expenses, production or turnover costs, and one-time investments in fixed assets and working capital, for example, the cost of purchasing or overhauling fixed assets involved in the logistics process (warehouse building, vehicles, etc.). It should be noted that the two types of costs have different nature and units of measurement. Recurring costs are comparable to a specific time interval and have units of measurement, for example, UAH/quarter. One-time investments are denoted in monetary terms (thousand UAH).

Summing up the two types of costs requires bringing them to a single measure by means of coefficients that characterise the relative profitability of one-time investments in alternative areas of their use over a certain period.

Figure 1 shows a diagram of the cost flow formation in the process of transformation and movement of material flow elements.

During a specific time interval, the elements of the material flow are affected by any operation or elements of the flow that are at some stage of transformation/movement, as shown in the diagram. This means that at each specific moment of time, monetary, labour, information and other resources are used, and thus costs are generated. It is well known that the distinction between the



**Figure 1** Interaction of material and cost flows

Source: compiled by the author

economic meaning of the category's "costs" (inputs / expenses) is associated with the difference in the resources used and their cost estimate. In economic theory, "costs" are understood as certain losses that must be incurred to obtain some useful results. Losses can be of various types: objective and subjective, monetary and non-monetary, etc. (Derii & Lukanovska, 2020).

Costs are, first, in the form of a certain amount of capital in monetary form necessary to provide a specific production process with the necessary resources and factors of production (Kravets, 2024). Formation and fixation in time of the costs of the object of implementation of the logistics approach, logistics costs are formed now of recording in the accounts of expenses directly related to the transformation and movement of elements of material and related flows. Only after non-monetary costs and losses are converted into monetary terms and attributed to a specific period by management's decision do they form logistics costs. One-time capital expenditures related to the acquisition of fixed assets (buildings, structures, machinery and equipment), which will be further used for the purposes of implementing the logistics approach or transformation, movement of elements of the analysed flows, will also be the costs of implementing the logistics approach and/or the costs of the object of implementation of the logistics approach after being brought to a certain period of time (in proportion to their operation) using special coefficients. The presented facts can be considered the first evidence of the flow nature of the considered aggregate objects.

The cost flow is discrete in nature: it is formed by objects that move at intervals, for example, at an interval that coincides with the production cycle of the enterprise.

The amount of total logistics costs (or total costs of the object of implementation of the logistics approach) is estimated depending on the following indicators:

- In relation to sales volumes expressed in terms of value and percentage;
- in cost per unit weight of raw materials and finished products;
- as a percentage of the cost of conditionally clean products, etc.

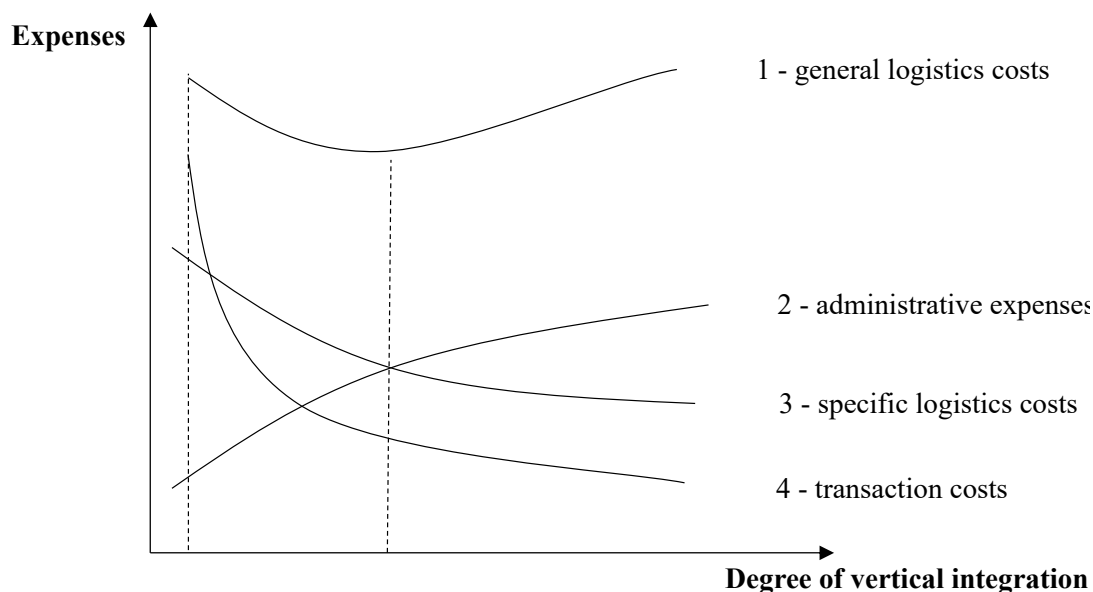
This confirms the possibility of a functional presentation of logistics costs.

In practice, a graphical interpretation of a set of cost flow objects is possible. For example, Figure 2 shows a graph of the dependence of logistics costs on the degree of vertical logistics integration.

The figure shows a family of curves: the curve of specific logistics costs, administration costs, transaction costs of the logistics system, and total logistics costs.

In relation to a particular economic system (logistics), the cost flow can be internal and external. The total cost of goods, most of which is made up of the previously determined costs of the object of implementation of the logistics approach or logistics costs that are formed on the way from the primary source of raw materials to the end consumer. The material flow of the enterprise's logistics system, moving along the chain of production, transport, and intermediary links, is transformed and becomes more expensive.

Thus, considering the incoming material flow entering the system from the external environment, the relative cost of material resources is assessed, which will depend on the specifics of the production and technological stages, the number of intermediary links, the distance of



**Figure 2** Graph of dependence of logistics costs on the degree of vertical logistics integration

*Source: compiled by the author*

transportation, the amount of transaction costs, etc. The external cost flow is formed because of stages and operations outside the logistics system, or over external material and related flows. The internal cost flow is formed because of the impact of operations for the purpose of transformation, movement of elements of internal flows, material, information and financial.

The main indicators of the cost flow are the volume of total costs of the object of implementation of the logistics management approach (representing the sum of costs at all stages and operations for transformation and movement of flow elements, as well as the costs of implementing the logistics management approach for a certain time interval), the intensity of the flow and the rate of change over time.

The introduction and substantiation of a new object of study – the cost flow as a source of logistics costs, accompanying material, financial, and information flows, is more practical in nature, the study of its spatial, quantitative, and temporal parameters in real time is the most effective source of information for logistics management, which performs the functions of ensuring and controlling the process of implementing the logistics management approach.

### **3 Essence, Structure, Composition and Evaluation of Logistics Costs at the Stages of the Logistics Process**

Understanding the essence of logistics costs is interconnected with the scientific and practical

vision of logistics. There are many multidirectional and often contradictory definitions, the main ones of which consider logistics as an economic process, as a sphere and functions of management and as a science (Bilyk, Zamohylnyi & Lapida, 2024; Kravets, 2024; Tytenko, Bohdan, & Muravskiy, 2018; Yakymenko, 2019 etc.).

Logistics costs on the scale of a single business structure are usually calculated as a percentage of sales, in value terms per unit weight of raw materials, finished products, etc., as a percentage of the cost of net output; and on a national scale – as a percentage of the gross national product (Yakymenko, 2019).

Logistics costs are used as a management tool in practical activities. Determination of the composition of logistics costs and cost analysis facilitate the adoption of economically sound business decisions at all levels of management. The level of logistics costs affects the economic condition of the enterprise and its competitiveness. Reducing logistics costs and increasing profits on this basis increases the financial capabilities of the enterprise and expands its economic independence.

In the commercial practice of economically developed countries, logistics cost accounting is integrated with their rationing, planning and analysis into a single information system, which allows for prompt detection and elimination of violations during logistics activities. This helps to determine the profitability for the company of purchasing certain products, manufacturing in a particular location, using certain channels.

Logistics costs are the costs associated with the performance of logistics operations and, in general, represent the monetary value of the resources (labour, material, financial and information) spent to ensure the movement of material and related flows within the logistics system and the fulfilment of customer orders.

Logistics costs are inextricably linked to the functioning of the enterprise's logistics system and are formed in different areas: supply, production and distribution, which complicates the possibility of their effective management.

Logistics costs are formed because of logistics operations and constitute a significant part of the total costs of the enterprise, thereby determining the cost of products and services, the results of production activities, and, consequently, the overall economic efficiency of the business.

Summarising the achievements of research (Bilyk, Zamohylnyi & Lapida, 2024; Kravets, 2024; Tytenko, Bohdan, & Muravskyi, 2018; Yakymenko, 2019 etc.), it can be determined that logistics costs are a monetary expression of the aggregate of material, labour, financial, and information resources of an enterprise associated with the provision of business processes and

operations for the movement of material flows within the logistics system.

The classification of logistics costs by one or several features is advisable to be carried out both for methodological purposes – to clarify their content, and for practical purposes – to organise accounting and analysis of logistics costs, as well as for costing. Each of the existing classifications can be used in the organisation of the management process, but in terms of separating and summarising information on logistics costs for the purposes of the enterprise management process, the following classification features can be used:

- By economic elements (labour costs, use of production factors, financial costs);
- by functional areas (supply costs, production support costs, distribution and sales costs);
- by time periods (day, week, quarter, year, six months);
- by participation in the logistics process (logistics costs and costs of supporting logistics business processes);
- by business process participants (suppliers, divisions, consumers);
- in relation to the logistics system (external and internal);

**Table 1** Classification of logistics costs for the purposes of logistics management

№	Classification feature	Types of logistics costs
1	By functional feature	- Supply costs (procurement; transport; maintenance of warehouses and equipment; storage; freight; administrative and management); - production costs (management of production processes; intra-plant movement; management of work-in-progress stocks; control; cargo handling; administrative and managerial) - sales and distribution costs (order management; transport; finished goods inventory management; warehouse maintenance; return of finished goods);
2	By operational basis	- Costs of placing an order; - costs of manufacturing the product; - loading and unloading costs; - transport costs;
3	By types of expenses	- Material costs (depreciation and amortisation; materials, fuel, energy; third-party material services; labour costs); - Intangible expenses (services; attraction of third-party capital; cash payments in the form of taxes and fees, other expenses);
4	By place of origin	- Expenses of the supply department; - expenses of the sales department; - expenses of production units; - expenses of transport units; - warehouse expenses;
5	By the main components of logistics processes	- Costs of physical movement of material flow; - costs of related processes;
6	By economic content	- Direct costs (use of production factors and labour, financial costs); - force majeure costs; - costs of lost profits;

Source: compiled by the author

– by the nature of logistics operations (direct and indirect).

Table 1 shows the classification of logistics costs, which is necessary for the purposes of logistics management.

In addition, logistics costs can be classified by other important features. According to the method of obtaining data, logistics costs are divided into actual, normal, and planned. Actual logistics costs are the costs actually incurred for a given logistics operation or facility in the period under review, given the actual volume of activities performed. Normal logistics costs are the average costs incurred for a given logistics operation or a given object in the period under review given the actual volume of activities performed. Planned logistics costs – costs calculated for a particular logistics operation or a particular facility in a certain period with a planned work programme and a given technology.

According to the method of attribution to logistics processes, logistics costs are divided into direct and indirect. Direct logistics costs can be directly attributed to a logistics operation or a product, service, order or other specific medium. Indirect logistics costs can only be directly attributed to a logistics transaction or a product, service, order or other specific item by making ancillary calculations.

Grouping costs by economic elements and costing items is very important for practical use. Grouping by elements makes it possible to identify economically homogeneous types of logistics costs. The composition and content of cost elements may be determined by the Regulations on the composition of costs of production and sale of products (works, services) included in the cost of products (works, services) and on the procedure for the formation of financial results taken into account when taxing profits.

Grouping by costing items is related to the organisational and technical features of the service system. At present, this grouping of costs remains important in internal production management, organising cost control at all stages of the process of fulfilling customer orders.

A significant difference between the grouping of costs by costing items and the grouping by economic elements is the presence of items that combine elements by their economic content, the principle of purpose (basic costs and costs of maintenance and management), the method of their distribution between certain types of service (direct and indirect) and those that depend on the volume of service (conditionally fixed and variable).

According to the nature of the description of economic turnover, transformation and transaction costs are distinguished:

1) Transformational costs are the costs of economic turnover caused by natural characteristics, primarily the costs of the production process itself;

2) transaction costs are the costs of economic turnover caused by the social nature, i.e. the relations between people that have developed over a given object, and ultimately, the institutions that structure these relations. Transaction costs are associated with certain actions in the process of preparing, concluding and executing a transaction, namely: searching for information, negotiating, concluding contracts, and protecting property rights.

The problem of accounting for transaction costs becomes particularly relevant when organisational difficulties become more important than technological limitations. The material precondition for this is the gradual displacement of people from direct participation in the production process.

Logistics costs are also divided into explicit and implicit:

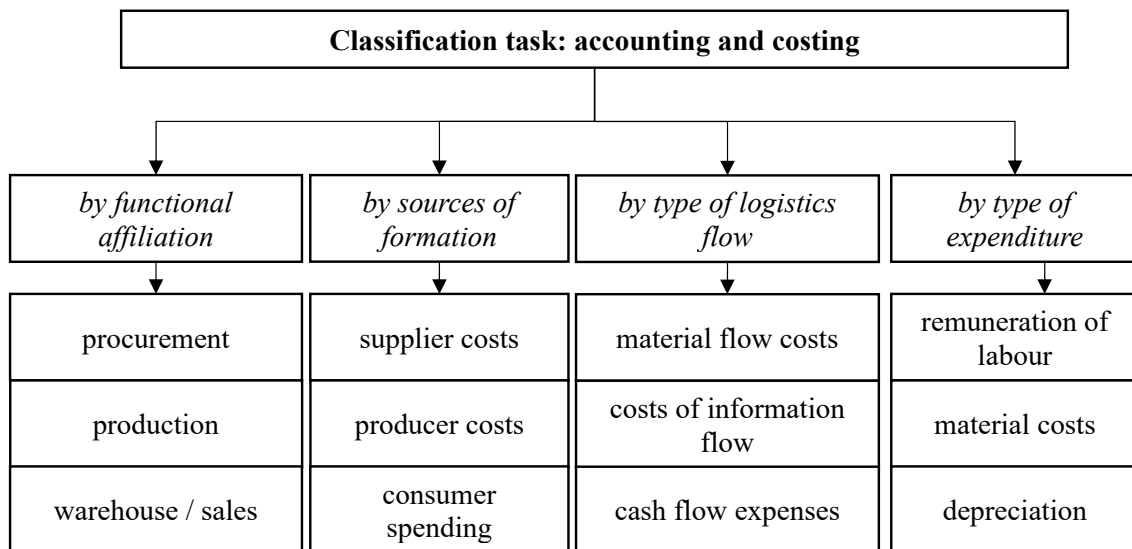
1) Explicit costs are costs that take or can take the form of cash payments to resource suppliers, i.e. they are or can be reflected in the accounts of enterprises, as the economic entity itself will assess them by making a payment to the resource suppliers;

2) implicit costs are implicit costs that are not explicitly paid by the subject of economic relations, and therefore it is very difficult to statistically account for them, and if possible, indirectly. Implicit costs are the costs of all kinds of resources owned by the enterprise. They can be covered, for example, by comparing payments for the use of similar resources made by other market participants.

The diversity of classification features and the lack of hierarchy is a problem of cost classification. Therefore, the allocation of different groups of logistics costs will depend on the type of logistics system, management and optimisation tasks in specific logistics chains and channels.

It is advisable to classify logistics costs as objects of logistics management at an enterprise according to the functional tasks of the accounting and analytical system. The primary purpose of accounting for logistics costs is their calculation (Figure 3).

Even though the collection of complete timely information on the costs of the object of implementation of the logistics management approach, the costs of the logistics system have



**Figure 3 Classification of logistics costs in accordance with the tasks of the accounting and analytical management system**

*Source: compiled by the author*

some difficulties associated with the unsuitability of accounting data, its importance is great. Accounting for the costs of the object of implementation of the logistics management approach is primarily necessary in inventory management as a criterion for optimising production stocks, work in progress and finished goods stocks. At the same time, at the enterprise level, inventories require large capital investments and represent one of the factors that determine the policy and level of logistics services in general.

In accordance with the definition, considering the peculiarities of cost formation of the object of implementation of the logistics approach, it is reasonable to take as a basis their classification of stages and operations of transformation and movement of elements of material and related flows. To do this, it is necessary: firstly, to classify stages and operations; secondly, to determine the range of costs associated with their implementation; thirdly, to establish the places of operations, and thus to determine the places and centres of cost occurrence.

The composition of logistics costs depends on the following factors: the specifics of the company; the scale of the company's operations; the type of transport used in the core business; the availability of owned or leased vehicles; the type, weight and size of the transported cargo; the packaging of the transported cargo; the route and type of

communication: international, long-distance or city transport; the distance of transportation; the organisation of warehousing: own warehouse, lease of warehouse space, etc.; the methods of loading and unloading used in the core business.

#### 4 Conclusions

Thus, the subject of study, logistics research is a complex purposeful flow process. The introduction and substantiation of a new object of study - the cost flow as a source of generation of logistics costs, accompanying material, financial, information flows, is more practical in nature, the study of its spatial, quantitative, temporal parameters in real time is the most effective source of information for logistics management, which performs the functions of ensuring and controlling the process of implementing the logistics management approach. For enterprises of different industries, the importance of each element of the classification of logistics costs is different. The generalised classification should allow combining important aspects from the point of view of organising the management process, namely: allocating logistics costs for the three main phases of material flows (procurement, production, sales), determining the areas of expenditure (storage, transportation, sales and costs associated with the maintenance of logistics infrastructure), grouping costs by business processes and business process participants.

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