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Logistics Industrial Enterprise Systems Methodology of Building Material Formation

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Abstract: This article describes in detail the methodology for forming logistics systems for enterprises of the building materials industry. The main goal of the study is to develop theoretical and methodological foundations for creating and managing effective logistics systems for enterprises producing building materials. Ways to increase the economic efficiency of enterprises through optimal management of logistics processes are shown.

Key words: logistics systems, building materials industry, methodology, logistics processes, supply chain, economic efficiency, optimization.

Introduction

In the current process of economic development of our country, the rapid adaptation of business entities to market conditions is a very necessary and large-scale task. This directly applies to industrial enterprises, especially the construction materials industry, which is one of the main sectors of the national economy. This area is currently characterized by a lack of coordination of production processes with procurement, storage, transportation, and implementation processes, inconsistencies in plans, a lack of clear development forecasts, incorrect distribution of resources, and inconsistencies in the goals of structural subdivisions of enterprises. As a result, each organization loses time and resources, which exacerbates internal problems, reduces flexibility, and leads to the loss of potential competitive advantages in the market.

RESEARCH METHODOLOGY

The main purpose of this study is to study and analyze methods for increasing the efficiency of modern construction logistics systems. The methodology used in the study mainly uses methods such as a systematic approach, statistical analysis, comparative analysis, factor analysis, sample observation, analysis and synthesis.

Main part

The most effective external and internal interaction between business entities can be achieved by applying a systematic approach to managing internal and inter-organizational flows. In other

words, it is necessary to transition to the organization of control through the application of logistics principles and methods and the creation of logistics systems. Previous approaches to the concept of a logistics system have been considered and presented.

The main conditions for the formation of a logistics system in economic sectors are:

- understanding the market and logistics mechanisms with new approaches as a strategic resource in the implementation and development of the competitive potential of enterprises, increasing competition and ensuring the market flexibility of the enterprise through effective resource management;
- promising and modern approaches to the mutual integration of participants in economic relations contribute to the further optimization and increase the competitiveness of economic systems by ensuring the creation of new organizational forms;
- optimization of economic processes with the help of modern information technologies, new technological approaches and innovations, which allow improving the level of interaction between market participants and reducing costs.

In order to effectively manage the implementation of logistics principles and methods at enterprises of the building materials industry, it is recommended that enterprises use the methodology developed by the author to create a logistics system that includes a number of sequential stages.

1) The purpose of the material and technical supply system of construction materials industry enterprises is mainly to ensure efficient and uninterrupted production processes, optimal resource management, and increase the overall economic efficiency of the enterprise.

2) The boundaries of the logistics system form a complex and multifaceted system aimed at optimizing resources and time, including the processes of delivery and return of products from production to the end consumer.

3) formation of links and subsystems of the logistics system of enterprises of the building materials industry, effective management and ensuring the continuity of production processes. This contributes to the effective distribution of resources and the optimization of logistics processes of the system's links and subsystems.

4) formation of the organizational structure of the material and technical supply system of enterprises of the building materials industry, effective management of production processes, ensuring uninterrupted supply of resources and materials, as well as optimization of costs and increasing production efficiency.

5) Determining the system of material and related flows in the construction industry and determining their operating parameters is very important for ensuring the effective functioning of the logistics system and logistical support in the building materials industry.

6) Distribution of business processes performed by each link of the logistics system at construction enterprises contributes to ensuring efficient and uninterrupted supply and production processes at construction materials industry enterprises.

7) To ensure the effective functioning of the logistics system, it is necessary to develop its performance indicators. These indicators allow measuring the efficiency of logistics processes, how to manage resources, reduce costs, ensure product quality, and optimize customer service.

8) Monitoring the effectiveness of the logistics system is the process of evaluating the system's performance, measuring its effectiveness, and implementing the necessary changes to achieve maximum results with available resources. Monitoring is carried out by observing various sections and processes of the system, collecting and analyzing the necessary data. By monitoring

efficiency, it is possible to optimize logistics processes, reduce costs, improve quality, and improve customer service.

Let's consider a complete analysis of each stage of the formation of the logistics system at the enterprises of the building materials industry. Defining the functions of the logistics system. The formation of a logistics system is a complex process, in which it is necessary to identify and study a set of goals that affect such aspects as the interaction of system elements, meeting market needs, the number of structural units (at the micro level) and enterprises included in the logistics system (at the macro level). the level of profitability and the availability of material, human, financial, and information resources are of great importance. Factors of production of business entities in mutual relations interact at each enterprise, forming a single economic space that ensures the production of products or services.

The enterprise always operates under conditions of limited resources. According to economic laws, it can act as follows:

- achieving maximum results (i.e., obtaining the highest product with a given volume of production resources);
- minimizing costs for the volume of construction materials production.
- maximizing the correspondence of results (i.e., costs and results should be in optimal compliance).

Thus, the purpose of the logistics system operation can be defined as obtaining maximum profit by all links or minimizing costs throughout the entire material flow process. For the purposes of the logistics system's operation, along with cost indicators, it is necessary to consider the quality characteristics of goods produced through the system. At the same time, every enterprise must ensure financial balance and fulfill its obligations on time, i.e., make payments to the budget, employees, and suppliers. In market conditions, the enterprise independently determines consumer demand, links resources with market demand, and sells its products at market prices.

Explain the boundaries of the logistics system. Subsequently, it is necessary to define the boundaries of the logistics system, as this affects its objective structure and the functions performed by the system. The boundaries of the logistics system can be determined depending on the cost of manufactured products and the costs of their storage, sale, and transportation to the place of consumption. First, we determine the selling price of the product, which can be expressed as a sum:

$$N=Xp/c+Xsc+Xcp+T_t*m+F$$

Here: P- Price of selling, sum / per; Xp/c- Production costs per unit of output, sum/unit; Xs/c- costs of storing products, sum/unit; Xcp - costs for the sale of products, sum/unit; Tt - tariff for the transportation of raw materials, materials, and finished products to the point of consumption in the logistics systems of industrial enterprises, sum/km, m - distance from the point of creation of the material flow to the point of its absorption in the logistics system, km; F-planned profit, sum. Based on the obtained equality, the required distance m is calculated, which determines the system boundary to create equal working conditions at all links of the logistics system. Later, a simplified expression can be used to calculate m.

$$M=(N-(Xp/c+Xsc+Xcp+ F))/ Tt$$

In this case, m represents the interaction of logistics systems X1, X2, X3,..., Xn in a certain region and the economically advantageous radius R. This calculation can be used on the basis of the proposed methodology as a useful tool for quick determination of the boundaries of the logistics system for enterprises in the field of basic and building materials.

3. Formation of components and subsystems of the logistics system. It is aimed at determining the main purpose of the logistics system elements of industrial enterprises, establishing relationships with construction materials and their composition, methods, forms and other components, as well as organizing the hierarchy of logistics system objects. The main links and subsystems of the micrologistics system in the building materials industry are presented in the table.

Specific aspects of the main links of the micrologistics system in the field of construction materials production. (table 1)

Communication systems between logistics services.	Logistics Processes	Aim	Indicator
Purchase (Supply)	Inspection and evaluation of raw material suppliers; management of raw material supply processes; evaluation and management of the supply system.	Stable provision of production with raw materials and supplies	Ensuring minimum costs when carrying out logistics purchases
Transport	Delivery of raw materials, supplies, and finished products to consumers; Cargo insurance; Development of the most effective routes; Determination of freight transportation prices; Management of internal transport processes	Timely and high-quality execution of transportation processes	Minimum transportation costs
Production	Production capacity planning; Planning the need for material resources; Formation of a production plan.	Production of quantity and quality products	Minimum production costs
Warehouse	Determination of the most optimal dimensions of the warehouse capacity; Control of the inventory system; Assembly and packaging of sets; Loading and unloading of goods.	Efficient use of warehouse capacity	Reducing costs for storing raw materials, materials and finished products
Distribution	Determination of the method of material flow distribution; Determination of the optimal number and location of distribution centers (warehouses); Determination of product distribution routes	Smart selection of construction materials distribution system	Minimum costs in the process of distribution of building materials
Sales	Implementation of inventory management; Effective	Implementation of products at	Minimum costs for the

	management of the product delivery and processing process; Carrying out cargo transportation operations; Management of the delivery process and control over the execution of transport operations; Logistics Process Management	specified times in accordance with quality, volume, price and deadlines	production and implementation of products

4. Development of an organizational structure for managing the logistics system. The organizational structure of logistics system management currently has three variants:

- ✓ centralized;
- ✓ decentralized;
- ✓ specialized (outsourcing logistics operations).

In a centralized organization, material and technical support activities are concentrated in one department and report to top management through the deputy director (chief engineer).

The advantages of the centralized management method serve to increase the efficiency of logistics work, but the disadvantages lead to high costs for maintaining the management apparatus. In the decentralized management method, logistical tasks are divided into several subdivisions, and there is no centralized management. Advantages:

high level of scientific knowledge of the logistics manager in individual functional systems, disadvantages:

duplication and weak coordination of tasks and functions.

In the decentralized method, logistics functions are divided into different structural units, and there is no centralization in the management process. The main capabilities include:

high-level scientific knowledge of logistics management in individual functional subsystems, has the following disadvantages:

duplication of tasks and functions, weak coordination.

Outsourcing logistics tasks and operations is the transfer of all or part of the functions of logistics services for material and related equipment to a third-party organization (contractor or outsourcer) in the form of flows (logistics service).

Comparison of different organizational systems of logistics management(table 2)

Form of organizational management structure of the logistics system	Advantages of the management structure of the logistics system.	Specific shortcomings of the organizational management structure of the logistics system.
Centralized	The possibility of ensuring high efficiency in logistics processes.	High costs of operating and maintaining the management apparatus
Decentralized	Reducing and controlling operational costs, increasing the level of specialization of the organization, applying	releasing internal resources for other purposes, and distributing risks.

	global technologies,	
Specialized (outsourcing of logistics operations and tasks)	Advanced scientific fields of knowledge for logistics specialists in individual functional systems.	The loss of control by a third-party organization, problems arising in establishing relationships.

The expediency of using logistics outsourcing for an organization is explained by the following factors:

- there are strong links between enterprises in the transport industry at all stages of the value chain with the supply and production sectors;
- the possibility of reducing work that does not correspond to the main activity for the manufacturer;
- increasing flexibility in relation to the development of the organization and its activities in the markets;
- using all the advantages of the logistics approach to manage your activities without developing your competencies in this construction area;
- reducing overall costs and improving the cost system;
- a wide range of quality logistics services provided by the provider;
- improving the quality of services for the end consumer, which positively affects the image of the consumer company, etc.

5. Determination of materials and the corresponding flow system, determination of their operating parameters. At this stage, a scheme is developed that determines the directions of material, financial, information, and service flows in the logistics system, the main flow is determined, and the efficiency indicators of the flows are calculated. (Table 3)

6. Distribution and designation of business processes in the logistics system according to individual links. After identifying, analyzing, and evaluating the logistics system, it is necessary to identify and describe additional existing flows, as well as to determine and distribute business processes for pre-formed links. In describing and distributing business processes across the links of the logistics system.

The following classifications can be used for business processes.

1. Based on the APQC process classification system. The model includes 12 large groups of business processes:

1. Creation of a targeted strategy and mechanisms for its implementation;

2. Development, improvement, and management of products and services;

3. Carrying out marketing activities and ensuring the sale of products and services;

4. Delivery of construction products and provision of relevant services;

5. Control and management of the quality of services provided to clients;

6. Improvement of the personnel training and human resource management system;

7. Modern Information Technology Management (IT) in the construction industry;

8. Effective distribution and management of financial resources;

9. Acquisition of real estate, implementation of construction work and management of its activities;

10. Acquisition of real estate, implementation of construction work and management of its activities;

11. Management of compliance with environmental protection, health, and safety requirements;

12. Implementation and management of external relations;

13. Management of knowledge resources, improvement of activities and implementation of changes;

Parameters determining the operational efficiency of flows in the building materials production system (table 3)

Construction industry resources (raw materials, materials and finished products)	**The main dimensions of the object are: volume, area, and linear dimensions.**
	Weight indicators: total mass, net weight.
	The main physicochemical parameters of construction products include density, heat transfer capacity, and high-temperature resistance.
	Vhar = S / t delivery speed characterizing the total mass (Q) or volume (V) of the material flow delivered to a specific point of consumption
	over a certain time interval t Vyet = Q / t or Vyet = V / t delivery intensity (or speed) (Iyet) - the ratio of the total mass (Q) or volume (V) of the delivered material flow to a specific point of consumption to a designated road segment (S).
	Iyet = Q / DS or Iyet = V / DS delivery time (t) - the ratio of the distance (S) from the initial point of the material flow to the final point of consumption to the speed of movement (Vhar).
	t = DS / Vhar The length of the material flow path is the distance between the initial and final points, expressed in meters or time.
	The intensity of material flow represents the speed and volume at which resources in the production system move in the form of a flow.
	The capacity indicator of the material flow is the maximum volume of product movement per unit of time.
	Capacity indicator of material flow Maximum volume of product movement per unit of time
Financial	Flow volume Funds allocated for financial support of material flow processes
	Flow value Costs of financial support necessary for the movement of material resources
	Time Duration of time from the beginning of financial flow to the final stage
	Direction Criterion determining to which organization the financial flow belongs or from where it originates
Information	Cause of occurrence
	Direction of movement
	Information transfer efficiency
	Flow intensity is characterized by the mathematical expectation of the number of events per unit of time; the average number of events per unit of time in flow velocity l, and the intensity of a stationary flow can be experimentally calculated using the following formula:

	l = n/t = const, where n is the number of units passed, t is the time period; non-stationary flows are characteristic of unstable processes, and their intensity changes over a certain period of time: l = f (t) ≠ const
Service (flow of services created by the logistics system)	Accuracy and stability of delivery
	Time interval between order and delivery
	Flexibility of the delivery system
	Amount of resources available in the warehouse
	Possibility of issuing loans

According to the model developed by J. Stock and D. Lambert, business processes include:

- ✓ development of customer relations; - customer service process;
- ✓ management of demand for construction products; - planning and control of order fulfillment;
- ✓ management of construction product production processes;
- ✓ management of the construction product delivery system;
- ✓ distribution and sale of commercially developed construction products;
- ✓ management of returnable materials. In accordance with ISO standards:
- ✓ main business processes;
- ✓ auxiliary business processes;
- ✓ business process management;

7. Development of performance indicators for the logistics system. In order to develop the logistics system, it is necessary to develop a set of specific indicators and criteria for assessing the effectiveness of its activities. When forming a logistics system, it is important to determine the indicators of the effectiveness of material and technical support of enterprises producing building materials. This requires scientific research based on the development of a special methodology and economic-mathematical modeling for the stable functioning of the system. Within the framework of the methodology developed as a result of the study, groups of main indicators are proposed that serve to assess the effectiveness of the logistics system of enterprises operating in the building materials industry:

- ✓ cost indicators;
- ✓ time indicators;
- ✓ efficiency indicators;
- ✓ logistics system;
- ✓ risk indicators for the operation of the logistics system.

8. Evaluation of the effectiveness of logistics processes The final stage of the formation of the logistics system of building materials industry enterprises includes: continuous analysis and assessment of supply chain and flow parameters in the organization, identification of the weakest points by analyzing business processes in the logistics system, redesign of these processes (reengineering), as well as periodic calculation of indicators that show the effectiveness of the system.

Conclusion

The developed methodology serves to maintain costs at a minimum level and determine the overall economic effect, creating organic and flexible links between all links of the logistics system. This ensures the achievement of maximum results, even when insufficient attention is paid to certain subsystems.

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