

Improving Cost Management Processes in Construction Logistics Chains

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Abstract: The article deals with the issues of improving the cost management mechanisms in the supply chains of the construction industry. The activities of foreign and domestic scientists, reflecting the results of various studies, and some related concepts, as well as the author's definitions. For the activities of a large construction company, a multifactorial model was chosen based on the factors influencing the formation of costs in the supply chains of the construction industry. Based on the indicators for 2014-2021, a multifactorial model of non-linear relationships was developed, and on the basis of this model, forecast indicators for the formation of costs in supply chains for the medium term were determined. In the course of the study, a complex organizational and economic mechanism for managing the logistics business processes of a construction cluster was developed, which expands the possibilities for improving the efficiency of the process of managing the movement of material and information flows in logistics chains in the activities of regional construction clusters.

Keywords: construction industry, logistics, capital construction, building complexes, logistics chains, management, logistics costs, construction cluster.

The introduction of approaches to the formation of logistics chains in the management of the capital construction process, taking into account the existing economic and organizational potential, is of great importance at the current stage of the development of the industry. This is related to the acceleration of construction production, the use of new materials and construction technologies, the expansion of the level of horizontal economic relations between the enterprises of the construction complex, the increase of the intensity of economic flows in construction, and the necessary level of integration of sectors related to the activity of the industry. In such conditions, the importance of logistical coordination of material, information and financial flows, ensuring coordinated activities during construction, procurement, transportation, delivery and preparation of production-technological configurations for the objects under construction, as well as in the space where the process is taking place, is objectively increasing.

The logistics system consists of interconnected chains (links). Suppliers of material resources of enterprises, production enterprises and their divisions, trade, intermediary organizations of various levels, transport and delivery enterprises, stock exchanges, banks and other financial institutions, information and computer services and communication enterprises, etc. operate as chains of the logistics system.

Analysis of literature on the topic. In recent times, among scientists and researchers conducting theoretical research, there is an increasing interest in studying the cost category of logistics chains. These studies are important in the formation of effective logistics chain links based on the rational management of material, financial and information flows in the construction industry.

According to research by J. Stock and D. Lambert, if marketing determines the level of necessary services, logistics provides it with optimal costs and economic attractiveness of capital.

In the 60s of the twentieth century, the German economist M. Kufel was the first to study the concept of logistics chain costs and interpreted them as costs incurred by the enterprise in the process of ensuring the movement of material flows in the enterprise.

M. Kufel defines: "... logistics costs are costs in the form of money related to the planning, implementation and control of the movement of material flows in addition to technological processes within the limits of time and space." However, in this approach, only the movement of material flows is considered, and storage of raw materials, finished products in warehouses, packaging and post-sale services are not taken into account.

Theoretical aspects of logistics chain costs are presented in the studies of L. B. Mirotin, Y. E. Tyshbaev and O. G. Poroshina. According to researchers, the costs of logistics chain enterprises include labor costs, material costs, financial costs, and information resource costs arising from activities related to the fulfillment of orders received from consumers.

Analysis and results. The analysis of the changes taking place within the framework of the structural changes taking place in our country determines the support of the activities of the construction industry entities operating as the main factors of ensuring economic growth at the macro-economic level, the formation of logistic chains in the construction industry, and at

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the same time the establishment of a new, modern and effective system of management of construction industry activities. received.

In the econometric analysis of the factors affecting the development of logistics chains in the construction industry, taking into account the wide use of multifactor production functions and the functions derived from them, we determine the econometric model of the state of change of costs in the enterprises of the logistics chains of the construction industry in our country in the form of a production function based on a multifactor connection. The defined model helps to determine the target forecast indicators for the short and medium term based on the direction of management of the factors affecting it in the optimization of costs in the logistics chain activity and to determine the measures necessary to ensure these indicators.

In the Republic of Uzbekistan, a multi-factor analysis was carried out on the change of the costs of the logistics chain in the construction sector under the influence of the main influencing factor on the indicator considered as an endogenous factor.

Having determined the cost of the logistics chain in the construction industry as the peak of the production function, i.e. as the resulting factor, the following indicators were selected based on the conclusions of industry experts as indicators of the influencing factor:

X1 – volume of completed construction works;

X2 – management costs in the logistics chain;

X3 – share of own logistics systems in the total chain;

Each influencing exogenous factor is intrinsically a driver of logistics chain costs in the construction industry. For example, if the volume of the total completed construction works determines the load of the logistics system necessary for the organization of the activity, the management costs represent the possibility of optimally providing the activity of the logistics chain, the share of its logistics systems in the total chain represents the degree of specialization of enterprises in logistics services.

Modeling of logistics costs in enterprises in the logistics chain operating in the construction sector of our country can be done with the help of models such as trends, trends and time series occurring in the market of specific services. In the course of the research, an analysis of the trends of changes in logistics chain costs and some indicators affecting its formation during 2014-2021 was carried out in the construction and assembly enterprise operating in Fergana region (Table 1).

Indicators such as volume of construction works (x1), volume of management costs in the logistics chain (x2) and the share of own logistics systems in the total chain (x3) were selected as exogenous factors affecting the volume of logistics chain costs (Y) selected as the resulting factor in the econometric model.

Table 1. Indicators of the volume of logistics chain costs in construction and assembly enterprises and factors influencing its change (billion soums)

Years	Logistics chain costs, mln. soums (Y)	Amount of completed construction works, mln. soums (X1)	Logistics chain management costs, million soums (X2)	The share of own logistics systems in the total chain, % (X3)
2014	53639,1	487628,4	64952,1	19,6
2015	63161,6	619231,8	83441,5	19,6
2016	72647,8	698536,5	85500,9	23,4
2017	76331,8	763317,9	107337,8	25,3
2018	99376,5	1057197,3	135786,4	63,2
2019	77528,5	861427,9	103759,0	66,7
2020	73728,1	801392,2	127902,2	69,5
2021	82208,7	838714,3	109328,1	68,8

If the nature of the indicators of the endogenous factor and the exogenous factor affecting it is considered, the volume of construction work performed as influencing factors, management costs in the logistics chain, and factor indicators representing the factors that have a significant impact on the share of its logistics systems in the overall chain are considered in the form of the Cobb-Douglas production model. will have a close connection to the model.

Table 2. The characteristics of connection of selected factors and the main indicators of the quality of the constructed factor model according to "Kuvasony Tamir Kurilish" LLC²Dependent Variable: **Logistics chain costs, LnY**

Method: Least Squares

Date: 01/06/22 Time: 20:23

Sample: 2014 2021

Included observations: 8

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Volume of completed construction works, LnX₁	0.935742	0.183239	5.106663	0.0070
Management costs in the logistics chain, LnX₂	-0.065730	0.177574	-0.370157	0.7300
The share of its logistics systems in the overall chain, LnX₃	-0.047867	0.043978	-1.088423	0.3376
General effects of random factors, ε	-0.518473	1.66369	-0.379453	0.7236
R-squared	0.972202	Mean dependent var		11.20875
Adjusted R-squared	0.951354	S.D. dependent var		0.182791
S.E. of regression	0.040316	Akaike info criterion		- 3.277287
Sum squared resid	0.006501	Schwarz criterion		- 3.237567
Log likelihood	17.10915	Hannan-Quinn criter.		- 3.545188
F-statistic	46.63254	Durbin-Watson stat		2.370829
Prob(F-statistic)	0.001435			

Based on the connection of the main endogenous and exogenous factors, the above time series data were analyzed using the EViews10 program in order to determine the change trends in the volume of logistics chain costs at "Kuvasony Tamir Kurilish" LLC. In the activities of "Kuvasony Tamir Kurilish" LLC, the level of intercorrelation of costs in logistics chains and the factors influencing it was studied on the basis of correlational analysis. Correlation analysis shows that the relationship density between the resulting factor and influencing factors satisfies the necessary condition, that is, $ryx1=0.9774$, $ryx2=0.8618$ and $ryx3=0.8618$. In all three relationships, the pairwise correlation coefficient shows a strong relationship, which indicates that the influencing factors are correctly selected with respect to the resulting factor.

Using the identified data, a multifactor econometric model of changes in logistics chain costs and factors influencing it was created in the activity of "Kuvasony Tamir Kurilish" LLC. According to him, representing this process

$$LnY = 0,936 \cdot LnX_1 - 0,066 \cdot LnX_2 - 0,048 \cdot LnX_3 - 0,518 \quad (1)$$

a regression equation was constructed.

If the determined linear logarithmic model is potentiated, a non-linear econometric model representing the costs of logistics chains in the enterprise's activity is derived:

$$Y_1 = \frac{X_1^{0,936}}{X_2^{0,066} \cdot X_3^{0,048} \cdot e^{0,518}} \quad (2)$$

Table 3 shows the values of changes in the volume of logistics chain costs of enterprises taken for analysis using a multifactor econometric model under the influence of economic and management factors in the short term, i.e. in 2022-2024.

² Computationally developed by the author in EViews10 software.

Table 3. In 2022-2024, forecasts of the volume of expenses and indicators of management activity in logistics chains at "Kuvasoy Tamir Kurilish" LLC³

Years	Logistics chain costs, mln. soums (Y)	Amount of completed construction works, mln. soums (X1)	Logistics chain management costs, million soums (X2)	The share of own logistics systems in the total chain, % (X3)
2022	89982,1	988303,5	135259,5	85,3
2023	93729,4	1037719,6	142594,7	94,4
2024	97117,6	1087135,8	149929,9	100,0

Based on the regression coefficient of the variables in the multifactor model representing the change in the volume of logistics chain costs in the construction enterprise taken for analysis, we can estimate the level of their influence on the resulting factor. In particular, it is seen that the volume of construction works performed in "Kuvasoy Tamir Kurilish" LLC and the increase in the share of its logistics systems in the total chain are directly related to the change of the resulting factor, the volume of management costs in the logistics chain and the level of general influence of random factors are inversely related.

When using the proposed multi-factor model in the process of managing the formation of costs in logistics chains in a construction enterprise, it is necessary to take into account the influence of each influencing factor on the resulting factor. In this case, it will be possible to focus on increasing the share of its logistics systems in the logistics chain and the volume of management costs at "Kuvasoy Tamir Kurilish" LLC. The use of identified trends allows to optimize the efficiency obtained from a factor unit, while correctly distributing the amount of resources used in the organization of the cost management process in the logistics chain in enterprises.

The trend models determined on the basis of multi-factor connection allow to predict the change of costs in the logistics chains of enterprises in the future period under the influence of selected factors, taking into account errors within a certain limit. Based on the above analytical data and the evaluation of the values of the indicators, it can be used in the process of developing scenarios based on development strategies in the future at Kuvasoy tamir construction LLC.

Using structured trend models, determining the amount of resources (exogenous factors) introduced from the point of view of management in these enterprises operating in the construction sector, taking into account the effect obtained from each unit of additional resource input, allows to ensure the optimal efficiency of logistics costs and ensures the balanced and stable development of the logistics chains of the enterprise.

The construction cluster is an integrated organizational and economic mechanism for managing logistics business processes - it is a set of subjects and management objects interconnected by means of logistic factors, principles, tools and management functions based on information supply.

Subjects of the management of the logistics system carry out regulatory, methodological, organizational and coordination activities that ensure the implementation of the control effect on the logistics processes within the framework of the implementation of construction cluster projects and the achievement of the set goals of the cluster at the regional level.

The composition of the subjects of the organizational-economic mechanism of complex management of logistics chains of the construction cluster is determined mainly at two levels - at the level of the internal cluster and at the regional level. The internal cluster management level includes the cluster council coordinating material and financial flows and the coordinating logistics group, which unites all participants of the cluster and their logistics units within a single organizational structure and provides the cluster development strategy and management of financial, economic and information flows.

The activities of the coordinating logistics group should be carried out based on the need to achieve the following goals:

1. Formation of stable logistics relations between cluster participants, creation of conditions for optimization of logistics processes.
2. Improving socio-economic indicators of construction projects on the basis of expansion of economic relations between construction enterprises and logistics infrastructure enterprises.
3. To attract new participants to regional construction clusters, to ensure the development of specialized and innovative contracting enterprises based on the optimization of the system of external integration relations, not only within the cluster, but also outside the cluster.

The following can be specified as the main tasks of the coordinating logistics group in the direction of designing logistics chains:

- ✓ formation and optimization of logistic connections between the participating enterprises within the construction cluster;

³ Developed by the author.

- ✓ design and evaluation of logistics chains;
- ✓ ensuring the balance and proportionality of general incoming and outgoing material flows;
- ✓ control of the operational activities of the logistics departments of the enterprises that are cluster participants;
- ✓ ensuring balance in the activities of the center of territorial development of clusters and the cluster council coordinating material and financial flows;
- ✓ evaluation of the results and effectiveness of the developed and implemented logistics chains.

Summary

Based on the tasks and practical results defined above, the following proposals and recommendations were made:

- multi-factor models based on the factors affecting the formation of costs in the logistics chains of the construction sector were selected based on the performance indicators of large construction enterprises for 2014-2021, multi-factor models of non-linear communication were developed, and based on these models, the forecast indicators of the formation of costs in the logistics chains for the medium-term period were determined. Based on the relationship between factors such as the volume of completed construction works, management costs in the logistics chain and the share of their logistics systems in the total chain, which are influenced by the developed multi-factor models, with the costs of the logistics chains selected as the resulting factor, 3 large constructions that are the object of analysis for the next period directions for optimizing the level of the output factor in enterprises were determined.

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