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ANALYSIS OF LOGISTICS SUPPORT FOR CONSTRUCTION PROCESSES AT LLC "BMU-2019"

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АНАЛІЗ ЛОГІСТИЧНОЇ ПІДТРИМКИ БУДІВЕЛЬНИХ ПРОЦЕСІВ ТОВ "БМУ-2019"

In the article we show that construction is characterized by a fairly long chain, from project development to its implementation and operation, which includes a significant number of small and medium enterprises, which leads to partial loss of information (because it largely depends on the accumulation and data exchange, their quality and reliability). It is shown in the article that the need for materials, structures and products is determined by the individual characteristics of construction objects, technology and organization of construction. Procurement and supply of materials must be carried out in strict accordance with technological requirements and minimize excess inventory.

In the article we have shown to the main directions of improving the activities of construction companies Ukraine includes: — development of domestic public and private investment support programs; — support and promotion of after-sales maintenance and service of construction services; — development and modernization of construction infrastructure; — partnership of government and business of the construction industry as a form of long-term interaction of the parties; — introduction of innovative technologies in the construction industry.

It is important to analyze the construction industry and its activities in recent years. It is necessary to identify problems and prospects of construction based on a comparison of the state of construction companies for the current and previous periods, to find ways to improve the economy of the construction industry.

The trend of increasing the need for effective management of construction projects indicates the importance of logistics, especially the dominant role observed in the planning and implementation of procurement, as they consist of processes such as ordering, receiving, transporting and storing materials.

Under the problematic situation of providing logistical support for the life cycle of construction facilities is a violation of the terms of commissioning of construction facilities; violation of the planned estimate for construction and/or its maintenance; inefficient use of material and labor resources and inefficient operation of the construction site due to lack of detailed information on the needs of current maintenance and repairs.

У статті ми показуємо, що будівництво характеризується досить довгим ланцюгом, від розробки проєкту до його реалізації та експлуатації, до якого входить значна кількість малих і середніх підприємств, що призводить до часткової втрати інформації (оскільки вона значною мірою залежить від накопичення та обмін даними, їх якість та надійність). У статті показано, що потреба в матеріалах, конструкціях і виробів визначається індивідуальними особливостями об'єктів будівництва, технологією та організацією будівництва. Заготівля і постачання матеріалів повинні здійснюватися в суворій відповідності з технологічними вимогами і мінімізувати надлишкові запаси.

Важливим був аналіз будівельної галузі та її діяльності за останні роки. Нами визначено проблеми та перспективи будівництва на основі порівняння стану будівельних організацій за поточний та попередні періоди, знайдено шляхи покращення економіки будівельної галузі.

У статті ми зазначили основні напрямки вдосконалення діяльності будівельних компаній Україна, а саме: розвиток вітчизняних державних та приватних програм підтримки інвестицій; підтримка та просування післяпродажного обслуговування та обслуговування будівельних послуг; розвиток та модернізація будівельної інфраструктури; партнерство влади та бізнесу будівельної галузі як форма довготривалої взаємодії сторін; впровадження інноваційних технологій у будівельну галузь.

Тенденція зростання потреби в ефективному управлінні будівельними проєктами свідчить про важливість логістики, що спостерігається при плануванні та здійсненні закупівель, оскільки вони складаються з таких процесів, як замовлення, отримання, транспортування та зберігання матеріалів.

У статті зазначено, що проблемною ситуацією забезпечення матеріально-технічного забезпечення життєвого циклу будівельних об'єктів є порушення термінів введення об'єктів будівництва в експлуатацію; порушення планового кошторису на будівництво та/або його обслуговування; неефективне використання матеріально-трудових ресурсів та неефективна експлуатація будівельного майданчика через відсутність детальної інформації щодо потреб поточного технічного обслуговування та ремонту.

Key words: logistics, construction industry, construction company, Ishikawa diagram.

Ключові слова: логістика, будівельна галузь, будівельна компанія, діаграма Ісікава.

FORMULATION OF THE PROBLEM

Construction is characterized by a fairly long chain, from project development to its implementation and operation, which includes a significant number of small and medium enterprises, which leads to partial loss of information (because it largely depends on the ability to accumulate, operate and exchange data, their quality and reliability).

The need for materials, structures and products is determined by the individual characteristics of construction sites, technology and organization of construction. Procurement and supply of materials must be carried out in strict accordance with technological requirements and minimize excess inventory.

As one of the largest consumers of raw materials and related products for construction, the industry is characterized by their inefficient use, high rates of waste generation (up to 25% — 30%) in the process of repair and construction work (dismantling, repair, construction, etc.), which are currently extremely rare. reuse [5].

This is often accompanied by inadequate assessment of the volume and quantity of products, over fulfillment or shortage of procurement, increased logistics costs for transportation and storage, which in a constantly growing cost of construction products significantly increases the total cost of construction and operation.

ANALYSIS OF RECENT RESEARCH AND PUBLICATIONS

Problems of functioning and development enterprises of the construction industry are reflected in the

works of many scientists: I. Adamskaya, K. Zasikan, A. Kolosova, O. Oskoma, Y. Pindy, A. Stelmashchuk, M. Sukhonos and others. But despite being quite large number of publications, many questions about the modern status and prospects for the development of enterprises in the construction industry are relevant, remain little disclosed in the scientific literature and require further research.

The purpose of the article is to analyze the logistics activities of construction processes at LLC "BMU-2019".

PRESENTING THE MAIN MATERIAL

The construction industry is characterized by high production costs, especially given that since Soviet times, production technology has changed from the current, when the same buildings and structures were built according to standard design documentation and time for construction and commissioning, as well as their costs, were fully defined and maximally optimized, to individualize. Today, each construction project is a unique project that requires considerable attention from all participants in the construction, as well as unique logistical support of all construction processes in order to optimize costs and create construction sites competitive in terms of cost of sale.

First of all, considering the specifics of logistics for the construction industry, it should be noted that, as in production, is the processing of materials and raw materials using labor and machinery, resulting in a finished product — a building or structure, with the uniqueness of construction requires the application of a design

Fig. 1. Ishikawa diagram of the reasons for choosing integrated logistical support for life cycle of construction projects at LLC "BMU-2019"

approach, namely a detailed work plan linked to specific dates and resources used, careful calculation of the budget for each object [1, p. 673]. Accordingly, logistics for a construction company can be considered as ancillary activities that provide the expected construction site, which:

- fully completed and ready for operation (quantitative indicator);
- meets the quality standards of the construction industry and customer requests (quality indicator);
- built in accordance with the established terms of the construction schedule (time indicator);
- built on the planned location (location indicator);
- demanded only the planned minimum costs (price indicator);
- required by a specific customer (customer-oriented indicator).

One of the reasons why integrated logistical support of the construction process is needed is the increase in costs, which are associated with the desire to achieve timely completion by increasing the number of construction crews or additional construction equipment. In addition, the increase in costs may also be affected by the costs associated with the downtime of leased equipment, for example due to lack of building materials for any reason on the construction site according to the construction schedule, or for the same reasons payment for simple hired construction crews.

In addition, integrated logistical support of the construction project should be not only at the stage of production, but also at the stage of operation, because according to statistics: only 20% of costs are for the

construction of the facility and more than 80% of costs are for maintenance construction object.

Lack of access to detailed information on all networks and features of construction of the facility after commissioning of the next organization does not allow to make correct schedules for plans for maintenance, renovation or modernization of facilities, which also leads to unnecessary costs and inability to properly assess the situation and resources.

We present the reasons described above, in the form of components that encourage the use in construction and subsequent operation of construction sites to the use of integrated logistical support of the life cycle of construction sites in the form of a diagram of Ishikawa.

The resulting diagram illustrates the causal links between the causes and the need to support the integrated logistics of the life cycle of the construction site from the time of design to the time of overhaul.

Thus, four major causes (problems) have been identified:

- violation of terms of putting construction objects into operation;
- violation of the planned estimate for construction and / or its maintenance;
- inefficient use of material and labor resources;
- inefficient operation.

It should be noted that these reasons might also affect each other. For example, if we talk about the timing of commissioning of buildings, it should be noted that their shift from the planned is often accompanied by rising construction costs, as well as inefficient use of labor, as some time is idle staff due to violations of the terms object.

At the same time, violation of the planned estimate for construction and / or its maintenance will inevitably be associated with inefficient use of material and labor resources, as they may require the purchase of additional material resources (for example: due to improper storage) or due to forced downtime. The facility staff will need more crews or extra paid uptime for existing crews.

Of course, the violation of the planned estimate for the maintenance of the facility during operation is interrelated with the inefficient operation of the facility, as the estimate can increase significantly due to the lack of accurate plans for current and major repairs at such facility.

Accordingly, then for each consolidated group of problems were added for several main, in our opinion, reasons. However, we would like to note that most of these causes are also interrelated, ie each of them leads not only to the problem to which we attributed it, but also to some related problems or their causes.

It also confirms that the situation during the life cycle management of a construction site must be saved at the level of integrated logistical support for its operation.

Taking into account the data from the website of the State Statistics Service of Ukraine, the volume of construction products (construction products means residential and non-residential buildings, engineering structures, complex industrial structures, entertainment and sports facilities) for the last 3 years amounted to (UAH million) (fig. 2).

In 2020, compared to the corresponding period of 2019, the growth of construction work was recorded in the following areas:

Volyn — UAH 2.5 billion (+ 2.9%);
 Donetsk — UAH 10.1 billion (+ 35.6%);
 Kyiv — UAH 12.6 billion (+ 16%);
 Lviv — UAH 14.1 billion (+ 22.3%);
 Odessa — UAH 27.9 billion (+ 45.8%);
 Poltava — UAH 8.1 billion (+ 3%);
 Sumy — UAH 1.7 billion (+ 3%);
 Ternopil — UAH 2.6 billion (+ 1.2%);
 Khmelnytsky — UAH 6.5 billion (+ 58.3%);
 Cherkasy — UAH 2.5 billion (+ 14.9%);
 Chernihiv — UAH 2.4 billion (+ 24.3%)

[5].

According to the distribution of construction output by the nature of construction in 2019, new construction, reconstruction and technical re-equipment accounted for 74.2%, while current and major repairs accounted for only 25.8%. In 2020, these indicators have changed: repairs account for 36.9%, new construction 36.1%, and reconstruction and technical re-equipment 27.0%, and if you combine the last two indicators, they

Fig. 2. The volume of construction products by type of 2017–2020

will be 63.1%, which is 11.1% less than last year (fig. 3).

As shown in the above diagram, construction product indices in 2019 increased by ~ 20% compared to 2018, while in 2020 this figure decreased by ~ 23% compared to 2019 and correspondingly less than in 2018.

The price index for construction works allows to determine the trends of price changes both in construction as a whole and by types of buildings and structures. For the period from 2015 to 2021, we can see that the lowest value of the price index was found in 2019 (100.6%), while the highest — in 2015 (122.8%). The lowest indicators of the price index by types of buildings in 2019 and the growth of this index in 2020. According to data from 2021, this value continues to grow for all types of buildings, except industrial (taking into account data from January to August, the price index for industrial buildings is 120.9%, which is 10.8% less than in 2020).

The success of the construction market in general depends on filling it with investment resources. The following is a diagram of capital investment in the country as a whole compared to capital investment in construction.

In 2020, the volume of capital investment in Ukraine decreased significantly compared to other years. In the

Fig. 3. Indices of construction products 2018–2020 [5]

construction sector, capital investments amount to UAH 39,614.9 million, which is only 7.79% of the total investments. In my opinion, this is due to the fact that the industry itself is quite expensive and usually the construction of, for example, industrial facilities requires significant investment, and investors in this economic situation around the world do not risk investing heavily.

In addition to the above problem, which creates obstacles to the development of both enterprises and the construction industry in general, there are several: imperfect pricing system; bureaucratic obstacles to the implementation of investment projects; lack of equal legal conditions for all participants in the investment process; imperfect system of mechanisms of normative-legal regulation of economic, social and legal relations in the housing sphere (for example, the legally regulated mechanism of property liability for breach of contract, etc. [2, p.75].

However, there is a solution to each problem and there are several options to improve the situation in this area: modernization and development of construction infrastructure; expansion of sales of construction products; development of domestic public and private programs of investment support of construction; financing of priority investment projects by the state fund of regional development; introduction of advanced innovative technologies in construction; partnership of government and business of the construction industry as a form of long-term cooperation between the parties; monitoring the quality of construction and installation work [3, p. 50].

LFA logistics audit reveals the sources of excess logistics costs and develops a plan to optimize the logistics function by improving functional efficiency, managing the enterprise spreadsheet system, integration and close interaction of all links in the supply chain [7, p.19].

BMU-2019 LLC carries out its activity in the construction industry, the specifics of which to some extent create preconditions for the emergence of risks in the development of the logistics system. In order to classify the risks of the enterprise, assess the probability of their occurrence and impact on logistics processes, a survey of employees was conducted (table 1).

For a more complete study of the company, the company's financial statements for 2019 and 2020 were analyzed. The analysis revealed both an increase in the company's revenue and an increase in costs, because of which the company's net income in the reporting year is lower than in the previous year.

An analysis of the logistics activities of the enterprise was also conducted; the available capacities and logistics costs were acquainted.

Fig. 4. Capital investment in construction 2018–2020

Table 1. Classification of risks and their assessment at LLC "BMU-2019"

Logistic flow	Risk classification	Probability of occurrence
Input	Rising prices for materials	4,1
	Supply failures	2,2
	Delivery problems	2,15
Internal	Unforeseen circumstances	3,3
	Equipment breakdown	1,85
	Lack of materials	2,65
Output	Reducing the cost of work	1,75
	Untimely performance of works	2,35
	Non-fulfillment of contractual relations by contractors	1,95

To improve logistics activities, a tree of goals of BMU-2019 LLC was built, with the help of LFA methodology, the main risks that may arise in this area from the point of view of logistics were identified and measures to minimize them were proposed.

Priority areas should be: improving the work of construction companies through renewal of fixed assets; introduction of innovative construction technologies; improving the quality of construction products; improve management, broaden planning horizons and more accurate accounting market requirements; developing long term programs with expanding construction financing opportunities state and regional authorities; assistance development of cluster formations. An important direction in formation of competitiveness of the Ukrainian construction industry, stabilization and consistent development construction market in the regions is to identify and stimulate the development of a regional construction cluster.

The peculiarity of the construction industry is that that they are very sensitive to macroeconomic factors environment. That is why the main task of ensuring the

efficiency of construction in general is minimization negative impact of the external environment through strategic management. To increase production, it is necessary to adhere to such principles as efficient use of all types of resources enterprises, control over the activities of customers and substantiation of the estimated cost of the objects under construction, minimization of the number of objects under construction at the same time. Therefore, construction companies must objectively determine their competitive position, identify the main external factors affecting

production volumes, and create new competitive ones benefits. Exit from the crisis is possible only for through a combination of effective government regulations and strategically designed activities construction companies.

CONCLUSIONS

So, to the main directions of improving the activities of construction companies Ukraine includes:

- development of domestic public and private investment investment support programs;
- support and promotion of after-sales maintenance and service of construction services;
- development and modernization of construction infrastructure;
- partnership of government and business of the construction industry as a form of long-term interaction of the parties;
- introduction of innovative technologies in the construction industry.

Thus, the peculiarity of logistics in construction is because the construction company is not always the "master" of the logistics process. It is seen as a consumer in the logistics systems of manufacturers and suppliers of building materials and components. This feature is a consequence of insufficient attention to the opportunities that logistics can provide in the field of cost optimization. With the traditional organization of logistics processes at the "entrance" of the construction, organization requires a clear formulation of logistics service standards. These are such procedures as order execution time, level of logistics costs, reliability of deliveries, etc. Knowledge of these indicators will change the logistics processes in production management and make transparent the control system of the logistics system. In addition, a feature of logistics in construction is the widest opportunities for logistics outsourcing, in particular, in supply and transportation. For the construction organization, most of the operations at performing logistical functions of transportation, warehousing, inventory management and procurement are ancillary processes.

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