ABSTRACT

Introduction. An important direction for the modernization of the sphere of housing and communal complexes is the optimization of logistics processes. Logistics is considered a special branch of housing and communal activities not only because of the importance of the development of housing and communal complex but also to create the necessary economic conditions for the growth of the quality of services. Logistics in the housing and communal complex has a number of requirements, including the need to constantly maintain the approved quality-quantity and to promote continuity of material and information flows. The risks of lack of stable provision to meet these requirements are a problem for the development of the entire service sector of the housing and communal complex. Methods existing for risk management should be adapted to the specifics of the operation of housing stock. When using various methods of risk analysis, it is necessary to take into account not only the economic performance of the logistics department of the management company but also to consider the working conditions and quality of services to apply further techniques to eliminate significant risks. The subject of research — risks in logistics processes of companies providing housing and communal services as one of the main vectors of housing and communal complex development. The objectives are to determine the methods that can regulate the risks arising from the logistics processes in work, to establish the relationship of modernization of housing and communal complex by reducing logistics risks.

Materials and methods. The study considers the most rational methods of risk assessment and the possibility of their synthesis.

Results. It is revealed that the assessment of the risks arising in the company’s logistic activity housing and utilities sector must be implemented using a systematic approach to analysis, i.e. analysis should be carried out on the basis of available data on logistics management company, by the use of analogy with the logistic activities of management companies, as well as on statistical data collected by the object of logistics activities. In the synthesis of all three methods, it is possible to obtain the most general and suitable for further work information on the state of risks from the logistics processes of the management company.

Conclusions. By applying a mathematical analysis of the logistics data management company, as well as performing quality control during work with the use of modern techniques for the warehouse and the introduction of electronic tracking of information and material flows, it is possible to reduce the risks associated with the logistic operations in the field of housing and communal complex. In General, this modernization of the logistics Department will not only increase the efficiency of work but also can improve the quality of services provided.

KEYWORDS: system analysis, logistics in housing and communal complex, modernization of logistics processes, methods of risk assessment in logistics, risks in logistics

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Risks in the organization of logistics activities in the housing and communal complex

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INTRODUCTION

Logistics in the housing and communal complex is an organizing structure for the processes of transportation, storage, and warehousing of materials and information in order to carry out the direct activities of management companies for the operation of facilities. Risk analysis and management is a promising direction for development in logistics. Risk analysis should be carried out using specially developed methods for risk assessment in housing and communal complexes. In managing companies, logistics processes are not considered as the leading stream of economic and qualitative leakage; however, at the implementation of the economic analysis, it is possible to note that logistics operations are the most probable places for the emergence of risks. Nevertheless, housing and communal complexes require detailed and modern approaches to logistics to produce quality results that could lead to the modernization of activities, in general.

MATERIALS AND METHODS

The choice of the analysis method is based on the specifics of the types of risks of logistics activities of the management company. Risks in the field of logistics can be divided into types:

- technological risk — the risk of disruption of logistics flows;
- economic risk-non-compliance with the financial obligations of the parties;
- environmental risk-reduction of the quality index of material flows;
- operational risks—arise as a result of improper construction of the company’s logistics activities, the impact of external conditions on logistics activities.

These types of risks describe the possibility of an unfavorable outcome in the main directions of the logistics activities of the management company. Quantitatively, the risk of any kind can be defined as:

\[ R = \frac{n}{N}, \]

where \( n \) is a quantitative indicator of real cases of disruption of logistics flows; \( N \) is the number of possible cases of flow disruption in logistics, and \( R \) is a quantitative measure of logistic risks determined over a particular time interval.

Methods of risk assessment in the logistics of the housing sector can be based on the collected statistical data on the object of logistics activities using available statistics and information over a long time.

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1 PMI 2017. A guide to the Project Management Body of Knowledge (PMBOK Guide) 6 (USA: PMI).
In order to calculate the probability of an adverse event, the method is divided into three main stages [10–12]: the collection of a number of data on the object, the analysis of various models of the outcome of the event, and calculation of the probability of risk. Often, statistical methods are used such as failure tree, the method of assessing the probability of an unfavorable outcome of the event, or simulation modeling using mathematical models based on the analysis of the logistics structure of the company [13]. The bottom line is that different types of risk have a different probability of an adverse event. Determination of the level of risk by analysis is aimed at identifying potential risk areas. This allows identification of the most vulnerable places, as well as determine ways to eliminate them [14–16].

Another method is based on the analogy of the logistics activities of another management company with individual experience in the logistics sector of housing and communal complex. This method allows, on the basis of a comparative analysis, to determine the quality of the logistics structure of the management company with respect to which a risk analysis is conducted to determine the feasibility of innovative approaches in logistics, housing and communal complex and the likelihood of adverse events and look at the results of using specific methods of work.

Risk management is one of the essential functional areas in project management methodology. In practice, qualitative risk assessments are generally applied [19]. However, the theory of risk management based on qualitative assessments is virtually absent. This article defines qualitative risk assessments and complex risks. It also sets the tasks of risk management and proposes the algorithms for solving the corresponding problems.

To determine the qualitative risk assessments, we define two scales: the probability scale and the damage scale. Let us confine ourselves to the consideration of two evaluation scales [20]. On the probability scale, we determine the expert boundary point \( v \). If the project has a low risk in probability, it means that there is damage, and another point, a high risk in probability, it means that the probability of an adverse event is less than or equal to a low risk in probability, it means that the probability, for damage (\( um \)-coefficient, which determines how many times the maximum damage is less or more than the cost of the project, respectively, if we denote the cost of the project \( c \), the amount of maximum damage will be \( umc \)). For certainty, we assume \( um = 1 \), i.e., the maximum damage does not exceed the cost of the project, although the opposite happens [21].

It is now possible to determine the boundary level of the expected damage (i.e., the degree of impact): \( w = vu \) and its base levels \( w_1 = v \mu_1 \) and \( w_2 = v \mu_2 \). There are two variants of the qualitative estimates-low value of the indicator \( L \) and high \( H \) [22]. For any situation, the expected damage can be described by a pair, where the first place is the assessment of probability, and the second — the damage. Four combinations of qualitative assessments are possible: (LL), (LH), (HL), and (HH). Obviously, the variant (LL) has a low degree of influence, (HH) — high. To determine the degree of influence of options (LH) and (HL) proceed as follows. If for option (LH) \( v \mu_1 \leq vu \), then the option has a low degree of influence, otherwise — a high. For option (HL) will be considered in the same way \( v \mu_2 \) [23].

Let us move on to assessing complex risks [22–24]. Let the project consist of \( n \) works. We will consider the risks of work as independent random variables. In this case, the damages are summed up. Let us denote for each work \( i \) three qualitative estimates — \( (x, y, z) \); where \( x \) — probability estimate; \( y \) — damage estimate; \( z \) — the degree of influence of the \( i \)-th work. Because the expected damages of independent random variables are summed up, the qualitative assessment of the impact of the project is determined as follows. Let us denote \( Q_i \) — much work with low rating and probability and damage \( Q_2 \) — much work with a low rating of probability and low damage, the \( Q_3 \) — is much work with a high rating for probability and low damage \( Q_4 \) — much work with a high rating and probability and damage:

\[
a_i = \frac{c_i}{c}, \quad i = 1, 4,
\]

where \( c_i \) is the cost of works of the set \( Q_i \); \( c \) — is the sum of the costs of works [25].

Calculate the expected damage per unit cost

\[
W = a_1u_1v_1 + a_2u_1v_2 + a_3u_1v_3 + a_4u_2v_4,
\]

and probability \( V = \frac{W}{U} \).

We determine qualitative risk assessments of the project as a whole using appropriate scales. When using these methods, the main objects of study are [26–28]:

- mathematical data on the turnover of the management company;
• data on the quality of logistics processes (frequency of delays in delivery of goods, turnover rate of products, organization of warehouses, etc.);
• analysis of problems and drawing up a plan for the modernization of the logistics bodies of the management company.

RESULTS

Risks associated with logistics processes in organizations providing housing and communal services need to be taken under control by modernizing the processes of warehousing, storage, and organization of trade. The methods used in the study will help to identify the weakest points for logistics processes and determine the primary vector of development of the logistics activities of management companies. The most in-depth information about the existing risks can be obtained through the synthesis of three methods. The main part of the risks in logistics activities is the leakage of material and information flows. There is no global control system for the movement of goods, which increases technological and economic risks. Risk management should include the following stages of activity:

1. Risk assessment using the synthesis of existing methods;
2. Definition of the most priority directions on the modernization of activity;
3. Measures to reduce risks in logistics processes;
4. Measures to eliminate risks at the level of the organizational structure of the department.

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