

MANAGEMENT OF SAFETY IN CHAINS OF DELIVERIES BASED ON THE SYSTEM APPROACH

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ABSTRACT

In given article it was analysed the intrinsic characteristic of concepts on the basis of the system approach: uncertainty, risk and stability in chains of deliveries.

The basic directions of development of the modern theory and practice in the field of management of safety in chains of deliveries were formulated.

The purpose of the given work is studying of sources of uncertainty in chains of deliveries and development of operating influences for stability maintenance in chains of deliveries.

In the given article management of safety in chains of deliveries is investigated with use of all arsenal of methods of economic influences in connection with toolkit of the general theory of systems, the system analysis, the theory of probability, cybernetics and logistics.

In the beginning of the article we prove an actuality of a considered problem and formulate the purposes and problems of the given research. Then we specify set of methods used during the decision of tasks and we offer standard set of the actions providing balance of indignant and operating influences.

JEL CLASSIFICATION & KEYWORDS

■ M29 ■ 033 ■ Safety ■ Supply chain ■ System approach

INTRODUCTION

Management of chains of deliveries gets the increasing value, both for the large enterprises, and for the enterprises of small and average business. Participation of the enterprise in a chain of deliveries is one of determinatives of preservation and increase of level of incomes and competitiveness in the modern and future markets. The data of modern researches testifies that managers of chains of deliveries spend from 40 to 60 % of working hours for elimination of infringements [1]. If we consider efficiency of chains of deliveries it is necessary to define two aspects of efficiency. The first is connected with level of the income of production's sales due to the increase of level of service, accuracy of deliveries and forecasting demand. The second is realised through stability of chains of deliveries. Therefore, The maintenance of stability of chains of deliveries has great value for complex efficiency of chains of deliveries along with economic efficiency of chains of deliveries.

Chains of deliveries are difficult multistructural system with the active elements, functioning in the conditions of dynamically developing market environment. Functioning of chains of deliveries is connected with considerable uncertainty. The uncertainty sources can be fluctuations of demand, an error of forecasts, failure of resources, discrepancy of the data, erroneous decisions of managers, inexact information transfer and interpretation of those or other events, purposeful actions on destruction of a chain of deliveries (terrorism, plunders of cargoes), and also such extreme cases, as political or an environment changes.

Uncertainty of chains of deliveries

Uncertainty is one of the basic problems arising at formation and management by chains of deliveries.

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Uncertainty exists in chains of deliveries irrespective of us.

The problem of management is reduced by safety to a balance finding between volume of space of uncertainty (risk area) from the point of view of the system approach and system spaces (when infringements can be compensated by means of reliability and flexibility reserves).

One of the basic purposes of safety increasing of chains of deliveries is revealing, elimination and strengthening of so-called "bottlenecks" of a chain of deliveries. Not all indignant influences can have essential influences on efficiency of a chain of deliveries. As practice shows, stability of weak places of a chain of deliveries substantially defines its efficiency.

Certainly, revealing and the analysis of such bottlenecks for each chain of deliveries is individual and any techniques should be considered from positions of the system approach for the given subject domain and concrete filling occurs within the limits of concrete conditions of a chain of deliveries. Nevertheless, if we work out the system reference points for revealing and strengthening of bottlenecks of chains of deliveries in a combination to specificity of functioning of this or that chain of deliveries it allows to raise efficiency of functioning of chains of deliveries essentially.

it is possible to formulate following directions analyzing achievements of a modern science and practice in the field of management of uncertainty:

- Introduction of certain redundancy of structures of deliveries' chain (for example, time buffers, insurance stocks, additional warehouses, stocks of capacities etc.),
- improvement of coordination and information exchange for improvement of quality, timeliness and availability to all participants of a chain about forecast's demand,
- introduction of the system of monitoring and regulation of a chain of deliveries in case of occurrence of infringements and deviations from the plan, formation of not final decisions, for example, the postponed differentiation of production (postponement) or methods of "sliding" or adaptive planning (rolling/adaptive planning).

All history of development of a human society is connected with the decision of problems which are connected with the factors of uncertainty both at forecasting of the future events, and at decision-making in various subject domains. In connection with that fact that we have many criterias of uncertainty there is a set of classifications of factors of uncertainty [2].

Typology of sources of uncertainty

It is possible to distinguish following basic groups of sources of uncertainty:

- The factors related to object to which there is an interaction,
- the factors caused by uncertainty, uncertainty of those or other procedures,
- the factors related directly to environment (uncertainty of influence of environment on the objects "shipped" in it),

- the factors arisen by uncertainty, by not clear way of thinking and knowledge of the person - subjective or personal uncertainty.

Personal and logic uncertainty are special and still insufficiently studied. They reflect uncertainty of knowledge and thinking of the person, and also uncertainty of knowledge and conclusions of artificial intellectual systems. Consideration of these factors of uncertainty is extremely important since they cause occurrence of administrative risk, i.e. risk of acceptance of the incorrect decision [3].

Concept of risk and stability of chains of deliveries

The concept of risk is one of the key in a number of the international and Russian standards: ISO/IEC 15288 «System engineering - Processes of life cycle of systems» (System engineering. System life cycle processes (IDT) and ISO/PAS 28000: 2007 of "the Control system of safety of chains of deliveries» (Specification for security management systems for the supply chain). So, for example, State standard of the Russian Federation of GOST R 51897-2002 «Risk Management, Terms and definitions» defines risk as a combination of probability of event and its consequences.

The concept of stability is one of the main properties and it is widely investigated in the general theory of systems, the system analysis, the theory of management and cybernetics. The main requirement during the synthesis of any systems including chains of deliveries, maintenance of stability is providing stability [4].

In process of development of these theories the concept "stability" began to be treated in various values - from Lyapunov's classical stability to global generally systemized properties.

Without entering terminological polemic, we consider that it should be used the complex category characterising approachability of economic efficiency of chains of deliveries in the conditions of its interaction with environment. Leaning against terminology of difficult systems, we will name this category stability of chains of deliveries.

Directions of maintenance of stability of chains of deliveries

It is necessary for maintenance of stability of a chain of deliveries, that the balance of indignant and operating influences was reached.

Operating influences can be divided on two categories:

- Redundancy adding at construction planning of chains of deliveries,
- regulating (adaptive) operating influences at a stage of realisation of a chain of deliveries.

While planning the uncertainty account can be reached at the expense of adding of certain redundancy into reliability (reserves) and flexibility (adaptability) of a chain of deliveries on the basis of carrying out reengineering of business processes, for example:

- Introduction of redundancy of structures of a chain of deliveries (for example, expansion of assortment of production, introduction of time buffers, insurance stocks, additional warehouses, stocks of capacities etc.),
- improvement of coordination and an information exchange for better quality, timeliness and availability forecasts of demand to all participants of a chain,
- introduction of monitoring system and regulation of a chain of deliveries in case of infringements and deviations from the plan,

- unifications of elements of management by chains of deliveries (i.e. various sites of decision-making could be invested by variety of administrative functions that in case of impossibility of performance of administrative function on a site A it can be executed on a site B),

- uses of methods of "sliding" or adaptive planning (rolling/adaptive planning) and periodically it is modified by change of parameters of a chain of deliveries or characteristics of operating influences on the basis of the information arriving on a chain about a current condition of a chain of deliveries, the past and the updated forecasts of the future,

- formations of not final decisions, for example, the postponed differentiation of production (postponement),
- creations of virtual reserves (for example, a pool of alternative suppliers).

At strategic level the major factors of loss of stability are:

- Narrow specialization and orientation to one market (or one client),
- plans for constant growth of profit,
- high credit debts,
- absence of alternative suppliers,
- high dependence of incomes on share factors,
- geographical concentration of the basic capacities of a chain of deliveries in one region.

At tactical and operative level the major factors of loss of stability are:

- Weak coordination of plans and the operative information on demand and deliveries,
- work «without stocks»,
- weak control over safety of cargoes and safety of transportations,
- technological refusals (the equipment, transport, information systems)
- human uncertainty (errors, wrong transfer and information interpretation).

It should be used various actions for compensation of indignant influences, they are:

- Management safety of chains of deliveries,
- liquidity stocks,
- strategic stocks of materials,
- a diversification of the markets,
- outsourcing and flexibility of assortment of production (for example, modality),
- insurance stocks,
- industrial and distributive insurance buffers,
- additional warehouses,
- reservation of capacities,
- creation of system of coordination and monitoring,
- a control system of events in chains of deliveries.

All these measures serve, as a matter of fact, as reserves of adaptation of a chain of deliveries. They are characterized by different degree of efficiency (for example, use of stocks of materials or a diversification of the markets). It stresses the major role of time and dynamics in models of management of chains of deliveries.

Conclusion

In this article we have analyzed a modern view on management of chains of deliveries and have formulated a problem of management of safety in chains of deliveries from the point of view of the system approach. It was offered original typology of factors of sources of uncertainty. We have offered the basic directions of increasing stability in chains of deliveries at strategic and tactical levels of management. The results of research can be used at formation and management of chains of deliveries in various fields of activity.

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