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PROBLEMS OF LOGISTIC SYSTEMS SUSTAINABLE DEVELOPMENT IN DELIVERY CHAINS

Abstract
The purpose of the article is in elaboration of scientific and methodological recommendations on management of interactions in logistic systems, which consider specificities of supply chains influence on the environment. In the article it is grounded, that formalized description of interaction process for logistic systems with the environment requires performance of complex interdisciplinary research from ecological, social, economical, organizational and technological, technical, natural scientific positions.

Key words: supply chains, logistic systems, logistic environment, logistic approach.

Realization of supply chains management paradigm, covering significantly more volumes of logistic space, logically leads to complication of logistic systems, which, in its turn, arises significant number of problems of both theoretical and practical character. Addressing to theoretical analysis allows to specify typology of logistic systems in supply chains, reveal their specific qualities in new conditions and state adequate requirements to the problem of logistic systems design [1]. Addressing the question of reliability provision for logistic systems, that allows to increase reliability of supply chains at the expense of system management factor [3], and also considering of ecological, organizational and technological sides of the reverse flows formation process in logistics systems [2] allowed to make a conclusion on the higher-order problem.

In our opinion not all the aspects of logistic systems design and their sustainable functioning have received by the present time corresponding coverage in scientific literature. So, more detailed consideration require specific problems of logistic systems interaction with their environment. In our opinion we can talk about formation of new scientific direction (which we suggest to name logistic environics), being applied addition to classical approach [4] to design of logistic systems. Revelation of these regularities undoubtedly will contribute to adequate answer for the requirements of modern economics globalization and will add existing base of logistic systems design.

Logistic system, as any material system, exists in concrete environment, which consists of everything, that is outside the considered system. Environment includes external in relation to it objects, which participate in forming of its integrative qualities mediately, through independent components of their systems and systems in whole.

Logistic system, as any open system, constantly exchanges substance, energy, information – all necessary for provision of its vital activity, growth, development and improvement, with the environment. Material system cannot exist outside environment, cannot stay indifferent to the influence from the side of environment. If environment is favorable, system can successfully develop, under the influence of negative factors of environment system can collapse.

Environment can be determined as objective material world, existing outside this system in all diversity of its demonstration, directly and mediately influencing each other.

Environment of logistic systems we shall call macro-logistic environment. Along with environment exists also internal environment of the system, which consists of higher levels of sub-systems and elements of system and interaction process between them, and also interaction with the environment. Logistic system internal environment we shall call micro-logistic environment. Exists dialectic relation (unity and struggle) of external and internal

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environments. Environment creates systems, and every system forms its internal environment, that can only develop in unity with external environment.

Interaction determines basic content of any environment, aims for performance of concrete work, action. Environment content is conditioned by the type of system elements mutual interaction and system with the environment. Interaction types depend on purpose, to which the system aims. Such purposes in logistic system may be creation of clear organization structure and actually organization of management process for material and accompanying it flows; achievement of supply high quality; performance of effective logistic functions and operations; rational management for all above motioned interacting processes.

In correspondence with set aims in interaction process of internal functional sub-systems of logistic systems and logistic systems between each other, are formed corresponding environments (table 1).

Table 1. Logistic environment and its sub-systems

Logistic environment	Content	Aims
1. Micro-logistic environment	Different types of interactions between managers and specialists, working in sub-divisions of logistic system, aimed at creation of its rational organization.	Development and improvement of logistic systems; organization of basic and auxiliary logistic processes; effective usage of transportation and warehousing capacities; reduction of duration of order execution cycle; logistic coordination of interrelation with suppliers, consumers and logistic agents; rational decision of ecological problems.
1.1. Economical component of micro-logistic environment	Totality of economical relations, determining possibilities of logistic system.	Performance of processes of production supply and support, distribution, and also effective functioning of the company in whole in the market.
1.2. Technological component of micro-logistic environment	Interaction between materials, incomplete production and finished product, between machinery and mechanisms of different stages of logistic process.	Improvement of machinery work and improvement of quality of logistical services for consumers.
2. Macro-logistic environment	Economical, political, social and cultural environments, in conditions of which functions concrete logistic system.	Optimization of conditions of goods movement process organization.
2.1. Economical component of macro-logistic environment	Interactions (transactions) between logistic systems in the process of industrial and economic activity of companies and enterprises, distribution, exchange and consumption of finished product.	Creation of logistic potential of national economics, increase of possibilities for effective international economical relations in conditions of world economics globalization.
2.2. Technological component of macro-logistic environment	Interactions, connected with the development of technics and technology, with saturation of society with technical systems, growth of machinery, mechanisms and other technique influence on environment.	Development of innovation technologies, creation of more productive machines, mechanisms, equipment, transportation means, and also technical systems designated for provision of country economical security.

Significance of any material system consists not in the very fact of its existence as a material object, but in its interaction with the environment.

Appearance, development, improvement of systems, their collapse – all these is related with the character of their relations with other systems, environment. Interaction determines existence, structural organization and qualities of any material system. Interactions inside logistic systems, and also of the systems with the environment are complicated, multivariant and bear strictly purposeful character.

Multitude of logistic systems, and also micro and macro-logistic environments exists only in constant interaction between each other. The more complicated is logistic system or environment, the more diverse and differentiated are their interconnections and properties. On the character of these interconnections depend degree, organization level of logistic system, its quality, reliability, sustainability, ability for development.

For every system are typical its own types of substance, energy and information, their determined volumes, which can be called affecting factor, transforming the system. Exactly affecting factor, possessing necessary and sufficient amount of substance, energy and information, is able to move, transfer, support development and improvement of the system. Imagine logistic system as result of interaction of micro- and macro-logistic environments factors. Logistic systems are impacted with the following factors:

x_i – factors of macro-logistic environment, positively influencing on logistic system,
$x`_i$ – factors of macro-logistic environment, negatively influencing on logistic,
y_i – factors of micro-logistic environment, that allow logistic system to influence on environment,
$y`_i$ – factors of micro-logistic environment, that do not allow logistic system to influence on environment,
z_i – energy, which is spent by logistic system for counteraction to external factors,
$z`_i$ – factors, collapsing logistic system from inside.

In this case condition of sustainable development of logistic system will be the following:

$$\Sigma (x`_i + y`_i + z_i + z`_i) \langle \Sigma (x_i + y_i)$$

Logistic system is able for sustainable development in the case, if the sum of positively influencing factors of micro-logistic and macro-logistic environments exceeds the sum of negatively influencing factors of micro-logistic and macro-logistic environments, factors, collapsing logistic system from the inside and expenses of energy, which it is necessary to spend by logistic system for counteraction to external factors.

Thus, logistic aims to regulation of the whole process of production manufacturing and services rendering from resources supplier to the final product consumer. It shall be noticed, that market economics in whole and sphere of distribution and circulation in particular are extremely sensitive to alien structures, artificially introduced to economical system. Logistics consistently fit into modern market economics, i.e. it is in demand by the whole way of economics development.

Macro-economical aspect of logistics is in increase of public production effectiveness at the expense of reduction of expenses in the sphere of circulation, first of all of material and technical provision and transportation, with which is connected up to 98% of time and up to 40% of resources, appearing in the process of reproduction. Practically the search of ways for reduction of expenses is performed in the following directions:

- Improvement of management for the sphere of production provision, storage and distribution,
- Optimization of economic relations by improvement of marketing activity and interaction of suppliers, consumers and brokerage structures,
- Positive changes of material flows movement technology.

Logistics suggests to consider the circulation system in all its complexity and diversity. Research of the development and functioning of large systems requires system approach. Other approach is impossible here. We can say, that logistic approach – is the system approach to research of social and economical and man-machine systems. Application of logistic approach to design of economical systems development supposes the solution of the following tasks:

- Set of aims for development and determination of their optimal combination,

- Determination of ways and means for achievement of these goals through revelation of connections and research of interaction of considered factors and concerned objects in quantitative form,
- Associativity of goals and means of their achievement with demand in resources, considering their limitedness.

From the point of view of integrated logistics, logistic approach is a multi-criteria optimization of the business-process: so, designers shall take into account the requirements of manufacturability, transportability, ability for utilization at the stage of new products elaboration, and elaboration of package shall be performed with consideration of peculiarities of cargo treatment in different transportation types. Main instruments of logistic approach are analysis and synthesis of the researched system. System analysis allows to disclose the most significant factors, gives their characteristics, quantitative estimation of interaction with each other, determines their influence of researched system parameters. Synthesis is provided in the process of elaboration and functioning of formalized model of researched system parameters; this model unites factors in development dynamics of considered system.

On micro-level logistic approach introduces changes into many conceptions of company's economics and organization of production process:

- Task of full use of capacities is replaced with the task of minimization of terms of circulation means pass through the enterprise,
- Initially may be foreseen reserve capacities for rapid reaction on the change in the market demand (it is understood, that doesn't mean availability of idle capacities. Under reserve is understood possibility of cooperation, purchase of services on products manufacturing or performance of certain production operations),
- One-sided orientation on reduction of expenses as a method of competition is replaced with the aim for the higher level of logistic service,
- Replacement of material resources of information on possibility of their operation acquisition on acceptable conditions (traditional supply agent turns into information broker),
- Absence of technological limitations for decrease of batch size for manufactured production and its determination from the conditions of delivery volume to consumers.

Basing on the above mentioned, we can affirm, that formalized description of logistic systems interaction process with the environment requires performance of complex interdisciplinary research from ecological, social, economical, organizational and technological, technical, natural-scientific positions.

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