

LOGISTICAL MANAGEMENT OF FLOW PROCESSES OF ENTERPRISES PARTICIPATION IN INTERNATIONAL PRODUCTION AND COOPERATION RELATIONS

A methodological support for the organization of logistics management of the development of international industrial cooperation of enterprises has been developed, which differs from the existing one by correlating the concept of planning based on functional abilities with a description of the distribution of components of global logistics flows by levels of the economic structure of society and taking into account the interests of participants in cooperation interaction when optimizing the structure of value creation.

It has been established that, based on the results of the selection of participants in international industrial cooperation, it becomes necessary to organize the management of their interaction, which is quite difficult, given the legal independence of such participants.. Since cooperation is aimed at promoting value, it was appropriate to introduce the principles of logistics for the operation of the mechanism of international industrial cooperation of companies and the development of methodological support in the organization of logistics management of the development of international industrial cooperation of companies. The organization of logistics management in this case is reduced to the regulation of the roles of participants in international production cooperation, optimization of the responsibility structure of the links in the global logistics chain of value creation and the use of the concept of planning based on functionality.

The complexity of organizing the logistics management of the development of international production and cooperation interaction between enterprises lies in the absence of direct subordination of the participants in such interaction to each other. Accordingly, in the developed model of organization and implementation of the logistics management of the development of international industrial cooperation, it is proposed to introduce the sphere of responsibility of the facilitator of cooperation interaction. This model also provides for the selection of the processes of movement of the target system along its life cycle and the selection of business processes for adapting to the requirements of cooperative interaction.

Key words: Logistics, Management, Organization, International Industrial Cooperation, Enterprise, Flow Process, Production and Cooperation Relations.

JEL Classification: L210, M110, Q130.

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Introduction. The result of the implementation of the approach to building a network of international industrial cooperation of enterprises is an agreed list of practices for promoting the target system (consumer value) along its life cycle, as well as a set of economic entities that ensure the implementation of these practices and for which a geographical location is specified (nationality is taken into account). It is clear that the formation of a configuration of practices and executors of such practices corresponds to the strategic level, therefore, the organization of managing the interaction of such practices becomes necessary. When organizing such management, it is proposed to focus on the logic of taking into account the fractal nesting of production and cooperation cooperation in developing a strategy for international production cooperation of companies. This logic presupposes the formation of a system of benchmark indicators for the implementation of business practices (further, such indicators will become the basis for organizing monitoring in the mechanism of international industrial cooperation between enterprises). The subordination of all such practices of activity to the general guidelines for the operation of the network of international industrial cooperation (such guidelines are both a component of global strategic priorities and an element

of institutional support for the operation of the mechanism of international industrial cooperation of enterprises).

Analysis of recent research and publications. The main goal and advantage of the logistical management of the network of international industrial cooperation is the coordination of all ongoing practices of activity on the basis of obtaining such an integral criterion as the logistical flow. In the classical formulation of the problem of organizing logistics management, given in the works (I. Goi, 2014, M. Doronina, 2002, D. Ivanov, 2006, V. Sergeiev, 2005, A. Kolobov, 1997, N. Tiurina, 2014, O. Shkodina, 2014) and a number of other researchers, flow processes are deployed around the movement of resources towards creating value at the output of the global supply chain. In this regard, the ISO 15288 standard is laid down, according to which the target systems and systems are secured and protected for the life cycle, logistics management is put forward on the basis of ensuring the security of the target systems.

The purpose of the article is to develop methodological support for the organization of logistical management of the development of international industrial cooperation between enterprises.

Presentation of the main material of the article. From the point of view of the operation of the mechanism of international production cooperation of enterprises, a number of advantages arise from the combination of logistics methodology with architectural and ontological modeling of production and cooperation cooperation. Let us consider such advantages in more detail, taking into account the need to harmonize the different levels of the holarchy of international industrial cooperation. As an example of taking into account the holarchy of international industrial cooperation in the organization of logistics management, we note that the approach to building a network of international industrial cooperation of enterprises ends with the optimization of the territorial distribution and national jurisdiction of the participants in the international industrial cooperation network. This approach should be consistent with proposals to represent the network of international industrial cooperation as a set of mutual services and interfaces (such a service-oriented approach has become the basis for the formation of cluster-network structures). From the point of view of organizing the logistics management of a network of international industrial cooperation, it should be noted that the deployment of a service system as a tool for implementing a strategy and cluster initiatives ensures the consistency of individual links in the global logistics chain. The functioning of such a chain is based on the cooperative interaction of members of a cluster or a network of international industrial cooperation. However, the global value chain may extend beyond the geographic boundaries of the cluster. This is possible, for example, in terms of distribution processes, when value is created within the cluster, and its implementation outside the cluster. Such implementation can also take place within the framework of cooperative agreements. Accordingly, the issue of modeling the geographical location of participants in cluster-network interaction is of great importance. Thus, logistics management is revealed through the formalization of the system of roles of participants in international industrial cooperation, the implementation of which is supported by the business processes of enterprises designed to perform such roles. The architectural model for coordinating collective roles allows, in addition to determining the subjects of the logistics management organization, to model the locations of cooperation participants (thus, the approach to selecting partners for cooperation is expanded). Given the architectural model for coordinating collective roles, it is possible to provide for the possibility of displaying at the model level any geographic configuration of enterprises that will perform functions (activity practices) to ensure the movement of flow processes within the global value chain (i.e., implement logistics management).

From the point of view of supporting competitiveness and building up the potential of production and cooperation cooperation, the mechanism of international production cooperation of enterprises should integrate the tools for selecting cooperation participants with the levers for implementing guiding influences in the logistics management loop. Focusing on the developments of the authors (M. Doronina, 2002, D. Ivanov, 2006, V. Sergeiev, 2005, A. Kolobov, 1997), it is possible to define the content of logistics management as a certain type of management activity aimed at optimizing the flow processes of a certain business entity (regulating its material, financial, informational and other flows) according to a certain criterion. In the available studies, as a rule, logistics management is considered not through optimization, but through the regulation of logistics flows. Also, economists mainly use the minimization of total logistics costs as a criterion for regulating logistics flows. The author's interpretation of logistics management to a certain extent expands such a proposal, assuming a plurality of criteria for optimizing flow processes. For example, when expanding to the markets of other countries, the optimization criterion can be the speed of

value formation at the output of an integrated global value chain. The choice of the optimization criterion for flow processes in the case of the study will be subject to the goals of the activity of the network of international industrial cooperation, as well as the distribution of global strategic priorities between the levels of the holarchy of international industrial cooperation. This refers to the possibility of different criteria for optimizing logistics flows at different levels of the holarchy. At the same time, the coordination of such criteria will lead to the manifestation of the effects of emergence and supervenience.

In addition to defining goals, in the organization of logistics management, a clear identification of the subject and object of management is of particular importance. Based on such identification, principles, tools, regulations, methods and levers of logistical management of the network of international industrial cooperation will be determined. Accordingly, focusing on the logic of correlating the spatial and geographical distribution of enterprises that ensure the implementation of flow processes in the network of international production cooperation, the organization of logistics management is largely reduced to optimizing the structure of responsibility of the links in the global logistics chain of value creation for the final product (not even so much for the final product, how many while observing the timely change of the stages of the life cycle of the target system). The author's proposal in this case is the use of an agent-role approach not only to regulate the cluster-network interaction of enterprises, but also to organize their logistical management. At the same time, it is important to distinguish between the roles of stakeholders of different levels of the holarchy of international industrial cooperation, as well as the contours of operational and strategic logistics management.

The basis of the methodological support for the organization of the logistics management of international industrial cooperation is the development of the formation of a set of organizational capabilities and key competencies necessary for the functioning of the network of international industrial cooperation. Specifically, the process of such formation of competencies is the basis for highlighting the contour of the organization of the logistics management of the network of international industrial cooperation. The main difference from the classical approach to the appointment of the subject of logistical management is the definition of a whole set of performers of this collective role. For example, such performers are companies that joined the output of the network of industrial cooperation as a result of the implementation of the logic of their selection with the introduction of the method of analyzing hierarchies. We should also pay attention to the proposal to use the concept of operation as the basis for organizing the contours of the strategic logistics management of the network of international industrial cooperation. In the context of this proposal, a number of clarifications should be made. The main goal of bringing the concept of exploitation of the created value to the presented contours of the organization of logistics management is to implement the hypothesis for determining the areas of attention of logistics management, taking into account the parameters of managing the competitive behavior of international industrial cooperation. Thus, taking into account the approach to the formation of a consolidated strategic vision of the stakeholders of the network of international production and cooperation, it is possible to divide the proposal on the distribution of the strategic component of the organization of logistics management of the development of international production cooperation into several meaningful blocks. These blocks correspond to the options for using a combination of key competencies and dynamic capabilities of enterprises in the management of cooperative interaction, as well as the contours of the organization and implementation of logistics management. So, it is also proposed to put the connection between planning blocks and implementing the strategy of international production and cooperation cooperation as the basis for the organization of logistics management (such blocks will partially overlap with existing developments in the field of strategic management, and in part will require a certain extension of the traditional practice of developing and implementing the strategy).

The logic of the system-dynamic model of planning and implementing the strategy of international production and cooperation of enterprises is based on the proposal of A. Levenchuk on the development of the practice of «strategy» (A. Levenchuk, 2018) Accordingly, the presence of an enterprise in the global market leads to the fact that the resulting network of international production and cooperation cooperation cannot remain unchanged both in terms of the attributes of the value that is displayed on the selected segment of the global market, and in terms of systems that ensure the emergence of such value. Thus, both the strategy of international production and cooperation cooperation and the parameters of organizing the logistics management of the strategy implementation network cannot remain unchanged. The strategy and parameters of logistics management should be reviewed on

an ongoing basis. In addition, the consideration of strategy as a permanent process is declared by the provision of the concept of managing the development of international industrial cooperation. It is in accordance with it that one of the options for disclosing the logic of strategizing is given, when certain directions for implementing the strategy of production and cooperation interaction are dynamically linked. From the point of view of organizing the organization of logistics management contours, presented as a tool for implementing the strategy of international production and cooperation cooperation, the system-dynamic model contains two key blocks. The first block is reduced to determining the parameters of value at the exit from the network of production and cooperation cooperation and its market positioning. Here there is a certain intersection with the existing developments on the formation of an international marketing strategy.

It is clear that the organization of strategic logistics management must take into account that value is created not by a separate enterprise, but by the result of cooperative interaction. That is, if you do not focus on the presence of an emergent effect, then when planning a strategy, you can focus on developments in the formation of vertical marketing systems. (O. Korolchuk, 2004) or proposals for the formation of networks for coordinating the capabilities and needs of business entities involved in the integrated business structure (Yu. Ivanov, A. Pylypenko, 2012). The whole layer of research from the field of affiliate marketing can also come in handy (N. Antonova, 2015; Ya. Gordon, 2001; D. Igan, 2007; R.Spencer, 2005). Such developments cannot serve as the basis for all forms of international production and cooperation. Separate forms, such as a cluster or contract cooperation, do not provide for the presence of a consolidated management entity. Therefore, the organization of logistics management within the framework of the implementation of the first circuit should be based on the position that the target system, as a product of the functioning of the value chain, is built into the target system of a higher level or used by such a system.

Accordingly, the organization of logistics management, as well as strategy planning, should be guided by provisions to ensure the imitation of life cycle stages. It is this imitation that is described, modeled and formalized in the concept of exploitation. (ConOps). It is appropriate to base the description of the value creation process on the VDML value delivery modeling standard. The movement of logistics flows must also comply with the requirements of this standard. The value according to VDML reflects how the consumer will earn money using the target system formed by international production and cooperation cooperation. That is, the process of organizing logistics management in this case is reduced to modeling how the satisfaction of the interests of the consumer will be ensured by the results of cooperative interaction (logistics management, in turn, will implement such a model). At the same time, the VDML standard does not provide for the mandatory presence of a joint decision-making center, and the value stream in its content is a functional cut of the movement of cash flows between roles to create value (it is clear that taking into account national jurisdiction). That is, focusing on the requirements of the VDML standard, it is possible, within the framework of the organization of logistics management, to correctly establish the area of responsibility of the facilitator of the production cooperation network.

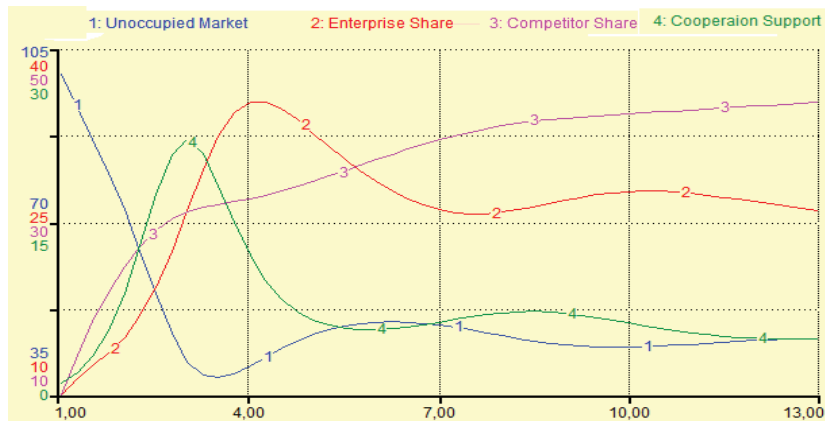
The second block of the system-dynamic model for planning and implementing the strategy of international production and cooperation cooperation between enterprises is directly related to their interaction and consolidation of business processes and activities to support the movement of value flows in global value chains. The planning process in this case consists in the translation of the components of the 5P model of the description of the system formation strategy in ensuring the promotion of the value offered at the output of the global value chain. In this case, it is indicative to consider the interaction of the first and second feedback loops presented in the system-dynamic model of planning and implementing the strategy of international production and cooperation cooperation between enterprises in the context of the conceptual position regarding the combination of process and project approaches to the implementation of international production and cooperation interaction. The logic of combining these two approaches was presented as an implementation of the principle of integrating business processes and practices within the stages of the life cycle of the target system. The project approach provides constructive configurations for the network of international production and cooperation cooperation. The need for the implementation of such a project may arise in the event of the accumulation of a large number of small improvements while moving along the feedback loops. The process approach in this case is presented as a stream of bringing value to the market, implemented through a selected set of practices of activities of participants in production and cooperation interaction.

the described market participants using the ones shown in Figure 2 of logistics functions. The third group of indicators models the mutual influence of an enterprise (*Enterprise_Impact*) and its competitors (*Competitor_Impact*) on the distribution of market share. These indicators identify the value of the flows that model the decrease in the market share of the enterprise (*Out_Flow*) and its competitors (*Decrease_Compervisor*), and are also responsible for the fluctuations shown in Figure 2 logistics functions. In the iThink environment, the value of such variables is presented as a function that determines the strength of influence depending on the market share of an enterprise or competitor. An example of the description of such functions is shown in Figure 3, containing a complete listing of the one shown in Figure 1 model. Within the framework of the mechanism of international production cooperation of enterprises, the application of the indicated in Figure 1 of the model can serve as the basis for determining the features of the competitive positioning of participants in international industrial cooperation (for example, the basis for determining the level of aggressiveness of the competition policy) and the requirements for the parameters of logistical flow management (for example, setting the speed of flow processes responsible for the implementation of the *Out_Flow* variable shown in Figure 1). Also, the mechanism of international production cooperation of companies can use scenarios for the development of logistics interaction within the framework of cooperation relations. An example of such a scenario is shown in Figure 2, and a variant of the alternative scenario is shown in Figure 4.

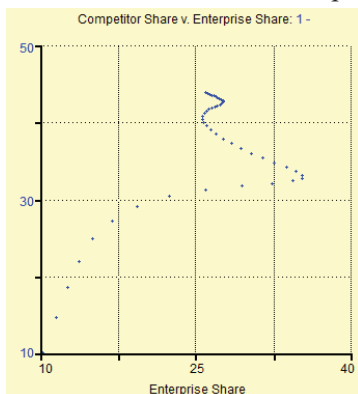
Therefore, taking into account the one shown in Figure 2 dynamics, we will make a proposal that the organization of the logistics management of the network of international production and cooperation between enterprises should consist in coordinating the movement of streaming processes in order to comply with the desired dynamics of the selected indicators. That is, the logistics management must implement the observance by the participants of international industrial cooperation of the global strategic priorities transmitted to their level. Accordingly, the methodological support of the logistical management of the development of international industrial cooperation should provide an opportunity to implement this requirement. In this statement, the aspect of development is of great importance, when the organization of logistics management takes place in parallel with the qualitative improvement of the network of international industrial cooperation. In this context, two key challenges arise. First, the reflection of the imitation of operations within the framework of ongoing business processes. Secondly, the definition of those responsible for the implementation of such operations. Moreover, the appointment of responsible persons should be made taking into account the role structure of international industrial integration described above.

Given these limitations, it is proposed to use the BPMN (Business Process Management Notation) business process modeling notation specifically to describe flow processes and regulate the interaction of participants in international industrial cooperation. The use of BPMN notation makes it possible to formalize and describe the implementation of cooperation processes within the framework of the distribution of elements of business processes performed between the areas of responsibility of individual participants in international industrial cooperation. In this case, BPMN models will act as a detail of the architectural and ontological integration models described above. That is, for each element introduced into the description of the architecture of international industrial cooperation, it is possible to develop a model of the processes of its implementation. But here it seems appropriate to have a top-level BPMN model that describes the interaction of various architectural roles. Since roles in BPMN models are defined through a system of pools and lanes, it seems appropriate to single out the roles of participants in different levels of the hierarchy of international industrial cooperation within one model. This will make it possible to develop both regulations for the implementation of the translation of global strategic priorities, and ensure the implementation of selected priorities by modeling business processes for the implementation of such priorities.

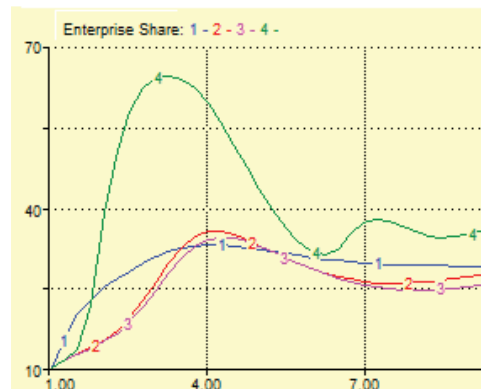
Thus, the formation of descriptions and models of business processes of participants in the international production and cooperation of enterprises is the basis for the organization of logistics management. The basis for the implementation of such management is properly collected information, which can only be formed within the framework of logistics monitoring systems. The organization of such monitoring faces the same difficulties as the organization of logistics management in general. Information for monitoring is accumulated at different levels of the hierarchy of international industrial cooperation, which makes it difficult to achieve a sufficient level of reliability for the operation of the mechanism of international industrial cooperation of enterprises.



A) Implementation of the Selected Scenario for Changing the Market Share of all Participants in Competitive and Cooperative Interaction



B) Correlation of Market Shares of Enterprises and Competitors



C) Comparison of Options for the Dynamics of the Company's Market Share under Various Logistical Impacts

Figure 2. Results of Modeling the Mutual Behavior of Participants in Competitive and Cooperative Relations (Source: Author's development)

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4 Competitor_Share(t) = Competitor_Share(t - dt) + (Increase_Competitor - Decrease_Competitor) * dt
INIT Competitor_Share = 10
INFLOWS:
  Increase_Competitor = Competito_Gap*Competitor_Power
OUTFLOWS:
  Decrease_Competitor = Competitor_Share*Enterprise_Impact*0
4 Cooperaion_Support(t) = Cooperaion_Support(t - dt) + (Increase_Cooperation - Support_Flow) * dt
INIT Cooperaion_Support = 1
INFLOWS:
  Increase_Cooperation = Cooperation_Gap*Cooperation_Power
OUTFLOWS:
  Support_Flow = Cooperaion_Support
Enterprise_Share(t) = Enterprise_Share(t - dt) + (In_Flow + Support_Flow - Out_Flow) * dt
INIT Enterprise_Share = 10
INFLOWS:
  In_Flow = Enterprise_Gap*Enterprise_Power
  Support_Flow = Cooperaion_Support
OUTFLOWS:
  Out_Flow = Enterprise_Share*Competitor_Impact
Unoccupied_Market(t) = Unoccupied_Market(t - dt) + (Decrease_Market + Out_Flow - In_Flow - Increase_Competitor - Increase_Cooperation) * dt
INIT Unoccupied_Market = 100
INFLOWS:
  
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

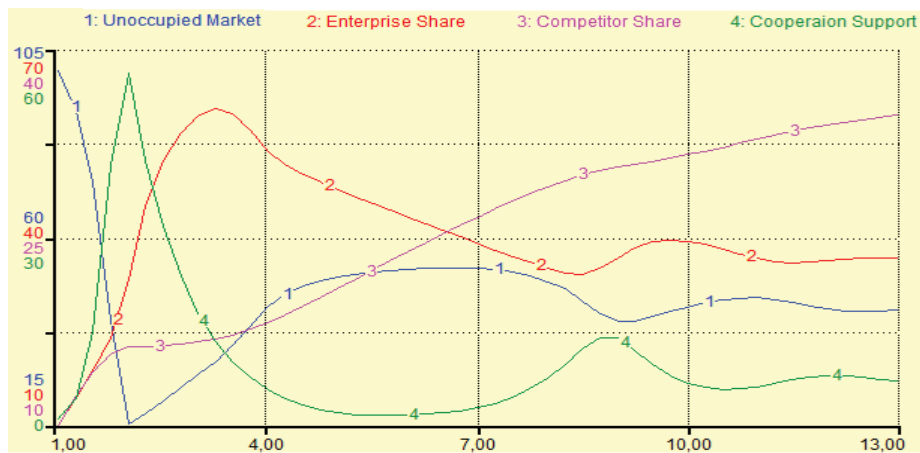
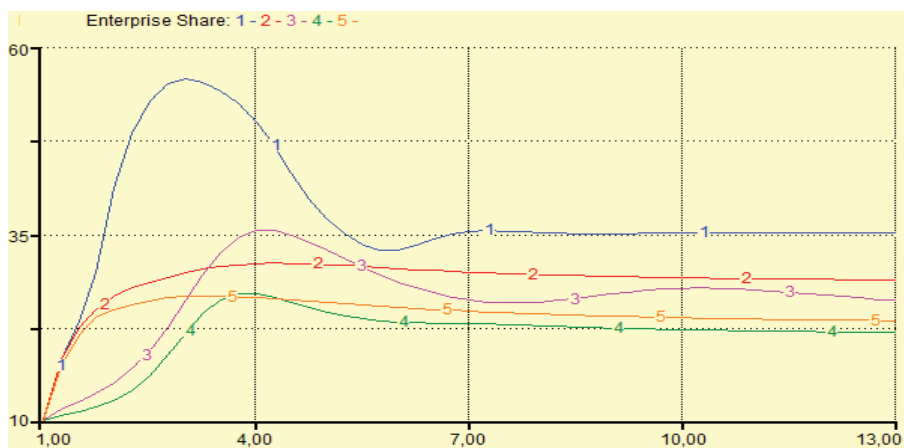
\Rightarrow Decrease_Competeritor = Competitor_Share*Enterprise_Impact*0
 \Rightarrow Out_Flow = Enterprise_Share*Competitor_Impact
OUTFLOWS:
 \Rightarrow In_Flow = Enterprise_Gap*Enterprise_Power
 \Rightarrow Increase_Competeritor = Competito_Gap*Competitor_Power
 \Rightarrow Increase_Cooperation = Cooperation_Gap*Cooperation_Power
 Competitor_Power = 0.1
 Competito_Gap = Unoccupied_Market-Competitor_Share
 Cooperation_Gap = Enterprise_Gap*Cooperaion_Support
 Cooperation_Power = 0.15
 Enterprise_Gap = Unoccupied_Market-Enterprise_Share
 Enterprise_Power = 0.19
 Competitor_Impact = GRAPH(Competito_Gap)
 (0.00, 0.29), (10.0, 0.215), (20.0, 0.4), (30.0, 0.135), (40.0, 0.31), (50.0, 0.435), (60.0, 0.235), (70.0, 0.155), (80.0, 0.065), (90.0, 0.065), (100, 0.05)
 Enterprise_Impact = GRAPH(Enterprise_Gap)
 (0.00, 0.33), (10.0, 0.59), (20.0, 0.34), (30.0, 0.79), (40.0, 0.87), (50.0, 0.13), (60.0, 0.13), (70.0, 0.13), (80.0, 0.54), (90.0, 0.28), (100, 0.81)

Figure 3. Listing of the Competition Deployment Model in the Conditions of Production and Cooperation Interaction



A) Implementation of the Selected Scenario of Behavior of Participants in Competitive and Cooperative Relations



B) The Dynamics of the Market Share of an Enterprise in Various Conditions of the Intensity of Competition and Cooperation Relations

Figure 4. Results of Modeling the Mutual Behavior of Participants in Competitive and Cooperative Relations (Source: Author's development)

Conclusions. After the list of participants in international production and cooperation cooperation is formed, it is necessary to organize the management of their interaction. The orientation of international cooperation to support the creation of value and its promotion through the stages of the life cycle determined the appropriateness of using the principles of logistics in the operation of the mechanism of international industrial cooperation. The complexity of organizing the logistics management of the development of international production and cooperation interaction between enterprises lies in the absence of direct subordination of the participants in such interaction to each other. Accordingly, in the developed model of organization and implementation of the logistics management of the development of international industrial cooperation, it is proposed to introduce the sphere of responsibility of the facilitator of cooperation interaction. Such a facilitator is responsible for translating the requirements of the supersystem to the subordinate levels of the hierarchy of international production cooperation, where the interaction of independent participants in the value chain takes place. The regulation of the facilitator's work is made dependent on the organizational form of the formation of a network of international industrial cooperation. In the developed model of the organization of logistics management, the allocation of the processes of movement of the target system along its life cycle is provided and the business processes of adaptation to the requirements of cooperative interaction are identified. This representation of the processes allows optimizing the structure of the responsibility of the links of the global supply chain for creating value and distributing the components of global logistic flows according to the levels of the economic structure of society. The basis for the implementation of this distribution is the use of the method of analysis of hierarchies, through which the territorial distribution and jurisdiction of the performers of collective roles is determined. In the developed model for organizing the logistics management of the development of international industrial cooperation, submodels are identified that reflect the procedure for performing individual roles of participants in the global value chain.

Methodological support for the organization of logistics management of the development of international industrial cooperation between enterprises was developed. This provision is different from the existing correlation of the concept of planning based on functional abilities with a description of the distribution of the components of global logistics flows according to the levels of the economic structure of society and taking into account the interests of the participants in cooperative interaction when optimizing the structure of responsibility of the links in the global logistics chain of value creation.

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ЛОГІСТИЧНЕ УПРАВЛІННЯ ПОТОКОВИМИ ПРОЦЕСАМИ УЧАСТІ ПІДПРИЄМСТВ У МІЖНАРОДНИХ ВИРОБНИЧО-КООПЕРАЦІЙНИХ ВІДНОСИНАХ

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Розвинуто методичне забезпечення до організації логістичного управління розвитком міжнародної виробничої кооперації підприємств, що відрізняється від існуючого співвіднесенням концепції планування на основі функціональних спроможностей з описом розподілу складових глобальних логістичних потоків за рівнями економічного устрою суспільства та врахуванням інтересів учасників коопераційної взаємодії при оптимізації структури відповідальності ланок глобального логістичного ланцюга створення вартості. Встановлено, що за результатами відбору учасників міжнародної виробничої кооперації виникає потреба організації управління їх взаємодією, що доволі складно з огляду на юридичну самостійність таких учасників. Оскільки кооперація орієнтована на просування цінності, доречними виявилися запровадження принципів логістики до роботи механізму міжнародної виробничої кооперації підприємств та розвиток методичного забезпечення до організації логістичного управління розвитком міжнародної виробничої кооперації підприємств. Організація логістичного управління у цьому випадку зведена до регламентації ролей учасників міжнародної виробничої кооперації, оптимізації структури відповідальності ланок глобального логістичного ланцюга створення вартості та використання концепції планування на основі функціональних спроможностей.

Складність організації логістичного управління розвитком міжнародної виробничо-коопераційної взаємодії підприємств полягає у відсутності прямого підпорядкування учасників такої взаємодії один одному. Відповідно у розробленій моделі організації та реалізації логістичного управління розвитком міжнародної виробничої кооперації запропоновано введення сфери відповідальності фасилітатора коопераційної взаємодії. Також в даній моделі передбачено виділення процесів руху цільової системи за її життєвим циклом та виокремлено бізнес-процеси адаптації до вимог коопераційної взаємодії.

Ключові слова: логістика, управління, організація, міжнародна виробнича кооперація, підприємство, потоковий процес, виробничо-коопераційні відносини.