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## **POLYCENTRIC MANAGEMENT OF THE GLOBAL SUPPLY CHAIN INTEGRATION**

**Volodymyr Kulyk, Myroslava Semeriahina, Ristvej Jozef, Alla Zakharchuk.** *"Polycentric management of the global supply chain integration". The impact of modern conditions of functioning of the world economic system on the processes of its globalization and global supply chains was examined in article. One of the main factors in intensifying the deepening of production and technological ties is recognized as logistics integration. It creates a new scheme for global supply chain management. It is based on the unity of the principles of hierarchy and heterarchy in the choice of forms and scope of integration.*

*Logistics integration is seen as a process of organizing the interaction of cooperating entities in the chain, aimed at achieving the ultimate system goal. In-depth and situational adjustment of production and*

*technological relations and joint use of resources and capital of enterprises in the logistics chain is realized either through their mergers and acquisitions or in other forms of virtual integration.*

*The consequence of such integration is the formation of comprehensive logistics services with high added value.*

*The author's vision of building a heterarchical system of global supply chain management using the institutions of focus centers is presented. Basic recommendations for strategic and tactical planning of the chain's activities as a single integrated entity have been developed.*

*Such a system provides self-organization of management and flexible dispersion of centers of general system management decisions according to the functions and competencies of specialized supply chain centers.*

*Heterarchical self-organization of management operates on the terms of relations' equality, full openness and transparency between interacting entities, a single information environment and communication channels.*

**Keywords:** logistics management, integration, hierarchy, heterarchy, focal specialized coordination centers.

**Володимир Кулик, Мирослава Семерягіна, Ріствей Джозеф, Алла Захарчук.**  
**"Поліцентричне управління інтеграцією глобального ланцюга постачань".** В статті досліджено вплив сучасних умов функціонування світової економічної системи на процеси її глобалізації та логістизації. Одним із головних факторів інтенсифікації поглиблення виробничо-технологічних зв'язків визнано логістичну інтеграцію, що породжує нову схему управління глобальними ланцюгами постачань. Вона базується на єдності принципів ієрархії та гетерархії при виборі форм і обсягів інтеграції.

Логістична інтеграція розглядається як процес організації взаємодії співпрацюючих господарюючих суб'єктів ланцюга, спрямований на досягнення кінцевої системної цілі. Поглиблене і ситуаційне коригування виробничо-технологічних зв'язків та спільне користування ресурсами і капіталом підприємств логістичного ланцюга реалізується або через їх злиття і поглинання або в інших формах віртуального об'єднання.

Наслідком такої інтеграції є формування комплексних логістичних послуг з високою доданою вартістю.

В статті пропонується авторське бачення розбудови гетерархічної системи управління глобальними ланцюгами постачань з використанням інституцій фокусних центрів, для яких розроблено базові рекомендації щодо стратегічного і тактичного планування діяльності суб'єктів ланцюга як єдиного цілісного утворення.

Така система забезпечує самоорганізацію управління і гнучке розосередження центрів прийняття загально-системних управлінських рішень за функціями та компетенціями спеціалізованих центрів ланцюга постачань.

Гетерархічна самоорганізація управління функціонує на умовах рівноправності взаємовідносин, повної відкритості і прозорості між взаємодіючими суб'єктами, єдиного інформаційного середовища та каналів зв'язку.

**Ключові слова:** логістичний менеджмент, інтеграція, ієрархія, гетерархія, фокусні спеціалізовані центри координації.

**Владимир Кулик, Мирослава Семерягина, Риствей Джозеф, Алла Захарчук.**  
**"Полицентрическое управление интеграцией глобальной цепи поставок".** В статье исследовано влияние современных условий функционирования мировой экономической системы на процессы ее глобализации и логистизации. Одним из главных факторов интенсификации углубления производственно-технологических связей признано логистическую интеграцию, что порождает новую схему управления глобальными цепями поставок. Она базируется на единстве принципов иерархии и гетерархии при выборе форм и объемов интеграции.

Логистическая интеграция рассматривается как процесс организации взаимодействия сотрудничающих хозяйствующих субъектов цепи, направленный на достижение конечной

*системной цели. Углубленное и ситуационное корректировки производственно-технологических связей и совместное пользование ресурсами и капиталом предприятий логистической цепи реализуется или через их слияния и поглощения или в других формах виртуального объединения.*

*Следствием такой интеграции является формирование комплексных логистических услуг с высокой добавленной стоимостью.*

*В статье предлагается авторское видение построения гетерархической системы управления глобальными цепями поставок с использованием институтов фокусных центров, для которых разработаны базовые рекомендации по стратегическому и тактическому планированию деятельности субъектов цепи как единого целостного образования.*

*Такая система обеспечивает самоорганизацию управления и гибкое рассредоточение центров принятия общесистемных управленческих решений по функциям и компетенциям специализированных центров цепи поставок.*

*Гетерархична самоорганизация управления функционирует на условиях равноправия взаимоотношений, полной открытости и прозрачности между взаимодействующими субъектами, единой информационно-среды и каналов связи.*

**Ключевые слова:** логистический менеджмент, интеграция, иерархия, гетерархия, фокусные специализированные центры координации.

**Introduction.** Since the beginning of the XXI century, the world economy has undergone radical changes. They are related, on the one hand, to the reduction of trade barriers and the liberalization of trade regimes, and, on the other hand, to the dynamic development of export-oriented sectors of the economy of the Asia-Pacific region. The intensive process of relocating production from Western Europe and the United States to Asian countries and the formation of the reverse flow of finished products in the context of growing consumption in developed countries have become the most important stimulus for the global market for integrated supply chain management services. Logistics integration can be seen as a process of interaction between participants in the supply chain, aimed at achieving common goals by expanding and deepening production and technological links in the process of sharing resources. It can also be considered as a system-optimal adjustment of the combined capital of cooperating enterprises and the creation of favorable partnerships for the implementation of their joint economic activities. In principle, there are two forms of chain integration: the creation of alliances and other types of production associations of the virtual plan, or the merger and acquisition

of enterprises-entities of logistics activities in the form of transport and logistics holdings.

**Analysis of recent research and publications.** The problem of logistics integration is constantly considered in the literature and electronic resources and reports of the world's leading logistics companies. However, the issues of building an original system for managing the effectiveness of integration remain controversial, especially in global supply chains. A separate problem of logistics integration is the positioning of the world's leading logistics companies as integrated providers of comprehensive logistics services with high added value. An example is Kuehne + Nagel, which began establishing global logistics integration in Eastern Europe, and later entered into a strategic alliance with the logistics environment of East Asia and latterly the United States logistics environment. This was facilitated by the high professionalism of the company's specialists, the availability of a developed specialized infrastructure of logistics business processes, which provided a global impact on the quality of comprehensive logistics services. Given the expansion of activity areas and the transformation of logistics providers, we can conclude that today logistics companies are ready to provide their customers with integrated integrated logistics solutions. They

provide manufacturers with information that can ensure the efficiency of the global logistics chain through integration into its production business processes. A logistics company becomes not just a service provider, but part of the manufacturer's business. They provide a full range of logistics services. The boundaries of a logistics provider's product

are becoming wider, and competencies are becoming more complex.

As we can see, the importance of integration processes is growing, and their scope is expanding as a result of the constant changes in the world economy. The main prerequisites for the development of integration processes in logistics is considered in Table 1.

Table 1 -Prerequisites for change and development of integration processes in global supply chains

No.	Organizational and economic changes in logistics activities	Solutions and suggestions
1	Globalization of the economy and expansion of trade	Privatization of previously public sectors of communication and transport industries
2	Globalization of freight transportation, increasing the length of transport routes, complicating delivery schemes	Focus on meeting the need for integrated supply chain management in just-in-time (JIT) mode according to Capacity Requirement Planning (CRP)
3	Increasing the need for new communication and integrated solutions	
4	Personalization and development of the service economy, the need to respond quickly to customer needs, the growth of competition	The emergence of new participants in the transport and logistics market, the formation of new packages of services, the emergence of new types of competition
5	The need to reduce technological and production cycles, the emergence of the effect and change the structure of cargo flows	Concentration on core business and outsourcing of non-core business
6	Elongation and complication of supply chains, environmental aspects, the desire for "waste-free" management	The emergence of interaction structures of large and small companies, a multi-stage system of subcontracting

The development of the European market for integrated chain management services today focuses on mergers and acquisitions as forms of coordination, integration and interaction of interdependent resources.

The European market shows a high level of activity on mergers and acquisitions, characterizing the periodicity of the stages of reforming the leading logistics companies into global logistics operators.

Depending on the chosen forms of integration of logistics business processes and entities that perform them, the methods and technologies of interaction management, communication links of integrated facilities have change.

After all, not all logistics companies, as well as companies - consumers of logistics services, can accept the trend of integration through acquisitions. This is confirmed by studies of the American and European markets regarding the ways and scope of development of logistics outsourcing (see Table 2). It should be noted that the objects of such outsourcing are not ancillary, but the main logistics processes.

According to data of Table 2, most consumers need one-component services, integrated logistics solutions are more in demand in the European market than in the US market.

A similar trend is observed in the market of logistics services in Ukraine. A study conducted by the Ukrainian Logistics Alliance



showed that customers primarily order transport and / or freight forwarding services, 33% cited customs brokerage, 31% noted warehousing, 8% listed supply chain

management. Some say they prefer to use the services of vehicle owners. 41% of respondents expressed a desire to order express delivery of goods.

Table 2 - Share of outsourced logistics services

No.	Logistics function	USA	Europe
1	Warehousing	72	70
2	International transportation	66	89
3	Customs brokerage	60	34
4	Customs clearance	57	48
5	Cross-docking	55	19
6	Domestic transportation	54	82
7	Freight bill auditing and payment	53	19
8	Freight forwarding	47	40
9	Distributed order management	35	22
10	Reverse logistics (return)	27	32
11	Product labeling, packaging, assembly, kitting	25	29
12	Reverse logistics (defective, repair)	22	30
13	Consulting	21	12
14	Information technology (IT) services	19	24
15	Contract production	16	16
16	Supply management	16	33
17	Inventory management	14	27
18	Tariff negotiations	14	12
19	Carrier selection	13	21
20	Integrated logistics solutions	10	19
21	Water transport management	9	18
22	Order management and fulfillment	8	7
23	Inventory holding	6	9

The paradox of the market is that, on the one hand, customers talk about the lack of specialization and the offer they need, and on the other hand, they have no specific requests for new services.

**Basic material and results.** The system of integration processes management in supply chains provides development of mutual relations which basis is:

- scheme of serial-parallel connections of business processes and separate operations of the generalized supply process;
- a set of executors of divisions and other economic entities of separate stages of process with definition of resource streams and actions between executors;
- determination of conditions and requirements for needs, territorial limitations, information and other parameters of supply chain operation;

- development of the scheme and conditions of constant contacts between the participants of the supply chain;

- preliminary consultation, preparation and negotiation of contracts between the parties to the chain with the end-to-end division of responsibilities and rights of chain participants;

- organization of intensive processes of training and mutual consultation of chain participants by:

- a) establishing direct contact between the participants;
- b) documenting the main processes assigned to each entity;
- c) in-dept end-to-end understanding of the essence of the goals and mission of the supply chain by all its actors;

d) obligatory acquaintance and general participation in realization of joint projects and joint use of resources;

e) use of effective benchmarking and exchange of the latest technologies and developments between the participants of the chain.

In addition, partnerships in the logistics chain should be based on the principles:

- mutual benefits;
- mutual trust;
- equality;
- transparency and controllability of the activities of each entity for all participants in the logistics chain;
- unity of philosophies of partnership cooperation and moral and psychological values;
- corporate culture of functioning and interaction of economic entities of the logistics chain;
- system orientation of all entities of the logistics chain to create the maximum value of a comprehensive logistics service for the end customer.

These principles and conditions of logistics integration can be achieved only by self-organization of the management system of a new type, combining two opposite forms of management: hierarchy and heterarchy in the global supply chain.

Heterarchical management scheme forms the collective "mind" of logistics activities, and the hierarchy provides the "strength and dynamics" of the implementation of management decisions.

Hierarchy is inherent in any form of administrative (bureaucratic, rationalist) management. F. Taylor, A. Fayol, M. Weber, P. Drucker and other classics of management theory have developed the basic principles of it. A. Fayol's 14 principles are well-known, according to which any enterprises, organizations, institutions function.

The hierarchical system of management actually provides for a monopoly authoritarian dictatorship at each hierarchical level of the power vertical, based on a clear, officially defined division of powers,

subordination and responsibility. This scheme is specific to each individual entity in the supply chain.

Much more complex is the external management to all of each individual entities of logistics activities, required for the internal integration of the global supply chain, as a unified complex of its interacting enterprises and organizations. In this case, management for integrated holistic structure of supply chains requires the use of a heterarchical approach to the development, adoption and implementation of logistics decisions.

Heterarchies are complex adaptive systems, because many organizing principles are intertwined in them. New organizational forms are heterarchical not only because they have smoothing hierarchy, but also because they are arenas of collision and coexistence of value systems. The existing interdependence of autonomous participating entities of the chain leads to an increase in the number of criteria for evaluating a comprehensive logistics service. Distributed management not only implies that the enterprises and divisions of the chain will be accountable to each other, but also that each of them will be evaluated from different positions, but focused on the final system result. The chain system and the means of communication must create a sufficiently homogeneous environment to ensure interaction between economic entities without suppressing anyone's identity. Such cooperation smooths hierarchies without eliminating diversity and without conflicts of interest. Heterarchies create the ultimate value of a service by allowing more than one way to evaluate logistical criteria. Heterarchies are associations and organizations with multiple worldviews and belief systems, as a result of which products, processes and properties have several "labels" or interpretations. The supply chain is a dynamic system. It operates in a situation of constant variational and situational changes. Accordingly, the style of "anarchic" leadership is applied to it, which is characterized by the dispersion of decision-making centers (heterarchy). This liberates

the internal organizational environment for the initiative and creativity of staff. In turn, this allows to find alternatives that help get out of the crisis or improve results.

Supply chain heterarchy is a self-organizing management system. In this system, each business entity is its manager or

management center. He develops and coordinates with other participants in the logistics activities of their own and general system solutions of a specialized nature within its competences and in the systemic interests of the entire supply chain.

**The main characteristics of the heterarchy are:**

- 1 – the style of multicenter leadership of specialized supply chain actors,
- 2 – dispersal of decision-making centers by competencies and specialization,
- 3 – the system of self-organization of management (each manager is the command manager of all logistic system),
- 4 – individual responsibility of each for the overall result,
- 5 – flexible management structure that adapts to situational changes,
- 6 – dispersal of specialized business processes (production centers) assigned to individual subjects of the logistics chain,
- 7 – "bottom-up" planning management scheme: through agreement and coalition to corporate strategy,
- 8 – horizontal management structure, coordination and integration, which is provided by the organizational culture with a single system of corporate values and synergy potential,
- 9 – the form of cooperation of actors is partnership, alliances, agreements between all participants of conglomerate (supply chain),
- 10 – the form of individualized mutual coordination of employees (performers and managers of different levels) by rotation, change of profile, deepening and expanding experience,
- 11 – mutual openness, cross-control within the tasks of joint activities and systemic purposefulness,
- 12 – the promptness of constant consultations, coordination and changes.

*Source: [developed by the author]*

The main features of heterarchical self-organization of management are:

- transition in the principles of profit formation from the receipt of profit by each business entity at the expense of the other party to the receipt of joint profit;
- formation of the principle of equality of mutual relations: transition to equal partnership instead of domination of one party;
- formation of trust: transition to full openness of the parties (transparency of each actor's activity for supply chain partners) from its absence in competitive market conditions;
- formation of comprehensive communication channels open to partners

instead of formal relations in the field of communications;

- transition to a common single information space of all actors in the supply chain instead of restrictions, safety and confidentiality in the field of information;
- transition to control of the level and quality of implementation of delegated powers from comprehensive control with claims to interacting actors in the field of control;
- formulation of contract terms from strict definitions of all components of the system of relations to open flexible formations and timely adjustment of relations;

- the focus of each entity in the supply chain should be focused primarily on the interests of the consumer and not on their own;

- development of supply chain management strategy is carried out through logistical coordination and organizational and legal forms of business process integration.

This type of management and end-to-end planning is quite complex and the most risk due to the need to resolve possible differences and conflicts. Such management is carried out by the focus company of the supply chain and the functional focus centers specialized in logistic directions, territories and spheres of activity.

The focus company should be not only the initiator, but also the integrator and coordinator of the supply chain, performing the following management functions:

- development of the project of network structure and compound of actors of the supply chain, defining quantity of actors and their professional orientation, and also the list of the enterprises providing and servicing activity of each actor of the supply chain;

- setting common goals and concepts for managing the global supply chain;

- implementation of inter-functional distribution and coordination of business processes between the interacting actors of the general network of the global chain;

- organization of consultations and coordination of the division of competencies between the participants of the supply chain with the subsequent consolidation of the decisions made in the inter-entity agreements;

- calculation of the system of balanced performance indicators of the supply chain;

- orientation of all participants regarding the development of their own strategic plans, agreed with the focus company and with the indicators of the supply chain KPI.

Functional focus centers should be aimed at coordinating, managing and planning the activities of individual entities in the supply chain in the real conditions of

implementation of the planning of the chain strategy through more detailed calendar plans of each entity for the periods: year, quarter, month.

As a result of tactical planning, schedules of homogeneous business processes are created without their detailed division into operations.

The tactical planning algorithm consists of the following stages:

- receiving forecasts and other information from the focus company for the planning period;

- conversion of the received information into calculation of demand for all types of resources for each entity;

- assessment of the adequacy of available and planned resources and identification of gaps between them;

- formation of a program to eliminate identified gaps;

- joint evaluation of the developed plan and search for opportunities to improve it, which provides a soft form of integration to maintain independence and interactive initiation of supply chain development;

- integration of the tactical plan with other levels of planning and participants in the supply chain.

In the process of developing this tactical plan it is necessary to provide:

- conducting innovative research and diversification of business processes in the interests of the supply chain as a whole;

- training, retraining and instruction of staff;

- optimization of sources of financing and composition of own suppliers and service enterprises.

The implementation of tactical plans involves:

- the comprehensive integration of business processes and entities of the supply chain;

- the unification of all efforts of the network of enterprises of the supply chain.

This is important in order to timely and high-quality formation and provision of comprehensive logistics services.

In the course of operational management and planning, the focus company and specialized coordination centers form the main management recommendations and schedules, namely:

- to develop specific working hours for the supply chain entities on week;
- to form detailed programs, i.e. schedules of all business processes;
- to form the needs and schedules of materials consumption and other resources;
- to compose a consolidated weekly-daily work schedule and a schedule-application for the provision of material, mechanized and transport resources;
- control and adjust the hourly schedule-application for loading / unloading of transport, delivery of perishable materials.

These schedules should be illustrated by appropriate cyclograms and Gantt charts and provide a clear sequence of work and the

possibility of parallel overlap of their execution time.

**Conclusions.** According to the results of research on the theory and practice of logistics management and assessment of the growing requirements for the management of global supply chains, we can insist on:

1. Comprehensive integration of logistics business processes and their actors is the main condition for the efficiency of global supply chains.

2. Managing global supply chains requires:

- creation of an integrated planning system,
- implementation and coordination of comprehensive management decisions agreed by all actors in the supply chain and aimed at achieving the ultimate system goals.

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