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Development of logistics and supply chains in freight-generating sectors of economy

Abstract. The article deals with Kazakhstan's freight-generating sectors of the economy. It covers transport and logistics problems with regard to the required criteria of such services. The economic development of production chain is revealed. Recommendations on logistics services improvement as well as efficiency of logistics units in the freight-generating economic sectors are developed.
Keywords: Logistics; Supply Chain; Logistics Services; Freight Industry; Transport and Logistics Hubs
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Розвиток логістики та ланцюгів поставок у вантажоутворювальних галузях економіки
Анотація. У статті досліджено вантажоутворювальні галузі економіки Казахстану. Виявлено транспортні та логістичні проблеми в наданні транспортно-логістичних послуг, а також розглянуто вимоги, що висуваються до них. Надано рекомендації щодо поліпшення критеріїв логістичного обслуговування, окреслено шляхи підвищення ефективності функціонування логістичних ланок у зазначених галузях економіки.
Ключові слова: логістика; ланцюг поставок; логістичні послуги; вантажоутворювальні галузі; транспортно-логістичні центри.

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Развитие логистики и цепей поставок в грузообразующих отраслях экономики
Аннотация. В статье исследованы грузообразующие отрасли экономики Казахстана. Выявлены транспортные и логистические проблемы в оказании транспортно-логистических услуг, а также рассмотрены требования, предъявляемые к ним по определенным критериям. Даны рекомендации по улучшению указанных критериев логистического обслуживания, обозначены пути повышения эффективности функционирования логистических звеньев в указанных отраслях экономики.
Ключевые слова: логистика; цепь поставок; логистические услуги; грузообразующие отрасли; транспортно-логистические центры.

1. Introduction. Most of the approved strategies on development of economic sectors in Kazakhstan (industry, construction, agriculture, transport, etc.) do not take into account the intersectoral segment, requirements to suppliers and consumer demand. They do not focus on the formation of the complete logistics chain and product distribution, the effective functioning of which largely determines the success of the measures proposed in the strategy.

The reason for this is the presence of a number of gaps in the chain of product promotion (research – implementation – production – sale – use – disposal): fragmentation of research and production; the impact of the gap between basic and applied sciences; disparities of commodity infrastructure.

It is not necessary to create an economic policy based on the development of industrial production (as it was before). One has to take into account the logistics approach aimed at a comprehensive system to ensure the entire material flow chain, including the marketing of goods, production of competitive products and the supply of production.

One of the solutions to the problem of the elimination of these gaps and the development of economy core sectors towards the production of competitive products is to develop logistics systems in manufacturing complexes (holdings, corporations, consortiums, business groups), covering the whole chain of product creation: from the research development and design through production to the sales, servicing and disposal.

An analysis of the current situation in the field of logistics in the industry shows low demand for logistics outsourcing enterprises, which negatively affects the competitiveness of products. B. U. Syzdykbayeva and J. S. Raimbekov (2012) emphasise that the market of transport and logistics services is underdeveloped, while V. Mozharova (2011) stresses on the poorly developed infrastructure [1; 2].

Solving the problem of sustainable development of the economy is impossible without taking into account logistical factors.

2. Brief Literature Review. Features and trends in the development of transport and logistics services in the economy as a whole and its individual sectors in different countries of the world have already been a subject of research by authors such as Donald J. Bowersox, David J. Closs (2001) [3], A. V. Brykin (2008) [4], V. V. Klimenko (2012) [5], A. A. Kizim, A. Sinelnikov (2013) [6], A. Heiko (2010) [7], J. Mentzer et al. (2001) [8], D. Gligor (2013) [9], Ch. Kunaka (2013) [10], R. Large (2013) [11], L. Li (2011) [12], R. Shams et al. (2011) [13], M. Rajahonka (2013) [14], Von der Gracht and Darkow (2010) [15], O. Velychko (2014) [16], and W Chengjin., D. Casar (2014) [17].

These studies considered problems of logistics services specific to a particular country's business environment; they assessed the impact of various factors on the activity of the enterprises of transport and logistics services; the authors studied logistics services provided to customer segments, and analysed logistics providers in the domestic market and international logistics networks.

A. Heiko (2010) gives development scenarios of the logistics services industry until 2025 on the basis of statistical analysis where the main factors are as follows: politics, economics, culture, technology, the industry structure of the economy [7]. It is concluded that the main factor in the development of logistics services is the structure of industries and customer requirements for logistics.

The research [8] deals with the development of effective control mechanisms of production and development of transport and logistics potential, methods of cooperation of related industries at the stage of the procurement and sales through the use of modern logistic approaches that create a comprehensive and systemic organisation of their operation.

Based on the study of Chinese manufacturers and providers of logistics services to local and foreign customers, Shams Rahman and others (2011) [13] identified the following differences: foreign customers are focused on the different types of services compared to local clients. It is suggested to secure expansion of service activities and requirements to them by improving the quality of logistics services based on a study of the needs or the transfer of the functions of logistics outsourcing, as industrial, commercial and service companies prefer to give operational logistics functions to logistics intermediaries (operators, service providers) in the developed world focusing on core competencies and coordinating functions of logistics.

R. O. Large et al. (2013) examine the general question related to the extent the buyers of logistics services take into account the aspects of sustainable development [11]. It was found out that the procurement companies value environmental and social aspects. A fundamental prerequisite for sustainable procurement-oriented logistics services can be seen in the consciousness of the need to incorporate sustainable aspects in economic decision-making. The study on logistics service providers (LSP) by M. Rajahonka (2013) show that LSP must use a modular approach when choosing a service provider of the logistics industry, as customer requirements are becoming more diverse, and services, processes and organisational networks are becoming increasingly complex [14]. L. Li (2011) evaluated the effectiveness of logistics services from the point of view of manufacturers, determining the factors affecting the satisfaction of the manufacturer [12].

The issues of transport and logistics service quality are also relevant for Kazakhstan. Kazakhstan is losing its closest neighbors on the provision of transport and logistics services. Our closest neighbors, the Russian Federation and China, offer cheaper and better logistics services. The underdevelopment of 3PL market services (3PL operators provide integrated logistics services) in Kazakhstan does not allow to minimise logistics costs. Transmitting logistics to logistics operators outsourcing, logistics costs in the final price of the goods remain stable.

As can be seen from Table 1, trucking structure comprises 96.7%, transport and forwarding services – 3.0%, logistics management – 0.3% in Kazakhstan's market of logistic services, which is well below the global and Russian indicators.

Tab. 1: **Market of logistics services structure in the world, Russia and Kazakhstan in 2012, %**

Types of logistics services	World,%	Russia, %	Kazakhstan,%
Trucking and freight forwarding services	69.0	87.3	96.7
Integrated logistics services including services in storage and distribution of goods (warehousing and distribution) in addition to Trucking and freight forwarding services	19.0	12.0	3.0
Management logistics (outsourcing), including inventory management services, integrated planning, optimisation of logistic business processes	12.0	0.7	0.3
Total logistics services	100	100	100

Source: Prepared according to [1; 18-19]

The data in Table 1 indicate that Kazakhstan is far behind the world trends in the development of the logistics management component and the complexity of their provision.

First of all, it should be noted that logistics costs in our country are very high and largely exceed the level of developed countries. Today, the share of logistics costs in Kazakhstan can be up to 25% of the cost of the final product [1]. This average figure is 11%, whereas it implies 14% in China, 11% in the EU, 10% in the US and Canada, etc. (Turkensteen, 2012) [20].

At the same time, a significant number of scientific problems concerning the formation of an effective economic mechanism of development of the supply chain logistics, logistics transformation of economic systems and its adaptation to the conditions of Kazakhstan remain unresolved.

3. The purpose *of the research* is to study transport and logistics problems of the core sectors of the economy; to define the needs of logistics services; to develop recommendations to achieve the required level of development of logistics for freight traffic sectors. To conduct the research we used the following methods: polls among professionals of transport and logistics companies, industry, trade, tourism and agriculture.

We identified transport problems of the key sectors of freight traffic during our interview with 11 experts from different sectors of the economy. The experts were senior managers with over 15 years experience in the industry.

Based on the analysis of foreign and domestic literature, we selected 6 criteria that, in our opinion, have the greatest influence on the definition of requirements and the need for logistics services:

1) stability (reliable service), and affordability;
2) safety and security of cargo transportation;
3) the speed of delivery;
4) service (quality of service) and convenience (transportation, registration documents);
5) cost (cost of transportation);
6) national priorities (the most important areas of logistics industry, government support).

We used a five-point scale to measure the results. Each question has the scores from 1 to 5. The total mean score for each criterion was calculated as the average of scores for each expert.

Tab. 2: **Evaluation of transport problems of key freight traffic sectors of the economy**

No	Industry	Criteria					
		Stability and availability	Safety and security	Speed	Service and convenience	National priorities	Cost
1	Agriculture	2.1	1.6	1.8	1.5	2.3	2.3
2	Coal industry	2.1	2	2.9	2.2	3.3	2.9
3	Oil and petroleum industries	3	1.7	3	2	3.2	3
4	Mining (except for mining energy) and metallurgical industry	1.7	2.7	2.8	2.3	2.4	3
5	Light industry	3.6	2.3	3.7	2.1	2.9	2.2
6	Food Industry	3.3	2.3	4	1.2	2.3	2.4
7	Building and construction materials	2.5	2.8	2.9	2	2.2	2.1
8	Chemical industry	2.5	2.1	3.7	2.8	1.9	2.5
9	Mechanical engineering	2.9	2.2	3.4	2.1	3.1	2.4
10	Trade (wholesale and retail)	3.8	2.7	2.9	1.5	3.7	2.2
11	Tourism	2.3	2.4	3.1	2	3	2.2
	Total average	2.71	2.25	3.11	1.97	2.75	2.47

Source: Materials collected by the authors on the basis of the survey and submitted after statistical processing

4. Results. Below are The main problems in the sectors of freight traffic relating the provision of logistics services.

1. Agriculture: the lack of professional transport of agricultural products; difficulties in exporting products in the southward and westward directions; long processing of freights at the border with Uzbekistan; lack of awareness of agricultural producers of the potential markets for grain and transport routes; competition in the export of grain through the ports of the Black Sea region from Russia and Ukraine.

2. Coal industry: lack of infrastructure for transshipment of coal at the border with China; undeveloped export routes in the direction of China.

3. Oil and petrochemical industry: high railway tariffs on transportation of oil and oil products; no single transport operator.

4. Metals and Mining Industry: insufficient capacity of the transport route to China; low safety of goods during transportation of finished metals (especially ferrous-alloys and non-ferrous metals) by gondola cars; lack of maritime transport.

5. Light industry: lack of 3PL market operators; low speed of shipping containers (the lack of railway communication with a «rigid» schedule); low safety of goods.

6. Food industry: a lack of 3PL market operators; low speed of delivery (lack of railway communication with a «rigid» schedule); low safety of goods.

7. Construction and building materials: high transport component due to low prices for the majority of products (crushed stone, sand); volatility in demand; use of most goods for specific large infrastructure projects.

8. Chemical industry: lack of competence on the transportation of dangerous goods among the existing transport operators; ban on the transport of dangerous goods (red phosphorus) imposed by the European Union in the «eastern-type» containers; duty on transportation of wastes through its territory imposed by the Russian Federation.

9. Engineering: problems of preservation of valuable goods (precise engineering, electronics); problems with the transport of oversized cargo; lack of transfer stations for general cargo.

10. Trade (wholesale and retail). Logistics Services: lack of 3PL operators; lack of development of the logistics and distribution system for FMCG products, particularly food products requiring special storage conditions; weak presence of trading players in the country's large network; lack of TLC. Transport services: high price of transport services; poor quality of transport services; delays in deliveries; integrity and safety of cargoes in transit.

11. Tourism: low accessibility of key tourist sites (free economic zone «Burabay»); underdevelopment of regional and international network of air links; low speed of rail and bus transportation; underdevelopment of the hotel, entertainment infrastructure; poor state of roads; shortage and high wear of the rolling stock (air, rail and road).

The results of the expert survey on the current level of the criteria undertaken in 2015 are shown in Table 1.

Having applied the expert evaluation method, we determined the aggregated weighted assessment of the impact of each method on the logistics activities of the industry. It is possible to obtain a complete picture of the level of development of key techniques in the form of a cobweb diagram (Figure 1). The study revealed a great impact of speed, quality and preservation (the obtained value is above the threshold of 0.5), as well as a significant influence of stability. The results of the study also showed a slight impact of national priorities and cost. Accordingly, it was concluded that these methods are capable of providing a stable positive dynamics of logistic processes.

We can achieve the necessary level of criteria for the freight sectors of the economy by: increasing the accessibility and speed of delivery in agriculture; increasing national priorities and the availability of transport in the coal industry; increasing national priorities and security in oil and petroleum industries; increasing national priorities, availability and security of transport in mining and metallurgical industry; increasing production of steel products, which will increase the demand for transport services; increasing the speed and safety (5 points) in light industry; increasing national priorities and availability (4 points) in production of building materials; improving transport safety (5 points), national priorities and availability in chemical industry; improving safety (5 points), availability and speed of transportation in mechanical engineering; increasing safety and speed of delivery (5 points), convenience in trade (wholesale and retail); increasing the availability, safety, speed, convenience in tourism.

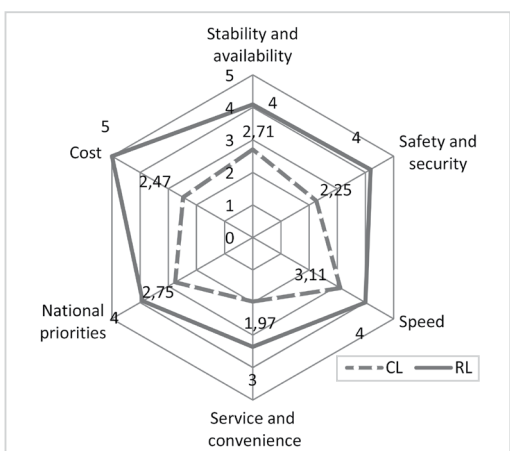

Fig. 2: **Assessment of the impact of methods to promote logistics activity, authoring (CL – current level; RL – required level)**
Source: Composed by the authors

Growth in trade will lead to a significant increase in freight volumes. The main problems are a lack of TLC and, consequently, low availability and quality of transport services. To provide sustainable development of trade, it is necessary to build more TLC for the redistribution of commodity flows.

Analysing the prospects for production, transportation of goods and the development of this industry one can notice that the weak link in the value chain is a product with high added value and distribution (Table 3).

Tab. 3: **Level of development of industries in the value chain of production**

Industry	Relatively developed	Underdeveloped
Agriculture	Cultivation; primary processing.	Wholesale and Logistics; deep processing; retail.
Oil and petroleum industries	Exploration and Production; transportation and storage.	Processing; sale.
Mining and metallurgy industry	Ore extraction; iron and steel; primary rental.	The goods with high added value; distribution.
Building and construction materials	Production of primary building materials; production with high added value; transportation.	Products with high added value; logistics, distribution, trade.
Trade	Wholesale; transportation.	Storage, sorting, packing, packaging, formation of consignments; retail.
Light industry	Production; marketing, sale.	Supply of raw materials, semi-finished products, component parts, logistics.
Food industry	Production and distribution.	Supply of raw materials, logistics.
Mechanical engineering	Production of parts and components with low added value; assembly of imported components.	Products with high added value; distribution and Logistics.
Tourism	Transportation	Logistics

Source: Composed by the authors

It is clear that the most important actors in the goods movement is wholesale and transport links, as well as logistics in each of the sectors under consideration.

Wholesale businesses in the process of sale of goods may perform work on the logistics services: storage of goods, transport, freight forwarding, packing, processing, sorting, machine-readable codes marking products. According to foreign sources, the first place belongs to the transportation, followed by storage services, labeling, sorting and packing of goods among the paid services provided by the wholesale enterprises in the developed market [3, 452-468]. As for Kazakhstan, these services, except for storage, have not been widely developed until now.

A significant impact on the cost of the promotion of goods to the end user has the organisation of transport in the distribution process. In countries with developed transportation logistics, specialised transport companies are generally involved in it. At the beginning of market reforms in Kazakhstan, transportation was carried out mainly by specialised transport companies. Currently, there is a widespread practice of self-fulfillment which is not typical to wholesale transport operations. As a result, the majority of transportion path utilization ratio is not more than 0.6, i.e. it does not provide full capacity utilization of transportation.

5. Conclusions. Effective operation of enterprises in various sectors of economy (industry, trade, construction and agriculture) is no longer sufficient for extensive development without taking into account logistics. The essence of the company's specialisation is to focus on customer service group with similar needs and technological conditions for performing transport, handling loads with similar transport and processing properties, to use the same type of rolling stock and other technical facilities.

Each of the surveyed industries has its own characteristics and requirements for the organisation of supply. This sectoral approach to the management is to work together with customers to optimise the quotation depending on the unique characteristics of each sector of the economy.

Such an approach is impossible without specialised infrastructure and centers of competence in SCM (Supply Chain Management), which can provide specific expertise necessary for a specific sector.

It is necessary to develop new innovative logistics technology, to introduce new solutions, clearly defining the terms of business growth. The main trend in the world is the transfer of the companies of the whole complex of logistics services in the management of a single professional operator. This is a good opportunity to optimize costs and ensure high quality and efficiency of logistics. Kazakhstani enterprises feel the apparent lack of such proposals. Therefore, it is necessary to work on the development of 3PL (Third Party Logistics (Tripartite logistics) – the provision of logistics services and shipping address storage to manage orders and track the movement of goods) on the basis of new Class A logistics terminals necessary to implement integrated solutions for all areas of business: engineering, banking and insurance sectors, FMCG (fast moving consumer goods), pharmaceuticals, medicine, retail, e-commerce.

There is a need to conduct further studies on the subject and apply the obtained results to optimise capacities of industrial enterprises, so that non-core freight logistics services are transferred to the logistics companies. To achieve this goal, it is advisable to create effectively organised new logistics centres cleared of non-core capacity, which is capable of conducting strategic planning of the development, designing and implementing business projects to date, using a rich experience of developed market economies.

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