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METHODOLOGY FOR EVALUATING AN INNOVATIVE LOGISTICS SYSTEM

Summary

Innovations in any field characterize the process of obtaining a technological innovation based on scientifically based knowledge. Since innovation processes are cyclical in nature. And the innovation process proceeds in stages, not directly. The research paper deals with seven stages of the implementation of the innovation process. It is shown that in modern Azerbaijan there is a need to switch to an innovative logistics development strategy. And the transition to this strategy is becoming a global problem in this area. The development of innovative logistics technologies makes it possible to process large amounts of data and expand the prospects for using information and analytical centers of logistics providers.

This study presents the classification features and types of logistics innovations, as well as a generalization of basic and innovative logistics. It is revealed that fundamental and innovative logistics complement each other, but at the same time, there is a contradiction between them. Only the optimal solution of the entire complex of mutual management tasks allows you to achieve your goals. Since only the logistics system is able to recoup all logistical costs and ensure the highest efficiency. The issues related to the expediency of using innovative logistics are noted.

The World Bank regularly calculates and presents the sequence of countries in the world in a ranking reflecting the effectiveness of the logistics system. The Logistics Efficiency Index, which is determined by this organization, is a unique comparative analysis tool that measures the flexibility of logistics systems with data for 140 countries in 2023. The index consists of six components - customs assessment, infrastructure assessment, ease of transportation assessment, quality assessment of logistics services, timeliness assessment and tracking.

The creation of a national innovation system is considered a strategic indicator of innovative development in market conditions for the countries of the former Soviet Union, including Transcaucasia. The national innovation system will ensure the identification of innovation priorities, the formation and implementation of state programs for the development of innovative logistics and the stimulation of innovation activities.

Keywords: *innovative logistics, types, logistics efficiency index, development of innovative logistics*

Introduction

Logistics activities include a set of indicator systems that are associated with the establishment of balanced ratios of material, information and fiscal costs in the company. Logistics activities proceed through a multi-stage stage of circulation from an external source to the end user. Logistics services are expanding under the influence of transformations in the field of informatization. They form the processes that determine the needs of market participants, Also filtering out those who will not be able to adapt to them. In connection with these problems, the concept of Logistics 4.0 was born in the context of the formation and development of «Industry 4.0" [8, pp.53-58].

In logistics innovation, the most optimal technologies are:

- Enterprise Resource Planning;
- Warehouse Management System;
- Transport Management System;
- Customer Relationship Management;
- Radio Frequency Identification system.

The task of digitalization processes in the field of logistics innovation is to accelerate logistics processes, ensure their maximum continuity, and the process of converting data into digital forms using new methods of transportation and robotization is changing the logistics market today. Information and communication technology (ICT) has become an indispensable tool for logistics service providers (Internet Service Providers Lsp). Lsp have benefited from the use of ICT in their business processes mainly in terms of reducing costs and improving customer service [25, pp.1-9].

The innovation process is the process of consistently turning new ideas into new products or services, which is characterized by an innovative process - the transformation of academic knowledge into innovations. Accordingly, innovation activity has a cyclical nature. For example, the innovation process is implemented in stages (of 7 stages). [28, pp.763-769].

It should be noted that the company's profit begins with the fourth stage of the innovation process. Existing systems are basic for an innovative economy, an innovative economy encompasses systems that include information, production technologies and computerized systems. Implementing information systems radically transform production systems, technologies and various means in the field of information production and increase human intellectual activity [9, pp.42-45]. Scientific and technical novelty is considered one of the main characteristics or properties of innovations. Since scientific novelty, in turn, is evaluated according to technological parameters, as well as with a market position [24]. In the field of innovation and various innovations, there is not only the development of something new, but also in the field of management, finance, logistics, marketing, information, which confirms the all-encompassing nature of innovation.

In modern Azerbaijan today, there is a need to switch to a strategy of innovative development of all sectors, including logistics, which is becoming a global problem in this area. The country's accession to the World Trade Organization and the development of international and economic standards lead to an increase in the need for high-quality logistics services. Currently, various logistics methods require an integrated innovative approach in the field of information storage and processing. The Azerbaijani economy is going through a difficult period and requires a way out of the current economic situation.

Literature review

An analysis of the economic literature proves that the work of many scientists is devoted to the problems of conducting research on the development and implementation of

innovations in the transport system and logistics, and in recent years foreign scientists have also shown interest in this process. However, the topics of "logistic innovations" are devoted to a small number of theoretical studies. While the prerequisites and results of logistics innovations have been identified in leading logistics journals, very few empirical trials have been conducted. The spread of logistical innovations has also been given attention in the logistics literature [13, pp.360-377]. The purpose of this article is to determine the effectiveness of investment in innovative technology and logistics process.

Some researchers describe innovative logistics as a set of scientific knowledge, methods and skills for the study and rational optimal organization of any flow processes in order to increase the effectiveness of their results by identifying and using additional, usually hidden management reserves [12, pp. 75-82]. The development of logistics technologies has become possible due to the active introduction of information technologies that allow processing large amounts of data and open up prospects for the use of information and analytical centers of logistics providers. Investments in logistics technologies have become the main factor in the development of supply chains.

Such investments provide not only economic benefits from the use of various modes of transport, but they can also add a serious boost to the country's economy. A large dose of investment in the development of notification technologies or innovations in the field of improving supply chains corresponds to the global trend:

- investments in the field of information systems and technologies are growing;
- information systems and technologies are used in logistics and supply chain management [15, pp.266-271].

The development of innovative logistics technologies has become possible due to the active introduction of the latest information and their technologies, which allow processing large amounts of data and expand the prospects for using information and analytical centers of logistics providers. Logistics automation and cloud technologies allow you to reduce the costs associated with attracting labor resources, optimize delivery processes, look for partners and customers, participate in electronic auctions and monitor cargo levels online [1, pp.97-105].

It is permissible to assume that in the future the volume of investments in improving information technology in logistics will increase [6, pp. 65-69]. According to industry experts, Germany is a leading country in the development and implementation of logistics technologies. Currently, the country's main logistics centers are located in 6 cities: Berlin Hamburg; Berlin, Dusseldorf Frankfurt, Stuttgart, Munich and Nuremberg. All of them are mainly located in the western part of the country and 11 large logistics operators carry out transport activities are. For example, Maneuverability logistics, Concept Logistics, CS4 Logistics, Inter global Shipping, etc. [18, pp. 17-21; 27, pp.49-53].

The PwC Central and Eastern Europe report on this area highlights five main factors influencing the development of the transport and logistics industry:

- digitalization of the sphere;
- changes in logistics processes due to the introduction of new software;
- changing market dynamics;
- changes in international trade;
- changes in technological processes due to the introduction of new equipment [11, pp.127-138; 26, pp.116-127].

Innovative logistics can be considered as a set of scientific knowledge, methods and skills for the study and rational necessary organization of any flow processes in order to increase the effectiveness of their final results by identifying and using additional [7, pp.11-22].

Research methods

The proposed study uses data from several sources, including information on the development of progressive innovative systems in logistics, statistical materials on these industries. At the same time, the World Bank's materials on the countries of the world on the logical efficiency index. The abstract basis of the article devoted to the innovative logistics aspect is the works of scientists from the CIS countries and abroad on the education and development of an innovative logistics system. Statistical and information bases of work on innovative logistics are government programs, periodic scientific publications, etc. As a methodological basis for the work, the author used system-functional, statistical analysis, comparison and rating of indices.

The work also used the method of analyzing the rating indicators of the LPI logistics efficiency index.

Any logistics companies in the field of delivery, healthcare, crisis management and storage management have a lot in common (Fig. 1). Indeed, all of these systems require modeling and optimization. In cases where they evolve in a multi-criteria environment, such logistics systems in a similar category need tools to support obtaining solutions (as a rule, with antagonistic or conflicting criteria).

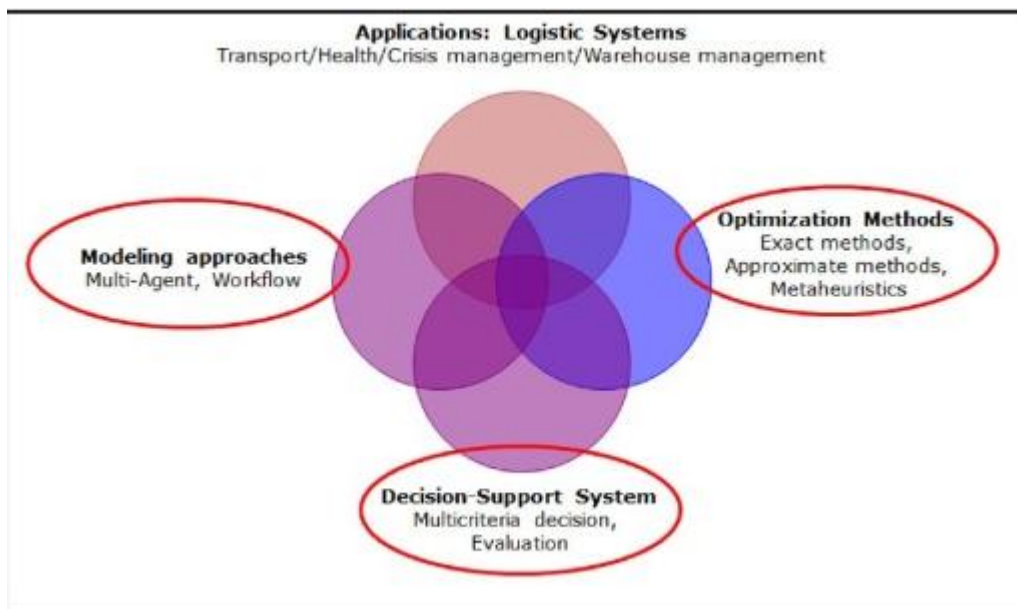


Figure 1. Analogies in the logistics system

A source: compiled by the author on the basis of [5, pp. 371-391]

Results and discussion

Innovative logistics follows the path of increasing the height of logistics process management in connection with the application of various innovations aimed at improving the quality of customer service, increasing the efficiency of logistics processes and reducing various costs.

Innovative logistics systems are connected and directly involved in the organizational system of product movement, which is a chain of logistics operations and system-wide innovations. Logistics innovations have a multi-level appearance.

Online business owners and logistics experts should be aware of the latest developments in the field of logistics. Since the expectations of fast and affordable delivery

motivate further research and development in the field of logistics innovations in the field of automation.

Logistics innovations represent improvements (changes) in logistics services, starting with warehousing and ending with order fulfillment and delivery at the "last mile". Therefore, it is necessary to highlight the following stages of the main logistics innovations of recent years, which have an impact on the supply chain in the logistics sector.

Such aspects include:

- warehousing according to requirements;
- Last-mile delivery;
- Warehouse management systems;
- Automation potential;
- Blockchain transactions;
- Geolocation technologies;
- Drones;
- Crowd shipping technology;
- Big data analytics;
- Autonomous vehicles;
- Cloud computing [31].

With a full set of technologies (a vendor-oriented dashboard and WMS used in all our order fulfillment centers), companies with data on the above-mentioned stages of the order fulfillment process for logistics innovation ensure transparency, consistency and visibility.

According to the study, carriers expect tariff increases this year, plan to increase investments in fixed assets and generally look positively at the introduction of technology as a tool to improve business efficiency. Now transport companies are forced to apply the technologies that their customers use. But most people realize that digitalization will increase efficiency and competitiveness. Innovative logistics services should be considered as management services. That is, traditional routine activities in economics and supply management (supply logistics) should be excluded from their composition, namely: physical operations with elements of flows in the field of commodity and material movement. Logistics is often grouped as a whole. But at the present stage there are various types of logistics related to diverse fields of activity. The scope of application (activity) and the stage at which the product is located determine the appropriate type of logistics. By definition, logistics is a set of stages that include from the beginning of product development, the production stage to the final stage of delivery to the consumer.

Table 1 shows the synthesis of basic and innovative logistics.

Table 1. Synthesis of different types of logistics

Basic logistics	Management objects	Forms and methods of management
	Material and material values	Necessary to ensure an acceptable level of management of this logistics structure
Innovative logistics	Any streaming processes	Necessary for optimal management of any streaming processes
Synthesis of basic and innovative logistics	Material and related financial and information flows	Necessary for optimal management of the supply of goods

A source: compiled by the author on the basis of [11, pp. 127-138]

The innovative aspect of logistics gives a unified methodology in terms of completeness and logical completeness [14, pp. 23-34]. All management decisions in the activities of companies related to procurement, warehousing, transport, service, distribution, etc. processes, in accordance with the concept of logistics, should be made taking into account the rationalization of the entire flow process.

From an economic point of view, basic and innovative logistics primarily complement each other, but at the same time there is a certain contradiction between them.

Only the optimal solution of the entire complex of mutual tasks (tactical and strategic) of management in a certain time mode based on the use of the main and additional potential of the entire logistics system allows you to achieve the invented (set) goals. In this case, only a logistics system that combines the majority of the numbers of operations or processes, levels, creating a synergistic effect, is able to recoup all logistics costs and ensure the highest efficiency.

It follows that the expediency of using innovative logistics is determined by:

- the possibility of developing a broader and meaningful logistics program by creating an end-to-end analytical and optimization organization for managing a set of material and service flow processes, i.e. integrated logistics, in several links of the supply chain of products or services based on a common information space in order to identify and use additional management reserves;

- solving logistical problems in various parts of the logistics chain in order to identify areas of mutual benefit and a promising compromise for several owners or associated logistics systems, etc.

Based on the above information on innovative logistics, it can be determined that the main principle of developing an organizational and economic management mechanism for this system is:

- detailing the main goal of the logistics project into composite sub-goals;
- the choice of an organizational management structure that provides the highest level of innovation sensitivity;

- formation of a new model for the development of companies in unstable environmental conditions;

- creation of a high-efficiency control and management accounting system for innovative logistics;

- creation of a new personnel management model focused on the collective participation of employees in the innovative logistics process, achieving the motivation of "resistance to change".

An analysis of the experience of foreign countries shows that based on factors such as economic, cultural, historical, social, etc. The innovative development of the countries of the world is individual. Therefore, so far, there is no single model that would suit all countries of the world without exception, and attempts to simulate the successful experience of other countries, perhaps, will not lead to the desired result without adapting to local conditions. However, there are certain areas for studying approaches to innovation management in countries with a high level of LPI.

According to the World Bank Group, most countries are well aware of the importance of logistics efficiency for development and integration. The book "Trade Logistics in the Global Economy" notes that the unambiguous nature of logistics is: logistics is not only the connection of infrastructure, but also the regulation of services, sustainability and resilience or simplification of procedures in the trade industry.

The World Bank Logistics Efficiency Index is a unique comparative analysis tool that measures the convenience of logistics systems in more than 140 countries with data in

2023. The World Bank Group uses the Logistics Efficiency Index as the most important starting point for dialogue with member countries on the driving forces of logistics efficiency. The index consists of six components - customs, infrastructure, ease of transportation, quality of logistics services, timeliness, and tracking [3].

The World Bank identifies the countries with the best trade logistics every two years, starting in 2007.

Table 2 shows the TOP 10 countries and CIS countries according to the logistics efficiency index in 2023.

Table 2. Ranking of the TOP 10 countries and CIS countries according to the logistics efficiency index, 2023

Range	Countries	LPI Score, points	LPI Group	Customs Score, points	Infrastructure Score, points	International Shipments Score, points
1	Singapore	4,3	1	4,2	4,6	4,0
2	Finland	4,2	2	4,0	4,2	4,1
3	Denmark	4,1	3	4,1	4,1	3,6
4	Germany	4,1	3	3,9	4,3	3,7
5	Netherlands	4,1	3	3,9	4,2	3,7
6	Switzerland	4,1	3	4,1	4,4	3,6
7	Austria	4,0	7	3,7	3,9	3,8
8	Belgium	4,0	7	3,9	4,1	3,8
9	Canada	4,0	7	4,0	4,3	3,6
10	Hong Kong SAR	4,0	7	3,8	4,0	4,0
...
27	Estonia	3,6	26	3,2	3,5	3,4
36	Latvia	3,5	34	3,3	3,3	3,2
40	Lithuania	3,4	38	3,2	3,5	3,4
81	Belarus	2,7	79	2,6	2,7	2,6
84	Georgia	2,7	79	2,6	2,3	2,7
85	Kazakhstan	2,7	79	2,6	2,5	2,6
88	Ukraine	2,7	79	2,4	2,4	2,8
96	Russian Federation	2,6	88	2,4	2,7	2,3
97	Uzbekistan	2,6	88	2,6	2,4	2,6
100	Armenia	2,5	97	2,5	2,6	2,2
109	Moldova	2,5	97	1,9	1,9	2,7
112	Tajikistan	2,5	97	2,2	2,5	2,5
128	Kyrgyz Republic	2,3	123	2,2	2,4	2,4

A source: compiled by the author on the basis of [3]

Calculations show that, according to the logistics efficiency index, the countries occupying the top ten (TOP 10) have the highest indices in the range of 4.0-4.3 points.

And the CIS countries, according to the country's logistics efficiency index (calculated by the World Bank), occupy 27 (Estonia)-128 (Kyrgyz Republic), which corresponds to 2.3-3.6 points on the index. The countries in the top ten are: 1st place Singapore (4.3 points), 2nd place Finland (4.2 points), 3rd-6th place Denmark, Germany, the Netherlands and Switzerland (all 4.1 points), 7th-10th place Austria, Belgium, Canada and Hong Kong (all 4.0 points).

The limit of points scored by the countries ranked 1-10 in the assessment of the logistics efficiency index according to the Customs Committee was 3.7-4.2 points. Among

these countries, the lowest score was in Austria (3.7 points), and the highest was in Singapore (4.2 points).

In the CIS countries, this indicator was in the range of 1.9-3.3 points. Among these countries, Moldova had the lowest score (1.9 points), and Latvia had the highest score (3.3 points).

The assessment of the country's infrastructure in the top ten received 3.9-4.6 points. Since Austria scored the lowest score (3.9 points), and Singapore scored the highest score (4.6 points). The CIS countries had a score within 1.9 points (Moldova) and the countries Estonia and Lithuania scored 3.5 points each.

According to the international freight transport indicator, the countries in 1st - 10th place had a score limit of 3.6-4.1. Among them, Canada, Denmark and Switzerland were rated with the lowest score of 3.6, and Finland with the highest score-4.1.

Among the CIS countries, the lowest level of assessment was in Armenia (2.2 points), and the highest was in Estonia and Lithuania (3.4 points).

Thus, it can be noted that the difference between Singapore, which took the first place, and the Kyrgyz Republic, which took the last place, according to the Logistics Efficiency Index was 2.0 points.

It should be noted that Azerbaijan's data on this indicator is not included in the assessment of the logistics efficiency index. In our opinion, Azerbaijan, having the Alat Free Economic zone and the Ipek Yolu road, would occupy a certain number according to the logistics efficiency index.

The Zangezur Corridor is a transport corridor project promoted by Azerbaijan through the territory of Armenia (about 40 km), considering providing transport links between the western regions of Azerbaijan and the Nakhichevan Autonomous Republic (NAR). The transport corridor project is promoted by Azerbaijan and Turkey every time. Armenia constantly objects to it, arguing that the "logic of the corridor" is not noted in the trilateral ceasefire statement. It should be noted that this is considered a form of propaganda by Armenia.

Various observers comment on the "Zangezur Corridor", analyzing the political consequences of using this term and, if implemented, characterizing the opening of this corridor as a pan-Turkist agenda.

According to the calculations of the Center for Analysis of Economic Reforms and Communications of Azerbaijan, unblocking transport links between the territory of Azerbaijan and the NAR will help the country to increase exports by \$710 million. In this regard, Azerbaijan will save about \$10 million on subsidizing flights from Baku to Nakhichevan. Also, the opening of the railway will help to establish gas supplies, since gas supplies are carried out through Iran. According to this, Iran retains 15% of Azerbaijani transit for gas supplies. According to experts, the opening of the Kars-Nakhichevan-Meghri-Zangilan-Baku railway is important from the point of view of lifting the blockade of Nakhichevan.

Also, this road is important for reducing transport costs, increasing the possibility of foreign trade, developing the tourism sector and passenger turnover, as well as attracting local and foreign investments in this region.

Conclusion

In modern conditions for the Transcaucasian countries, the creation of a national innovation system is considered a strategic direction of innovative development. The national innovation system provides for the definition of innovative priorities, the formation and implementation of state programs in this direction. The implementation of

measures to develop innovative logistics and stimulate innovative development will enable state development and the introduction of innovations in the field of logistics.

The technology level of existing transport companies and their management in the CIS countries remains unsatisfactory. Productive innovations are very slowly integrated into the innovation and logistics industry, and the accumulated foreign experience is slowly spreading. The transport infrastructure at this stage is characterized by a lag in the application of modern organization and management of freight and passenger transportation, advanced technologies for the construction and repair of transport networks, as well as in the informatization of management and control processes.

In modern conditions, innovation management and assessment of the importance of investment projects, as well as logistical coordination in the decision-making process related to product or process innovations, become an important element of the activities of logistics innovation systems.

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МЕТОДИКА ОЦЕНКИ ИННОВАЦИОННОЙ ЛОГИСТИЧЕСКОЙ СИСТЕМЫ

Резюме

Инновации в любой сфере характеризуют процесс получения технологической навизны на основе научных знаний. Поэтому инновационный процесс носит циклический характер. Инновационный процесс осуществляется поэтапно, а не напрямую. В исследовательской работе речь идет о семи этапах реализации инновационного процесса. Показано, что в современном Азербайджане существует необходимость перехода к инновационной стратегии развития логистики. А переход на эту стратегию становится глобальной проблемой в этой области. Развитие инновационных логистических технологий позволяют обрабатывать большие объемы данных и расширяют перспективы использования информационно-аналитических центров логистических провайдеров.

В исследовании рассматриваются классификационные характеристики и особенности логистических инноваций, синтез базовой и инновационной логистики и др. Определено, что базовая и инновационная логистика в первую очередь дополняют друг друга, но в то же время между ними существует противоречие. Только оптимальное решение всего комплекса задач взаимного управления позволяет достичь **поставленных целей**. Поскольку только логистическая система способна окупить все логистические затраты и обеспечить наивысшую эффективность. Отмечены вопросы, связанные с целесообразностью использования инновационной логистики.

Регулярно Всемирный Банк рассчитывает и представляет последовательность стран мира в рейтинге, отражающем эффективность логистической системы. Индекс логистической эффективности, который определяет эта организация, является уникальным инструментом сравнительного анализа, который измеряет гибкость логистических систем с данными по 140 странам в 2023 году. Индекс состоит из шести компонентов - таможенной оценки, оценки инфраструктуры, оценки простоты транспортировки, оценки качества логистических услуг, оценки своевременности и отслеживания.

Стратегическим показателем инновационного развития в рыночных условиях для стран бывшего Советского Союза, в том числе и Закавказья, считается создание национальной инновационной системы. Национальная инновационная система **обеспечит определение инновационных приоритетов**, формирование и реализацию государственных программ развития инновационной логистики и стимулирования инновационной деятельности.

Ключевые слова: инновационная логистика, виды, индекс логистической эффективности, развитие инновационной логистики

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İNNOVATİV LOGİSTİKA SİSTEMİNİN QİYMƏTLƏNDİRİLMƏSİ METODOLOGİYASI

Xülasə

İstənilən sferada innovasiya elmi biliklərə əsaslanan yeniliyin əldə edilməsi prosesini özündə xarakterizə edir. Odur ki, innovasiya prosesi tsiklik xarakter daşıyır. İnnovasiya prosesi birbaşa deyil mərhələlərlə həyata keçirilir. **Tədqiqat işində innovasiya prosesinin** yeddi mərhələli həyata keçirilməsindən bəhs olunur. Qeyd edilir ki, müasir Azərbaycanda logistikanın innovativ inkişaf strategiyasına keçid zərurəti mövcuddur. Bu strategiyaya keçid isə həmin sahədə global problemə çevrilir. İnnovativ logistika texnologiyalarının inkişafı böyük həcmdə məlumatların işlənməsinə imkan verir və logistika təminatçılarının informasiya və analitik mərkəzlərindən istifadə perspektivlərini genişləndirir.

Tədqiqatda logistika yeniliklərinin təsnifat xüsusiyyətləri, növləri, əsas və innovativ logistikanın sintezi və s. məsələlər geniş araşdırılır. Əsas və innovativ logistikanın ilk növbədə bir-birini tamamladığı, eyni zamanda aralarında bir ziddiyyət olduğu müəyyən edilmişdir. Qarşılıqlı idarəetmə problemlərinin bütün kompleksinin yalnız **optimal həlli məqsədlərə** çatmağa imkan verir. Çünki yalnız logistika sistemi bütün logistika xərclərini ödəyə və ən yüksək səmərəliliyi təmin edə bilər. İnnovativ logistikadan istifadənin məqsədəuyğunluğu ilə bağlı məsələlər qeyd olunub.

Mütəmadi olaraq Dünya Bankı logistik sistemin səmərəliliyini əks etdirən reytingdə ölkələrin sıralanmasını hesablayır və təqdim edir. Bu təşkilatın müəyyənləşdirdiyi logistik səmərəlilik indeksi, 2023-cü ildə 140-cü ölkə üçün məlumatları olan logistika sistemlərinin rahatlığını ölçən unikal bir müqayisə vasitəsidir. İndeks altı komponentdən ibarətdir - Gömrük qiymətləndirməsi, infrastrukturun qiymətləndirilməsi, nəqliyyatın asanlıqının qiymətləndirilməsi, logistika xidmətlərinin keyfiyyətinin qiymətləndirilməsi, vaxtında qiymətləndirmə və izləmə.

*Keşmiş sovetlər ittifaqı ölkələri, o cümlədən Zaqafqaziya ölkələri üçün bazar şəraitində innovativ inkişafın strateji göstəricisi milli innovasiya sisteminin yaradılması hesab edilir. Milli innovasiya sistemi **innovativ prioritetlərin** müəyyənləşdirilməsini, innovativ logistikanın inkişafı və innovativ fəaliyyətin stimullaşdırılması üçün dövlət proqramlarının formalaşdırılmasını və həyata keçirilməsini təmin edəcəkdir.*

***Açar sözlər:** innovativ logistika, növləri, logistika səmərəliliyi indeksi, innovativ logistikanın inkişafı*