

Electronic scientific and practical journal
**INTELLECTUALIZATION OF LOGISTICS
AND SUPPLY CHAIN MANAGEMENT**

#19 (2023)
June '23



WWW.SMART-SCM.ORG

ISSN 2708-3195

DOI.ORG/10.46783/SMART-SCM/2023-19

ISSN 2708-3195



9 772708 319005

Electronic scientific and practical publication in economic sciences

Electronic scientifically and practical journal “Intellectualization of logistics and Supply Chain Management” included in the list of scientific publications of Ukraine in the field of economic sciences (category "B"): **Order of the Ministry of Education and Culture of Ukraine dated October 10, 2022 No. 894 (Appendix 2)**

Field of science: Economic.

Specialties: 051 – Economics; 073 – Management

ISSN 2708-3195

DOI: <https://doi.org/10.46783/smart-scm/2023-19>

The electronic magazine is included in the international scientometric databases:
Index Copernicus, Google Scholar

Released 6 times a year

№ 19 (2023)

June 2023

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In 2020, the International Center for Periodicals (ISSN International Center, Paris) included the Electronic Scientific and Practical Edition "Intellectualization of logistics and Supply Chain Management" in the international register of periodicals and provided it with a numerical code of international identification: ISSN 2708-3195 (Online).

Recommended for dissemination on the Internet by the Academic Council of the Department of Logistics NAU (No. 7 of February 26, 2020). Released 6 times a year. Editions references are required. The view of the editorial board does not always coincide with that of the authors.

Electronic scientifically and practical journal "Intellectualization of logistics and Supply Chain Management" included in the list of scientific publications of Ukraine in the field of economic sciences (category "B"): **Order of the Ministry of Education and Culture of Ukraine dated October 10, 2022 No. 894 (Appendix 2)**

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Specialties: 051 – Economics; 073 – Management

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DOI: <https://doi.org/10.46783/smart-scm/2023-19>
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тел.: (063) 593-30-41
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INTRODUCTION

We are happy to invite you to get acquainted with the first issue of the new scientific and practical publication "Intellectualization of Logistics and Supply Chain Management".

We strongly believe that the launch of this magazine indicates the objective need to rethink a wide range of issues related to the development of theory and practice in logistics and supply chain management, awareness of the need to unite the scientific community and logistics practitioners, dissemination of modern knowledge and best practices for innovative development of the logistics services market.

The first issue of the magazine is published at a difficult time. The global coronavirus pandemic and the deep economic crisis have significantly worsened business activity in the world. Currently, global supply chains are collapsing, international trade is declining, and competition between global and regional logistics operators is intensifying. The most common thesis is that the world will never be the same again. Industry experts predict the emergence of new, more flexible and adaptive supply chain management strategies and approaches to logistics business process management. The trend towards collaborations, cooperation and unification of services is emerging, comprehensive proposals for clients are being developed. There is increasing talk about the need to build bimodal supply chains, which involves the development of different decision-making scenarios: the traditional approach - cost-effective efficiency, low risk, high predictability; a new approach "second mode" - rapid recognition of opportunities, adaptability, willingness to solve unexpected problems and look for new opportunities.

Radical transformations of the global and national markets for logistics services require appropriate scientific support. Logistics science has a special role to play in this process. Initiating the emergence of a new journal, we decided to focus on its coverage of problematic aspects of the formation and development of logistics systems at the micro, mezo and macro levels, supply chain management, digitization of logistics, methods and tools for optimizing processes in logistics and supply chains, sociopsychology relations and network interaction of enterprises using cloud technologies, artificial intelligence, e-learning, neural business process management systems, etc.

Therefore, we invite scientists, researchers and business representatives, as well as our colleagues from abroad, to cooperate and present the results of scientific research, to discuss and debate on them, to work together to develop the scientific theory of logistics and promote mutual intellectual enrichment.

We hope that the new scientific publication will become a theoretical guide for young researchers and representatives of other fields.

HRYPHORAK Mariia
Chief Editor



UDC 656.025.4 - 027.236 "364"(045)

DOI: <https://doi.org/10.46783/smart-scm/2023-19-1>

JEL Classification: L13, O12, Q10.

Received: 04 June 2023

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FACTORS INFLUENCING THE EFFICIENCY OF THE ORGANIZATION OF MULTIMODAL TRANSPORTATION UNDER THE CONDITIONS OF THE STATE OF MARTIAL

Dmytro Bugayko, Volodymyr Reznik, Shevchenko Olga *"Factors influencing the efficiency of the organization of multimodal transportation under the conditions of the state of martial".* Intermodal transportation plays an important role in the global economy. Many manufacturing sectors require various components in remote locations. Intermodal transportation is used to ensure that production processes are not interrupted. The war particularly affected Ukraine's entire intermodal transportation system. Ports, shelters and piers stopped their activities. The main role shifted to road transportation. Many airports were completely destroyed and most of the major ports were occupied, making further operations impossible until Ukraine was completely victorious. Road transportation became the saving link for supply chains and further economic activity. One of the main problems in this situation is to choose the best mode of transportation and the most suitable carrier. Trucking companies continue to cooperate with air agencies, but the shift of their main hubs to neighboring countries may raise new questions about optimizing deliveries. Factors such as price, quality of service, distance and time will always play an important role in the supply chain. The main goal of transport companies and their staff in intermodal transportation is to deliver the goods ordered by manufacturers safely, completely and on time. In this article, all the risks, bottlenecks of the organization of multimodal transportation under martial law are researched.

Keywords: transport system, cargo transportation, multimodal transportation, optimization processes, routes planning.

Дмитро Бугайко, Володимир Резнік, Шевченко Ольга. «Фактори, що впливають на ефективність організації мультимодальних перевезень в умовах воєнного стану». Інтермодальні перевезення відіграють важливу роль у світовій економіці. Багато виробничих секторів потребують різноманітних компонентів у віддалених місцях. Інтермодальні перевезення використовуються для забезпечення того, щоб виробничі процеси не переривалися. Війна особливо вплинула на всю систему інтермодальних перевезень України. Порти, причали та причали припинили свою діяльність. Основна роль перейшла до автомобільного транспорту. Багато аеропортів було повністю знищено, а більшість великих портів окуповано, що унеможливило подальші операції до повної перемоги України. Рятівною ланкою для ланцюгів поставок і подальшої господарської діяльності став автомобільний транспорт. Однією з головних проблем у цій ситуації є вибір найкращого виду транспорту та найбільш підходящого перевізника. Автотранспортні компанії продовжують співпрацювати з авіаагенціями, але перенесення їх основних хабів у сусідні країни може викликати нові питання щодо оптимізації поставок. Такі фактори, як ціна, якість обслуговування, відстань і час завжди будуть відігравати важливу роль у ланцюжку поставок. Основною метою транспортних компаній та їх персоналу в інтермодальних перевезеннях є безпечна, повна та вчасна доставка вантажів, замовлених виробниками. У статті досліджено всі ризики, вузькі місця організації мультимодальних перевезень в умовах воєнного стану.

Ключові слова: транспортна система, вантажні перевезення, мультимодальні перевезення, процеси оптимізації, планування маршрутів

Introduction. The modern globalized economy requires new conditions for the adaptation of intermodal transport. The role of intermodal transportation is becoming increasingly important. This is because this type of transportation allows production processes in different geographical locations to continue without interruption. When considering intermodal transportation, it is first necessary to consider the nature of this concept. Intermodal transport is the transportation of goods by two or more means of transport organized by a single logistics company. Moreover, the main transport company has the possibility to contract with subcontractors who provide other means of transport, but the main transport company is responsible for delivery. The different types of transport include rail, sea, car and air.

Thus, the main objective of the carrier's activity in the field of intermodal transportation is to ensure the timely delivery and integrity of the goods without violating

the conditions of a smooth production process.

A number of Ukrainian researchers such as Kharazishvili Y. [2, 7], Bugayko D. [1-2, 4-7], Reznik V. [1], Hryhorak M.Yu [4, 19], Ovdienko O., Marchuk V. [4], Logutova T. G., Poltoratskyi M. M [3] Hariesh Manaadiar [8-9] , David Simchi-Levi and Pierre Haren [11-13], Perkhun L.P.[16], F. Pérez-Galarce [17], are devoted to the study of the problems of further development of intermodal transportation. The work of many researchers is devoted to the development of aviation logistics, including: Johnson R., Hegre H., Karlsen J., Nygård H. M., Strand H., Urdal H., Shallcross N. J., Ahner D. K., Bogachov S., Feldman N., Eiran E., Rubin A., Brown G., Langer A., Schirch L., Kaspersen A., Barth E., Shetler-Jones Ph., Shallcross N. J., Ahner D. K., et al.

Also, among domestic researchers of the mentioned issue, the works of such scientists as: Arefieva O[20]., Simkova T., Zhurakivskyi V., Kharizashvili Yu., Bugayko D., Lyashenko V.,

Solovyova O., Gerasimenko I., Pron S. should be noted., Kravchenko T., Vysotska I., Valko A., Volkovska G [21]. Vysotska I [22] , Voychenko T., Radchenko O.[23] , Gura S [24]. and others.

Also, among the foreign researchers of the issue mentioned works are : Poliak M., Poliaková A., Mrníková M., Šimurková P., Jaśkiewicz M., Jurecki R., who researched the Competition and Regulation in the Provision of Local Transportation Services. Also, Glover, L. should be mentioned.

Dissertation studies sufficiently cover the issues of institutional support for the development of air transport in Ukraine, methodological aspects of increasing the efficiency of enterprises in the specified industry (Hura S. [24].), scientific justification for increasing the efficiency of managing logistics costs in the multimodal transportation (Kharchenko M.), the development of innovative activity of logistic companies (Tsymbalistova O.), management of the efficiency of logistics activities of e companies (V. Voytsekhovskiyi) and others.

While highly appreciating the available scientific achievements of domestic researchers, we will nevertheless single out insufficiently covered scientific problems related to the development of logistics in the conditions of martial law and in the post-war period in Ukraine. The article was written to note the most important factors influencing the organizing of the multimodal transportation under martial law.

The purpose of the article is to provide research is to provide the theoretical foundations and problems of managing multimodal transportation and to develop project recommendations for transformation of the organization of multimodal transportation under martial law. It was also reviewed the main bottlenecks at the process of the organization of multimodal transportation during the state of martial law". It was also reviewed on the example of the Transport Organization, including the data provided by LLC "Freight Transport Partner".

Presentation of the main results. The effectiveness of intermodal transportation depends on a number of strategic constraints of internal and external nature.

In today's unstable conditions of institutional functioning, it is important to create a logical chain that forms effective organizational and economic mechanisms for innovative development of the transport sector in the intermodal transport system.

The efficiency of intermodal transportation depends on several factors, including

- Availability. The efficiency of intermodal transport depends to a large extent on how well the different means of transport are connected and accessible to each other. Adequate connections between means of transport reduce transit times and costs and increase overall efficiency;

- Coordination and synchronization. For intermodal transport to be effective, the various means of transport must be well coordinated and synchronized. This requires proper communication, planning and management to ensure that all means of transport are ready when needed and that there are no unnecessary delays;

- Infrastructure and technology The quality of infrastructure and technology used in intermodal transportation affects the efficiency of transportation. Good infrastructure such as well-developed roads, efficient ports and modern airports can reduce delays and increase efficiency. Advanced technologies such as tracking systems and real-time information can also help optimize the use of different modes of transport;

- Economic efficiency. To encourage the use of intermodal transport and make it a viable option, the cost of intermodal transport must be reasonable and competitive with other modes of transport. [25]

The effectiveness of intermodal transportation depends on the extent to which the above elements can synergize. Done properly, intermodal transport can provide a variety of benefits, such as

shortening transport times, reducing costs and improving environmental sustainability.

Air plays a key role in improving the efficiency of intermodal transport and its benefits include speed and time savings (air transport is one of the fastest modes of transport and helps reduce the time needed to move goods and people over long distances); flexibility (ensuring the flexibility of intermodal transport, which consists of responding quickly to changes in transport routes and schedules), accessibility (improving accessibility to remote and hard-to-reach areas) and efficiency (the speed and efficiency of transporting large quantities of goods and people, which is also a key component of the intermodal transport system). (the use of air transport as a component of the intermodal transport system contributes to increasing the throughput and, ultimately, the efficiency of the overall system).

Thus, the main criteria for selecting the optimal transport company within the framework of intermodal transportation are the criteria of economic efficiency and convenience, which contribute to reducing the costs of transporting raw materials and supplies necessary to ensure an uninterrupted production process. In cases of martial law, intermodal transport is the best transport option for domestic production enterprises. These include regulations that have been taken in the form of solutions in the form of decrees, orders, requests, applications, manuals, etc. Regulations and orders of local authorities shall within the competence and operate within the respective cities, districts, villages, towns, neighbourhoods, etc. Typically, these acts regulate relations in the sphere of public order, health, and trade within the respective administrative- territorial unit.

The last challenge on the global transportation market was during the first staged of COV-19 pandemic. Because of closed borders the terms of delivery were corrected. But shortcomes and failures, which discontinue the whole scheme of

transportation. The main reason for this were COV-19 restrictions, due to which the most harm was for container transportation. The whole process was stopped and timely paused, a lot of containers were in harbours waiting for repacking and reloading in auto, there was the lack of auto which are constructed for container transportation. But unfortunately, after one problem, there is an another, due to the war in Ukraine, all the airports are closed and harbours also temporary inefficient. All the capacity fallen into road transport, which consequent the lack of car transport and higher prices in different cases prices for transportation increased more than twice. Ukrainian carriers, which capital and sources survived under russian aggression, fastly restructurised their kind of services under new market terms. The first priority is humanitarian cargo. According to the official statistics of volunteer organizations, only at the first month of war, 120 humanitarian transportations had been performed.

This number includes both domestic and international deliveries. Food medicines, clothing, hygiene products, ammunition and goods for the militaries were carried. Mainly from the west of Ukraine to Kyiv, and from Poland and the Netherlands to Lviv. From Lviv this were carried to other points which were dangerous.

In most cases first time, humanitarian routes were free, the freight included only costs for fuel, but when the situation became getting better, the prices and demand became to grow. All the trucks, moving from one point of loading to another, to avoid the empty fuel wasting, were loaded by humanitarian cargo.

A lot of big logistics companies temporarily stopped their operational activity in Ukraine during the first month of war. There was lack of drivers, so the Ukrainian authority in order to reduce lack, allow to drive trucks with different categories of driver license. The commercial transportation of cargoes was also almost stop, in average only 15%-20% from all the orders and customers remained.

Table 1. Classification of restrictions affecting the efficiency of transport infrastructure.

A group of restrictions	A types of restrictions	Brief description
1	2	3
1. External	1.1. Innovative resources	Restrictions at the state level, restraining the level of development of the technological base, equipment, the use of resource-saving technologies, which determine the presence of a scientific and technical development department for the development of transport infrastructure
	1.2. Financial resources	The availability of financial resources in the state for investing in transport infrastructure, including the possibility foreign investments.
	1.3. Workforce	The availability of engineering, production, and logistics personnel of the necessary qualifications and appropriate level in the studied region, the possibility of involving personnel in the development of transport infrastructure
	1.4. Environmental resources	The possible negative impact of the use of transport infrastructure on the ecological situation, i.e. to what extent transport, development and expansion of the productivity of its infrastructure correspond to the ecological capabilities of the region in terms of air pollution, ecological load on the biosphere, etc.
	1.5. Political resources	They are determined by the economic policy of the state, the political situation at the time of the management decision, etc.
2. Internal	2.1. Financial resources	The availability of financial resources at enterprises for the formation and development of transport infrastructure, for the implementation of measures for the modernization of the transport fleet, etc.
	2.2. Material resources	Availability of enterprise assets that are a necessary component of the transport system
	2.3. Workforce	The availability of personnel of the appropriate level of qualification who are able to develop management decisions and participate directly in the formation and further use of transport infrastructure
	2.4. Innovative resources	Restrictions restraining the level of development of the technological base of the transport infrastructure, which determine the level of scientific and technical developments regarding the development of a new spectrum of transport and logistics services that consumers need more
	2.5. Information resources	Availability of information communication between all participants of the transportation chain; the possibility of functioning of information systems of different levels on a real-time scale with appropriate accuracy, speed and productivity

Developed by: Developed by Bugayko Dmytro, Reznik Volodymyr, Shevchenko Olga

Only after few months of war, export starts to alive. As for domestic transportation, situation began stable in save and remote regions. The war also created a shortage of warehouses, with many buildings either completely destroyed or partially bombed. Warehouses in the Western Region did not have sufficient capacity to store so much

cargo, including humanitarian cargo, which more than doubled compared to before the war. Moreover, despite the restructuring of the normal logistics network, prices rose rapidly. For example, a 20-ton truck from Kiev to Lviv, which cost UAH 10,000 before the war, now starts at UAH 50,000. Many factors influence prices: - urgency of transportation,

delivery time- Existing transport conditions. The active use of scientific and technological achievements and innovative technologies can increase the competitiveness of transport companies in national and international markets. Therefore, "technological developments in the transport sector include:

- Intelligent transportation systems (intelligent road transportation systems);
- Robotic process automation (Robotic Process Automation);
- Artificial Intelligence (Artificial Intelligence);
- Blockchain (Blockchain and all distributed ledger technologies);

Table 2. Sea ports in Ukraine [3]

№	Port name	Port location
1	2	3
1	Belgorod - Dniester seaport	The port is located on the shores of the Dniester estuary northwest of the Dniester-Constantinople estuary (southern bucket of the Dniester estuary)
2	Berdyansk seaport*	Sea of Azov, Berdyansk Bay, Tonka Strait
3	Izmail seaport	Port in the Odessa region, located at the mouth of the Kili River Danube.
4	Chernomorsk seaport	Black Sea
5	Mariupol seaport *	North-western part of the Taganrog Bay of the Sea of Azov
6	Mykolaiv seaport	The Mykolaiv seaport is located in the city of Mykolaiv near the left bank of a bend of the river the Southern Bug for 19 miles to the north from its mouth. The port also includes the port of Ochakiv and a raid near the city of Ochakiv near the banks of Trutayev
7	Odessa seaport	Black Sea, Odessa Bay
8	Specialized seaport Olbia	The left bank of the Bug-Dnieper estuary
9	Reni seaport	Coastline on the left bank of the Danube
10	Skadovsk seaport*	Black Sea. Dzharilgatskaya Bay
11	Ust-Dunaisk seaport	Odessa region, Kiliya district, Vilkovye city
12	Kherson seaport*	right and left banks of the Dnieper River in the city of Kherson
13	Southern seaport	Black sea, Adzhalik estuary

Developed by: Volodymyr Reznik, Bugayko Dmytro

According to the operational data of SE "AMPU", by the end of 12 months of 2021, port operators in all ports of Ukraine handled 153.076 million tons of cargo, down by 6.04 million tons or 3.8% compared to the same period last year.

In 2021, port operators handled 118.1 million tons of export cargo at sea (-4% compared to the same period in 2020), 24 million tons of import cargo (+1.5% compared to the same period in 2020), 8.6 million tons of transit (-14.3% compared to the same period in 2020), 2.3 million tons of cabotage cargo (-2.4% compared to the same period in 2020). handled.

Grain and ore were the largest cargoes handled at the ports in the 12-month period, with 49.9 million tons (+3.9% y/y) and 37.75 million tons (-14.8% y/y), respectively. Transshipment of petroleum products increased by 82% in the 12-month period, reaching 1.93 million tons.

On the Figure, represented by author, you can see the map if the Ukrainian railroads. Railway transportation plays a key role at the transport infrastructure of Ukraine. Also it is one of the component of the whole systems of multimodal supply chain. [26]



Figure 1 – Railway road map of Ukraine

Source: Screenshot Electronic resource- [Link] - <http://www.ua-maps.com/map-10/>

As to the railway transportation, for accurate understanding the dynamics, the Table 3 is provided bellow.

Table 4 – Calculation of assessments according to quantitative criteria

№	Freight type	Years					
		2016	2017	2018	2019	2020	2021
1	Total freight	343	339	322	313	306	314
2	oil and oil products	15 (4)	14 (4)	12 (4)	12 (4)	11 (4)	12 (4)
3	coal	73 (21)	67 (20)	65 (20)	59 (19)	49 (16)	50 (16)
4	coke	8 (3)	6 (2)	6 (2)	5 (1)	5 (2)	5 (2)
5	ore	77 (23)	70 (21)	71 (22)	75 (24)	80 (26)	78 (25)
6	cement	6 (2)	6 (2)	6 (2)	6 (2)	6 (2)	6 (2)
7	chemical and mineral fertilizers	11 (3)	12 (4)	9 (3)	9 (3)	9 (3)	11 (4)
8	timber	4 (1)	4 (1)	3 (1)	1 (0)	1 (0)	1 (0)
9	ferrous metals (including scrap)	29 (8)	26 (7)	25 (8)	24 (8)	22 (7)	24 (8)
10	grains, cereals and flour	32 (9)	37 (11)	34 (10)	40 (13)	35 (11)	34 (11)
11	other freight	88 (26)	97 (28)	91 (28)	82 (26)	88 (29)	93 (30)

Source: State statistics service-[Electronic source]-Link- <https://www.ukrstat.gov.ua>.

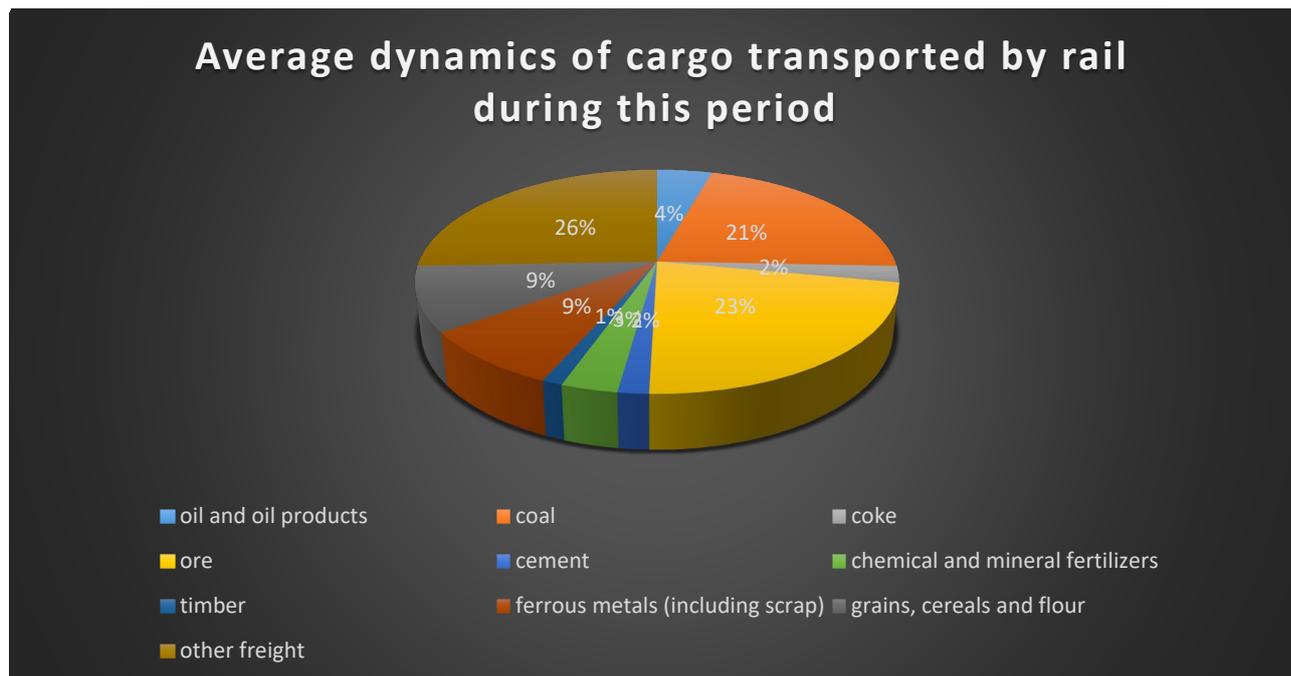


Figure 2 – Average dynamics of cargo transported by rail during this period (2016-2021)
 Source: State statistics service-[Electronic source]-Link- <https://www.ukrstat.gov.ua>.

Table 4. – Dynamics of volumes of cargo transportation by types of transport in Ukraine, million tons

№	Type of transport	Years									2022 in % by 2021
		2013	2014	2015	2016	2017	2018	2019	2020	2021	
1	Total of all transport including:	1837	1623	1474	1543	1582	1643	1579	1641
2	Rail	444	386	350	343	339	322	322	306	314	102,9
3	Road	1261	1131	1021	1086	1122	1206	1206	1232
4	including car companies	126	131	109	123	126	134	190	152	224	147,4
5	Sea	3	3	3	3	2	2	2	2	2	95,2
6	River	3	3	3	4	4	4	4	4	4	96,7
7	Air	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	92,7
8	Pipeline	126	100	97	107	115	109	113	97	78	79,6

Source: State statistics service-[Electronic source]-Link- <https://www.ukrstat.gov.ua>.
 Developed by: Reznik Volodymyr

The data in Table 4 shows that freight traffic by rail has been decreasing for six years: A slight increase of 2.6% in 2021 compared to 2020, but a decrease of 8.5% compared to 2016. At the same time, coal transport volumes fell significantly, by 31.5% in 2021 compared to 2016, and oil and petroleum

products by 20% compared to 2016. However, volumes of ore and grain, cereals and flour increased: 1.3% and 6.3% respectively in 2021 compared to 2016. The analysis of the structure of freight transportation by rail shows that the largest share in the structure of freight transportation

by rail belongs to other cargoes with 26%-30%. Ore and coal account for 21%-26% and 16%-21%, respectively.

According to the results of October 2022, 'Ukrzaliznitsia' transported 12.06 million tons of cargo. This is an increase of 380,000 tons or 3.3% compared to September this year. The volume of export cargoes in October was 5.186 million tons, of which 3.059 million tons were grain cargoes. UZ as a whole transported 3.598 million tons of grain in October (5.8% more than in September), the highest monthly volume since the start of the full-scale war. The transport volume was the highest on record.

Cement was transported at 288.6 million tons, coal at 2,213 million tons and construction materials for mines at 1,951 million tons. The volume of iron and manganese ore transported fell to 1.4259 million tons (-4.3% compared to September)

and steel to 6.285 million tons (-9.2% compared to September) [27]

It can be made such conclusions from the Table 4, as

Rail transportation: freight traffic fell by 65.3%. About 6.3 thousand km of tracks were destroyed. 'Ukrzaliznytsia' increased freight transportation tariffs by 70%.

Road transportation: the total length of destroyed roads is 24,000 km. Overloading due to huge queues at border crossings.

Water transport: closure of sea ports (exception: ships of the "Grain Agreement"). There are four ports in the occupied territory (Berdiansk, Mariupol, Skadovsk and Cologne).

Air transportation: all forms of civilian transportation are completely suspended. Twelve airports have been partially or completely destroyed.

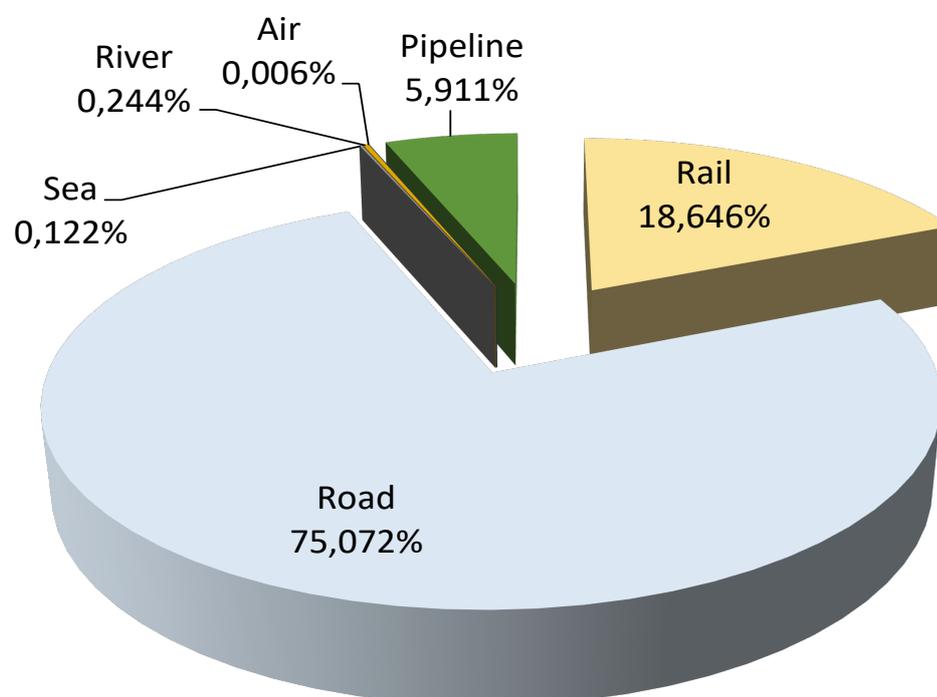


Figure 4 – The share of types of transport in volumes of cargo transportation by 2021 year.

Source: : State statistics service-[Electronic source]-Link- <https://www.ukrstat.gov.ua/>

Developed by: Bugayko Dmytro, Reznik Volodymyr, Shevchenko Olga.

Taking into account the experience of intermodal transport in Europe, the creation and development of this type of transport in

Ukraine is very important and requires solving a number of issues related to the organization of transport on existing and new routes, in

particular, compliance with EU norms. Due to the complex geopolitical situation, road and rail transport leads the westward transport flows. It is clear that the work of the transport complex reflects the state of the regional economy, which is currently not in the best condition. In order to make the most of Ukraine's transport capacity, especially as a transit country, it is necessary to create a customer-oriented transport service system, ensure effective organization of the country's transport and road complexes, and effectively combine all types of transport capacities and capabilities on the basis of partnership and competition in transport. Below are some of the key elements of the system. Measures should be taken to achieve synergies from the combination of two. [28]

Conclusions. In today's unstable situation of institutional functioning, it is important to create a logical chain that forms an effective organizational and economic mechanism for innovative development of the transport sector in the intermodal transport system.

The objectives of innovative activities of transport enterprises are:

- Ensuring the quality of transportation services;
- Responsiveness to orders and timeliness of transportation;
- Ensuring the safety of freight transportation;
- Implementation of up-to-date information systems;
- Use of energy-saving technologies;
- Increasing the environmental compatibility of transport services.

The priority direction of state regulation of the economy is the stimulation of innovative activities, which requires the establishment of an effective innovation and innovative processes management system to ensure the exit of the transport sector from the crisis situation and the development of an intermodal transport system. The main reasons hindering the innovative development of the transport sector in the intermodal transport system are:

- Incomplete legal basis for the implementation of intermodal transportation of goods;
- Incompatibility of regulations on the transportation of dangerous goods with EU norms;
- Lack of conditions for the establishment and operation of national intermodal transport operators;
- Incomplete customs policy in transport;
- High risks for intermodal operators when organizing long-distance transport involving multiple means of transport;
- Technological backwardness of transport and infrastructure; low level of implementation of modern technologies and innovative policies in the transport sector;
- Disproportion between the level of development of railway infrastructure capacities and cargo handling capacities of ports;
- Existence of 'bottlenecks' in the infrastructure for transit transport by rail;
- low level of development of railway infrastructure capacity and port cargo handling capacity;
- Slow adoption of new information technologies;
- Lack of compensation mechanisms for investments in strategic transport facilities;
- Lack of a transparent accounting system for transport costs and effective control mechanisms for the provision and use of funds for the repair, reconstruction and construction of transport infrastructure;
- Lack of specialized and experienced professionals in the field of intermodal transport; etc.

Taking into account the experience of intermodal transport in Europe, the creation and development of this type of transport in Ukraine is of great importance and requires solving a number of issues related to the organization of transport on existing and new routes, in particular, through adaptation to the norms of the European Union. Due to the complex geopolitical situation, road and rail transport directs transport flows westward. It is clear that the work of the transport complex

reflects the state of the domestic economy, which is currently not in the best condition.

In order to make the most of Ukraine's transport potential, especially as a transit country, it is necessary to create a customer-oriented transport service system, to ensure effective organization of the country's transport and road complexes, to ensure effective organization of all types of transport potential and capacities on the basis of partnership and competition in transport. Measures should be taken to achieve synergies from the combination of the two

The prerequisites for the formation of intermodal transport routes on the market under modern conditions were analyzed. The pre-war conditions of the transportation market were analyzed: Until February 2022, the market had a heterogeneous development structure, as the global downturn following the coronavirus pandemic had a significant impact on the market. At the same time, it should be noted that total transportation volumes in 2020 increased compared to 2019. This increase was mainly due to road transport. Other types of transport remained at the same level (water transport, air) or decreased (rail). The beginning of the large-scale occupation had a significant impact on Ukraine's transport infrastructure, many railway and road routes were destroyed, air routes were completely closed, and sea ports were almost completely blockaded. The increase in passenger and freight traffic to the West has highlighted problems with border infrastructure Logistics companies, like many commercial enterprises, had to rebuild their operations

with the start of the war and develop new operational plans under martial law conditions. Therefore, companies, having experienced the destruction of many transportation schemes, had to find ways to build new routes. Mixed air transport will be taken to airports in Poland and Germany, from where it will be transported by road to Ukraine. Transportation is a key complex activity related to the movement of material resources, work-in-progress or finished products by a certain means of transport in the logistics chain. The development of the multimodal cargo transportation system contributes to the solution of the region's economic issues; ensures coordination and organizational-technological interaction of all links of the cargo delivery chain; ensures the development of the transport services market infrastructure. The development of the country's transport complex under martial law is a very important task for supporting the country's economy. On the one hand, the need to restore many kilometers of destroyed roads will require huge investments, and on the other hand, it gives an opportunity to immediately build a modern transport infrastructure that meets all global quality requirements. At the enterprise level, it is necessary to solve the tasks of restructuring one's own business processes or modernizing existing ones to adapt to external circumstances. Thus, due to the cancellation of air transportation and the blockade of sea ports, the company should focus to rebuild its multimodal routes. Delivery by air transport will be carried out to the airports of European countries

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UDC 330.3:338:339.9

DOI: <https://doi.org/10.46783/smart-scm/2023-19-2>

JEL Classification: L12, Q10.

Received: 08 June 2023

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GLOBALIZATION CHALLENGES OF STRATEGIC MANAGEMENT OF THE EXPORT POTENTIAL OF AVIATION COMPLEX ENTERPRISES

Ganna Gurina, Serhii Podrieza. "Globalization challenges of strategic management of the export potential of aviation complex enterprises". In the article, it is determined that the policy of forming the strategy of enterprises to go abroad is an important form of strategic management of the development of the economy, which is aimed at long-term growth of efficiency with the minimization of risks during the optimal use of potential and existing resource limitations. The necessary steps to achieve the harmonization of cooperation between Ukraine and the EU and NATO, the development of the export potential of the enterprises of the aviation complex, the main areas of activity and the ways of their implementation are proposed. European integration is the main and constant foreign economic priority of Ukraine, the implementation of which will allow to improve the conditions for the export of Ukrainian goods in order to present them on the international arena. To solve the above-mentioned problems, it is proposed to implement measures that will increase the competitiveness of the national economy.

Keywords: aviation complex, export potential, integration, cooperation, external market, competitiveness.

Ганна Гуріна, Сергій Подреза. «Глобалізаційні виклики стратегічного управління експортним потенціалом підприємств авіаційного комплексу». У статті визначено, що політика формування стратегії виходу підприємств на зовнішній є важливою формою стратегічного управління розвитком економіки, що націлена на довгострокове зростання ефективності з мінімізацією ризиків при оптимальному використанні потенціалу та існуючих ресурсних обмежень. Визначені необхідні кроки для досягнення гармонізації співпраці України та ЄС і НАТО, розвитку експортного потенціалу підприємств авіаційного комплексу, запропоновані основні напрями діяльності та шляхи їх реалізації. Євроінтеграція є головним і незмінним зовнішньоекономічним пріоритетом України, реалізація якого дозволить покращити умови експорту українських товарів з метою представлення їх на міжнародній арені. Для вирішення

вищезазначених проблем запропоновано реалізувати заходи, які дозволять підвищити конкурентоспроможність національної економіки.

Ключові слова: авіаційний комплекс, експортний потенціал, інтеграція, співпраця, зовнішній ринок, конкурентоспроможність

Introduction. Export potential is a complex, dynamic, integrated, interconnected and synergistic combination of all types of its existing and promising resources and opportunities, which are used to achieve tactical and strategic goals of the enterprise's development at various stages of its life cycle.

The development of market relations in Ukraine, the need for its entry into the world integration process, the liberalization of foreign economic activity, the granting of access to the world market to enterprises and organizations that produce competitive products require the clear formation and development of export potential as a component of successful foreign economic activity. Therefore, the successful formation and development of export potential, especially at the enterprise level as the main and primary link of the country's foreign economic complex, is of great practical value today. Since integration into the world economy leads to much higher rates of economic growth, the regulation of export potential, both for the country as a whole and for individual enterprises, should become a strategic goal of the state's economic policy.

Analysis of recent research and publications. The analysis of literary sources showed that, depending on the basic evaluation criterion, resource, comparative and result concepts can be distinguished among the existing concepts; at the same time, among the methods of evaluation, it is worth highlighting: expert, point, method of analogies, factor analysis, methods of mathematical programming [2, p. 66-70].

Highlighting previously unresolved parts of the overall problem. All existing methods of assessing the economic potential of an enterprise have their own characteristics, which accordingly affect the

quality of the final result. However, none of them takes into account the cyclical nature of the enterprise's development. Also insufficiently developed are the problems of using a set of tools for developing the potential of the aviation complex, aimed at ensuring sustainable national economic growth.

Formulation of the goals of the article.

To investigate the structure of the export potential of the aviation complex of Ukraine, as well as to analyze the procedure of forming the strategy of the enterprise entering the foreign market. Export potential is inherent in economic subjects of all levels - enterprise, industry, region within the country, national economy, grouping of several states - which realize this potential through the development of foreign trade, primarily exports. That is, the export potential of the country consists of the export potential of individual industries, primarily industry as the most important producer of finished products, and the export potential of the industry - of the export potential of individual enterprises; secondly, export potential is objectively related to the competitiveness of products intended for sale on the world market. Given that national competitiveness has a three-level structure - country, industry, individual enterprise, it can be argued that there is a close relationship between increasing the competitiveness of domestic products on the world market and increasing the export potential of the national economy [1].

Presentation of the main results.

Export potential can be characterized as the readiness, ability of an enterprise to carry out foreign economic activity, in particular export activity, which consists in entering target sales markets outside its country. Export potential is the basis for developing a strategy for

entering the foreign market. Therefore, the factors that affect the development of export potential also indirectly affect and determine the procedure for forming the strategy of the enterprise entering the foreign market and the degree of representation of the enterprise on the foreign market [3, pp. 67-73]. One of the conditions for the integration of the Ukrainian economy into the world economic community is the assessment of the export potential, its ability to adapt and reorientate under the influence of internal and external environmental factors. For the productive activity of the enterprises of the aviation complex, it is necessary to have a clear understanding of the prospects for entering the foreign market, as well as a coherent strategy based on the competitiveness of the aviation industry. Among the most significant factors in the development of export potential, it is expedient to include the following:

1. enterprise management;
2. information provision of foreign economic activity;
3. planning the export of products;
4. accounting and analysis of export deliveries;
5. personnel management.

The main shortcomings of the development of Ukrainian exports under modern business conditions, on the solution of which the efforts of both the government and the top management of enterprises should be concentrated, are determined:

1. raw material nature of a significant part of exports;
2. lack of a clearly defined policy of changes in the material and technical base of production and technologies of economic sectors;
3. a small share of products with a high share of added value in the structure of Ukrainian exports;
4. lack of legal basis for the introduction of financial mechanisms of state support for export development (PPP and others);
5. an insufficient level of investment in the modernization of export-oriented

industries and the absence of the latest technologies for production [4, pp. 32-37; 7];

6. outdated transport infrastructure that does not meet the modern requirements of effective cross-border communication (International transport corridors, condition of the road surface, etc.);

7. spread of the practice of restrictive and protectionist measures by individual countries and leading transnational corporations;

8. presence of interest imbalance in bilateral trade with main partners;

9. high risks of financial losses during export operations;

10. unfavorable conditions for crediting exports (too high interest rates and short terms of loans);

11. corruption along the entire vertical of power, as well as settlement of export operations through offshore companies and tax evasion;

12. overcoming the post-war crisis.

European integration is the main and constant foreign economic priority of Ukraine, the implementation of which in the transport sector will allow to increase the volume of transportation through international transport corridors located on the territory of Ukraine, to improve the conditions for the export of Ukrainian goods, to attract national carriers to the transportation of transit cargo between Europe and Asia, and to improve traffic safety.

The development of the potential of EU countries is implemented on the principles of:

- systemic (comprehensive and comprehensive development of all components of the national innovation infrastructure);
- efficiency (comparability of the results of innovative activities with costs);
- priorities (stimulating activity by providing preferences and advantages compared to traditional production) [5, P.36-41];
- strategic focus (orientation on a long-term positive result and effect from the

development and implementation of innovations);

- information security (access to sources of scientific and technical information and exchange of experience with foreign partners);

- market orientation (taking into account the needs for innovations on the domestic and international markets);

- adaptability (flexible response to changes in political and economic conditions on the technology market);

- planning (coordination of actions of participants in the innovation process at all stages).

The internal and foreign political situation in the European Union and Ukraine is marked by increasing contradictions as a result of negative changes in the international security environment. Ukraine-EU relations are currently developing in a positive way, the format of the "Association Agreement" has given stability and predictability to relations. The main principles of the effective organization of the process of managing the enterprise's export potential are as follows: the strategic structure of the management cycle, which should reflect the external and internal conditions of the enterprise's international economic activity; logical sequence of stages of the management process according to the functions and degree of importance of the tasks; adaptability of the management process in adapting to changes in the environment of the international economic activity of the enterprise.

The deepening of market relations in Ukraine, the formation of an innovation-oriented system of management of national or regional economic development, the strengthening of the interaction of market mechanisms with socio-economic levers of anticipatory development takes place in the conditions of intensifying the competitive struggle between countries and their regions mainly for resources of a strategic nature, priority among which are financial, intellectual, informational and innovative.

Strategic competitive advantages acquired by the state or a separate region in modern conditions can be fully realized only under the conditions of implementation of the mechanism of strategic management of its sustainable and harmonious development. The necessity and expediency of strategic management of the competitiveness of the national economy or a separate region of the country is due to both the increased complexity of processes within the socio-economic system and the high turbulence of the environment both within the country and in the global environment. Increased attention to the problems of realizing potential production opportunities is due to the features of the modern stage of economic development and the increase in the efficiency of social production, the growing influence of various spheres of life.

Conclusions. The war, the crisis state of the national economy and individual enterprises, which is accompanied by low utilization of production capacities, the accumulation of excessive stocks of materials and finished products, a reduction in the number of employees, a decrease in their qualification level and labor productivity, and other negative phenomena, naturally leads to a loss of potential. International practice shows the need to involve foreign partner companies in innovative development for the joint implementation of R&D, decentralization of the development of the innovative potential of the industry, ensuring the participation of private business in innovative processes and focus on the effect. Ultimately, the effective interaction of all participants in such activities will allow to achieve synergy.

We will remind that the size and structure of the potential of modern industrial and commercial organizations are formed at the expense of fixed assets, land plots, and technologies accumulated during the Soviet era. The chaotic nature of development processes and the lack of control of crisis tendencies at the macro level caused the destruction of the potential structure, which

was manifested in the violation of proportions between the main elements of the socio-economic systems of modern enterprises. Therefore, comprehensive consideration of general and specific principles is an important

prerequisite for effective management of the enterprise's export potential and formation of a strategy for enterprises to enter foreign markets.

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UDC 004:65.01:658

DOI: <https://doi.org/10.46783/smart-scm/2023-19-3>

JEL Classification: L81, L86, L87, L90, M15, O3.

Received: 10 June 2023

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ARTIFICIAL INTELLIGENCE IN SUPPLY CHAIN MANAGEMENT: OPPORTUNITIES AND THREATS FOR PROFESSIONAL COMPETENCE

Mariia Hryhorak, Oleh Harmash, Tadeusz Popkovskiyi. «Artificial intelligence in supply chain management: opportunities and threats for professional competence». The article summarized the theoretical foundations of artificial intelligence and classified various technologies and algorithms related to it. Development prospects are also considered, starting from the automation of individual procedures and moving on to the development of complex autonomous systems for decision-making. Further, a detailed analysis of the transformation of key business processes in supply chains under the influence of artificial intelligence was carried out. This made it possible to discover how artificial intelligence technologies affect the organization and management of supply chains, which can lead to changes in management approaches and strategies. In the article, a matrix model of the interaction of specialists with artificial intelligence in supply chain management was developed and improved. It contributes to the understanding of how to effectively combine the role of humans and artificial intelligence systems to optimize processes in supply chains. Special attention is paid to the transition from supporting to autonomous role of artificial intelligence systems in supply chains. This change in dynamics may change the balance of power between humans and AI systems, and affect accountability and control mechanisms, as well as the ethical implications of delegating authority to AI systems. Accordingly, it is important to develop the digital skills of supply chain managers and increase their level of digital competence in order to implement artificial intelligence technologies effectively and ethically. The lack of such competencies can become an obstacle in the development and successful use of artificial intelligence in supply chain management.

Keywords: supply chain management, artificial intelligence, intelligent decision-making systems, automation and digitization of business processes, digital competencies of personnel.

Марія Григорак, Олег Гармаш, Тадеуш Попковський. «Штучний інтелект в управлінні ланцюгами постачання: можливості та загрози для професійної компетентності». У статті було узагальнено теоретичні основи штучного інтелекту та класифіковано різноманітні технології та алгоритми, що пов'язані з ним. Також розглянуті перспективи розвитку, починаючи від автоматизації окремих процедур і переходячи до розробки складних автономних систем для прийняття рішень. Далі, проведений детальний аналіз трансформації ключових бізнес-процесів у ланцюгах постачання під впливом штучного інтелекту. Це дозволило виявити, як технології штучного інтелекту впливають на організацію та управління ланцюгами постачання, що може привести до зміни підходів і стратегій управління. В статті була розроблена та удосконалена матрична модель взаємодії фахівців зі штучним інтелектом в управлінні ланцюгами постачання. Це сприяє розумінню того, як ефективно поєднувати роль людей та систем штучного інтелекту для оптимізації процесів у ланцюгах постачання. Особлива увага приділена переходу від допоміжної до автономної ролі систем штучного інтелекту у ланцюгах постачання. Ця зміна в динаміці може змінити баланс влади між людьми та системами штучного інтелекту, а також впливати на механізми підзвітності та контролю, а також етичні наслідки делегування повноважень системам штучного інтелекту. Відповідно, важливо розвивати цифрові навички менеджерів, які працюють з управління ланцюгами постачання, та підвищувати їх рівень цифрової компетентності, щоб впроваджувати технології штучного інтелекту ефективно та етично. Відсутність таких компетенцій може стати перешкодою у розвитку і успішному використанні штучного інтелекту в управлінні ланцюгами постачання.

Ключові слова: управління ланцюгами постачання, штучний інтелект, інтелектуальні системи прийняття рішень, автоматизація та цифровізація бізнес-процесів, цифрові компетенції персоналу

Introduction. Artificial intelligence is not the future, but our present, so logistics companies, manufacturing and trade enterprises are trying to actively use it and adapt it to their tasks. In the report "Future of Jobs Report 2023" ("The Future of Jobs 2023"), which was published within The World Economic Forum (WEF) has predicted that over the next five years, 83 million jobs will disappear, while 69 million will be created, artificial intelligence will play an increasingly important role in various sectors of the economy [1]. This is facilitated by the "end-to-end" nature of technological solutions based on artificial intelligence, the high degree of influence of these solutions on the effectiveness of activities and the availability of tools for the development of software and robotics products.

A new impulse of scientific and practical interest in the problems of artificial

intelligence has made the ChatGPT generative chatbot available to everyone by the OpenAI company. The launch of the technology late last year saw ChatGPT reach over 100 million monthly active users in just two months. A new version of ChatGPT-4, which is an advanced language model capable of generating and editing text, processing images, and performing creative and technical tasks, has already been launched.

The active development of artificial intelligence and its application in various spheres of activity gives rise to discussions in scientific circles about the possibilities and threats of this technology and its impact on society and the labor market.

Processes are also taking place in Ukraine that testify to the relevance of the issue of artificial intelligence. In particular, at the end of 2020, the Concept of the Development of

Artificial Intelligence, which was prepared by the Ministry of Digital Transformation of Ukraine, was adopted. This concept envisages, on the one hand, the deepening of fundamental research for the creation of a competitive new-generation computing machine based on traditional technologies and quantum computing technology, and on the other hand, the expansion of the areas of use of the latest technologies and systems with artificial intelligence in the military-industrial complex, education, medicine, industry, agriculture, etc.

Of course, what has been said applies to the field of logistics and supply chain management, which are essentially innovative and leaders in the implementation of the latest information technologies. According to analysts, by 2030 the market of artificial intelligence in logistics will be valued at 36 billion US dollars [2]. This forecast confirms the hypothesis that the spread of artificial intelligence will contribute to the creation of new jobs and higher-skilled specialties, will encourage companies to support advance training of personnel, stimulate intra-company mobility of employees with additional payment for learning additional skills and abilities. To work effectively with artificial intelligence, it is important to have a good understanding of the algorithms and data underlying the technology. This includes understanding how to preprocess and clean data, how to choose the right algorithm for a given problem, and how to interpret the results of an AI system.

However, knowledge of algorithms and data alone is not the only important aspect. It is also necessary to understand the limits and possibilities of artificial intelligence in order to understand where it can be used with benefit and where it is better to use other approaches. When developing artificial intelligence systems, it is also necessary to take into account ethical issues and problems related to the protection of privacy and data security. The use of artificial intelligence can have a significant impact on society and people, so it is important to consider potential

risks and ensure responsible use of this technology. For success with artificial intelligence, it is also important to have a team with a variety of specialists - from experienced researchers of intelligent systems to experts in the field of data and programmers. Cooperation between different specialists helps to create complex solutions that effectively solve various tasks.

It is also necessary to remember that artificial intelligence is not a universal solution for all problems. Some tasks may require different approaches, different methods of analysis, or may be too complex for the current state of the technology. Therefore, it is important to maintain a balance and realistically evaluate the capabilities of artificial intelligence in the context of specific tasks and problems.

In general, the successful use of artificial intelligence requires a combination of deep knowledge of algorithms and data, analysis of ethical aspects and the involvement of highly qualified specialists. This will allow the creation of powerful artificial intelligence systems capable of solving important tasks and contributing to the progress of society.

An analytical report by McKinsey&Company concluded that almost a quarter of surveyed companies plan to implement artificial intelligence [3]. According to McKinsey estimates, logistics costs for businesses that adopt supply chain management with artificial intelligence have decreased by 15%, while inventory levels have increased by 35% and service levels have increased by 65%.

Literature and researches review. The issue of artificial intelligence occupies a leading place in scientific research in recent years. Scopus[3-7] literature reviews state that dynamic supply chain processes require the use of artificial intelligence tools and techniques to cope with increasing complexity and improve efficiency. As early as 2010, HokeyMin outlined the areas of application of artificial intelligence in supply chain management, focusing on inventory planning, demand forecasting, transportation

network design, etc. [7, 8]. With the help of artificial intelligence, companies can identify weaknesses in supply chain management and allocate resources accordingly [8,9], detect consumer requests, build customer profiles, and develop products [10]. B. Mohsen claims that artificial intelligence can be used to analyze data and forecast demand, optimize logistics and transport routes, and identify inefficiencies in supply chains [10, 11]. The work [12] analyzed the ability of artificial intelligence to control the forwarding of goods on a large scale and predict delivery needs.

The problems of disruptions in supply chains and risk management caused by the global pandemic of COVID-19 are of particular interest to researchers. Ivanov and Dolgui demonstrated the impact of this unprecedented pandemic on demand, supply, production, and other logistics operations. Demand fluctuations and uncoordinated logistics operations were typical scenarios in this case. To increase resilience, the authors proposed game-theoretic modeling using artificial intelligence [13, 14]. Belhadi and others, continuing to explore the impact of artificial intelligence on mitigating supply chain disruptions related to COVID-19, argued for the need for real-time information sharing. Based on data from 479 manufacturing companies, they showed that fuzzy logic programming, big data machine learning, and agent-based systems are the most promising methods used to increase the resilience of supply chains [16]. The work [15] also used multi-criteria optimization methods with the use of artificial intelligence to increase the stability of supply chains in the conditions of the COVID-19 pandemic.

In recent years, many studies have focused on green supply chains. Of course, artificial intelligence can play a key role in finding better solutions related to reducing the harmful impact on the environment. Let's note some publications in this area. In particular, the authors [16] conducted an analysis of 144 articles over 14 years to

classify, summarize and analyze the literature in two dimensions - from the perspective of digital technologies and environmental supply chain practices. They have proven that the Internet of Things, big data, cloud computing, blockchain and artificial intelligence can reduce resource and energy consumption, as well as pollutant emissions, ultimately improve the efficiency of green supply chains and achieve economic, social and environmental benefits. Bochao Liu combined artificial intelligence deep learning technology to build an ecological supply chain management system, improving the intelligent algorithm and creating an intelligent model. These two factors together improve the effect of green supply chain management for small and medium-sized enterprises, reducing carbon emissions [17].

A separate direction can be singled out the research of artificial intelligence as a breakthrough innovation and a tool of the knowledge economy. In particular, Mariani M.M. and Borghi M. considered the theoretical and practical implications of the integration of artificial intelligence in supply chain management, identified the technological, social and economic reasons that encourage firms to use AI for firm product innovation, process innovation, business models, etc. [18]. Christian Hendriksen proposed a new theoretical framework for AI Integration, which is based on two key dimensions: the level of AI integration in the supply chain and the role of AI in decision-making. Considering these two dimensions, AI provides a comprehensive view of the integration of AI in SCM, considering the potential disruptions and transformations that may arise from the implementation of AI [19].

Jarrahi H. revealed the possibilities of using artificial intelligence for knowledge management, in particular, for the creation, storage, search, exchange and application of knowledge. They propose practical ways to build partnerships between humans and artificial intelligence in support of organizational knowledge management activities, and assess the implications of

managing artificial intelligence systems based on human, infrastructure, and process components. [20].

Despite the fact that the use of ChatGPT in business became possible not so long ago, the first studies appeared. Thus, the work of Indian authors [21] shows that ChatGPT can be fine-tuned for specific use cases, such as customer service, e-commerce and supply chain management, training it on additional domain-specific data. ChatGPT can handle multiple simultaneous interactions and provide real-time responses to customer queries, making it well-suited for use in customer-facing applications [22, 23].

The above indicates a significant increase in the number of foreign scientific publications related to applications of artificial intelligence in logistics and supply chain management. However, in our opinion, there are still few such studies in Ukraine. To prepare this article, the materials of the collective monograph edited by S. I. Dotsenko and V. S. Kharchenko [38] were used, in which a thorough theoretical analysis of the concepts of artificial intelligence and intelligent decision-making systems was made. The recently published monograph under the scientific editorship of A. I. Shevchenko summarizes the results of a two-year scientific discussion and the results of a survey of over 300 organizations with the aim of determining the need for the introduction and use of artificial intelligence technologies in their activities, as well as the prerequisites and scientific foundations of the creation of the Strategy for the Development of Artificial Intelligence in Ukraine [38].

Usually, in the scientific literature on supply chain management, we are talking about information or digital technologies, among which artificial intelligence is mentioned. Articles that are devoted to the practical aspects of the use of technologies related to artificial intelligence are mainly descriptive in nature or justify certain management decisions using mathematical methods and algorithms. Thus, in the work of Skitsko V.I. the application of the bat

algorithm for solving a multi-index transport problem, in the formulation of which logistic risk is taken into account, is shown [24]. Article Poznyak O.V. and Melnyk K.O. devoted to the study of trends in the transition of logistics from automation to the use of artificial intelligence technologies in the management of goods of strategic purpose [25]. O. Yu. Kyryk analyzed the directions and advantages of using artificial intelligence in logistics processes, and also justified the need to combine human intelligence with established artificial intelligence and automated processes [26].

AI and objectives. The purpose of this article is to address the current gaps in research on the impact of artificial intelligence as an integrated technology on the productivity and efficiency of SCM, to identify a set of technologies that are related to artificial intelligence, methods and algorithms capable of optimizing both individual business processes in supply chains and in general. The article begins with an analysis of the definitions of artificial intelligence and structures a set of technologies, methods and algorithms related to this field. This allows you to identify the prospects and potential opportunities offered by artificial intelligence. Next, the author conducts an analysis of business cases and highlights trends in changing the nature of the use of artificial intelligence in various fields. This analysis helps identify trends and directions in the development of artificial intelligence, as well as its impact on modern society and the economy. The last block of the article is devoted to defining the competencies that are necessary for the successful implementation and use of artificial intelligence. Skills in the field of programming, statistics, data analysis, understanding of business processes, as well as the ethical aspect of using artificial intelligence technologies can be indicated here. In general, the article offers the reader a systematic approach to understanding artificial intelligence, starting with basic definitions and technologies, moving to

business aspects and potential trends, as well as highlighting the necessary competencies for the successful implementation of intelligent systems in various spheres of life.

Results, analysis and discussion.

Artificial intelligence is one of the most promising technologies of today, which affects various areas of the economy and business. It is able to revolutionize the way of decision-making, optimize processes, strategy and business tactics. First of all, research on the application of artificial intelligence helps to better understand the potential and limitations of this technology. They make it possible to discover exactly where artificial intelligence can be most useful and what specific tasks can be solved with its help.

It is known that any scientific research needs to define the object and subject of research. Currently, there is a very wide divergence of views on the issue of artificial intelligence among scientists and practitioners. The vast majority of researchers refer to artificial intelligence as a "black box", without specifying what exactly is contained in this box. This leads to the fact that supply chain management specialists focus their attention on improving existing information technologies and often do not understand that artificial intelligence requires radical changes in the organization and management of not only the movement of goods, but also the external business environment. Therefore, let's start with an analysis of terminology.

1. Theoretical basis of artificial intelligence.

The analysis of various literary sources shows the ambiguous interpretation of the concept of "artificial intelligence", as there are currently more than a hundred of its definitions. In the early 1980s, scientists in the field of computational theory Barr and Feigenbaum proposed the following definition of artificial intelligence - it is the field of computer science that deals with the development of intelligent computer systems, that is, systems that have capabilities

that we traditionally associate with the human mind, - language comprehension, learning, the ability to reason, solve problems, etc. [27]. The international standard ISO/IEC TR 24028:2020 considers artificial intelligence as "the ability of an engineering system to acquire, process and apply knowledge and skills"[28].

An examination of the terms presented in the literature reveals the existence of four characteristics that are commonly mentioned in the scientific literature on artificial intelligence:

a) is a field of technology that deals with the development of systems capable of performing tasks that require human mental abilities;

b) methods and algorithms of information processing;

c) programs that perform complex tasks and at the same time increase their capabilities based on pre-processed data;

d) a mathematical model capable of self-improvement, obtaining new information and improving its own algorithms based on it [29,30].

Almost all authors agree that artificial intelligence should be similar to human intelligence and related to data, information and knowledge, and its main characteristics are the understanding of natural language, the ability to learn, the ability to think (generalize and draw conclusions), as well as to accept decision.

It is interesting to define artificial intelligence as an algorithm for solving creative tasks formed by artificial consciousness [31]. The scientific school of the Institute of Cybernetics of the National Academy of Sciences of Ukraine connects the development of artificial intelligence with the application of the principles and mechanisms of the functioning of the human brain. In particular, work [32] proposed a noospheric concept of artificial intelligence, which is based on the concept of smartenvironmental (intelligent environment), created by a three-level info sphere (sphere of information technologies).

In the Concept of the Development of Artificial Intelligence in Ukraine adopted in 2020, prepared by the Ministry of Digital Transformation of Ukraine and approved by the Decree of the Cabinet of Ministers of Ukraine dated 02.12.2020 No. 1556-r, artificial intelligence is defined as an organized set of information technologies that can be used to perform complex tasks by using a system of scientific methods of research and algorithms for processing information obtained or independently created during work, as well as creating and using own knowledge bases, decision-making models, algorithms for working with information and determining ways to achieve set tasks [33, 34].

In our view, artificial intelligence is a specialized branch of computer science rather than computer science because it focuses on developing algorithms and models that allow computers to analyze data, use logic, and learn from data. Artificial intelligence deals with the research and development of machine learning, deep learning, neural networks, decision-making, and other algorithms that allow computers to detect imitation of intelligent behavior. Although computer science may include elements of artificial intelligence, artificial intelligence stands out as a separate field that focuses on mental functions, self-organization, learning, and other aspects related to the simulation of human intellectual activity in computer systems.

Since most researchers associate the concept of artificial intelligence with information technologies and algorithms, let's consider in more detail which technologies we are talking about, Fig. 1 [35].

Our core AI technologies include machine learning and deep learning, natural language processing, and various object recognition technologies, including image processing, object recognition, and video analytics. Accordingly, each of the named technologies involves the use of various

methods and algorithms, which are also classified in Fig. 1.

Note that the field of artificial intelligence is constantly developing and new technologies, methods and algorithms are emerging. Scientists continue to work on expanding and improving deep learning, including creating more efficient neural network architectures, developing new methods for learning and understanding complex data such as graphs and sequences, and improving generative pre-trained and transformers (Generative Pre-trained Transformers). In the near future, more complex and independent artificial intelligence systems may appear, capable of making independent decisions, taking into account unpredictable situations and changing conditions.

The question of the ratio of artificial intelligence technologies and other technologies, in particular, the Internet of Things (IoT), which is interpreted as a system of data collection and transmission by connecting the Internet to various objects, sensors, devices through software or other devices, is a controversial issue. That is, the goal is to connect simple objects to computers and other computing machines. In this sense, both technologies are important components of an intelligent system, where artificial intelligence plays the role of the "brain", and the Internet of Things - the "body". Artificial intelligence can manage and automate the operation of connected IoT devices. It can analyze data from sensors, make decisions and send instructions to control devices in order to optimize energy consumption, ensure safety and improve comfort. The interaction of these two industries creates powerful opportunities to develop innovative technologies and improve the efficiency and functionality of various areas of life, including industry, transportation, health care, agriculture, and many others.

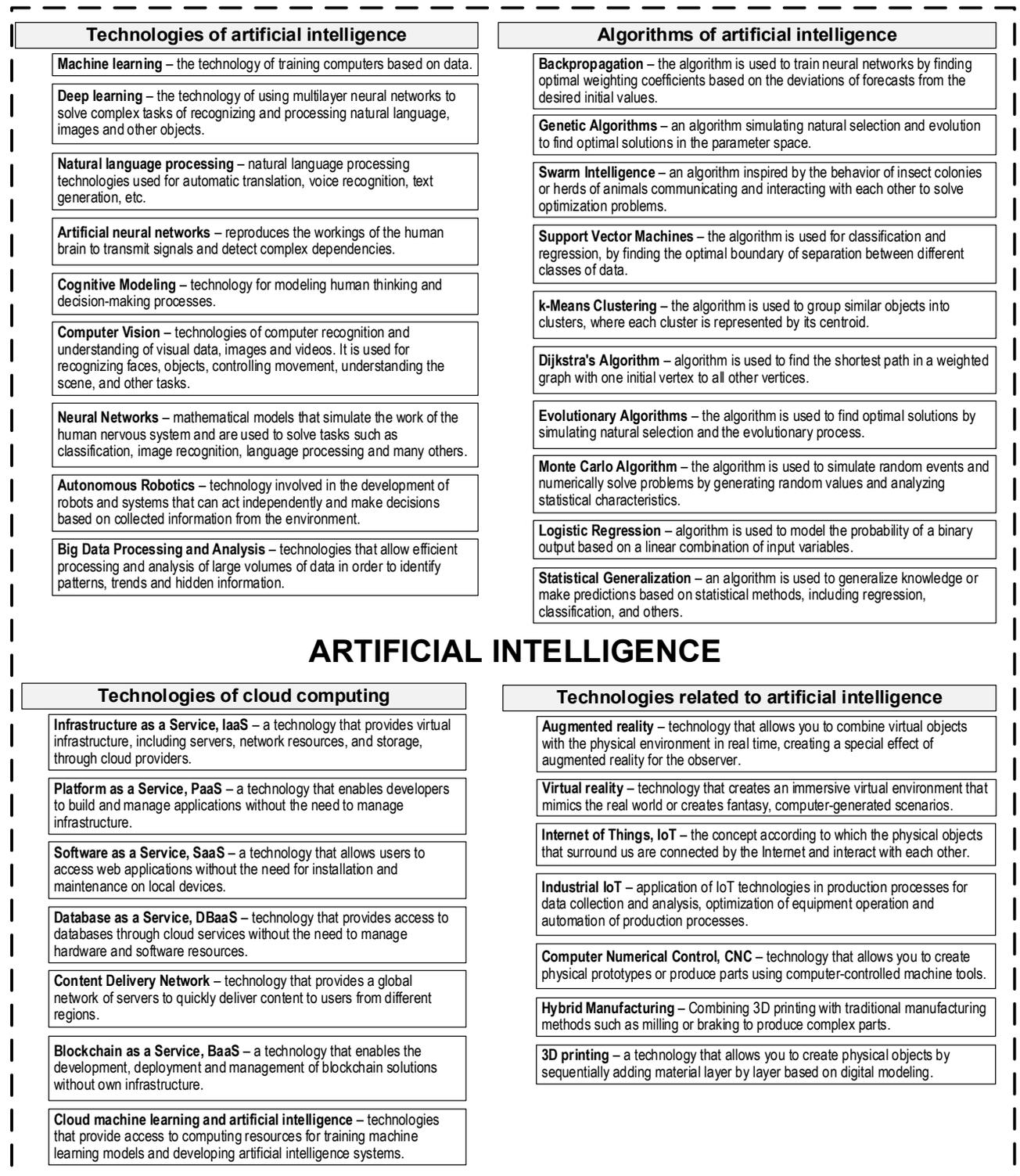


Figure 1 – Generalized classification of technologies, methods and algorithms of artificial intelligence (developed on the basis of [35])

The same can be said about the connection of artificial intelligence technologies with blockchain technology, which provides a distributed data storage system. Blockchain can be used to record the

results of AI models, allowing third parties to verify the authenticity and immutability of these results. The combination of artificial intelligence and blockchain can lead to the development of augmented intelligence,

where smart agents on the blockchain can communicate, share data, and learn from each other [36]. In augmented intelligence, intelligent agents can have their own learning algorithms and models that allow them to improve their abilities and skills over time. They can exchange experience, knowledge and information, which makes it possible to collectively acquire new knowledge and solve complex tasks.

So, the collection of technologies, methods and algorithms depicted in Fig. 1 reflects a wide range of scientific achievements and opportunities for the practical use of artificial intelligence in various spheres of human activity. Existing algorithms make it possible to process colossal amounts of information, to identify cause-and-effect relationships that are beyond the power of humans, which means that forecasts can be made more accurately and decisions made more effective.

In work [18], artificial intelligence is called a breakthrough innovation and a key driver of the digital transformation of the economy. Technologies based on artificial intelligence provide a unique opportunity to transform business operations by reducing the number of repetitive, routine tasks, significantly increase labor productivity, create new products, create new models of economic growth, improve the efficiency of government institutions, especially at the level of developing solutions aimed at ensuring welfare of citizens.

The authors of the monograph [37] associate the concept of artificial intelligence with the formation of intelligent information systems capable of transforming data, information, and knowledge into purposeful activity and learning. Artificial intelligence itself is not an intelligent system in the traditional sense, as it does not possess consciousness or self-awareness. Intelligent systems can be implemented on the basis of artificial intelligence, using machine learning methods, neural networks, expert systems and other technologies. They can optimize processes, recognize patterns, analyze data,

make predictions and automate a variety of tasks.

So, to date, the concept of artificial intelligence is developing and describes a set of multi-level systems capable of fully understanding and representing the world, as well as generating creative and new ideas. Generative artificial intelligence refers to systems that have the ability to generate new, creative ideas, solutions, or content. They can create something original and unpredictable, using their ability to associative thinking, combining ideas and using their own "creative" potential. Full artificial intelligence refers to systems that have the ability to understand, perceive and analyze information in the same way that humans do. This means that they can have a broad contextual understanding, take into account social, cultural and emotional contexts, recognize complex relationships between objects and events, and perform abstract thinking and draw conclusions.

The concept of full and generative artificial intelligence is intended to describe the desired level of development of intelligent systems that can have a deep understanding of the world, the ability to create something new and use their abilities to achieve highly intellectual tasks. However, to date, the implementation of full and generative artificial intelligence remains a challenge and the subject of active research in the field of artificial intelligence.

2. Using AI in supply chain management

The authors [38] believe that the use of artificial intelligence in the management of supply chains fundamentally changes the concept of SCM both at the organizational and individual levels. The main idea of SCM theory is that people and organizations are the links of SC, and the chains themselves arise as a result of these interactions. Since enterprises constantly interact with a significant number of different counterparties (buyers, competitors, wholesalers and retailers, suppliers, distributors, dealers, government institutions), this leads to high

transaction costs for enterprises. From the point of view of the theory of transaction costs, supply chain management should contribute to the reduction of total costs, primarily transaction costs.

The active use of artificial intelligence technologies can help reduce overall costs, providing new opportunities for automating routine procedures and operations, optimizing the use of resources, reducing costs for individual operations, etc.

First, artificial intelligence can help automate routine and repetitive processes that usually take a significant amount of time and effort. For example, in the field of manufacturing, the use of robots and machine learning systems can help perform monotonous tasks that previously required a lot of manual labor.

Second, artificial intelligence can help optimize the use of resources, such as energy, raw materials, time, and labor. By analyzing data and using predictive models, artificial intelligence systems can make more accurate demand forecasts, use resources more efficiently and avoid excess costs.

Thirdly, artificial intelligence makes it possible to reduce the costs of certain operations, for example, in the field of medicine and diagnostics. The application of intelligent systems to analyze medical images or other diagnostic data can help in the early detection of diseases and the implementation of more effective treatment strategies, which reduces the cost of treatment in general.

On the other hand, artificial intelligence enables the collection, analysis and interpretation of large volumes of data from various sources in real time. This enables companies and organizations to make more informed decisions based on up-to-date information. For example, artificial intelligence systems can analyze data about customers, their preferences and habits in order to adjust the range of products and personalize offers.

In general, artificial intelligence has significant potential to reduce costs and improve business processes. However, the

successful implementation of this technology requires a proper understanding of its capabilities and limitations, as well as careful attention to ethical and privacy issues, ensuring the responsible use of artificial intelligence for the good of society and people.

This provides businesses with greater transparency throughout their supply chain, allowing them to identify problem areas, improve processes and make informed decisions. This improves the quality of service, customer trust and provides timely and accurate information on the status of orders.

Virtualization and intellectualization of supply chain management is changing the nature and forms of integration of business entities - a transition is being made from traditional vertical or horizontal integration to the formation of supply networks and network interaction. Traditionally, the supply chain was characterized by a linear model, where information and resources flowed from suppliers to manufacturers, distributors and end users. However, the development of artificial intelligence opens up new opportunities for networked cooperation and coordination within the supply chain. Artificial intelligence enables the creation of intelligent agents that can collaborate, share information and make decisions based on common goals. This creates an opportunity for more flexible, efficient and transparent interaction between the various participants in the supply chain. Instead of simply passing information in one direction, network interaction allows for more dynamic and adaptive systems where decisions can be made collaboratively and based on data from multiple sources. This can lead to better coordination, solving complex problems and increasing innovation in supply chains.

In work [38], supply chain management specialists are offered to classify forms of interaction with artificial intelligence depending on its participation in the integration of supply chain links and decision-making (Fig. 2).

		Integrating artificial intelligence into supply chain management	
		Partial	Full
The role of artificial intelligence in decision-making	Supporting role	<p>A person manages all operations in the supply chain.</p> <p>Artificial intelligence is partially integrated and plays a supporting role, expanding human capabilities, exchanging and processing data, automating routine operations</p>	<p>A person makes final decisions and supervises the work of artificial intelligence.</p> <p>AI manages supply chain operations, increasing its reliability and flexibility, as well as analyzing data, forecasting demand, analyzing risks, monitoring suppliers and more.</p>
	Autonomous role	<p>The person reserves the right to make final decisions and can change the choice of artificial intelligence.</p> <p>Artificial intelligence has the power to make individual decisions, for example, to analyze suppliers according to a set of criteria and choose the best.</p>	<p>A person minimally interferes with the work of the ecosystem, which learns and adapts, forming a complex interconnected network.</p> <p>Artificial intelligence is fully integrated into all functions of the supply chain and has the authority to make decisions independently.</p>

Figure 2 – Forms of interaction of specialists with artificial intelligence in supply chain management (developed on the basis of [38])

Each quadrant of the 2×2 matrix expresses ways of human (specialist) interaction with artificial intelligence in supply chain management. The level of integration of artificial intelligence into the supply chain refers to the degree of integration of artificial intelligence into the various activities and processes of the supply chain. At one end of the spectrum, the integration of AI is low, where only a few actors in the supply chain use AI or use it only for specific tasks. This can be compared to the early stages of AI implementation, where AI is used as a tool to perform specific tasks, such as demand forecasting or inventory management, but in a limited capacity. At this stage, AI acts as a support system, augmenting human capabilities but not replacing them, and never makes autonomous decisions or executes without human guidance. At the peak of AI integration, many supply chain actors are embedding AI deeply into their operations, spanning tasks from demand forecasting to delivery and broader operations

management. A high level of integration means not only the extensive infrastructure of one company, but also the involvement of all participants in the use of artificial intelligence tools for all functions. While the tools may be individualized, their shared use across the supply chain results in a robust AI-driven supply chain.

The second axis (vertical) reflects the role of AI in decision-making. This refers to the extent to which artificial intelligence systems are given autonomy and decision-making authority. At the initial stage, AI plays a supporting role, providing data analysis, information retrieval and providing certain recommendations. In this case, AI is primarily a tool that augments human capabilities by providing decision support but not autonomous decision making. At the other end of the axis, AI is assuming decision-making power, potentially making decisions that significantly affect the supply chain. The shift from a supportive to an autonomous role is a significant shift in supply chain dynamics as it changes the balance of power between

humans and AI systems, accountability and control mechanisms, and the ethical implications of delegating decision-making authority to AI systems.

The first aspect to consider is the balance of power between humans and AI systems. When implementing autonomous systems in the supply chain, the role of people can change from direct management of processes to a more strategic and supervisory function. This can lead to efficiency and speed of work, but it can also raise questions about liability and risks associated with uncontrolled functioning of systems.

The second aspect concerns accountability and control mechanisms. When artificial intelligence systems operate autonomously, their actions can become less predictable to humans. This can make it difficult to determine the cause and effect of certain decisions, especially in cases where problems or errors occur. Providing accountability and control mechanisms is an important aspect to ensure that AI systems can be understood and intervened when needed.

The third aspect is the ethical consequences of delegation of authority to artificial intelligence systems. Autonomous systems can make decisions based on large amounts of data and use complex algorithms that can exceed the capabilities of the human mind. This can give rise to ethical dilemmas, for example, when artificial intelligence systems are forced to choose between different groups of people or risk their lives to achieve a goal. Developing ethical standards and regulations for the use of autonomous systems is critical to ensuring fairness, safety, and trust in this technology.

Overall, the transition from a supportive to an autonomous role in the supply chain has many advantages, but also raises challenges related to power, control and ethical aspects. For the successful implementation of autonomous artificial intelligence systems, it is necessary to actively explore these issues and find a balance between automation and

maintaining a humanitarian approach in decision-making.

Let us consider in more detail the transformation of traditional business processes and functions in supply chains under the influence of artificial intelligence technologies, summarizing the results of research [39-41] and focusing on the possibilities of interaction of decision-makers with new technologies.

A. Management of relations with counterparties (suppliers, subcontractors, intermediaries, etc.).

AI can automate many routine tasks related to interaction with counterparties. For example, automatic ordering, payment, delivery tracking, etc. This reduces the time and effort required to perform such tasks and enables more efficient interaction with suppliers, while providing improved communication and real-time information sharing. For example, AI-based data sharing systems can enable automatic exchange of orders, tracking of delivery status, sharing of product information, etc. This helps to increase transparency and mutual understanding between the parties and reduce errors and delays. It can also be used to analyze large amounts of data about counterparties, including transaction history, product quality, delivery times, and other parameters. Based on this data, AI can make predictions and optimize decisions about supplier selection, optimal order allocation and inventory management, as well as supplier risk analysis, including financial stability assessment, reputation assessment and other parameters. This allows you to identify potential risks and take appropriate measures to manage them.

B. Customer relationship management

AI helps analyze large amounts of data about customers, their preferences, purchases and behavior. Based on this data, AI can create personalized marketing offers, recommendations and predict customer needs. This allows companies to attract and

retain customers by providing personalized services and offers, increase customer loyalty, and accelerate the return on investment in CRM. Advanced CRM can learn and improve over time using machine learning techniques. AI-powered chatbots can provide quick and accurate answers to frequently asked questions, as well as engage in real-time dialogue with customers. This creates an opportunity for more natural and human interactions with customers, facilitates the process of ordering goods, improves the speed and quality of customer service, and also ensures 24/7 availability of support. The application of AI can include analyzing the emotions and sentiments of customers based on their interactions with the company, their messages on social networks, etc. By analyzing data about customers, their interactions and feedback, AI can identify trends in customer satisfaction and recommend actions to improve them.

C. Demand planning and forecasting

Artificial intelligence helps analyze and process large amounts of data, including historical sales data, trends, seasonality, advertising campaigns, social media, and more. This allows for more accurate demand forecasts and reveals complex patterns that may be imperceptible to human analysis. Machine learning algorithms and mathematical models and multivariate analysis methods analyze data in real time and allow businesses to quickly respond to changes in demand and take the necessary measures to optimize inventory and production processes. In conditions of market instability or variable supply conditions, an artificial intelligence system can simulate various scenarios and evaluate their impact on demand and supply chain management [42].

D. Inventory control and planning

AI can analyze large volumes of data about sales, purchases, market trends, forecasts, delivery times, inventory constraints and other factors to predict future

demand. It helps companies reduce the risk of stockouts or overstocks, optimize production and supply planning, and detect anomalies and respond to unusual trends or supply issues. For example, an expert system can be incorporated into a materials requirements planning system so that it can maintain databases of historical master production schedules, bill of materials, and order patterns, and then develop systematic lot-sizing rules to estimate optimal future order levels and optimal replenishment times.

For example, machine learning helped Otto Group, an e-commerce retailer, reduce its alarming inventory by 80%, making it more profitable and better able to adapt to market changes [43]. The authors [44] prove that the use of artificial intelligence without code (NCAI) can increase sales by 10.3%.

E. Procurement and supply management

On the one hand, artificial intelligence allows you to automate many routine tasks related to procurement, such as finding suppliers, reviewing and comparing offers, processing documents, etc. This helps reduce manual labor and increase the speed and accuracy of the process. On the other hand, the use of machine learning algorithms allows processing large volumes of data and identifying trends, predicting demand for products or services, and avoiding shortages or overstocking of goods. Taking into account various factors, such as prices, delivery times, product quality, intelligent systems can develop optimal purchasing strategies that ensure maximum efficiency and reduce costs. Artificial intelligence can support electronic marketplaces where suppliers and buyers can find each other, interact and make deals in virtual space. These changes help to improve efficiency, reduce costs, improve the quality of products and services, and improve risk management in procurement management.

F. Logistics management

Logistics operations play an extremely important role in managing supply chains and creating added value for goods and services

for consumers. Logistics costs can reach half or more of the added value of products. AI can be used to determine the shortest and optimal delivery routes, taking into account various factors such as fuel consumption, road conditions, time, volume and weight of cargo, as well as efficient use of resources. Coordination and synchronization of the movement of vehicles and cargo flows in the territory of logistics centers, ports or warehouses helps to speed up the delivery of goods to the final consumer. Thanks to sensors, GPS trackers and other technologies, it is possible to accurately track the location of goods and monitor delivery conditions such as temperature, humidity and the condition of the cargo. Using artificial intelligence techniques such as optimization algorithms, genetic algorithms, neural networks and other techniques, intelligent scheduling tries to find the best solutions that take into account the constraints, requirements and priorities arising in a specific situation. This helps reduce logistics costs, improve delivery quality and safety, and ensure customer needs are met. Timely identification of potential problems, such as delivery delays, equipment malfunctions, or supply instability, allows for timely decisions and the development of emergency action plans to avoid problems and reduce risks [44].

It should also be noted that intelligent transport systems based on artificial intelligence can help to improve the management of traffic flows in real time, reduce congestion and improve road safety. ML algorithms can analyze traffic patterns and optimize signal timing at intersections, while DL algorithms can identify potential hazards and warn drivers in real time. Smart cameras and traffic lights controlled by artificial intelligence can monitor and analyze traffic patterns to improve the efficiency of traffic management systems. Installing sensors on vehicles allows you to predict when maintenance is needed. Electronic toll collection systems and intelligent parking systems also help to optimize the transport system of a city or agglomeration.

Autonomous vehicles are able to perceive and interpret the environment, make decisions based on data, and safely navigate roads without human intervention [45].

Thus, the analysis of the possibilities of using artificial intelligence in the optimization of supply chain management processes and procedures shows its great potential for solving various tasks. However, as noted by the authors [46], most of the tasks that are currently solved with the help of artificial intelligence technologies are well structured (or rarely defined, narrowly defined) and are operational and tactical in nature. The vast majority of tools used allow generating a better alternative from a set of possible solutions, such as supplier selection, inventory planning, route optimization, etc. The authors link future research and prospects for expanding the use of artificial intelligence tools with the techniques of multi-criteria optimization and fuzzy logic, as well as hybrid models and methods. Figure 3 summarizes the set of main drivers stimulating the implementation of artificial intelligence technologies in supply chain management processes, as well as software applications, cognitive methods and possible results in terms of increasing productivity and efficiency.

Therefore, artificial intelligence consolidates the main drivers of supply chain management in improving productivity and efficiency. The effectiveness of artificial intelligence tools largely depends on the efficiency and accuracy of the software, the quality of the data, and the chosen methods and algorithms.

We should not ignore the threats and challenges that the use of artificial intelligence also creates, in particular:

- insufficient data quality: Artificial intelligence needs a large amount of quality data to function properly. If the data on which the system is based is imprecise, noisy or incomplete, it can lead to incorrect analytical conclusions and incorrect decision making;
- incompatibility with the human factor: Artificial intelligence can be difficult to take

into account human aspects, such as personal relationships, ethics and intuition. Some decisions made by artificial intelligence may be technically sound, but not always acceptable to humans;

- dependence on technology: Artificial intelligence relies heavily on computer software, which can lead to incorrect decisions if programmed incorrectly. The development of artificial intelligence depends on technological innovation, which means that there is a risk of obsolescence and cost of the system. It is necessary to ensure constant updating and support so that

artificial intelligence remains effective and modern;

- privacy and security issues: The use of artificial intelligence requires the collection and processing of a large amount of data, which can create privacy and security issues. Insufficient protection of information can lead to data leakage or unauthorized access to it;

- impact on jobs: The use of artificial intelligence may lead to the automation of certain work processes and the replacement of humans by robots. This can have a negative impact on employment and the socio-economic situation.

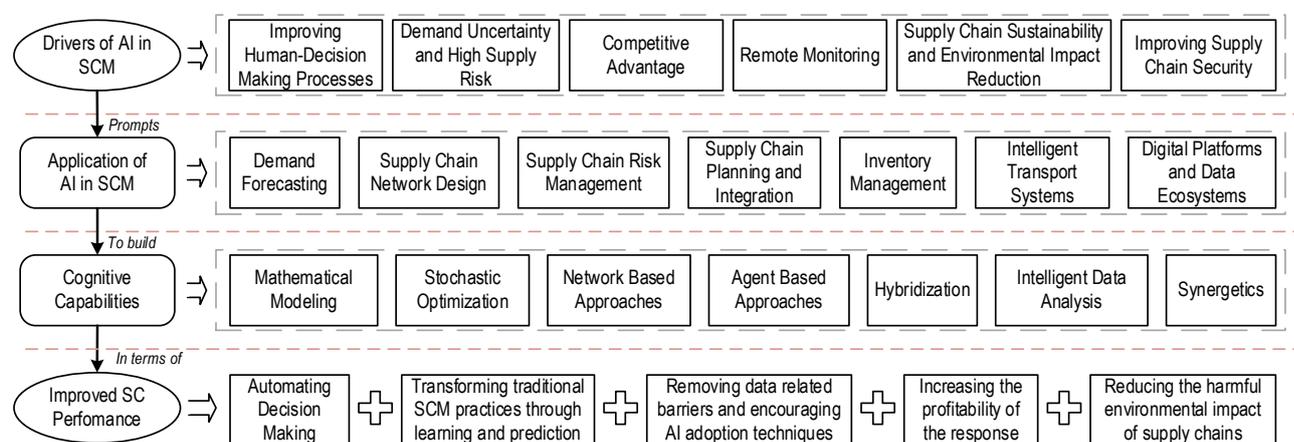


Figure 3 – Scheme of the synergistic effect of artificial intelligence tools on the productivity of supply chains (modified on the basis of [46])

To reduce the risks of using artificial intelligence in supply chain management, it is necessary to conduct thorough analysis and planning, ensure data quality, develop ethical standards and information protection procedures, and actively involve personnel in the implementation and use of these technologies.

3. Professional competence and training of supply chain managers

The impact of artificial intelligence on the labor market and the personnel training system is being actively discussed in scientific and business circles. There is a common myth that artificial intelligence can replace workers, take jobs away from people, etc., but in reality this is not the case. While AI can automate

routine tasks and provide valuable insights, it still requires human expertise to make sense of data and make strategic decisions. Supply chain managers should not compete with artificial intelligence, but learn to work effectively with it, and develop new skills and abilities [47].

Let's consider in more detail how artificial intelligence affects the professional competence of supply chain management specialists.

One of the key reasons for the need to improve professional competence is the understanding of artificial intelligence technologies, which underlie many innovations in the field of supply chain management. Specialists must be familiar with the fields of machine learning, deep

learning, data analytics and pattern recognition in order to effectively use these technologies in their work. Understanding the capabilities and limitations of artificial intelligence allows professionals to effectively use it to perform demand forecasting, inventory optimization, route planning, and many other supply chain management tasks.

A second important competency is the ability to analyze and interpret large volumes of data. With the help of artificial intelligence, specialists have access to a significant amount of information from various sources. The ability to analyze this data, extract key information and use it to make decisions becomes a necessary skill. Understanding data processing and analysis techniques, such as machine learning and statistical analyses, helps professionals identify trends, forecast demand, and perform other analytical tasks.

The application of artificial intelligence technologies also requires specialists to have the ability to cooperate and communicate with artificial intelligence systems. Understanding how to properly interact with these systems, including communicating information and making decisions based on their results, becomes a key skill. Communicating with AI requires the ability to explain, interpret, and use analysis results, and to interact with colleagues and customers based on that data.

Since artificial intelligence technologies fundamentally change the logistics business and supply chain management systems, it is necessary to make changes to the curricula and training programs of relevant specialists, namely: big data processing methods, real-time decision-making methods and procedures, system analysis and business optimization - processes. From modern graduates as future specialists, employers expect the ability to look at a work task from different angles and find non-trivial solutions for it, the ability to work in cross-functional teams, where each member is an expert in his field. But the main task of such a specialist is the ability to think with one's head, include critical thinking, analyze information and

integrate one's share into the general whole, under the specific request of a task or project. A robot and no chatbot can do this (yet).

Therefore, continuous learning and improvement of digital skills will help professionals to be successful and competitive in supply chain management. It is important to stay on top of the latest trends, learn new things, and constantly improve your skills to effectively use the opportunities that artificial intelligence provides in supply chain management. In general, supply chain managers can co-operate their activities with artificial intelligence using an approach known as "human-machine collaboration" or "collaborative intelligence", which manifests itself in the use of artificial intelligence to cover human weaknesses or automate routine tasks. In particular, an expert can have strategic thinking and creativity, while artificial intelligence can ensure the speed of processing large amounts of data, find correlations, make predictions and provide recommendations.

The development of the digital infrastructure of Ukraine and the adaptation of international rules and standards related to the formation of a single digital market will contribute to the development of digital competencies of supply chain management managers. The reduction of cross-border barriers for digital trade and the development of the Diya online platform encourages businesses to more actively develop digital business models and multi-channel strategies, including for international supply chains.

To increase the level of motivation regarding the use of digital public services, the Ministry of Digitization of Ukraine launched the Index of Digital Transformation of the Regions of Ukraine, which allows determining the effectiveness of government bodies in the direction of digitalization. The results of the 2022 study show that the Index within Ukraine is 0.650 points out of 1 possible. According to the results of the study, the share of Ukrainians with digital skills at the "basic" and "higher" levels is 52.2%. At the

same time, the ambitious goal of the state is the integration of digital technologies in all areas of business, which should lead to fundamental changes in the way citizens, enterprises and organizations act, how they provide value for themselves, their employees, customers, partners, achieving their own and common, economic and social goals faster, cheaper and with new quality. The strategic goal of the digital transformation of Ukraine is to enter the list of the top 50 countries in the world in the field of artificial intelligence.

Conclusions. The analysis of scientific publications on the issue of artificial intelligence made it possible to establish the ambiguity of its interpretation from the point of view of the object and subject of research, as well as the field of knowledge. Almost all authors agree that artificial intelligence should be similar to human intelligence and related to data, information and knowledge, and its main characteristics are the understanding of natural language, the ability to learn, the ability to think (generalize and draw conclusions), as well as to accept decision. According to the authors of this article, artificial intelligence focuses on developing algorithms and models that allow computers to analyze data, use logic, and learn from data using various technologies. The classification of methods, algorithms and technologies of artificial intelligence is proposed and it is concluded that the set of technologies used determines the level of development of intelligent systems from those that perform an auxiliary role to more complex autonomous systems of artificial intelligence capable of making independent decisions, taking into account unforeseen situations and variables conditions.

From the point of view of practical use, according to experts, in the coming years, AI

will become the only and best tool for the promotion and development of products and services on the market. Analysts predict that around 70% of companies worldwide will adopt at least one form of AI by 2030 as part of scaling their operations, and a significant proportion of large enterprises will use the full range of available innovations to enhance existing lines of business. The paper provides a thorough analysis of the transformation of traditional business processes and functions in supply chains under the influence of artificial intelligence technologies. It was concluded that most of the tasks that are currently solved with the help of artificial intelligence technologies are well structured and are operational and tactical in nature. The vast majority of tools used allow generating a better alternative from a set of possible solutions, such as supplier selection, inventory planning, route optimization, etc. The authors link future research and prospects for expanding the use of artificial intelligence tools with the techniques of multi-criteria optimization and fuzzy logic, as well as hybrid models and methods.

For the practical use of advantages and prevention of risks of artificial intelligence, the competence of management personnel is extremely important. While AI can automate routine tasks and provide valuable insights, it still requires human expertise to make sense of data and make strategic decisions. Supply chain managers should not compete with artificial intelligence, but learn to work effectively with it and develop new skills and abilities. Communicating with AI requires the ability to explain, interpret, and use analysis results, and to interact with colleagues and customers based on that data. Continuous learning and improvement of digital skills will help professionals to have strategic thinking and creativity, as well as to be successful and competitive in supply chain management.

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UDC 656.7.086 (45)

DOI: <https://doi.org/10.46783/smart-scm/2023-19-4>

JEL Classification: L82, M15, O3.

Received: 18 June 2023

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THE PLACE OF ORGANIZATIONAL CULTURE IN THE MANAGEMENT SYSTEM OF AVIATION ENTERPRISES

Oksana Kyrylenko, Valentyna Novak, Mykhailo Podrieza. *«The place of organizational culture in the management system of aviation enterprises».* This scientific article is devoted to the study of the organizational culture of air transport enterprises. Organizational culture defines the values, norms, ideas and practices that shape the way the enterprise functions. A detailed analysis of the organizational culture of air transport enterprises will allow to understand the key factors that affect their efficiency and competitiveness, to determine the place of organizational culture in the management system. In addition, the article offers strategies for the development of organizational culture aimed at improving the performance of air transport enterprises.

Keywords: organizational culture, aviation enterprises, management system, development strategy, leadership.

Оксана Кириленко, Валентина Новак, Михайло Подреза. *«Місце організаційної культури в системі управління авіаційними підприємствами».* Дана наукова стаття присвячена дослідженню організаційної культури авіатранспортних підприємств. Організаційна культура визначає цінності, норми, ідеї та практики, які формують спосіб функціонування підприємства. Детальний аналіз організаційної культури авіатранспортних підприємств дозволить зрозуміти ключові фактори, що впливають на їх ефективність і конкурентоспроможність, визначити місце організаційної культури в системі управління. Крім того, у статті запропоновано стратегії

розвитку організаційної культури, спрямовані на підвищення ефективності діяльності авіатранспортних підприємств.

Ключові слова: організаційна культура, авіапідприємства, система управління, стратегія розвитку, лідерство.

Introduction. In recent years, managers increasingly raise the issue of the need to create a high organizational culture at enterprises, which also has proper scientific justification. The culture formed in organizations has a significant influence on management decisions and, in fact, all processes of the enterprise's functioning. The management of powerful foreign enterprises sees the reasons for success precisely in a high organizational culture, because among the important factors of the effectiveness of personnel functioning, it is the organizational culture that ensures the formation of a set of unique conditions. In many Ukrainian enterprises, the role of organizational culture remains implicit, especially from the point of view of influence on the efficiency of operations. That is why the question of researching the process of organizational culture formation is important for the implementation of the experience of foreign enterprises in the practice of Ukrainian enterprises, the basis of which should be the synthesis of modern scientific provisions.

The formulation of the goals of the article is a generalization of theoretical and practical issues of organizational culture formation and ensuring its positive impact on the effectiveness of the organization's functioning. Based on the set goal, the following tasks are expected to be solved: to systematize the approaches of scientists to the definition of the concept of "organizational culture"; to investigate the development factors and stages of formulating the organizational culture of the enterprise; clarify the key characteristics of the organizational culture that corresponds to the high level; to investigate the influence of organizational culture on the efficiency of the enterprise; summarize the experience of foreign companies and determine the

conditions for its implementation in the practice of Ukrainian companies.

Analysis of recent research and publications. The work of many scientists has been devoted to research on the formation of organizational culture. In their works, the factors and goals of the formation of the organizational culture of industrial enterprises are defined, and the algorithms of the formation of the organizational culture of enterprises of certain industries are given. However, the peculiarities of aviation enterprises during the war and in the post-war economy of Ukraine, which act as factors of influence on organizational culture, have not yet been investigated, which led to the conduct of this study within the framework of the article.

Presenting main material. Organizational culture is one of the most influential elements of organizational management. It can be attributed to the factors of influence on management, since it is based on the ability of managers to communicate correctly with subordinates, to determine under which cooperation the work will be most successful: performed individually by each subordinate or collective performance. Each manager must develop the culture of the enterprise, and for this he must apply methods of assessing the organizational culture in his team, which include questionnaires, conducting exercises, trainings, researching instructions or other documents that explain cultural elements, comparing his own organizational culture with others, more perfect and be able to introduce changes in a timely manner, if necessary. Organizational culture is defined as the conceptual essence of the organization, which determines the general value system of the enterprise [2]. It is subject to regular

changes, which are carried out by introducing innovations into the work of the enterprise.

Thanks to an effectively functioning organizational culture, the enterprise can respond in time and dynamically to any manifestations of the market environment, be a market leader and have high competitiveness. For this purpose, it is necessary to understand the mechanism of formation of the organizational culture of the enterprise, its goals, influencing factors and values. Taking into account the research in the field of organizational culture, it is worth noting that the specifics of the formation of the organizational culture of water transport enterprises have not been considered by scientists before, but it has its own characteristics that should be taken into account when forming it. There is still the question of ensuring the moral and material interest of water transport workers of Ukraine in increasing the efficiency and quality of work, stimulating the continuous labor activity of workers, consolidating the professional staff and its development.

Organizational culture determines the way of life and work in the organization. In the context of air transport companies, organizational culture plays an important role in shaping corporate identity, motivating employees to achieve high standards and providing quality services. This article offers an in-depth analysis of the organizational culture of the world's air transport enterprises, highlights the key factors affecting their effectiveness, and considers development strategies for achieving high results.

Organizational culture is a set of values, ideas, norms, symbols and practices that shape the way the organization functions. It affects the thinking, behavior and interaction of employees. Organizational culture can be visible (symbols, clothing, rituals) and invisible (values, norms, ideas). Components of organizational culture include leadership, communication, management style, cooperation, innovation and other aspects.

Factors influencing the organizational culture of air transport enterprises:

A. Leadership and corporate values. Leadership affects the formation of organizational culture. Quality leadership should contribute to the development of values that support high standards of quality and safety. Leaders must lead by example and encourage employees to self-develop and innovate.

B. Communication and interaction. Effective communication is an important element of organizational culture. Clear communication and openness help build trust and understanding between employees. In addition, it is important to encourage cooperation and interaction between different departments and levels of management.

C. Management style. Management style determines how decisions are made, how resources are allocated, and how control is exercised. A high-quality management style promotes the development of autonomy, stimulates their creativity and initiative. Flexibility and openness in decision-making contribute to rapid response to changes in the aviation industry.

D. Safety and quality culture. In aviation, safety and quality are critical aspects. Organizational culture should contribute to the formation of an uncompromising approach to flight safety and service quality. Ensuring training and conscious compliance with safety regulations and procedures help create a high safety culture in air transport enterprises.

Strategies for the development of the organizational culture of air transport enterprises:

- Attracting and developing talented employees. To develop organizational culture, it is important to attract and develop talented employees. This may include a system of support and career development, educational programs and trainings that contribute to the development of professional skills and leadership qualities.

- Creating a stimulating environment. Creating a stimulating environment is an important aspect of organizational culture

development. This may include establishing reward and recognition mechanisms, encouraging creativity and innovation, encouraging cooperation and collective achievement of goals.

- Definition of clear goals and values. Defining clear goals and values is an important element in the development of organizational culture. It helps direct the efforts of employees, stimulates their independent motivation and focus on achieving common goals.

- Communication and employee engagement. Effective communication and involvement of employees in decision-making processes are important elements of organizational culture development. Openness, transparency and cooperation contribute to the involvement of employees in the formation and improvement of organizational culture.

1. Organizational culture is a key element of the success and competitiveness of air transport enterprises. Leadership, communication, management style, safety and quality culture are important factors that determine organizational culture. Development strategies, such as attracting and developing talent, creating a stimulating environment, defining goals and values, communication and engaging employees, contribute to achieving high performance and developing the organizational culture of air transport enterprises.

2. Leadership in aviation enterprises affects the formation and development of organizational culture. Leadership defines the company's values, vision and mission, and motivates employees to achieve high standards and achieve common goals. Quality leadership contributes to the formation of a holistic organizational culture in which employees feel part of a team, a community, and develop in accordance with common values and norms.

3. Leaders in aviation enterprises have a great influence on the formation of organizational culture by:

4. Setting goals and defining a common vision. Leadership defines strategic goals and directs the enterprise to achieve a common vision. This helps create a common goal and direction for all employees.

5. Creation of corporate values and norms. Leadership establishes corporate values that define standards of behavior and interaction within the organization. This includes ethical principles, responsibility to employees and customers, and a commitment to innovation and improvement.

6. Stimulation and motivation. Leadership stimulates and motivates employees to achieve high results and exceed expectations. This can be done with the help of a system of rewards and recognition, promotion of professional development and expansion of competences of employees.

7. Communication and interaction. Leadership ensures effective communication within the organization. Leaders must be open to feedback, listen to employees, and facilitate interaction between different levels and departments.

8. Example and influence. Leadership sets an example for other employees. Leaders must live up to the values and norms they promote and demonstrate responsible and ethical behavior.

Organizational culture is formed in the process of communication and joint problem solving to achieve the common goal of the founder of the enterprise and a group of like-minded people [4]. As a result of these processes, one's own values, criteria for achieving common goals, rules and norms of behavior, and forms of interaction with the external environment are produced. That is, a necessary condition for the formation and development of organizational culture is the joint activity of people and the presence of a common goal. When forming organizational culture, one must realize that it is necessary to create conditions in which its continuous development will take place.

In order to maintain their positions in the market, organizations need to respond to

changes in the external environment and change their organizational culture accordingly. Adapting to changes, organizational culture creates an internal environment that contributes to the constant process of accumulation, distribution and exchange of knowledge among employees, which prepares the enterprise for possible future changes in the environment [3,5].

The results of the aviation enterprise are related to its organizational culture. Organizational culture occupies a place in the basis of the organization of management of all factors of the company's activity, which seem imperceptible, but are actually the most significant. Thanks to a high organizational culture, the airline company receives results that embody the complex effects presented in the article. At many enterprises, a well-formed or high organizational culture occupies a key place in the management system at the same level as the development strategy. The question of the dependence of the results of the researched enterprises on the key characteristics of the organizational structure requires further research.

Conclusions. So, organizational or corporate culture is a combination of the organization's politics and ideology, its system of priorities, motivation and distribution of power. It characterizes the social values and norms of behavior of its participants, is a basic belief, a standard for norms and patterns of behavior shared by employees of the organization during a certain period of its existence. It is laid in the

subconscious of employees and determines the style of their behavior, forms the unity of the organization. It can also be defined as a formed set of templates, basic values and principles of adaptation of the organization to external changes, which are recognized and accepted by employees, as well as the process of forming relationships among groups of employees in the enterprise. In order to understand the influence of organizational culture on an aviation enterprise, it is necessary to determine the stages of its formation and what processes it affects. Organizational culture is formed either consciously as a result of individual and purposeful actions of leading members or arbitrarily under the influence of social processes arising from the relationships of persons employed in the organization, important events at the enterprise and the stability or dynamics of the external environment. Undoubtedly, when the key development goals were in the area of building up the material and technical base, the issues of culture were not even considered, and its formation took place in parallel. And therefore, gaining experience in building a corporate structure took place over a long period of time. In modern conditions, when attention to issues of organizational culture has increased, its influence on the effectiveness of activities has been proven, the issue of its formation is gaining formal consolidation. Leading corporations form organizational culture consciously and it must be embedded in the organizational structure.

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Field of science: Economic.

Specialties: 051 – Economics; 073 – Management

ISSN 2708-3195

DOI: <https://doi.org/10.46783/smart-scm/2023-19>

The electronic magazine is included in the international scientometric databases:
Index Copernicus, Google Scholar

№ 19 (2023)

June 2023

ISSN 2708-3195

DOI: <https://doi.org/10.46783/smart-scm/2023-19>



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