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SUBSTANTIATION OF EXPEDIENCY OF THE COMPLEX APPROACH FOR SUPPLY CHAINS MANAGEMENT IN THE COVID-19 CONDITIONS

Mariia Hryhorak, Henryk Dzwigol, Nataliia Trushkina, Yuliya Shkrygun "Substantiation of expediency of the complex approach for supply chains management in the COVID-19 conditions". *The transformations of management approaches to global supply chain management under the influence of a pandemic were analyzed. Key barriers to supply chain development in the context of the COVID-19 pandemic have been identified: non-diversification of supply chains; instability of the logistic activity organization; stretched supply chains; lack of flexibility and a single information space for all sections of global logistics networks; the dominant role of China as a "world factory".*

Based on the analysis of development indicators of global supply chains dynamics new trends and patterns for the post pandemic period were revealed. While transparency from start to finish (end-to-end). The

application of new technologies to ensure the transparency of supply chains was considered. Peculiarities and tendencies of supply chain development in Ukraine were researched. The expediency of applying an integrated approach to supply chain management taking into account global economic changes substantiated.

The directions of transformation of global logistics networks determined in the post coronavirus epoch among them we can note the following: increasing the volume of special air cargo transportation – airlines are already redeploying the fleet for exceptional air freight services; increasing the number of cargo inspections and border control protocols; intensification of the introduction of digital technologies and e-commerce; reconfiguration of global chains.

***Keywords**:* global supply chains, logistics networks, supply chain management, COVID-19, barriers, threats, consequences, management approaches, integrated approach, transformation, globalization, digital technologies, synergetic effect.

Мрія Григорак, Дзвігол Гендрик, Наталія Трушкіна, Юлія Шкригун "Обґрунтування доцільності застосування комплексного підходу до управління ланцюгами постачань в умовах COVID-19". *Проаналізовано трансформації управлінських підходів до управління глобальними ланцюгами поставок під впливом пандемії. Виявлено ключові бар'єри для розвитку ланцюгів постачань у контексті пандемії COVID-19: недиверсифікованість ланцюгів постачань; нестабільність організації логістичної діяльності; розтягнутість ланцюгів постачань; відсутність гнучкості та єдиного інформаційного простору для всіх ділянок глобальних логістичних мереж; домінуюча роль Китаю як «світової фабрики».*

На підставі аналізу динаміки показників розвитку глобальних ланцюгів постачань виявлено нові тренди і закономірності для постпандемічного періоду. Встановлено, що на перший план виходить видимість і прозорість ланцюгів поставок, при цьому прозорість від початку до кінця (end-to-end). Розглянуто застосування нових технологій для забезпечення прозорості ланцюгів постачань. Досліджено особливості й тенденції розвитку ланцюгів постачань в Україні. Обгрунтовано доцільність застосування комплексного підходу до управління ланцюгами постачань з урахуванням глобальних економічних змін.

Визначено напрями трансформації глобальних логістичних мереж в епоху посткоронавірусу, серед яких можна відзначити такі: збільшення обсягу спеціальних вантажних авіаперевезень – авіакомпанії вже перерозподіляють флот для виняткового обслуговування вантажних авіаперевезень; зростання кількості перевірок вантажів і протоколів прикордонного контролю; активізація впровадження цифрових технологій та електронної комерції; реконфігурація глобальних ланцюгів.

Ключові слова: глобальні ланцюги поставок, логістичні мережі, управління ланцюгами постачань, COVID-19, бар'єри, загрози, наслідки, управлінські підходи, комплексний підхід, трансформація, глобалізація, цифрові технології, синергетичний ефект.

Мария Григорак, Дзвигол Гендрик, Наталия Трушкина, Юлия Шкригун "Обоснование целесообразности использования комплексного подхода в управлении цепями поставок в условиях COVID-19". *Проанализировано трансформацию управленческих подходов в управлении глобальными цепями поставок в условиях пандемии. Выявлено ключевые барьеры для развития цепей поставок при влиянии пандемии COVID-19: недиверсифицированость цепей поставок; нестабильность организации логистической деятельности; растянутость цепей поставок; отсутствие гибкости и единого информационного пространства для всех участков глобальных логистических сетей; доминирующая роль Китая в качестве «всемирной фабрики».*

На основе анализа динамики показателей развития глобальных цепей поставок выявлено новые тренды и закономерности для постпандемического периода. Определено, что на первый план выходит видимость и прозрачность цепей поставок, при этом прозрачность от начала до конца (end-to-end). Рассмотрено применение новых технологий для обеспечения прозрачности цепей поставок. Исследовано особенности и тенденции развития цепей поставок в Украине. Обосновано

целесообразность использования комплексного подхода в управлении цепями поставок с учетом глобальных экономических изменений.

Определены направления трансформации глобальных логистических сетей в эпоху посткоронавируса, среди которых можно выделить следующие: увеличение объемов специальных грузовых авиаперевозок – авиакомпании уже перераспределяют флот для исключительного обслуживания грузовых авиаперевозок; рост количества проверок грузов и протоколов пограничного контроля; активизация внедрения цифровых технологий и электронной коммерции; реконфигурация глобальных цепей.

Ключевые слова: глобальные цепи поставок, логистические сети, управление цепями поставок, COVID-19, барьеры, угрозы, последствия, управленческие подходы, комплексный подход, трансформация, глобализация, цифровые технологии, синергетический эффект.

Introduction. The world economy has tended to globalize, which has contributed to the formation and development of global supply chains. However, the COVID-19 pandemic has led to an unprecedented halt or slowdown in production in virtually all industries around the world. This in turn has threatened the functioning of global supply chains. Currently global supply chains characterized by complexity and a large number of intermediary companies that according to some specialists is one of the barriers that hinder the development of chains in a COVID-19 pandemic. This opinion is shared by D. Simchi-Levy [1], a specialist in logistics from Massachusetts Institute of Technology (MIT), who argues that in the 1980s, a significant number of companies relocated production to Asia, particularly China, in the short term to reduce costs. As well, one of the main lacks of the stretched supply chains showed in the pandemic conditions – the ability to "break" at any time and in any area, which directly affects the entire supply system.

Analysis of recent researches and publications. A significant number of scientific papers are devoted to conceptual principles, scientific and methodological approaches and practical recommendations for improving supply chain management.

As the analysis of foreign and domestic scientific sources on the problems of logistics shows, scientists have paid much attention to the justification and development of:

- a logistics model of distribution, a rational structure of sales channels, an effective marketing policy of distribution at the enterprise [2];
- the offers for improving supply management [3; 4];
- the methodical approaches to determining the optimal volume of the delivery party [5];
- the measures to improve the level of services and customer service [6-10];
- the concepts, models of optimization and supply chain management strategies [11-18];
- the recommendations for the use of digital technologies (Internet of Things, artificial intelligence, blockchain, logistics 4.0, robotics, 5G) to improve the efficiency of supply chain management in the context of the Industry 4.0 [19-30].

However, despite such close attention to the outlined problem by scientists, it remains relevant to conduct research in the direction of transforming management approaches to the management of global supply chains, taking into account new challenges and threats, one of which is COVID-19.

The purpose and objectives of the study is to study the features and trends of global supply chains; identifying key barriers to the development of supply chains in the context of the COVID-19 pandemic; determining the directions of transformation of global logistics networks in the post coronavirus era; substantiation of an integrated approach to supply chain management.

Basic material and results. Supply chain management carried out using such basic

management approaches as quantitative, process, system, situational (Table 1).

Table 1. Characteristics of management approaches to supply chain management

Approach	Content	Advantages
Quantitative	Transition from qualitative to quantitative assessments using mathematical, statistical methods, engineering calculations, expert assessments. The essence is to use in the decision-making process of mathematical and statistical analysis methods. This approach calls an operations research (the use of research methods to the operational processes of the organization). In other words it is an application of economic and mathematical methods to solve management problems	- an accuracy; - a possibility of forecasting; - a selection of the best option from possible in solving management problems; - a speed of information processing and management decisions
Process	The essence is to build a system of organizational processes and management of these processes to achieve maximum efficiency of companies in supply chains. Management is sees as a process in other words a set of continuous interconnected actions that call management functions.	- the optimization and maximum automation of the general corporate governance system; - a transparency of the general corporate governance system for management and its ability to respond flexibly to changes in the external environment; - a constant increase of efficiency of the management system and the maximum consideration of needs of stakeholders; - an effective use of the information system of the enterprise
Systemic	The way of thinking about organization and management, but in no way it is a set of instructions or principles for managers. It allows only conditionally to represent the organization in the unity of its constituent elements	- an efficiency of the management process
Situational	Close relationship with the systems approach. The key point is the situation, so a specific set of circumstances significantly affect the company at this time.	- a better understanding of what techniques will be more conducive to achieving the company's goals in a particular situation

Source: revised by the authors on the basis of [31; 35; 36; 37; 38]

The system approach allows to consider any more or less difficult object as rather independent system with the features of functioning and development [31, p. 27]. According to the methodology of scientific knowledge, the basis of this approach is the consideration of objects as systems consisting of regularly structured and functionally organized elements [32, p. 32].

The application of the system approach allows to investigate the functioning, development, structure of the whole (object), to establish the properties of its parts (elements), to trace the interactions and relationships between them [33, p. 157].

While the relationship management system within the functional approach, as noted in [34, p. 63], is a hierarchical structure of interconnected processes of implementation of management functions. It allows to optimize the overall corporate governance system, make it transparent to management and able to respond flexibly to changes in the external environment.

It is worth noting that management approaches to managing global supply chains are being transformed under the influence of the COVID-19 pandemic. The consequences of its impact on the development of global supply chains can be viewed through the prism of a new vector of the world economy, namely: regionalization of production, market diversification, which will lead to the localization and reduction of supply chains.

Key barriers to the development of supply chains in COVID-19 include:

- non-diversification of supply chains, which, in turn, leads to instability in the organization of logistics activities;
- the factor of stretched supply chains, lack of flexibility and a single information space for all sections of global logistics networks;
- China's dominant role as a "global factory" that leads to the fact that a serious disturbance in the Chinese market directly threatens global supply chains. It is evidenced by the fact that more than 200 Fortune Global 500 companies [39] operate in Wuhan, the highly industrialized province where the outbreak originated and which has suffered the most from the spread of the virus.

Due to the rapid spread of the virus and the announcement of quarantine around the world, supply chains have already suffered serious disruptions. Supply chains play a crucial role in the organization of fast, safe and uninterrupted delivery of goods and services. It is important for company executives to make decisions quickly and immediately implement a set of measures to maintain business continuity to meet the demands of consumers and customers, as well as to protect and support their employees [40]. The 94% of Fortune 1000 companies report supply chain failures through COVID-19 [41]. The 75% of companies have already experienced a negative or very negative impact on their business. The 55% of companies plan to revise their growth forecasts downwards (or have already done it).

Well-known scientist D. Simchi-Levy draws attention to the significant growth of China's role in world trade. According to him, "If in 2002, during the SARS epidemic, China's share in global GDP was 4.3%, so today it is 16%" [1] (Figure 1).

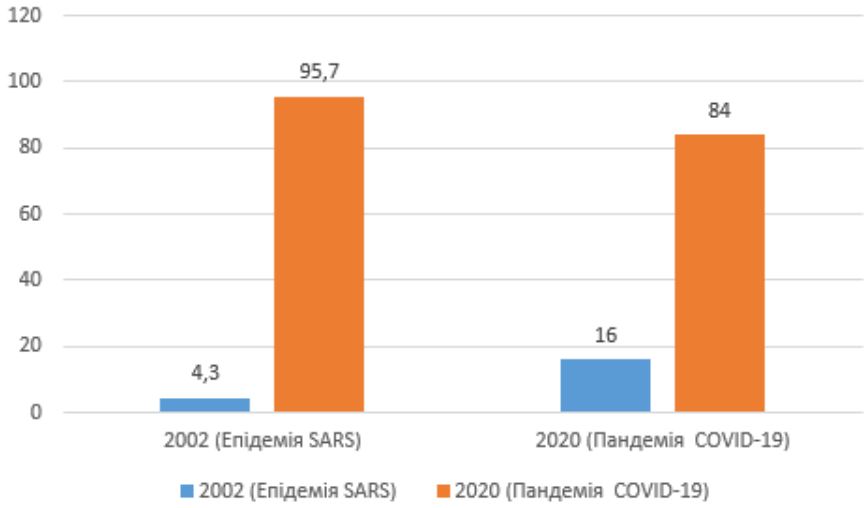

Figure 1 – China's share of global GDP
Source: developed by the authors on the basis on [1]

The rapid spread of COVID-19 and the measures taken by governments to contain it have serious consequences for the world's largest economies. According to the World Bank, it expects that world GDP will be characterized in 2020 by the sharpest decline since World War II [42]. The economic shock which caused by the coronavirus has been compared to the financial crisis of 2009 [43].

In a pandemic situation, the International Monetary Fund expects the Eurozone economy to shrink by 10% in 2020 and recover by 6% in 2021. According to Eurostat, in January-May 2020, compared to the same period in 2019, international trade between EU member states decreased by 13.9%. Should note that the transport and logistics sector is particularly vulnerable to economic shocks. It is dues to the fact that more than 80% of world trade are accounting for by commercial transportation [44].

The further condition of transport and logistics companies depends on types of economic activity and scales of business of clients. It will affect the transformation of the customer relationship management system and the quality of logistics service [45-51].

The COVID-19 pandemic has also significantly affected the road transport sector. Consider this aspect on the example of Polish carriers. Thus, in 2019, they became the EU leader in terms of traffic, increasing them by 14%. And the share of Polish traffic increased to 32% of total cross-border traffic in the EU. During the pandemic from January to May 2020, the tonnage of goods transported by Polish carriers decreased by 8.3%. This is primarily due to the decline in production and trade activity in Poland and the EU [52].

The impact of the pandemic on the general processes in the world economy, in particular on logistics, the WTO Secretariat considers through the analysis of trends in world trade for the pre-coronavirus period and forecasting indicators for the coming years. They based on the current unstable situation in the world, which leads to the need to consider both optimistic and pessimistic scenarios for further development of the situation (Figure 2, Table 2).

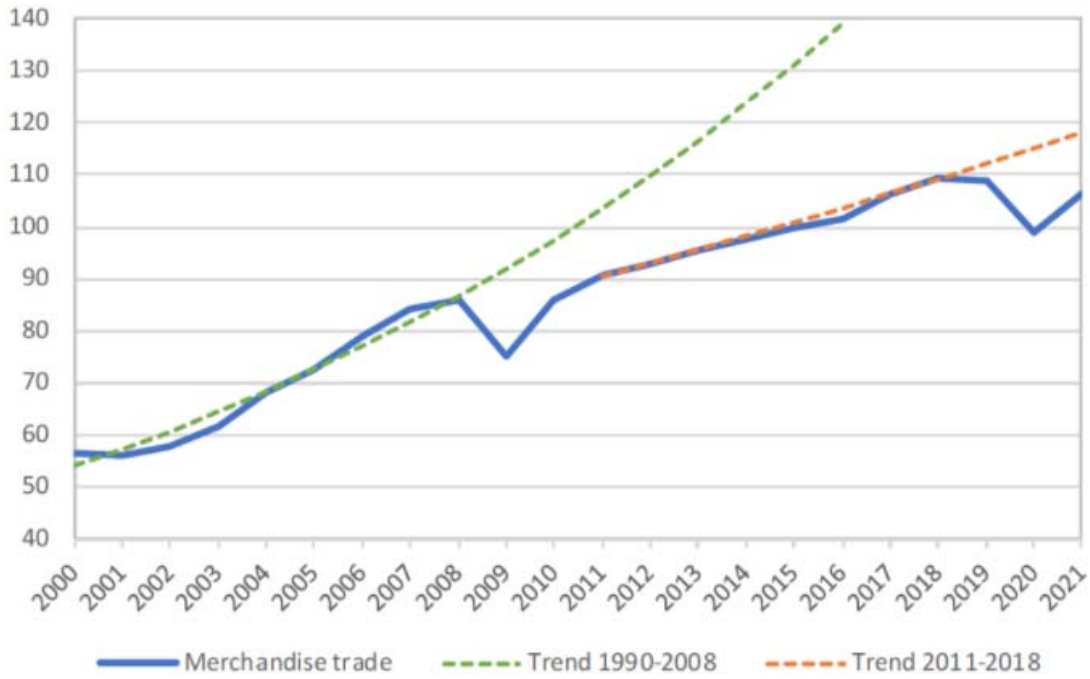

Figure 2 – Dynamics of world trade in goods in 2000-2021
Note: Figures for 2020 and 2021 are forecasts. Indices, 2015 = 100
Source: developed by the authors on the basis on [53]

Table 2. The dynamics of trade in goods for 2015-2021

Indicators	Years						
	2015	2016	2017	2018	2019	2020	2021
World trade volume (b)	2,3	1,4	4,7	2,9	-0,1	-9,2	7,2
Export							
North America	2,6	0,7	3,4	3,8	1	-14,7	10,7
South and Central America	0,6	1,3	2,9	0,1	-2,2	-7,7	5,4
Europe	2,9	1,1	3,7	2	0,1	-11,7	8,2
Asia	1,3	2,3	6,7	3,7	0,9	-4,5	5,7
Other regions (c)	1,8	3,5	0,7	0,7	-2,9	-9,5	6,1
Imports							
North America	5,2	0,3	4,4	5,2	-0,4	-8,7	6,7
South and Central America	-7,6	-9	4,3	5,3	-2,1	-13,5	6,5
Europe	3,6	3	3	1,5	0,5	-10,3	8,7
Asia	2,1	2,2	8,4	4,9	-0,6	-4,4	6,2
Other regions (c)	-3,9	-4,5	3,4	0,3	1,5	-16	5,6

Notes: Figures for 2020 and 2021 are projections (a); Average of exports and imports (b); Other regions comprise Africa, Middle East and Commonwealth of Independent States (CIS), including associate and former member States (c). Annual change – in %.

Source: developed by the authors on the basis on [53]

The WTO considers 2 scenarios of changes in the volume of commodity trade depending on the factors considered (Figure 3).

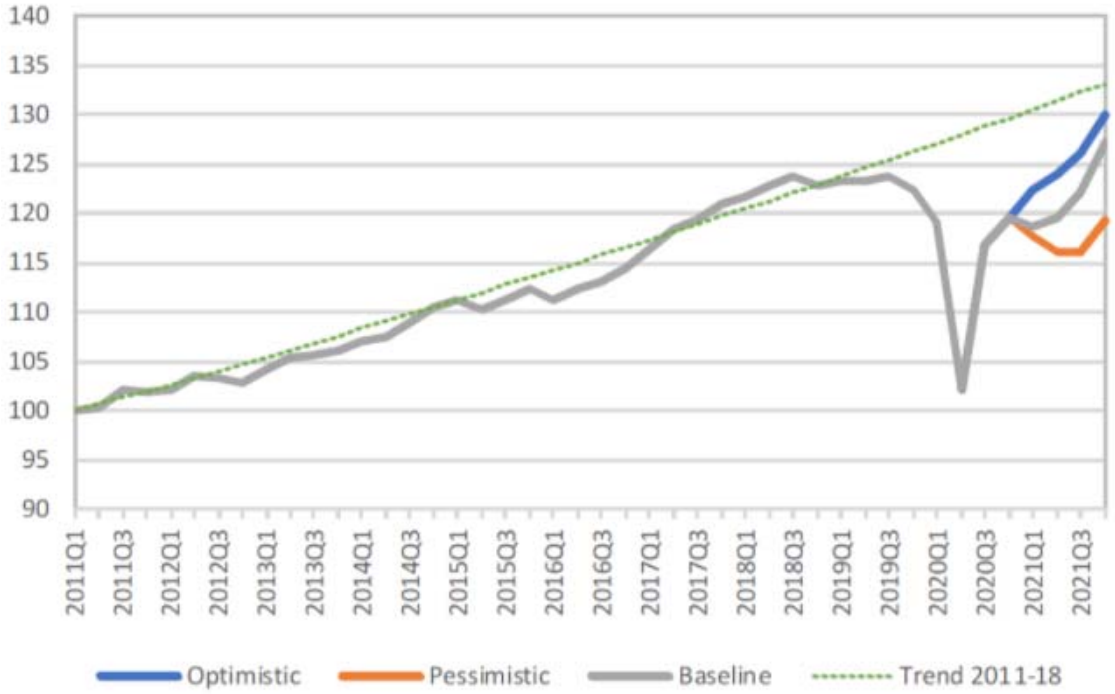

Figure 3 – Optimistic and pessimistic scenarios of trade volume

Note: Index, 2011Q1 = 100

Source: developed by the authors on the basis on [53]

In the event of a second outbreak of COVID-19, a number of further blockades will be required, which should affect fiscal policy and exacerbate problems in the labor market.

On the other hand, the emergence of an effective vaccine will promote rapid and confident growth in production and trade. Other positive factors include the emergence of new technology sectors, such as artificial intelligence and e-commerce, and the increasing use of innovation in traditional industries, that had forced to make greater use of information technology to deliver goods and services to customers during a pandemic.

The WTO comments that from early January to mid-April 2020, the number of flights worldwide fell by about 80%, the number of international flights decreased significantly than domestic. Since that period, the total number of flights has gradually recovered, rising to 57% of its level at the beginning of the year (Figure 4). The recovery was more successful in the European Union, with the number of flights within the EU rising to 95% from January.

According to the transport company Bollore Logistics, the global introduction of the vaccine will not have a significant impact on air traffic. It is expected that the introduction may generate about 65 thousand tons of air traffic, that equivalents to 0.3% of air trade in 2019, but the impact may be more significant if the vaccine will be released in batches [54].

Barthelme Bonadio from the Michigan University and 3 co-authors point out that when considering placement chains, it is necessary to separate the criteria of reliability of creation chains (possibility of continuing work in crisis conditions) from the criteria of stability (ability to be responsible for crises) [55].

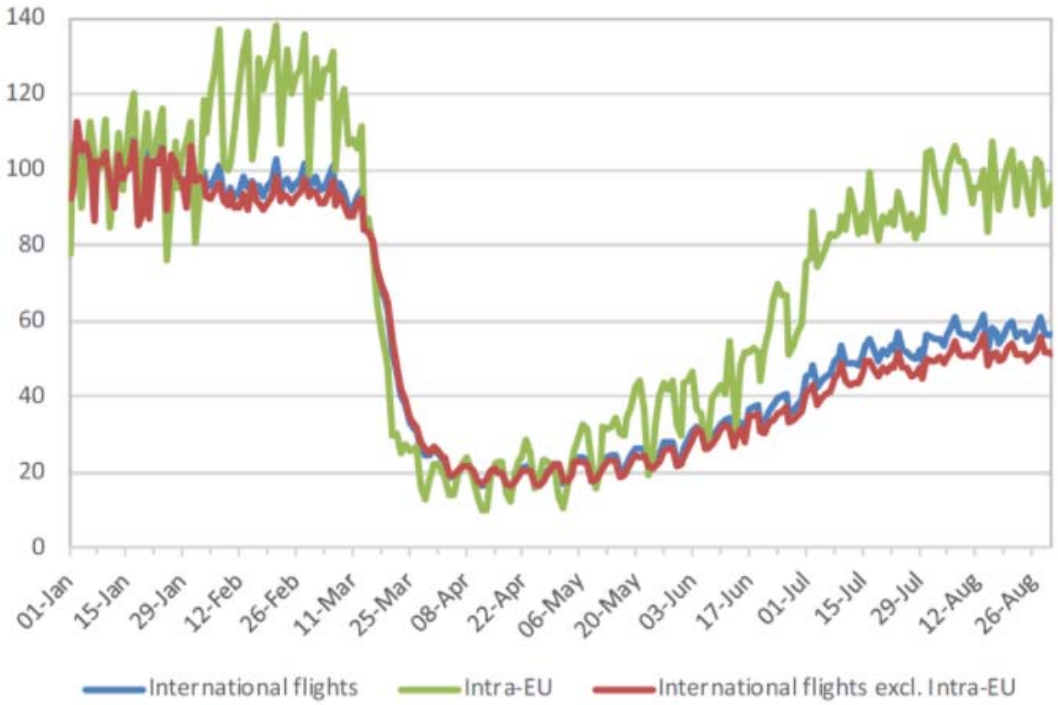

Figure 4 – International commercial flights January 1, 2020 - August 31, 2020
Note: Index, week 1 January = 100
Source: developed by the authors on the basis on [53]

The increased digitalization caused by COVID-19 can significantly increase the size of the services market, despite the fact that the goods market continues to slow down (Fig. 5). However, it should be noted that the growth of the services market directly depends on the nature of the long-term impact of the pandemic on the labor market.

According to D. Payne, an economist at business magazine Kiplinger, supply chain

disruptions affect more than just China. Enterprises that import spare parts or raw materials from Southeast Asia face the fact that their suppliers, in turn, depend on supplies of raw materials from China, for example, garment factories in Cambodia have stopped due to a shortage of fabric in China.

Simchi-Levy thinks that companies around the world need to invest more in logistics [1]. On his opinion, they should know not only their suppliers but also suppliers. You need to make sure that the supplier has different sources in different regions, or there must be multiple suppliers that can be replaced if necessary.

The research, prepared by experts from the consulting company Bain & Company [56], reflects the ineffectiveness of the basic principles of supply chain management, which have been in place for the past few decades and are to minimize costs and inventories. The research notes as well that the construction of flexible and adaptive supply chains is a necessary condition for the successful operation of logistics networks in the current realities of the economic crisis.

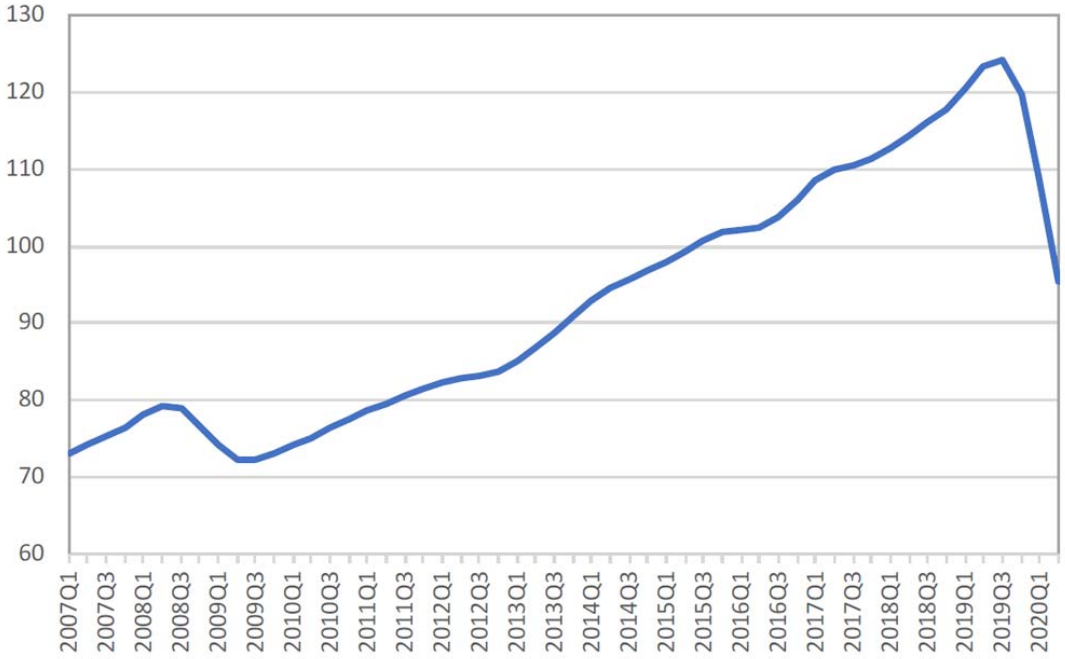

Figure 5 – Index of activity in world trade in services for the I quarter 2007 – II quarter 2020
Note: Index, 2015 = 100
Source: developed by the authors on the basis on [53]

The COVID-19 pandemic is a short-lived crisis. Its impact on the functioning of supply chains in companies will be long-term. Therefore, businesses need to increase long-term resilience throughout the value chain to effectively address the challenges of the future. It requires an integrated approach to supply chain management (Figure 6). So, companies need to have enough flexibility to protect themselves from future crises. They should also consider creating a reliable system that has the necessary tools for rapid and flexible risk management. The latter should be a technological solution using platforms that offer access to applied analytics, solutions using artificial intelligence and machine learning. It is necessary to ensure end-to-end transparency throughout the supply chain. In the long-term run, responding to situations that involve certain risks should become an integral part of traditional work standards. It is worth noting that the current crisis situation encourages businesses to reconsider existing supply chains with a focus on more adaptable and flexible systems.

For decades, cheap supply and minimum stocks have been key principles in supply

chain management. However, in a changing world, supply chains that are overly dependent on the supplier with the lowest prices and the lowest level of inventory can put businesses at risk.

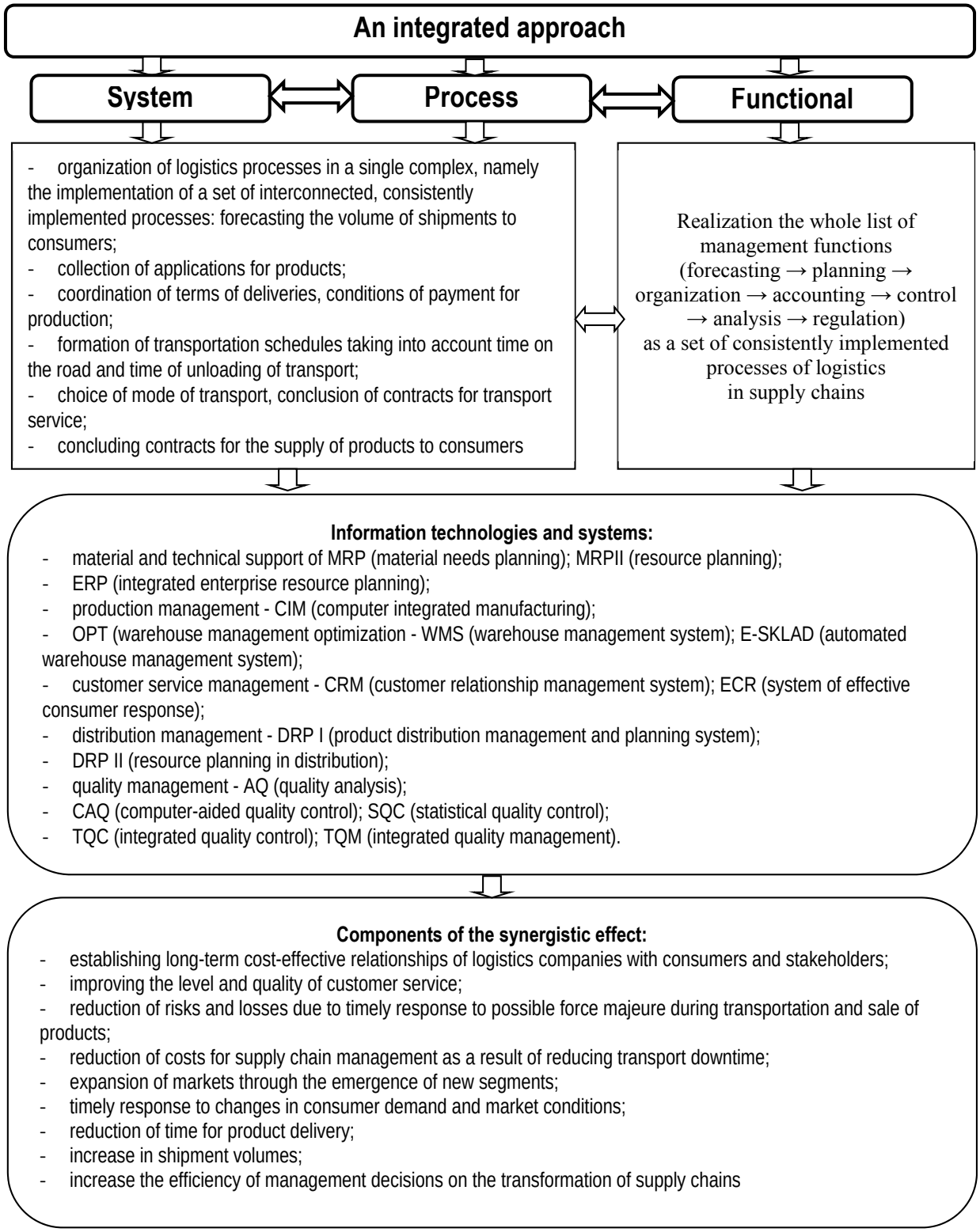

Figure 6 – An integrated approach to supply chain management
Source: developed by the authors

During the tense trade relationship between the United States and China, many leading companies have already begun to reconsider the cost of network risk and invest

in more flexible and adaptive supply chains. Flexible networks help to adapt quickly in times of crisis, allowing production facilities to respond quickly to changes in market demand. This in turn is a significant competitive advantage.

According to experts, companies with flexible supply chains are growing faster due to greater mobility and the company's ability to meet volatile demand and customer needs. In addition, for such companies there is an increase in orders by 20-40% and an increase in customer satisfaction by 30% [57].

Currently, some companies are investing in the flexibility and reliability of supply chains in order to minimize risks and make a profit by improving their efficiency. For example, Procter & Gamble used cloud technology to provide real-time production and demand information. The use of advanced tools of broad analytics allowed Hurricane Sandy, which hit New Jersey in 2012, to make operational decisions and reduce downtime to 2.5 days. In turn, the experience gained in the use of digital tools allowed Procter & Gamble to prepare for Hurricane Irma, which was approaching in 2017. So, the company was able to guess which suppliers, production facilities and distribution centers might be at risk of loss, and take inventory management measures in a way that helped avoid disruptions and financial losses. Flexible supply chains enabling rapid reorientation of production processes have allowed Giorgio Armani, Gucci, Prada and other world fashion leaders to launch the production of hygienic and medical products used in the fight against the COVID-19 pandemic.

Companies that invest in the adaptability and sustainability of supply chains reduce the production cycle of the final product by 40-60%. They primarily are able to do it due to rapid response and adaptation to changes in market demand and the corresponding acceleration of revenue growth. Flexible supply chains are able to increase production from 15% to 25%, which achieved by optimizing processes [56].

The economic crisis caused by the COVID-19 pandemic and its aftermath has shown that a number of companies already have flexible production lines. With the spread of coronavirus infection in Europe, in particular in France and Italy, the haute couture and luxury industry has rapidly restructured the production process for the production of medical and hygienic products. In particular, the manufacturer of luxury perfumes LVMH within 72 hours after the French government's appeal to the business established the production of disinfectants. Giorgio Armani, Gucci and Prada repurposed their designer clothing factories to produce protective overalls, and Burberry began producing protective masks and gowns. Obviously, the reorientation of production required not only the re-equipment of factories and production lines. However, the crucial role played flexible supply chains, which allow for a rapid search for raw materials, design and development of finished products. Thus, companies that invest in flexible supply chains are in a better position in times of crisis than those who do not pay due attention to it.

Gartner [58] has released another ranking of the top 25 companies in the supply chain. According to the results of 2020, the first place was taken by Cisco Systems (in 2019 – the 5th place). The top 25 includes companies such as AbbVie, British American Tobacco, Reckitt Benckiser and Biogen, and Lenovo and Kimberly Clark returned after a short break.

There have been no changes in the category of "masters" of supply chains: they have included Amazon, Apple, McDonald's, Unilever in terms of their merits over the past 10 years. Given the temporary closure of many businesses as a result of the COVID-19 coronavirus pandemic, ranking leaders need to have a flexible strategy. This allows supply chains to respond to changes in the context of the business environment.

Among the key features that allowed leaders to overtake competitors in 2020 during the pandemic and crisis, we can name [58]:

1) Target management model is the most successful supply chain management teams build their activities based on the goals. They form supply chains based on the expansion of partnerships and the principle of transparency;

2) Transformation of business models is one of the main external factors influencing corporate supply chains is a dynamic competitive landscape. It determines by expectations of consumers, the entry into the market of new players from existing industrial ecosystems, the emergence of non-traditional competitors;

3) Leadership in digitalization is the leaders of the ranking of supply chains are among the first to introduce the latest digital technologies. These investments help to succeed even in difficult economic conditions.

Under today's circumstances, most companies naturally reduce costs, including the cost of digital transformation programs. However, leading companies continue to develop supply chains and even boost investment in their cross-cutting visibility, improved real-time planning and flexibility, helping them to overcome fluctuations in demand.

As a result of the spread of the COVID-19 threat, companies may implement a set of measures to protect their supply chain operations. For companies operating or having business relationships in China and other affected countries, steps can include: informing employees about the symptoms and prevention of COVID-19; strengthening screening protocols; restriction of insignificant trips and encouragement of flexible work schedule; harmonization of IT systems and support with changing work requirements; preparation of succession plans for key management positions; focus on cash flow.

For companies that manufacture, distribute or supply suppliers in China and other affected countries, steps can include: increasing attention to staff / workforce planning; focusing on the risks of first tier suppliers; illustration of the expanded supply network; understanding and using alternative sources of supply; updating inventory policy and planning parameters; preparation for plant closure; focus on production planning flexibility; evaluation of alternative options for outbound logistics and reliable throughput; conducting global scenario planning.

For companies that sell goods to China or other countries, the steps can include: understanding the impact of demand on business; confirmation of the short-term strategy of synchronization of supply and demand; preparation for potential channel shifts; evaluation of alternative logistics options; opening communication channels with key customers; preparation for a "jump"; conducting global scenario planning.

Today it expects to accelerate the transformation of the traditional logistics model of the linear supply chain into digital networks, which provide end-to-end visibility, responsiveness, the ability to optimize current processes. It should note that in modern conditions a qualitatively new model of supply chains need. Many years of emphasis on supply chain optimization to minimize costs, reduce inventory, and increase asset utilization have eliminated buffers and flexibility to reduce disruptions. COVID-19 shows that many companies are not fully aware of the vulnerability of their supply chain relationships to global shocks.

That's why new technologies for the development of global supply chains are now emerging, which significantly improve the transparency of the entire chain and support the ability of companies to withstand such shocks. The traditional linear supply chain model transforms into digital supply chains (DSNs), in which functionally disparate blocks shared and organizations connect to their complete supply chain to provide end-to-end visibility, collaboration, flexibility and optimization.

From the experience of responding to the COVID-19 event, digital supply networks provide the ability to respond quickly to a wide range of possible problems: from

military action and the threat of terrorism to the bankruptcy of a supplier or a sudden and abrupt change in market conditions.

The further development of the logistics sector is connected with the general scenario according to which the world economy and in particular trade activity will recover. Today the emergence of an effective and widely available vaccine against COVID-19 and the elimination of real threats of a re-global outbreak of the virus is the main basis for the functioning of logistics and the global economy as a whole.

Experts of the logistics company Corex Logistics [59] based on the developed forecasts identified trends in the development of the logistics market in the post-corona crisis:

- price dumping in the freight market;
- exit of weak players from the market;
- development of collaborations, cooperation, association of services;
- refusal to purchase, increasing demand for repair and maintenance services of fleets;
- introduction of the latest IT technologies;
- the transition of employees mostly to remote work;
- order transportation from a mobile device; emergence of a separate industry "mobile carriers";
- development of domestic freight and logistics chains;
- development of outsourcing;
- emergence of demand for delivery of goods to small towns and villages;
- contactless courier delivery;
- development of delivery of parcels by drones;
- development of "autopilot" deliveries;
- "Last mile" delivery, etc.

According to the CEO of the Association for Supply Chain Management (ASCM) [60], one of the key approaches to the restructuring of supply chains should be the so-called "mapping" (supply chain mapping) as a visualization of the entire supply chain of the company ("maximum supply chain"). It should do in order to analyze not only their counterparties (level 1), but also the suppliers of their counterparties (levels 2-3). That is to see the whole supply chain from raw materials to the production and distribution of final products.

Thus, "mapping" supply chains allows to systematically assessing the geographical location of suppliers, distribution centers, transport routes and major markets.

"Mapping" includes information about the actions performed on each section of the supply chain, the time of change, frequency of use, association and volume of products, delivery efficiency. This allows assessing the potential risks and "weak" areas in the supply chain.

According to experts of the consulting portal Future Purchasing.com, to increase its resilience in unforeseen situations, businesses in addition to "mapping" supply chains, it is also necessary to explore approaches to supply to contractors and conduct stress testing of business continuity. The first direction allows you to assess the quality of interaction of their counterparties with their suppliers at 2-3 levels and jointly determine which supply strategies can change to reduce the risks of their counterparties. The second direction allows businesses to assess what can happen to supply chains for each product in the case of the implementation of scenarios of so-called "black swans". A similar assessment will help to prepare an action plan for each stress scenario and build supply chains based on the identified risks.

In order to effectively adapt supply chains the following step-by-step approach can be used [60]:

1) creation of a center for supply chain management, the main tasks of which will be to organize work on preparing supply chains for emergencies, identifying priority transformation initiatives, distribution of roles between structural units, the implementation of the necessary communication with all parties;

2) adaptation of current business processes of logistics activities under the conditions of remote work;

3) "Mapping" the supply chain and identifying its most vulnerable areas, both geographically and in terms of suppliers; research of approaches to supply from counterparties;

4) conducting stress testing of supply chains and developing approaches to responding in the event of stress scenarios or deterioration (the transition from demand forecasting to scenario threat forecasting is underway at this stage); when conducting qualification selection of suppliers, it is necessary to shift the emphasis from minimizing costs to minimizing risks; when drawing up contracts it is necessary to consider risks of a rupture of supply chains and to form requirements to terms and ways of recovery in case of failures.

5) monitoring the effectiveness of new approaches to supply chain management and their transformation in a case of necessary

It should note that the visibility and transparency of supply chains come to the fore, with end-to-end transparency. There is a difference between visibility and transparency. The visibility of the supply chain allows you to see a specific action with access to data in a particular node (hub). Transparency opens the supply chain to see all nodes and share data throughout the supply chain. In addition, transparency transmits internal and external data at a certain desired level [61]

The advantages of transparency are huge. This can improve the reputation of company among consumers, increase productivity and reduce operating costs. According to researchers from the MIT Sloan School of Management [62], companies can increase profits from 2% to 10% by improving end-to-end transparency from start to finish with innovative tools that reduce diversity.

Thus, companies can use supply chain transparency as a key factor for identifying, recording, sharing and forecasting events and transactions, as well as for the ability to translate data into useful information, ensure the flow of goods, gain more control over supply chains.

Due to the need for technologies that bring together stakeholders and systems, investment in innovation has begun to develop a technology tool with real-time capabilities to make changes and eliminate losses in supply chains. The tool collects data from all stakeholders in one place and provides analytics that can begin to anticipate and help make better decisions about how continuously manage supply chains from end to end and with maximum performance. For example, a truck delays due to traffic jams on the way to the retailer. With this new transparency technology, all parties notify of the delay in real time and can control it immediately rather than through a few phone calls that used to take hours. For a truck, you can change the route, calculate the time of arrival, and then send to the seller. It allows the seller to better plan the activities of employees, increase the level and quality of service and reduce operating costs.

To take full advantages of transparency technology, it have to link to people and processes. Platforms including the best business intelligence tools are able to apply predictive machine learning as well as real-world supply chain experience. These ideas and analysts communicate future decisions, prepare supply chains for unexpected events and rapid recovery from failures. All this leads to increased flexibility.

As an example is deliveries that do not have documents of origin. These are results in shipments detained at receiving docks, causing supply chain disruptions. However, due to the transparency of technology, stakeholders can see the goods as they move through the supply chain. That is why companies can avoid this failure. Delivery process documents can transmitted digitally in real time from sender to recipient, eliminating any "bottlenecks" in the nodes. It ensures full transparency for all parties.

Transparency increases value through the ability to gather and share information in

supply chains and logistics networks, improving business processes that support work. Transparency allows companies to prepare for possible failures and respond quickly to emerging situations. It is relevant in the case of a violation is a single event, a seasonal peak in sales or a pandemic. As a result, supply chain operators can respond to failures faster than ever before.

Thus, transparency expands the possibilities of routing, tracking and inventory management, return support and authentication and quality of goods. It also makes all participants in supply chains more reliable and efficient. It leads to a more flexible process of transporting goods, logistics that are more efficient, greater customer satisfaction and stability of the supply chain.

In developing the Logistics Trend Radar to determine supply chain management actions at the future, the DHL Innovation Center [63] relied on three core values: close to customers, close to new technologies, and close to operations.

Possible technologies to ensure the transparency of supply chains include [62]:

- Internet of Things (IoT) can assign logistics based on data. Now everyday objects can send, receive, process and store information and thus take an active part in event-driven logistics processes. The Internet of Things allows logistics service providers to benefit by generating ideas that drive change and new solutions.

- Transport marketplaces are logistics markets combining the demand of shippers and the supply of carriers in an increasingly complex network of supply chains. Providers of these digital brokerage services offer a centralized trading platform to manage not only tariffs and delivery schedules, but also additional services such as shipment control and customs document management, providing clients with an expanded and individual digital experience.

- "Supergrid" logistics – beyond the 4PL logistics and logistics markets, the "supergrid" logistics trend refers to the next measurement of consolidation and optimization of global supply chain networks, integration of many different manufacturing companies and logistics service providers. This opens up new business opportunities for a variety of players, including existing 4PLs, specialist companies and small startups.

- Big data analytics is logistics which transformed by the power of databased insights. Owing to the significant digital transformation and the Internet of Things, it is possible to obtain unprecedented amounts of data from various sources in the supply chain. Capitalizing on its value opens up huge potential for improving operational efficiency, improving customer service, reducing risk, and creating new business models.

- Blockchain is an eliminating the complexity of global supply chains. Blockchains, and other distributed registry technologies (DLTs) can help increase trust and transparency between stakeholders and customers by supporting the automation of administrative and commercial processes.

Regarding the situation in Ukraine, transformational transformations of supply chains are also taking place at present. Consider this on the example of the logistics operator "Raben Ukraine" [64]. At the beginning of the COVID-19 pandemic, the company decided to freeze the expansion of the goods storage area under controlled temperature conditions (+ 14-18 ° C). Now work in this direction resumed. At the beginning of 2020, the expansion of its own fleet was suspended, although it was planned to increase the number of trucks by 17%. Instead, they began to attract more third-party carriers. In addition, the introduction of digital technologies has been accelerated, namely the use of electronic document management has been significantly expanded (85% of all invoices and acts of work performed by clients have already been translated into electronic format). Electronic document management helps to optimize resources and reconfigure the process management system. Digitization, even at the

level of primary document flow, reduces costs by six times. Reconstruction and modernization of video surveillance systems is planned, the website of the company is updated.

In addition, digital technologies have been introduced to improve the quality of service. For example, drivers are equipped with special Panasonic FZ-N1 devices that use TISLog solutions that work as scanners, as well as in real time to track the movement of goods. With this system, customers receive data on the estimated time of arrival of the machine (ETA: Estimated Time of Arrival) with a time interval of +/- 2 hours. If it is a temporary vehicle, drivers can install a special application on the smartphone, which allows you to perform almost the same functions. For a B2B logistics operator, only the Raben Group uses this truly new solution in Europe. And the technical capabilities of the devices in the future will be used to further automate electronic trade.

Conclusions. Depending on the current changes, the organization of the work process has been modernized (70% of office workers already perform their duties remotely). Rules for compliance with the existing sanitary norms have been developed for warehouse staff, conditions for staff rotation have been created, and the delivery scheme for employees has been reorganized. The approach to meetings with clients and contractors is reconsidered. The online mode of communication is using to the maximum. The staff-training program has also been made online. One of the interesting projects worth mentioning is the Manager-Choice learning game. This is an innovative management development program involving about 1,000 managers from 13 countries. The aim of the game is to master the best management practices. In addition, attention is focused on the development of contract logistics.

Raben Ukraine strengthened the direction of international transportation, including groupage cargo. The volume of cargo transportation in the direction of Poland-Ukraine increased in 2020 by 4 times compared to 2019. Accordingly, the volume of services provided for customs clearance of imported goods increased. Warehouse logistics and e-commerce are developing. The main changes concern innovative IT-technologies. Thus, several projects successfully implemented together with leading international clients. This allowed to ensure the maximum integration of the individual client system into the Warehouse Management System (WMS) of Raben Ukraine. The process of transmitting information to courier services is also automated. There is a special software product for this is the Last Mile Connector.

It should note that today Ukrainian companies are just beginning to realize the importance of procurement. Entrepreneurs focus on procurement relates to the awareness of their strategic importance and with the need to optimize costs and economic crises of recent years as well. According to the procurement and supply chain expert of IPSM CEO [65], the Ukrainian procurement sector has begun to take modern forms. Among them: allocation of the procurement function and certain areas of procurement; creation of educational platforms for procurement specialists; focus on supply chains and strategic procurement function; digitalization of procurement; consulting and outsourcing in procurement. The right approach to procurement provides businesses with up to 30% budget savings. This is not only due to lower supplier prices, but also due to the optimization of the procurement process as well.

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