Impact of pandemic on supply chain development

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Abstract. This article reveals the main aspects of the logistics situation development in the conditions of the COVID-19 pandemic, in particular, it highlights the main elements of the logistics companies functioning ensuring a competitive position in the market. The priority role of statistical data collection in logistics and verification of its development monitoring with high growth and expanded coverage of forecast indicators without taking into account the pandemic statistics is emphasized. At the same time, the main aspects of supply chain recovery, taking into account the pandemic, were identified and highlighted in such interrelations as identified signs, stocks, realistic consumption by efficient users, optimization of production and computing capacities, identification and use of logistics capacities, cash management and net working capital.

1 Introduction

The traditional rivalry between individual enterprises in the modern market has begun to turn into a rivalry between entire supply chains. The supply chain can be compared to a well-played and experienced team, all members of which coordinate their actions to participate in competitions. The implementation of the supply chain management concept provides great opportunities in the field of specialization, cost discounts, productivity improvements, as well as the speed and flexibility of responding to the needs of end users. The growing demands and needs of consumers, progressive globalization and increasing pressure from competitors in the market encourage modern enterprises to integrate into supply chains. This solution allows them to achieve deeper specialization as a result of dividing tasks between individual participants in the chain, reducing operating costs, sharing risks, utilities and information related to the actions performed, as well as integrating activities and effective cooperation to better serve the end user and gain a competitive advantage. At the same time, the coronavirus pandemic has made major changes in the activities of logistics companies and supply chains, disrupting the standard relationships between suppliers, manufacturers and consumers. The closure of the border between the countries and the introduction of a self-isolation regime led to a significant reduction in production capacity. Thus, there have been significant changes in the situation on both local and global markets. The trends outlined above, respectively, determined the subject of the study.
2 Literature review

The problems of effective management of material and information flows from the supplier to the final consumer based on the concept of the supply chain are reflected in the works of many domestic scientists, in particular B. V. Teklin, N. F. Zavyalov, I. A. Poskryakov, V. K. Chertykovtsev [1-3], and foreign, in particular, D. Baursox, M. Christopher, K. Lysons [4-6].

At the same time, despite sufficient readiness of issues related to the development of logistics and supply chains and its elements, further elaboration of the issue of an integrated mechanism elaboration for the development and functioning of logistics companies and supply chains in a pandemic is required.

3 Results and discussion

A separate problem for logistics was the quarantine, which was introduced in March 2020 in connection with the COVID-19 disease.

According to experts of the IFO Institute in Munich, European logistics as a whole can recover by the beginning of 2022. However, this is a very complex industry, where during the crisis caused by the coronavirus, different segments suffered unequal damage. According to analysts, the weighted average logistics recovery period should be considered 9 months.

The entire German economy, having lost 12.4% of production, will reach the pre-crisis level not before the second quarter of 2022. The most optimists state the approximate period of 5-6 months, the pessimists suppose it to be in 2023 [7].

At the same time it is reasonable to note that even if some freight forwarding companies have borne losses, there are some companies which have successfully passed sustainability and adaptability tests and made a strong step ahead.

During the quarantine period, “PEK” ltd opened 59 new branches, now it has 401 satellite branches and partners. In the first half of 2020, the company's cargo turnover increased significantly. Thus, compared with the year of production, the increase in wood weighing more than 30 kg is more than 10%, pallets 6% [8].

Taking into account the abovementioned, it is possible to highlight the urgent need to identify priority areas for the development of logistics in the context of a pandemic fig. 1. Let's look at the main ones.

The COVID-19 pandemic contributes to the withdrawal of weak players from the logistics market, that is, this is a “perfect storm”. Small and some medium-sized players will leave the market in the near future, and there will be a series of bankruptcies, acquisitions, and mergers [9]. On the other hand, logistics companies whose market positions are stable will have the opportunity to expand their market share, in particular, “PEK” ltd and “Delovye Linii” ltd are the examples of that.

Recently, there has been a dynamic trend of increasing demand for the “combined cargo” service. There is a tendency to decrease the volume of transported goods, in contrast to which there is an increase in the number of shipments of “combined cargo”. The very development of outsourcing will become an incentive for market players to “refuel” cars and group batches of orders on mutually beneficial terms [10].

Using outsourcing is actively promoted in other areas of logistics, in particular, the professional 3PL operator “FM Logistic” has 8 logistics centers of class “A” and “B”, regional offices in Russia, 27 cross-dock terminals, more than 50,000 square meters of warehouse space. Its services include cargo delivery throughout the country 24/48, storage and warehousing services, customs brokerage services, international forwarding services, order fulfillment. According to existing data: on average, savings of up to 30% can be achieved by outsourcing 100% of all processes for the storage, maintenance and delivery of goods, the E3S Web of Conferences 402, 01005 (2023) TransSiberia 2023
https://doi.org/10.1051/e3sconf/202340201005
The use of services and after-sales service in the complex, then customers and cargo owners no longer need to rent, maintain a warehouse and keep the staff. Using the warehouse logistics outsourcing service, companies pay only for the number of pallets they need and receive a full range of technical, operational and management support. A number of additional services cover all needs related to movement, delivery, tracking the status of the cargo, as well as document management [3].

One of the main trends of our time is contactless courier delivery. The end consumer is offered a wide range of products with contactless home delivery. To avoid public places during the pandemic, buyers are willing to overpay 5–10% of the cost for goods with fast delivery (1–3 days) [8]. Quadient company offers a new contactless parcel delivery system for residents of high-rise buildings in the UK. A certain number of special lockers are installed in front of the entrance, which outwardly resemble large mailboxes. The system works like an automatic luggage storage. The courier delivers the parcel to the address, puts it in an available locker, closes it and informs the client via a short message containing the PIN code. The advantage of the system is that there is no need to install name lockers in accordance with the number of apartments in the house [11], and also that they are available to the client around the clock, they do not need to go far. They guarantee the safety of the parcels.

The continuation of the idea of contactless goods delivery by courier is the development of parcel delivery using “drones” or “autopilot” delivery.

Fig. 1. Challenges of the COVID-19 pandemic for logistics activities
«UPS Ventures» has invested in «TuSimple», an autonomous vehicle company. Both companies are testing dump trucks in the United States to determine if these unmanned vehicles can improve the service and efficiency of the UPS network, meaning they aim for trucks to deliver goods without human assistance.

More and more unmanned aerial vehicles are being considered for delivering small parcels. In 2019, «Alphabet'S Wing», which is the first officially approved drone in the United States, has already made its first delivery [10].

A digital twin is a real-time model of a system that captures a set of physical assets. This allows you to manage both digital and accessible assets in general. The potential for using digital twins in logistics is enormous.

In the transportation services sector, digital twins can be used to collect product and packaging data and apply that information to identify potential gaps and recurring trends to improve future operations. Delivery networks can use this technology to provide real-time information that will improve delivery times and further assist autonomous vehicles on their routes [2]. DHL, in its "Next-Generation Wireless in Logistics" survey, identified digital interleaving as a new growth direction. DHL company has identified three major challenges in promoting digital twins in logistics, namely cost, accurate representation of assets, and data quality. The wireless communication of the next generation and 5G can solve the last two tasks [9].

Significant changes are taking place in the personnel policy of many logistics companies, they are transferring their employees to a remote form of work, respectively, this requires optimization and automation of all business processes in a logistics company.

For security reasons, logistics companies will be forced to comply with sanitary standards, disinfect equipment, vehicles, as these conditions will be dictated to them by users of their services.

The transition of all global logistics events to an online format is becoming an undoubted trend. The trend of holding most logistics events online will continue, as this format of meetings, negotiations, webinars, conferences has shown high efficiency. According to research, more than 60% of events planned for 2020 without an online format are doomed to failure [2; 8].

It is advisable to focus on such a key concept of logistics as the supply chain. According to a study by Professor D. Hannes Utikal, Vice President for Academic Development and Corporate Cooperation at «Provadis School of International Management and Technology AG», four scenarios for the development of supply chains in 2020 were identified before the pandemic [12]. They are developed according to two main criteria, such as the degree of supply chain integration and regional coverage. Each of these scenarios is a retrospective of the future, which allows you to optimize the decision-making process, simulate possible scenarios and expand your own planning base. The fig. 2 shows the distribution of spheres depending on the degree of integration of the network and the regional sphere.

The main indicators were identified by which the presented development scenarios were evaluated, namely: “customer requirements”, awareness, level of competence in the supply chain, risks, social sustainability, partnerships. Each of these scenarios has certain differences, consisting in focusing on one indicator and ignoring the rest [12].

Based on a study by D. Hannes Utikal, the relevance of four scenarios for the development of the future in the field of supply chains without taking into account the pandemic has shown in figure 3.
Without taking into account the pandemic, the world of digital networks was the most likely development option for key participants in the supply chain, since this area covers more than 53% of relevance. So, now the buyer wants a high-tech product of a well-known brand, and the participant in the process of satisfying the need maintains a high level of awareness, invests in the competence of the personnel and reduces possible risks. Meanwhile, today it is safe to say that the digital world is the leader in this segment of the division in a pandemic.

Of course, if some elements of the supply chain have not changed in the context of the pandemic, then the larger ones need some adaptation and adjustment. According to the latest Prologis Research study, in the process of overcoming the crisis caused by COVID-19, there is a growing need in the world to create new supply chains. In particular, experts point to such promising areas as the production of food, consumer goods and medical supplies, in particular pharmaceutical products.

In the context of the above, we will reveal the main elements of the supply chains recovery in a pandemic (Table 1).
Table 1. Key elements of supply chain recovery during the COVID-19 pandemic

<table>
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<tr>
<th>Supply chain element</th>
<th>Complex of logistics solutions</th>
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<tr>
<td>Complex of logistics solutions</td>
<td>1) identification of critical components and critical sources of supply; 2) analysis of the chain interruption risk and identification of the possible second-tier suppliers risk and further risk; 3) search for alternative sources if there are suppliers from especially affected regions</td>
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<tr>
<td>Assessment of inventory availability</td>
<td>1) assessment of stocks along the value chain, in particular spare parts/stocks for processing; 2) the use of after-sales service stocks to maintain the continuity of production.</td>
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<tr>
<td>Realistic end user demand analysis</td>
<td>1) work with sales and operational planning to receive demand signals in order to determine the volume of a supply request; 2) use of direct communication channels with the consumer; 3) use of market reviews/external databases to evaluate clients.</td>
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<tr>
<td>Finding and maintaining logistics capacity</td>
<td>1) assessment of available logistics capacities; 2) acceleration of customs clearance; 3) transport types changing and air or rail transport pre-booking taking into account the current state.</td>
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<tr>
<td>Cash and net working capital management</td>
<td>1) Stress testing of own supply chain and major supplier balance sheets to see when supply issues will begin to affect finances and liquidity.</td>
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Hence, it is the creation of transparency in multi-level supply chains; assessment of the availability of reserves along the value chain; analysis of the end users real demand; identification and preservation of logistics capacities; cash and net working capital management.

4 Conclusions

Improvement of service, increase in delivery speed, professionalization of logistics services become necessary factors that will help overcome business stagnation. Only those companies that can build a policy to reduce fixed and variable costs with the least loss to the business will be able to overcome the falling market for logistics services and remain competitive. Thus, the above trends in the functioning of logistics companies and supply chains in a pandemic will allow the majority to adapt to changing environmental conditions, maintaining a high competitive position in the market, reducing logistics costs and improving the quality of customer service, providing a various range of necessary services.

References

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