

Global Supply Chains in the Post-Pandemic

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Abstract

The world has experienced, from 2020 to the present, a widespread impact arising from a pandemic crisis, which forced supply chains to be limited or even suspended, generating important constraints from producers to sale points. This situation created challenges for organizations and consumers who were forced to look for solutions to satisfy their production and consumption needs. The importance of this topic is related to the need to avoid stock ruptures in supply chains such as those that happened with certain food products in 2020 and 2021, which was reflected in shortages of some products and inflation. The contribution in this work resided in, through scientific methodology, identifying and prioritizing the most relevant preventive measures that allow responding to crisis situations such as the one that occurred with the pandemic since 2020, or the one that takes place in 2022 with a shortage of materials and high inflation. Thus, managers who work with supply chains and logistics are given a portfolio of solutions to adopt with a certain level of priority. We were able to reasonably conclude that only a part of Portuguese companies are technologically prepared to respond to the new challenges of supply chains, since the incorporation of computer systems and integrators is far from being a majority of the mentioned universe. A minority of the organizations surveyed have prevention mechanisms in the management of supply chains, since the number of organizations that have, for example, risk and contingency manuals, sales forecasting software, or even simulation of the impact of disruptions in supply chain, is significantly reduced. Given the results obtained, and in hierarchical order of importance, the TOP 3 measures considered most appropriate to prevent stock outs in the event of disruptions in the supply chain in the food sector in Portugal are: to prepare contingency and risk plans; diversify suppliers (Dual Sourcing); and preventive risk budget (cap in case of crisis).

Keywords

Logistics, Supply Chain, Crisis, Technology, Risks, Portuguese

1. Introduction

The world has experienced, from 2020 to the present, a generalized impact arising from a pandemic crisis, which forced to limit or even suspend supply chains, generating important constraints from producers to points of sale. This situation raise some challenges in organizations and consumers who were forced to look for solutions to meet its production and consumption needs.

What is happening is a global phenomenon that many of us have never witnessed, a pandemic. It is known that there were other pandemics that haunted the world, such as the bubonic plague, black plague, cholera, Spanish flu, which also had an impact significant. Covid-19, the pandemic that appeared in the 21st century, in December 2019, the most recent and the one we currently live in, came to change the chain (CA), changing traditional work models.

Due to the outbreak of Covid-19 from China, which quickly spread around the world, in Portugal was declared a state of emergency on March 19, 2020, enacting the almost total closure of all commercial spaces, only essential trade remaining, such as pharmacies, food retail, supermarkets and few others in operation.

This mandatory stop brought sales down in most trade sectors, stopping thus purchases and sales, not only in Portugal, but worldwide. (Bueno, 2020) No one doubts now that the coronavirus pandemic has disrupted supply chains, traditional supply chains and affected world trade for a long time, much longer than other crises already over. In just a few weeks, the virus changed the way we work and consume, social behaviour, organizations and public policies of Worldwide.

Covid-19 has had a major impact worldwide. In this way, the importance of deepening and catalog which measures in the distribution chain can mitigate these consequences. Thus, as the main starting question for this work arises:

1) What are the most effective measures to prevent stockouts in the supply chain? Supplying the food sector in Portugal? As secondary questions, the following were identified:

a) Portuguese organizations are technologically prepared to respond to the new supply chain challenges?

b) Are there preventive mechanisms in the management of supply chains?

The main objective of this work is to offer a hierarchy of importance of preventive measures to deal with crises in the food sector. Secondary goals are recognize whether companies have changed structure because of the pandemic and whether they will return to normal after the pandemic, understand the biggest difficulties in the supply chain and their impact, and also analyse the technological situation of Portuguese companies in the food sector.

The study is based on, through scientific methodology, identifying and hierarchizing the measures, most relevant preventive measures that make it possible to respond to crisis situations such as the one that occurred with the COVID pandemic since 2020, or like the one taking place in 2022 with a shortage of materials and high inflation. Thus, it is given to managers who work with chains of

supply and logistics, a portfolio of solutions to adopt with a priority level.

2. Conceptual Review and Context

Logistics has been growing and gaining importance in the value chain in recent decades, especially in the business world, globalization and the growing quality demanded by the consumer accelerated growth even more, combined with what companies want to satisfy needs of an increasingly demanding consumer (Fernando, 2008).

Due to the demand of society in general, and the competitiveness of markets, national and international markets, innovation and evolution have led companies to grow and maintain their structure, with more quality in its products and services, and giving real importance to its chains supply and logistics department. Logistics emerges in the mid-1960s to simplify, organize and explain the movements of two physical spaces with different locations. Logistics started with relevance in military operations, as well as strategic ones, later on it was its application in the business world, changing its form, adapting to changing needs of goods and services (Silva, 2017).

During the 1980s, very motivated by growing competitiveness, organizations had the need to provide lower costs, and with products or services of higher quality, longer lasting products, and more diversity. According to the same author, they began various forms of work are emerging, such as Just in time (little stock and flexible production according to demand), the Kaizen methodology (eliminating waste), among others. The news techniques have reduced stock and improved logistical functioning and the flow of the supply chain (Silva, 2017).

Also, in the area of health, time has become a priority in various sectors, hospitals, clinics, laboratories, distributors, logistics operators and industries, have adapted quickly to what matters most: saving lives. It was in the context of the pandemic crisis that Supply Chain, proved to be essential for the whole process. Thus, it is necessary a permanent adaptation of changes and innovations reinforces (Bueno, 2020). According to Bueno (2020), the great example of the pandemic is the importance of stock management. There are some paths that must be taken, one of them with technology. The author stresses the need to invest in infrastructure, as air transport has been affected, it should be noted that the bus service played a leading role during the pandemic. And that the planning, management, technology, and innovation need to be always present in the short, medium and long term. In the initial phase of the Covid-19 crisis, Galloway (2021) wrote that it is critical to understand the position of organizations in the pandemic strategy. The logistics sector plays a role currently important, as an example in well-known sectors such as restaurants, supermarkets and accommodation (Silva, 2017) also reinforces the attention to the learning that Covid has brought us, and which is why supply chains need to evolve. Some chains have even changed to minimize ruptures, reduce costs, through new calculations, new lead time, in order to achieve the quarterly or half-yearly forecasts (forecasts), the precise ones for each chain. At Supply Chain we have the proc-

esses and technology, but the problem is that there are too many companies with very obsolete technology, and they are not getting a new organization in this disorganization, but it is necessary to adapt to the new world in order to proceed.

3. Base Methodology

Scientific research can be done by various methodologies. Your choice depends on the objectives of the study, the information available and the means of collecting that information, beyond the time and resources available. According to Fortin (2009), each researcher is responsible for selecting the method that best suits your investigation, always with the goal to reach the answers to the starting/research questions that were previously formulated.

According to the same author, the sample is a part of the total population on which the investigation. This same sample should be, as far as possible, representative of the population where it is inserted, so that the results obtained can be extrapolated to the population. Respondents who work in organizations with supply chain activities of the food industry. Our sample consisted of 110 individuals, representing 0.0005% of the 214,815, as we have a $N > 30$ the sample can be considered, taking in consideration the concepts of population and sample (Fortin, 2009). Companies existing in 2020, SMEs in the wholesale and retail sector. (Bueno, 2020) The sample of the present study consists of 110 valid and complete responses, and the initial goal was 100 valid responses for a 90-day data collection period (15-05 to 15-08) in 2022, so we obtained a sample above expectations. Fortin (2009) states that data collection is a method of collecting information from participants with previously selected instruments. Considering the objectives of this study, the instrument used is the questionnaire developed by the authors and supported in Master thesis related with the research field (Fortin, 2009).

The selection of this instrument was considered sufficient for the intended data collection. The chosen strategy made it possible to combine several potentialities, the review of the literature and the surveys, using beneficially virtual by sending the questionnaire via a self-completed link, which does not imply any type of contact between the inquirer and the respondent, the distribution of the survey, the platform chosen.

Google forms, with the objective that this tool has to be flexible and to be able to reach more respondents in the shortest amount of time. With the advantages of having no limitations geographic, response time, cost, and not getting empathy issues with the respondent (Fortin, 2009).

4. Main Results

The survey generated the results, in which for each question, in addition to presenting individually the results of the 110 valid respondents, we will prepare a small reflection of them, and when applicable, analyse the effects of this reality.

It is expected that the set of these data allows us to base our conclusions of this study.

In view of the results obtained in **Table 1**, it was found that 72% of companies earn less annually 1M€, and 24% between 1M€ and 5M€, that is only 4% earn more than 5M€. This situation demonstrates well the Portuguese business reality, made up mostly of micro and small companies, which entails difficulties in achieving economies of scale and, therefore, consequently, less financial availability to invest in technology as greater vulnerability to crises.

The data indicate that only 9% of respondents working in the area are over 55 years old, the majority, which represents 65%, is included in the range between 31 and 55 years old. This situation it is normal in types of work and sectors, in this case logistics, where experience and savoir faire is an important factor for the performance of functions. However, the presence of 26% of young people between 18 and 30 years old allows to incorporate new know-how and dynamism. There is still a very high male presence among the 72% respondents, which may indicate that in certain activities the entry of females into this sector has been done in a evolution, given the low starting point. Greater equity would be recommended.

The results obtained reflect a national reality, the low academic qualification of human resources, that is, 63% of respondents have at most secondary education. This situation implies that employees have greater difficulty in adopting new technologies, efficient management models and ability to adapt to new ways of working. Another relevant factor is the lack of doctorates among the respondents, similar to the reality of Portuguese companies, implies that organizations are unable to adjust the highest knowledge and innovation in the sector to its reality.

Also similar to the national reality, the area with the greatest business activity is Lisbon, followed at a distance by Oporto, and Aveiro. In this sector it is understandable that logistics canters located closer to the main consumer market, since it allows greater speed delivery to the majority of its customers and also savings on transport costs. When asked whether technology would change the supply chain, the overwhelming 89% majority responded positively, and only 2% responded negatively. 76% of respondents said they have some robotics component in their warehouses, and only 4% indicated they did not have it. The existence of robotics is a sine qua non condition for success in this sector, since it automates processes, it saves time and costs, in addition to making more efficient the supply chain, allows the probability of error throughout the pipeline of supply is smaller.

Table 1. % of responses done by the authors.

| Companies by Volume | | | |
|----------------------------|----------------------|------------------------------|----------------------|
| Revenue/Year | <1 Million | 1 Million - 5 Million | >5 Million |
| % | 72% | 24% | 4% |

In order to assess the technological level in the companies of the respondents, it was asked if the company where they work has a website with an online store incorporated. The expected answer with more weight would be affirmative, which actually occurred in a percentage of 71%, which means that the remaining 29% currently do not have online sales, which in fact delays its competitive factor, especially in the pandemic phase, when purchases online, even in B2B, have increased exponentially. This situation may be associated previously described, of micro and small Portuguese companies, as they have little scale have difficulty investing in technology.

Only 62% of respondents say they have a contingency plan that covers situation of supply chain disruption, such as the one that happened during a pandemic and also after the ongoing war in Ukraine. It follows that 38% do not have such a plan. Now, a contingency plan is one that identifies the measures to be taken with preventive and reactive in case of disruption of the supply chain, and allows, in a weighted and without pressure at the time of stockouts, inform the organization of the course and guidance to be taken if a certain cause occurs. In this way, it allows to reduce the time of response and consequent negative impact on sales.

Only 40% stated that they had collaborative processes with suppliers, which implies that currently 60% do not have it. This situation is worrying, since in cases of some volatility in the supply chain, or spikes in demand, whether seasonal or spontaneous, the non-existence of preventive collaborative processes implies that upstream there is no information for these changes in demand, either in the B2C or in the B2B market.

The same question, but asked downstream, shows a less close relationship between companies and its customers, which can be justified by the existence of some companies operating in the B2C segment, which operates differently from the B2B market. Still, 34% responded affirmatively and only 7% could implement these collaborative processes with customers and partners.

When asked this question, only 3% claimed to have integrated information systems with all its CORE suppliers, and only 9% intend to implement it, which reveals a high difficulty of software integration between companies, or its cost is too high or consider this aspect not a priority. The existence of such an integration would allow a much longer lead time between ordering and picking the goods at the supplier speed, in addition to the cost savings that human intervention entails.

Only 5% claimed to have software that allows simulating changes in the supply chain. Supply and predict the impact on the organization's profitability, and only 8% would be think about implementing it. Similar to a contingency plan, where the risks, it is of the utmost importance to know their probability of occurrence and impact on organization, and for that an information system is necessary to identify these factors and thus classify the risks by their degree of importance. The fact that 95% of companies still not having these tools means that in crisis situations, there is no hierarchy of the main and secondary meas-

ures to be taken, leading to an impact greater negative in companies.

Only 16% said they had a sales forecasting system, compared to 84% don't stop him. This situation is more serious when markets are seasonal or demand depends on a certain event, such as the increase in the production of electric cars if in a given year there is a better tax incentive to buy them, or in the sense contrary, if the price of electricity increases significantly, as it occurs in 2022, having predictive models of future demand tends to lead to a rupture of stock.

Following on from the previous question, since only 5% had a forecasting system sale, and therefore the material needs of its suppliers, it is natural that the rate of sharing this information with suppliers is only 2%, with the implications described in the previous point. In this matter, it is visible a need to implement technology in the warehouses of Portuguese companies since only 59% indicated that they had technology that indicate stock at any time. This situation indicates that 41% still do not have what they put at risk of stock-outs and customer service failure.

Only 24% indicated that the company has a risk manual, and 76% do not. And even despite the fact that 26% consider implementing it, the high absence of such a central document in any company. A risk manual covers different areas of company, the sector, but also the economy and society in general, and where it is included naturally the supply chain. The non-existence of this type of manual in the organizations implies exposure to very high internal and external risks, which can ranging from a simple flood in the warehouse that causes loss of goods, to a crisis global economic downturn, or a pandemic, which affects demand and therefore the entire pipeline of the upstream supply chain.

In another aspect of questions, it was clearly identified that 95% of people changed their way of working due to the pandemic.

Faced with the forced changes in the work methodology from 2020 onwards, only 32% indicated that some changes made during the pandemic would continue. 59% responded that the pre-pandemic work method would become a reality again in 2022.

In order to find out from the respondents the importance they attribute to 12 measures that mitigate stockouts in supply chains, a Likert Scale was used from 1 – least important to 5—most important.

The results of the study showed that the 3 answers that were most important—5, 76% went with preparing contingency and risk plans, with 72% diversifying suppliers and in third position ex aequo with 50% each, Preventive budget for risks (ceiling in case of crisis) and diversify means of transport. On the contrary, those measures that obtained the lowest percentage of maximum score – 5 are AI (augmented reality, optical recognition, virtual models to fuel the AC) with 7%, fully integrate blockchain with 15% and robotics in warehouses with 16%.

For the respondents, the measures that had more weight with the classification 1 were AI (reality augmented, optical recognition, virtual models to supply the CA) with 15%, integrate to the maximum blockchain with 12% and having

an integrated management and software system with 7%.

This situation highlights the low relevance in the adoption of technologies for prevention and reaction of crises. In order to determine at a global level, the importance of the various measures for the respondents was obtained a weighted average score for each of these measures. For respondents the more relevant measures they would take to mitigate stockouts in supply chains supply are:

- 1) Develop contingency and risk plans—4655 points.
- 2) Diversifying suppliers (Dual Sourcing)—4636 points.
- 3) Preventive budget for Risks (ceiling in case of crisis)—4318 points.

On the other hand, the least relevant measures were:

- 1) AI (augmented reality, optical recognition, virtual models to fuel the AC)—2491 points.
- 2) Integrate to the maximum blockchain—3091 points.
- 3) Robotics in warehouses with—3273 points.

The 12 measures presented above were divided into 3 areas: procurement, technology and documentary, with 4 measures each. In global terms, greater importance was given to measures procurement with a weighted average rating of 4.186 points, followed by measures of a documental nature with 4.041 points, and, finally, of a technological nature with 3.127 points.

5. Conclusion

The Portuguese business reality is mainly composed of micro and small companies—also validated by the results of this study, which causes difficulties in achieve economies of scale and, consequently, less financial availability to carry out investments in technology as well as greater vulnerability to crises.

The existence of robotics is a sine qua non condition for success in this sector, since automated processes, saves time and costs, and, in addition to making more efficient the supply chain, allows the probability of error throughout the pipeline supply is less.

The existence of a contingency plan is paramount, since it is the one that identifies the measures to be taken on a preventive and reactive basis in the event of a disruption in the supply chain supply, and allows, in a thoughtful way and without pressure from the moment of rupture of stocks, to inform the organization of the direction and orientation to be taken in case a certain cause occurs.

In this way, it allows to reduce the response time and consequent negative impact on sales. Like a contingency plan, where risks are identified, it is of the utmost relevance, knowing its probability of occurrence and impact on the organization, and for that it is. An information system is necessary to identify these factors and thus classify the risks by their degree of importance.

The non-existence of a risk manual in organizations implies exposure to risks very high internal and external levels, which can range from a simple flood in the warehouse that entails loss of goods, up to a global economic crisis, or a

pandemic, which affect demand and therefore the entire upstream supply chain pipeline.

In order to answer the secondary questions, the first a) whether Portuguese organizations are technologically prepared to respond to the new challenges of supply chains, we managed to earn with some reason that only a part of these companies can be prepared, since the incorporation of computer systems and integrators is far from being a majority of the referred universe, as shown by the results of questions 7 to 16. With regard to the second secondary question; b) about whether there are prevention mechanisms in the management of supply chains, it is possible to conclude that only a minority of surveyed organizations have prevention mechanisms in place since the number of organizations that hold, for example, risk and contingency manuals, forecasting software sales, or even simulating the impact of disruptions in the supply chain, is quite reduced.

These two answers to the secondary questions provoked a greater importance in the solution to the starting question 1), about what are the most effective measures to prevent stockouts in the supply chain of the food sector in Portugal. Given the results obtained, and in hierarchical order of importance, the TOP 3 of measures considered most adequate to the prevention of stockouts in case of disruptions in the supply chain are to elaborate contingency and risk plans, diversify suppliers (Dual Sourcing), and preventive budget for Risks (ceiling in case of crisis).

It should be noted that the resources needed to carry out the first two measures are quite small, which motivates organizations to implement them, with the consequent reduction of risk and response optimization in times of crisis. The contribution of this work resided in, through scientific methodology, identifying and hierarchize the most relevant preventive measures that allow responding to situations of crisis such as the one that occurred with the pandemic since 2020, or like the one that takes place in 2022 with material shortages and high inflation. Thus, it is given to managers who work with chains of supply and logistics, a portfolio of solutions to be adopted with a level of priority.

As the most relevant limitations, being an academic work, the scarce time and resources were the important factors for the sample not to be larger. As a suggestion for future work, it would be of utmost importance to carry out surveys with a larger sample, over several years, in order to carry out a temporal and comparative analysis of several indicators, evidencing the evolution of the sector. It is also suggested the replication in other activity sectors other than food that involve supply chains.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

Bueno, L. (2020). *O que o pós-pandemia diz para o setor de distribuição e logística de*

saúde. Business Revista Portugal (27 de abril de 2021). Oportunidades e desafios na Logísticos pós-pandemia.

Fernando, M. (2008). *Logística e sustentabilidade. Análise de Casos de Estudo e Tendências*. Dissertação de Mestrado, Escola gestão Porto.

Fortin, M. F. (2009). *Fundamentos e etapas do processo de investigação*. Lusodidacta.

Galloway, S. (2021). *Pós Corona: da crise à oportunidade*. Self.

Romana, F. A. (2016). *A Gestão Lean e o Comportamento Organizacional*. Bubok.

Silva, L. (2017). *Cadeia de suprimentos: definição, história, perspectivas, características e desempenho*. Universidade Federal de São João del-Rei.