Strategies for the preservation of service levels in the inventory management during COVID-19. A Case study in a company of biosafety products.

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Abstract

The current global situation due to the COVID-19 illness has seriously impacted the capacity of the supply chains to accomplish timely and in a reliable way the availability of essential biosafety products. Production and trading companies of biosafety products have experienced an unpredicted change in the product demand. This is due to the protocol international regulations from health organizations regarding the use of biosafety products and their use to mitigate the virus propagation. For the companies involved in these supply chains, their priority is to keep appropriate service levels in the current scenario, guaranteeing high availability at each echelon to help life's preservation. It requires to maintain articulation and flexibilization of the processes in the supply chain, reflected in the decision making. In this world with high volatility, uncertainty, complexity, and ambiguity (VUCA), where the traditional practices are no longer effective, rationality, people's training, and the experience for the decision-making are essential.

Nevertheless, despite the relevance of the problem, studies about business strategies of multiple product inventories and their impact on the service level and volatile demand during a pandemic is limited. This paper focuses on the experience of a Colombian Company of biosafety products.

The key contribution of this proposal leads to some important insights for biosafety companies managing many highly demanded products, volatile behaviour, and very important items for containing the spread of a virus in a complex and dynamic market influenced by a global disruption of supply chains, in this case the COVID-19 pandemic.

1. Introduction

A pandemic is defined as an epidemic disease that extends to many countries or that attacks almost all people, from a locality or a region. Due to the number of countries affected, it has serious and long-lasting repercussions in the operations of the supply chain.

Any epidemic outbreak is generally perceived as perturbations with high uncertainty (Paul et al. 2014; Paul et al. 2013).

For some years now, a VUCA World (Volatility, Uncertainty, Complexity, Ambiguity) is a reality, dealing with exponential technology growth, globalization and the environment issues (Bennett and Lemoine 2014). The COVID-19 pandemic has strengthened the concept, in this case every four elements are in a high level at the same time, adding demand disruptions in relation with bullwhip effect, virus outbreaks uncertainty, weak coordination actions between countries and institutions to stop the virus and lack of relevant and accurate data for predictions and decision making process. This is further affected by an unclear timetable for a vaccine.

The current scenario provides a rough route to success in supply chains, and there is a need of a VUCA Manager (Vision, Understanding, Courage, Adaptability), or VUCA 2.0, defined by (George 2017), and with an emphasis on the need for organizations to be flexible and agile to change and fit today's ever-shifting world (Baran and Woznyj 2020; Parnell and Brady 2019).

COVID-19 pandemic (WHO 2020b; Sohrabi et al. 2020) has generated disruptions in the supply chain, these are considered an extraordinary risk for companies from different sectors, which have been subject to different types of challenges: demand increase and uncertainty in some products, decrease in raw material's supply for production, among others cited by (Paul and Chowdhury 2020).

The control of inventories is one of the most complex topics of the logistics and the supply chain management. The aleatory fluctuations of the demand and the repositioning time (known as Lead Time) are the main causes related to the need of maintenance of inventories (Pérez-Vergara et al. 2013; Vidal Holguín 2010).

It is a great challenge for Small and Medium-Sized Enterprises (SMEs), to compete with multinational companies that have a developed process and financial stability. Therefore, SMEs are forced to increase the productivity levels through decision models to ensure service levels, impacting customer satisfaction. This has required the collaborative design processes between the inventories stakeholders for decision making.

These decision makings are relevant when a customer satisfaction orientation is implemented, and they belong to a complex system which involves stakeholder of various internal and external areas from the company, where each agent possesses limited information, for that, cooperation between these agents is key for the performance system (Pérez Vergara et al. 2020).

The current scenario has imposed regulations and a new life style. In addition, the supply chain of biosafety products (Zhou et al. 2019) has been highly impacted because of their demand generation, as well as the systemic effect. The companies have the social responsibility to approach the imperative demand through strategies development, asset management and reserve capacities for essential products. In this new context, SMEs have reviewed their processes and searched new adaptative strategies that considered objectives under multiple criteria, prioritizing service levels and costs (Paul and Chowdhury 2020).

The COVID-19 pandemic has affected the biosafety supply chain due to inherent complexity, which leads to shortages associated with different geographic events, at the same time disrupting the global supply chain at a time when the demand increased exponentially. Nowadays, it is necessary to monitor the global market with accurate and timely information, and analyze the supply risk, which range from moderate to high worldwide, depending on the product. Supply risk affects the global availability of the raw materials, products, materials, key equipment, antiretrovirals, insecticidal nets, diagnostics equipment, patient mechanical ventilators, among many others.

The current global shortage is due to the absence of production capacity to deal with such a peak in demand, at the same time the statistical models depend on data to decrease the uncertainty, hence the real demand is unknown, affecting the availability of raw materials. Closed borders are another factor that affects the distribution because distribution channels are at a low level due to the decrease of logistic operations.

The World Health Organization has consolidated a list of critical supplies necessary for any health system that is faced with the pandemic, uniquely encoded (Torres Rueda et al. 2020; WHO 2020a). A model has been shared as a forecasting tool, where according to the specific variables of each country, it could help to allow for the necessary elements to serve the populations. The inputs are related to infections and growth rate, Personal Protective Equipment (PPE) for staff and patients, laboratory tests, biomedical equipment, health workforce and bed availability.

For the supply chain management during the COVID-19 pandemic, it is necessary that people, processes, organizations, markets, and economy coordinate and collaborate amongst themselves in an unprecedented way (Kumar et al. 2020).

It's a need to produce literature about successful business practices in the management of this uncertainty, especially during the COVID-19 pandemic (Verma and Gustafsson 2020), where the business as usual is no longer effective, particularly in the inventory processes. The current situation has boosted researchers to propose a new risk definition for the chain supply. This paper shows the business experience of a Colombian trading company of biosafety products, and its strategies adaptation in inventories management. Strategies are based on the concerned parties' integration through teamwork and interoperability. The flexibility on the processes is reached in the making decisions, and this is a guarantee of the customer service level. Comparatives results are included for the applications.

2. Literature Review

Several authors analyze the concept of supply chain, agreeing that it is a network of entities that are related to produce value in the form of products and services to the customer, through processes and activities from the initial supplier to the final customer, where there are numerous actors interacting by material, informational and financial flows (Clivillé and Berrah 2012; Blanchard 2010; Albrecht 2009).

Within the supply chain management (SCM) special attention should be paid to the impact and selection of suppliers, information systems in the chain, product control and counterfeiting, outlining and simulation of processes in the links, actors of the network and the relationships between its members (Weenk 2019). These relations are formalized by contracts that usually focus on elements that each part includes to protect themselves, but in the current scenario the best will be to focus not in a business model focusing on transactions, but one based business model focusing on results, where collaborative agreements lead to create value through win-win solutions, as Vested Business Model advises (Vitasek et al. 2013; Vitasek and Ledyard 2013).

In this sense, the customer's demand and the pricing model are critical components of the supply chain, which has important implications for the operational and strategic objectives of the business (Diaz et al. 2016). Demand is a key entry to inventory management, which is summarized as the activity which guarantees stable availability of products demanded by customers, coordinating sales functions, production and distribution in relationships intra and inter companies in order to satisfy the objective market at a rational cost and taking into account the variability and uncertainty of processes.

A key question is why to have a product and in a certain quantity. The answer must be to reduce the intrinsic conflicts with a consensus between several areas and people responsible for the processes in entities such as sales, production employees, IT managers, logistics and warehouse managers, among others, so that an isolated inventory manager cannot have suitable results (de Vries 2020).

2.1 Supply Chain risk

The risk produced in the supply chain has been classified as an operational risk and interruption risks (Ivanov 2020). Operational risks are related to quality problems, quantity, and delivery times, which are predictable and controllable. Interruption risks are referred to as those associated with catastrophes, which are less controllable (Ray and Jenamani 2016).

As a result of the world current situation, the implementation of the Supply Chain Risk Management (SCRM) has been increased, focus on the interruption risks, named also as extraordinary risks. They are characterized by the existence of impact risk for a long time, high uncertainty of the future impacts, and the domino effect of the event in other functions or processes (disturbances propagations) (Ivanov 2020). This kind of risks are characterized as follows: *universal*: cover many sectors, unpredictability, it is not known which regions are going to be affected, nor to what extent the activity will be limited, and until when the politics will change; *severity*: the severe restrictions and the total closings are accentuating the importance of the chain supply, beyond what it was normally designed for, chain reaction; fear to stay without provisions, the states of emergency can force all industries manufacturers to reduce or scale the productions and supply on a short term, and finally, *stability*: the longer the pandemic lasts, society will be economically damaged bringing on payment delays, non-payment, and an increase in delinquency rates. In view of this, a question arises: how to stabilize a supply chain in turbulence times or a VUCA world?

Inventories administration under this uncertainty environment and risk, challenge the capacity analysis, interpretation, and search for solutions, requiring some time to take drastic decisions to force the restructuration of the chain.

2.2 Strategies for mitigation and stabilization of the supply chain

(Koonin 2020) suggests updating and modifying the response strategies of the supply chain for a specific product, particularly when a significant interruption is produced, to ensure that companies can minimize the variation between the demand and the offer.

However, for the trading companies, the inventory management has been very complex in this pandemic, due to the variety of products they work with. Strategies implanted must consider factors as demand coming from various customers from different sectors, and the variety of products, where time plays an important role.

Strategies for the risk mitigation of inventory management, must be oriented on, I) determination of the chain for materials administration, II) reposition frequency, III) preservation of properties levels that can be able to attend the demand, avoiding the decision to increase inventory coverage, which increases the probability of surplus stock, obsolescence, expiration, and deterioration.

Mitigation strategies for a simple product, for example, toilet paper, substantially differ from those which control other products, as they are not equally effective and applicable to all the products in demand.

The inventory management of multiple products has been studied by many authors, who have proposed that the main goal of the supply chain is the decision making according to the properties level. For that, the first consideration must be that inventories are different and that the ABC traditional model for classifications limits the control system only to one criterion (Chu et al. 2008; Dos Santos et al. 2019; Lolli et al. 2017).

Traditionally, companies usually use the ABC classifications to identify the most representative inventory products and, at the same time, control them efficiently. For companies with a lot of products in the inventory, the management and control process is more complex because of the limitations of the resources. The most appropriate actions are to group the stock and focus on the most important elements (Flores Benito and Clay Whybark 1986; Eraslan and İÇ 2019).

Interoperability is considered the ability of an organization to act in an interoperable manner, both internally and externally, with a significant and competitive advantage, as it can reduce costs, improve response timely, and allow a greater reach of its operations. It is vital in the area of information systems, as it allows effective connections between companies that allow the exchange, interaction, collaboration and compatibility of inventory, transport, production and other information. Specifically for inventory management, the unique identification of products in all package levels is crucial, supported among others by the ISO/IEC FDIS 15459-4:2014 standard, it guarantees interoperability between information systems of the supply chain actors using the standards to communicate globally (Lopes-Martínez et al. 2018).

Involving stakeholders in inventory management and the determination of performance index is crucial. (Pérez Vergara et al. 2020) propose a methodology that involves every area of the value chain, as a conducive framework to identify the necessary criteria for the application of the AHP multi-criteria group

decision-making technique based on (Saaty 1987). This approach can be particularly effective in the management of the current uncertainty, generating information exchange and participation in decision-making by interested parties, tending to interoperability, in its organizational dimension.

3. Case Study

The company attends the demand for products that ensure the biosafety of the process in different market segments (health, beauty, food manipulation). It is classified as SMEs, with 100 workers. It has been certified by the ISO 9001 and with the INVIMA (Colombian National Institute of Medicine and Food) about sanitary conditions, storage, and conditioning. The company has operations in Ecuador and Panama, with a view to be present in the segments in four countries of Latin America, doubling its operating income, generating economic and social value. Its product portfolio handles 63% of imported finished products, which are grouped into twenty product groups and, in turn, into eight families. The process of planning, including management and control of inventory, and the quantities to be ordered for their supply, is considered one of the most important, being located within the operational processes of the process map in the logistics area.

3.1 Research problem

The pandemic imposed a new world scenario in which biosafety protocols were established, reflected in policies adopted by the various countries, impacting the demand of the company, and (impacting) directly the inventory process.

As methodology, a quantitative approach was adopted, the research was carried out through a before-after study of a single group that is based on the measurement and comparison of the response variable before and after the subject's exposure to the experimental intervention.

The objective was to maintain service levels by minimizing the risks of inventory breakdowns, for which social responsibility was prioritized. A review of the literature was made that allowed the identification of superflexibility (Evans and Bahrami 2020), as the dynamic capacity, to act quickly and focusing on the organization. Adaptive strategies focused on mitigating a specific risk scenario were identified and proposed in each phase of the inventory process, implementing an agile approach for a defined time horizon. Decisions involving sectors, customers, products, forecasting method to be adopted, inventory control model, suppliers, among others, were considered.

3.2 Situation before COVID-19

The company clusters its customers as consumers, wholesalers, and distributors, defining the commercial politics for each one. The company knows the demand and manages the products through

imports from eight suppliers with individual contractual characteristics, as lead time, which guarantee the products availability.

The process manages a service level indicator, which is calculated using the Eq. (1) (Ballou 2004).

$$\textbf{Fill Rate} = \frac{\textit{Total number of customer orders shipped}}{\textit{Number of customer orders filled}} * 100 \quad \text{Eq. (1)}$$

The goal of the fill rate was established at 95%, and at the end of the second semester of 2019 had a fill rate of 95.5%, as shown in Figure 1.

An inventory management model has been applied, with the structure of five phases, as shown in Figure 2:

Phase 1- Integration of the teamwork, criteria selection, and classification.

Phase 2- Multicriteria ABC inventory classification

Phase 3- Analysis of demand behavior

Phase 4- Demand forecasting

Phase 5- Inventory Control Systems

3.3 Situation during COVID-19

The Company faced a situation of exponential increase in demand resulting from real need and compulsive behaviour from customers in the distribution channel, leading to a bullwhip effect in safety products. The disruption in the supply market threatened the ability to face the orders with a high level of service.

The Company decided to prioritize the maintenance of the service level, through the flexibilization of the supply chain, attending the effects affecting each link of the chain. As result of the pandemic and the

market response, the reality was that inventory and production capacity of products with higher demand were not enough to satisfy the orders from every customer. The decision could be to sell all products directly related to the orders increasing the price of high demand and poor offer products, and with this, increase the speculation on prices. Another option was increasing the collaboration within the supply chain and try to satisfy at a reasonable level every customer with the real capacity of the Company and the supply chain, it was the choice.

For that, three strategies were adopted to manage the crisis generated by COVID-19.

Strategy 1. Strengthen the communication between the stakeholders

The main goal was to consider the information and interest of the concerned parties in the decision-making stage (Elias 2019). A multicriteria framework is proposed for inventory management. The employing of the multicriteria method, provide the required flexibility to achieve the integration. More visibility along the supply has to be a priority.

Strategy 2. Prioritization of the customers

Prioritization of the customers is part of the flexible supply chain, adapted from (Singh et al. 2019) for a trading company, where it considers to share the resources among different types of customers, it means to distribute proportionately according to an agreement and priorities. It was proposed to fulfill demands in alignment with the policies issued by Health Ministry, in Colombia.

Strategy 3. The size of the order is decided by the customer

In this scenario, it is not possible to accurately forecast the demand pattern using theoretical models, the available historical information is not reliable. This strategy is based on the supplier-retailer relationship, and the strategical inventory concept, that can benefit both sides. Strategical inventory established that the supplier determines a wholesaler price at each stage and the retailers/customers decide the quantity of the order. This strategy is aligned with (Koonin 2020) who established that businesses' alliances can be used as a recovery plan for the COVID-19.

These three strategies were basic to modify the inventory control model during the COVID-19 period, with the vision to maintain and improve the following period. Figure 3 shows the changes in the model, impacting on phase 1, 3 and 5.

4. Results

The results show the real inventory behavior of the company from July 2019 to June 2020, taking into account the joined impact of the strategies. Teamwork was integrated, where the internal and external parts were involved, as it is shown in Figure 4. Teamwork contributes to an expeditious communication among the parts for the decision-making about the company demand during the pandemic, increasing, among others, the inventory visibility in the supply chain for mitigating the bullwhip effect.

Strategy 1. Strengthen the communication between the stakeholders

This strategy allowed to close all the concerned parties during the establishment of the Taskforce on Phase 1, and their improved integration in the communication process as is shown in Figure 4.

Through the AHP method implementation and checking the consistency index (CI), the selected ABC criteria classification were: Days of Inventory Outstanding (DIO), Unit Cost, and Lead Time, as the company worked previously. The grouping parameters were defined according to the indexes by item using the Eq. (2) (Zuluaga et al. 2011), the results found 17 items classified as A-type products, including them as essential products for the pandemic.

$$\text{Index by Item} = \sum_{i=1}^I W_j y_{n_{ij}} \text{ Eq. (2)}$$

where:

$y_{n_{ij}}$ is the normalized item value according to the criteria

W_j is the priority vector value for the j criteria.

Stakeholder incorporation in the decision-making process allows a reliable and timely information flow and decision making process for a better balance among social responsibility with the economic result of the company, making flexible the supply chain management.

Strategy 2. Prioritization of the customers

According to the regulatory policies issued by the Health Ministry during COVID-19, the companies of biosafety products must give priority to the customer over the wholesaler and distributors, to bring products closer to the population. The impact was reflected in the family demand structure, customer types, and segment, as is shown in Table 1, where the green highlight is referred to as a new commitment, and in red highlight, the affectations from low demand.

Table 1 Impact of the prioritization by types of customers

Items family	Before COVID-19		During COVID-19	
	Segment	Customer type	Segment	Customer type
Personal protection equipment (PPE)	Manufacturers	Consumer	Manufacturers	Consumer
			Healthcare	Consumer
Fogging machine	Healthcare	Distributor	Healthcare	Distributor
Gauze and compresses	Healthcare	Consumer	Healthcare	Consumer
Surgical caps	Healthcare	Consumer and distributor	Healthcare	Consumer
	Manufacturers	Consumer	Manufacturers	Consumer
	Food handling	Consumer and distributor		
Gloves	Healthcare	Consumer and distributor	Healthcare	Consumer and distributor
	Manufacturers	Consumer	Manufacturers	Consumer
	Beauty	Consumer and distributor	Beauty	Consumer and distributor
	Food handling	Consumer and distributor	Food handling	Consumer and distributor
			Drugstores	Distributor
DISPOSABLE POLYETHYLENE PROTECTION ELEMENTS	Manufacturers	Consumer and distributor	Manufacturers	Consumer and distributor
Masks	Healthcare	Consumer and distributor	Healthcare	Consumer and distributor
	Manufacturers	Consumer	Manufacturers	Consumer
	Drugstore	Distributor	Drugstores	Distributor
	Beauty	Consumer and distributor	Beauty	Consumer and distributor
	Food handling	Consumer and distributor	Food handling	Consumer and distributor

Polyethylene Gloves	Food handling	Consumer and distributor, and wholesaler	Food handling	Consumer and distributor, and wholesaler
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Personal protection equipments (PPE) and caps families are included in the Healthcare sector, while the drugstores appear as new customers, the demand for caps decreases in the food handling because of new governmental policies.

The flexible approach was guaranteed by the integration of the interested parties in a scenario of both parts doing business by cooperation, to establish a balance between the customer satisfaction and the economic impact for the company, in a win-win situation environment.

Favored by governmental policies, the major sales growth has been in the drugstores and followed by healthcare institutions, with the main goal to attend the general public, taking care of the health of the population. Later the sales of PPE to manufacturing plants experienced an important growth, due to the restructuration of biosafety protocols that they had to implement, inducing an increase in the purchase volume, made evident in the assortment.

Figure 5 shows the impact of the segment sales of products by sector or group of customers, evidencing the higher percentage from the drugstore and healthcare, achieving the main goals of the strategy.

Strategy 3. The size of the order is decided by the customer

The COVID-19 Essential Supplies Forecasting Tool (WHO 2020a) was taken as reference for the input information according to the pandemic behavior in Colombia. Focusing on items A-type, the demand was carefully analyzed and criteria was collected from the administrative employers, directly determining the future demand based on the customer's interaction.

An average demand was fixed, implementing a periodic checking system, that facilitates the simultaneous coordination from diverse items, achieving significant scale economies.

As shown in Figure 6, in February the highest peak of the masks demand was presented aligned to the arrival warning of the virus in Colombia, later the demand remained until March, when the first COVID-19 case was detected. A perpetual demand was employed for the use of the average requirements, prioritization, and alignment with the government's regulations, avoiding speculations and hoarding in inventories and prices. The decisions of perpetual demand for 7 months, allowed the organization to align all the process with the external suppliers, high service levels, sales projections, and inventory levels for 2021 forecast. Will be considered an erratic demand, following the same methods and variables from the inventory control model before COVID-19.

The highest influence received for the inventory control was the expected lead times variation from suppliers (61% imported items), which showed the projected increase in Figure 7.

This behavior evidenced the necessity of new suppliers to cushion the impact variation on the demand and supply relation. Until June 2020, the supply market in Colombia didn't meet the quality requirements by the Company to turn as an alternative.

5. Measuring The Effectiveness Of Strategies

The combined application of strategies impacted the service level, achieving the promise of customer value, improving from 95.5% before COVID-19 to a 96.2% during COVID-19, decreasing the variability of the service level. This result is specially important because it confirms that the Company was able to satisfy the contracted demand in this scarcity scenario, filling both parts needed in each supplier-customer relation. At the same time, it was possible to improve the Days of Inventory Outstanding (DIO) Key Performance Indicator (KPI) and the average inventory was reduced 19% due to the use of inventory to satisfy a higher demand. The results showed that it was possible to maintain and improve the service level of orders, it means high availability and less inventory, showing the effectiveness of the changes on the inventory control model and the strategies during the pandemic. Figure 8 is a summary dashboard that shows the results.

Conclusions And Future Work

Under these conditions of uncertainty generated by the COVID-19 pandemic, the companies must accomplish the social responsibility and keep the service levels of high demand items, like those prioritized by the World Health Organization for the COVID-19 crisis.

In this research, we strived to show strategies to keep the service levels for essential and highly demanded biosafety items in a pandemic situation, where the demand increased exponentially combined with a global disruption of the supply chains leading to shortage of inventory.

Fixing the goal guarantees the service level to the customer, in correspondence with the agreed demand between the concerned parties. Increase the visibility and communication through the supply chain based on a cooperation approach to ensure win-win results, safeguard the sustainable results in this scenario.

Results obtained with real data of the biosafety company shows that the proposed strategies were effective because they improve level service indicator with higher fill rate of orders, and, at the same time, decreased Days of Inventory Outstanding (DIO) and the capital invested on inventory, prioritizing essentials and highly demanded items closer to the consumer.

The model, its application and the proposed strategies, can be useful for other production and trading companies with many items in inventory in this context.

The supply chain systems of today are more presumable to face massive technologically changes in the next years, there are two topics that could impact the solution already provided and impact on flexibility. They are the following:

- 1- The Impact of Industry 4.0 on supply chain management.
- 2- Training in supply chain with risk management focus.

Although the disruptive technologies and hyper-connectivity offer great quantity of data, a number of issues need to be addressed in the future. Which factors could complement data management and automation to support inventory management? Are the persons prepared to breakdown silo mentality and go to a holistic and cooperative approach? Does the COVID-19 experience shows that inventory optimization is the best road map?

Big data will see huge difficulties even if the data volume is sufficiently large due to the inaccurate data and an absence of key data. This specific problem is a reality nowadays, due in part for the bullwhip effect faced in this period. Once this scenario is overcome, the logistics system can be optimized by degree, based on reliable data sources and disruptive technologies, besides suitable organizational changes. The Industry 4.0 approach will support inventory management in different fields, from visibility supporting traceability and stock control, to the high effective technologies supporting Auto-Id and operations in the supply chains. Inventory management is not only mathematics and quantitative approach, it has a great qualitative and organizational component, that's why the technology by itself will not solve the necessary flexibility needed, the human is in. (Winkelhaus and Grosse 2020)

Training people in supply chain has to focus on breaking the silo mentality present in the Companies affecting both their individual and the supply chain performance. The COVID-19 has shown the need to

transform the traditional training in academics and industry as well for an active and experiential learning simulating several risk scenarios (Pekkanen et al. 2020; Seow et al. 2019).

It's imperative to develop soft skills in people to manage the processes in this VUCA World, in Industry as well as in academic environment to achieve the required performance in supply chains in such scenario (Chawla and Lenka 2018).

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Figures

Figure 1

Service Level percentage in the second semester of 2019

Figure 2

Inventory control model before COVID-19

Figure 3

Inventory control model during COVID-19

Figure 4

Comparison of teamwork members for inventory management decisions in Phase 1

Sales increase by sector - 1st half of 2020 in comparison to same period 2019

Figure 5

Impact of the segment sales of products by sector or group of customers

Sales of Masks

Figure 6

Total sales of masks including period of COVID-19, in boxes of 50 units

Supplier Lead time before and during Covid-19

Figure 7

Impact of COVID-19 on suppliers lead time

Figure 8

Dashboard of main Key Performance Indicators