THE IMPACT OF SUPPLY AND DEMAND ON OPERATIONAL OPTIMIZATION DURING THE COVID-19 PANDEMIC

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Abstract: *Economic activity has been significantly impacted by the social restrictions imposed by the Covid-19 pandemic, resulting in disruptions to the supply-and-demand market regulation system. The pandemic's unknown context requires and tests the company's adaptability. In this paper, we analyze the redesign of the supply and distribution chains as well as the operational production and human resource protection policies. The study's objective is to underline the importance of optimizing operational flow and conceptualizing it using prior literature. Our study's findings contribute to managerial decisions in the light of Covid-19 pandemic.*

Key words*: management, supply and demand, human resources*

INTRODUCTION

Companies are faced with a variety of challenges in a complex and changing environment as a result of the Covid-19 pandemic. Crises are sequences of events that, if not managed properly, can have significant negative consequences for an organization [17], but crises have also served as a source of opportunity throughout human history [6]. According to [11] the adaptation of structures and networks and associated production control policies to individual firms are important determinants of the advent of the pandemic supply system. Unlike instant disruption (eg floods, earthquakes, etc.), a pandemic is not an event that strikes and disappears; pandemic is a super disturbance with an unknown timing, which is considered exogenous for the supply system [7].

The lack of knowledge on this critical topic has become particularly evident during the current coronavirus pandemic, as numerous companies have suddenly been forced to adapt their business models [18]. The key factor comes from the relationship between the company and all stakeholders (employees, suppliers, customers, community, and investors) and must result in the elimination or reduction of costs for the company.

MATERIALS AND METHODS

The method of the case study chosen is one of information, of exposing a reality through managerial decisions that in fact define the mission and vision of the company.

RESEARCH RESULTS

In this case study, we show the importance of operational optimization of the production process. The dynamics of supply and distribution, by using the financial data from previous years, comparing data, internal analysis, and customer analysis, can be the premises of a specific internal model. Following that, three levels of management action will be identified the operational one, supply and sales, and human resources. The common element is the dynamics of the market through supply and demand during the pandemic period (Figure 1).

The analysis of the existing literature leads us to the conclusion that the structural and process system dynamics can result in system inertia, giving rise to overlapping disturbances, for example, intersections of operational risks [9]. However, the system's behavior is determined not only by its structural configuration but also by operational processes such as supply and production control [14].

As a result, the graphic representation of the action's main parts creates a holistic image. Human resource protection is declared a priority objective during discussions with the company's manager. According to [3], 80% of organizations report a gap in employee availability to deal with any turbulent situation. Only 12% of organizations reported that their employees were completely prepared to deal with any adversity [3].

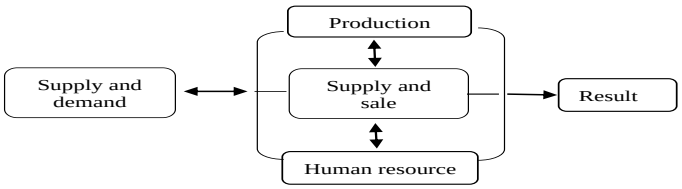

Figure 1. The dynamics of the market through supply and demand during the pandemic period

Source: Internal rules on the structural organization of the company

It was derived that reviewing employee performance is probably the only way to treat this underlying condition [16]. In order to improve employee retention, involvement and performance, constructive feedback (brainstorming sessions) on employee performance is a universal management practice [20]. Employee motivation and contribution to the work's outcomes can be enhanced through performance evaluation [12].

On the basis of these considerations, the required performance of the sales department's employees was re-evaluated through the recruitment and training of new employees from other internal activities, thereby facilitating the work of all and the division of responsibilities.

The decline in product demand and supply, exacerbated by the closure of HORECA units, necessitates structural reorganization, which is still required in light of the ordinances and new health regulations. The decision was made to transition from a two-shift to a three-shift organization, with surplus personnel covering other areas of activity, including supply management, distribution, production control, and sales.

The following Figure 2, illustrates the effect of social restrictions on the spread of the Covid-19 pandemic on the decrease in demand required to cover the assortment range (65 types of products).

By analyzing the company's historical data for the last four years and comparing them, it is clear that production decreased significantly in January and February (Figure 3).

This trend, become a historical and normal cycle for the company (Figure 4). Additional examination of the data provided by the company's management in our case study is necessary in order to ascertain the outcomes following the company's reorganization.

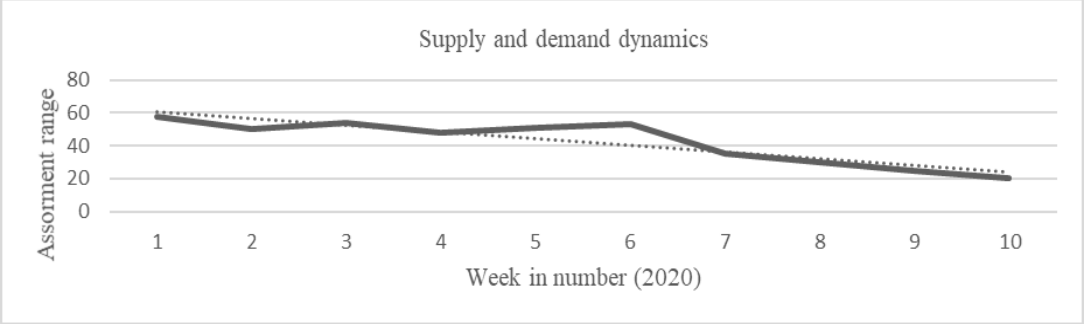

Figure 2. Supply and demand dynamics during the Covid-19 pandemic

Source: Internal accounting data of the company

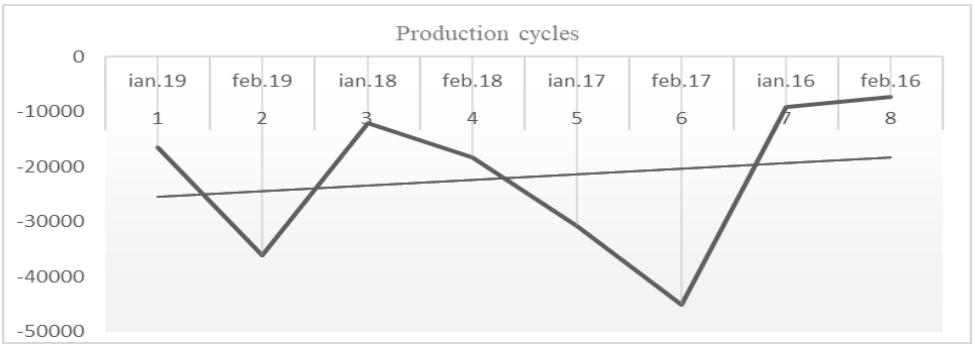

Figure 3. Production cycles during the Covid-19 pandemic

Source: Internal accounting data of the company

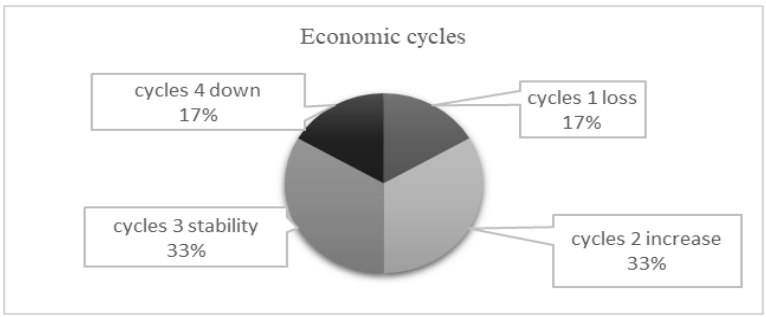

Figure 4. Economic cycles during the Covid-19 pandemic

Source: Internal accounting data of the company

Figure 5 demonstrates the successful implementation of supply and distribution system actions, operational optimization of production, and inventory control. We mention that the company's products are perishable (48-hour validity).

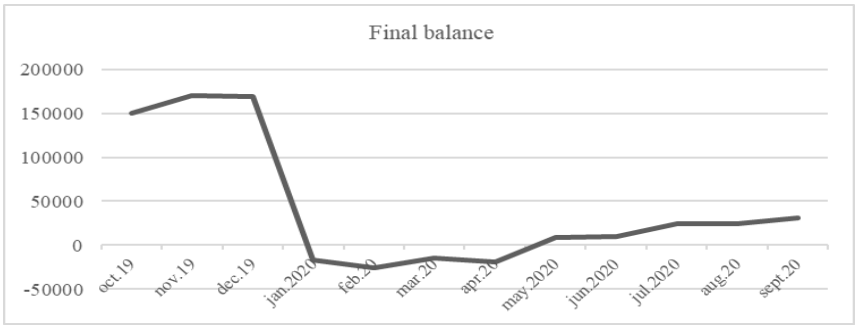

Figure 5. Final balance of the company

Source: Internal accounting data

As a result, the decision to protect human resources as a priority target with a post-pandemic goal is justified. In this sense, the concept of sharing employee responsibilities simplifies the work environment and enables employees, particularly those in sales who are confronted with an unknown situation, to adapt more quickly. According to the literature, adaptability is important for employees, especially for sales employees, whose contributions to the success of the company are thought to be important [2].

The supply and distribution systems may create uncertainties about the correlation between supply and demand during severe disruptions [19]. Prior to the pandemic, disruptions were usually studied as events that disrupt the flow of materials into the supply and distribution system, having a negative impact on their performance [21]. Recent

research has developed a number of useful methods and models for dealing with such event-induced disruptions [1].

The COVID-19 pandemic established a new and understudied field, namely the analysis of operations and performance under extreme exogenous shocks [8]. Decision-makers, in general and especially, have frequently lacked guidance on how to respond to a pandemic.

The existing literature highlights the critical nature of adapting processes, such as production control policies. Although process adaptation is widely used in practice, it has received much less research attention and has been studied using a variety of simulation methodologies without explicit integration of different models [5,15,13]. It is also necessary to consider the product's unique characteristics, as well as the perishability of food throughout the supply and distribution chain [10,4]. In our study, managerial actions and their implementation began immediately after the social restrictions were announced, with the establishment of managerial levels (Figure 6).

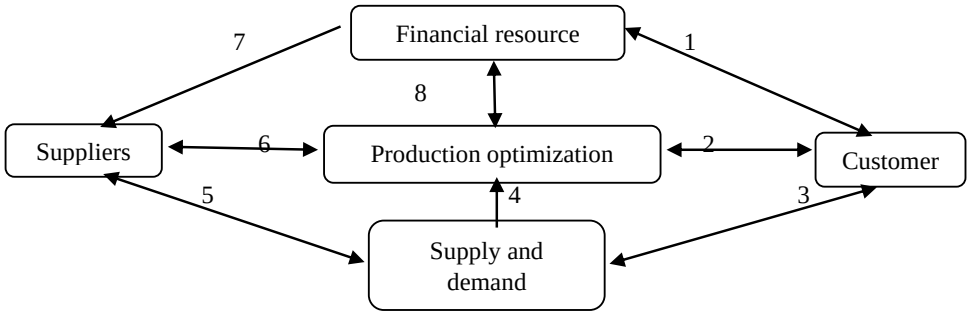

Figure 6. Conceptual model of action plan

Source: Internal rules of the company

1) The financial resource, by attracting all receivables in 72 hours, renewing credit lines, using dividends in the new spending structure.
2) Management of finished goods, in parallel with the control of orders.
3) Operational optimization of production, customer situation, by centralizing distributed products, without HORECA units.
4) Voluntary production contraction (abandonment of products that technologically create operational risk through the gap left by HORECA).
5),6) Recalibration of the company's supply system, in correlation with production optimization.
7) Use of financial resources to ensure the supply of raw materials.
8) Prioritize expenses.

We notice that the mode of action is predicated on the operational optimization of production. Market adjustment (3) occurs in the relationship between customers, supply, and demand and has a unidirectional effect on production (4). Financial resources consist of income from customers, dividends, bank loans (1). Another source of additional revenue comes from prioritizing expenditure and optimizing the production process (8). Allocation of financial resources (7) for the advance payment of the raw material, ensuring that it is provided under new delivery conditions and to gain the time necessary for the reorganization (6). Demand and supply have an implicit influence on suppliers through decreasing orders (5).

The reorganization and optimization of production also remains at the heart of cost optimization. This allows production to be pushed in conjunction with the centralized data system from taking orders, so that there are no interruptions (operational risks). For

example: ordering customer service should be as close as possible to the end of the customer program.

By accessing the customer database we can prepare the operational production processes, covering the optimization through historical orders, and the process will be complete, after taking over all orders. The reorganization is "cell time" by modulation on production cells according to the following model (Figure 7).

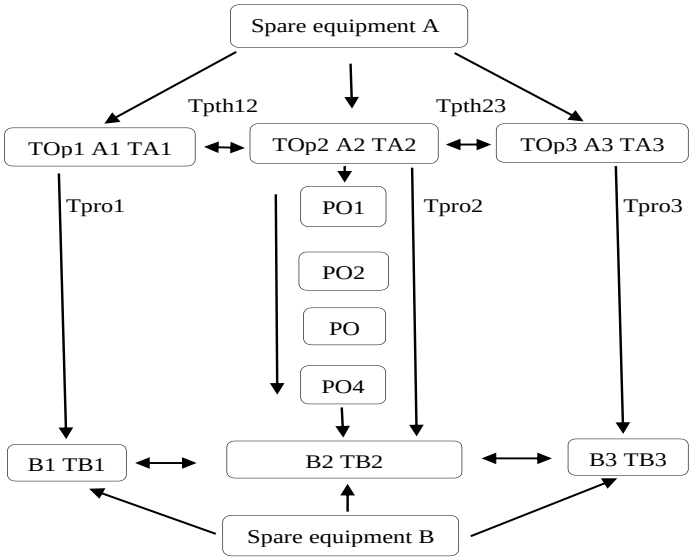

Figure 7. Production cells of the company

Source: operational sheets

TA, TB - operational times for each operation
Tpro - pre-operational preparation time, Tpro1 = Tpro2 = Tpro3
TOp - operating time
Tpth - technology break time, Tpth12 = Tpth23 = Tpth31 = Tpth,
| TA1 | = | TA2 | = | TA3 |
PO1, PO2, PO3, PO4 - operational procedure
TA1, representing the moment of origin of the production
TA2 = TA1 + Tpth
TA3 = TA2 + Tpth = (TA1 + Tpth) + Tpth = TA1 + 2Tpth

Operational optimization is based on the timing and uniformity of the product range. Essentially, maximum capacity is used to fragment operational processes by evenly dividing the maximum quantity into three smaller quantities, resulting in the modular production system. The analyzed results (Figure 5) demonstrate that the managerial actions were justified. There are no other comparable data. While we cannot assert that our findings constitute the solution, we can assert that they represent a strategy for surviving the pandemic period.

CONCLUSIONS

The dynamics of the pandemic can be considered a separate system that interacts with the system and simultaneously influences the network design structures, capacities, supply and demand. From our study, we distinguish three major directions of action, the first being the protection of human resources, the second the reallocation of financial resources for the purchase of raw materials and price blocking, this being a strategic point

to gain time for structural reorganization and the last by reducing costs by operational optimization of production.

REFERENCES

[1]. ALDRIGHETTI R., BATTINI D., IVANOV D., ZENNARO I., 2021, Costs of resilience and disruptions in supply chain network design models: a review and future research directions, International Journal of Production Economics, 235, 108103

[2]. ALRAJA M., 2022, Frontline healthcare providers' behavioural intention to Internet of Things (IoT)-enabled healthcare applications: A gender-based, cross-generational study, Technological Forecasting and Social Change, 174, 121256.

[3]. DELOITTE REPORT, 2021, Global human capital trends. https://www2.deloitte.com/us/en/insights/focus/human-capital-trends.html. Accessed 5 april 2022

[4]. DIABAT A., JABBARZADEH A., KHOSROJERDI A., 2019, A perishable product supply chain network design problem with reliability and disruption considerations, International Journal of Production Economics, 212, 125-138

[5]. DOLGUI A., IVANOV D., ROZHKOV M., 2020, Does the ripple effect influence the bullwhip effect? An integrated analysis of structural and operational dynamics in the supply chain, International Journal of Production Research, 58(5), 1285-1301

[6]. GOFFIN K. UND MITCHELL R., 2010, Innovation Management: Strategy and Implementation Using the Pentathlon Framework, Hampshire: Palgrave Macmillan

[7]. GOVINDAN K., MINA H., ALAVI B., 2020, A decision support system for demand management in healthcare supply chains considering the epidemic outbreaks: A case study of coronavirus disease 2019 (COVID-19), Transportation Research Part E: Logistics and Transportation Review, 138, 101967

[8]. IVANOV D., 2020, Predicting the impacts of epidemic outbreaks on global supply chains: A simulation-based analysis on the coronavirus outbreak (COVID-19/SARS-CoV-2) case, Transportation Research Part E: Logistics and Transportation Review, 136, 101922

[9]. IVANOV D., SOKOLOV B., 2019. Simultaneous structural–operational control of supply chain dynamics and resilience, Annals of Operations Research, 283(1), 1191-1210

[10]. IVANOV D., ROZHKOV M., 2020, Coordination of production and ordering policies under capacity disruption and product write-off risk: An analytical study with real-data based simulations of a fast moving consumer goods company, Annals of Operations Research, 291(1), 387-407

[11]. IVANOV D., DOLGUI A., 2021, OR-methods for coping with the ripple effect in supply chains during COVID-19 pandemic: Managerial insights and research implications, International Journal of Production Economics, 232, 107921

[12]. JUNG J.H., SCHNEIDER C., VALACICH J., 2010, Enhancing the motivational affordance of information systems: The effects of real-time performance feedback and goal setting in group collaboration environments, Management science, *56*(4), 724-742

[13]. KHAN F.U., TRIFAN V.A., PANTEA M.F., ZHANG J., NOUMAN M., 2022,. Internal Governance and Corporate Social Responsibility: Evidence from Chinese Companies, Sustainability, 14(4), 2261

[14]. LI Y., ZOBEL C.W., SEREF O., CHATFIELD D., 2020, Network characteristics and supply chain resilience under conditions of risk propagation,International Journal of Production Economics, 223, 107529

[15]. **LOHMER J., BUGERT N., LASCH R.**, 2020, Analysis of resilience strategies and ripple effect in blockchain-coordinated supply chains: An agent-based simulation study, International Journal of Production Economics, 228, 107882

[16]. MARY J., COENS T., JENKINS M., TOM C., 2010, Abolishing Performance Appraisals. ReadHowYouWant. com
[17]. PEDERSEN C.L., RITTER T., DI BENEDETTO C.A., 2020, Managing through a crisis: Managerial implications for business-to-business firms, Industrial Marketing Management, 88, 314
[18]. RITTER T., PEDERSEN C.L., 2020, Assessing coronavirus's impact on your business model, Harvard Business Review Digital Articles, 2-4
[19]. SAWIK T., 2021, On the risk-averse selection of resilient multi-tier supply portfolio. Omega, 101, 102267
[20]. YOHN D.L., Employee feedback is good for employee engagement: action is better. https://www.forbes.com/sites/deniselyohn/2019/08/06/employee-feedback-is-good-for-employee-engagement-action-is-better/?sh=1eda987674cc. Accessed 5 april 2022
[21]. ZHAO K., ZUO Z., BLACKHURST J.V., 2019, Modelling supply chain adaptation for disruptions: An empirically grounded complex adaptive systems approach. Journal of Operations Management, 65(2), 190-212