

Research and Analysis on Corporate Inventory Management Issues under the Epidemic - A Case Study of 3M Company

Xuankai Wu

Business school, University of Leeds, Leeds, United Kingdom

*Corresponding author. Email: Bn203xw@leeds.ac.uk

ABSTRACT

From the beginning of 2020 to the present, Covid-19 has been spreading around the world, continuously destroying the global economy and people's health. At the beginning of the Covid-19 outbreak, the global mask market was in short supply, and 3M, the world's leading mask manufacturer, expected to expand its production capacity in the midst of Covid-19. However, due to the impact of the supply chain management and the rising costs of raw materials and labor forces, 3M was unable to expand its production capacity in time. This paper studies the supply chain management of 3M, finds out the problems, and proposes corresponding countermeasures to improve the supply chain management of 3M, so as to help the company better achieve its strategic goals and gain more profits. It is found that supply chain management is a key source of competitive advantage and a powerful tool to boost performance. In the grand scheme of things, a methodical approach to supply chain optimization is both scientific and necessary. By optimising the supply chain, 3M has been able to improve customer satisfaction while lowering costs and increasing the efficiency of the entire system from the procurement of raw materials and components to the manufacture, distribution, and delivery to end users. The supply chain optimization and improvement programme at 3M are meant to increase customer satisfaction while lowering overall costs and increasing the efficiency of each company in the supply chain.

Keywords: Supply Chain Management, Analysis Models, Inventory Management Issues, Solutions, Epidemic.

1. INTRODUCTION

The sudden outbreak of the Covid-19 poses a major challenge to the global supply chain. It has affected countless manufacturing and logistics industries. Countries were affected by Covid-19 and there was a huge demand for medical supplies. This is the biggest shock to the global supply chain. As the first line of defense against the Covid-19 virus, masks have become a necessity in the daily lives of people today. As a result, there is a surge in demand for masks from people around the world. This is a great opportunity as well as a great challenge for medical device manufacturing and sales companies. The opportunity is that the company's product sales will increase significantly due to the surge in demand for masks. The challenge is how the company can improve its supply chain management and expand its production capacity according to the market demand. This paper examines the problems of the existing supply chain management of 3M, a medical product

manufacturing company, and makes recommendations to enable the company to respond to the surge in demand for masks. The significance of this paper is that it can help medical device manufacturers and distributors to better understand the problems of their own supply chains. At the same time, the author also hopes to help these companies find some ways to improve their supply chain management and cope with the Covid-19 contingency, thus providing some directions and suggestions for subsequent research.

2. PROBLEMS FACED BY MASK COMPANIES UNDER THE TREND OF NEW CORONAVIRUS PANDEMIC

Under the impact of Covid-19, 3M, as a mask manufacturer, faces many issues and challenges mainly in raw materials and manpower, as well as the supply chain management.

2.1 A severe shortage of raw materials and human resources

3M intends to expand its production capacity to respond to the surging market demand and the issue of raw materials is the first one that needs to be addressed. Therefore, the company needs to increase the number of production lines, and the raw materials needed are equipment and processed materials. In terms of the equipment, due to the rapid spread of the epidemic, many companies crossed the border to produce masks. This led to a sharp increase in the price of mask production equipment. In China, the price of a mask production machine rose from RMB 250,000 to RMB 1.2 million [1]. In order to expand its production lines, 3M has to purchase new mask production machines. However, the significant increase in the price of production machines will lead to a significant increase in 3M's production costs. This is a challenge that 3M must face. To expand the production capacity of masks, 3M needs not only machines, but also raw materials for production. The raw materials for the production of masks mainly refer to the meltblown cloth. However, with the outbreak of the epidemic, the price of the meltblown cloth rose from RMB 18,000 a ton to RMB 80,000 a ton [2]. Such a huge increase made 3M face the dilemma of insufficient raw materials.

Likewise, the shortage of personnel was a problem that 3M had to face. To expand its production capacity, in addition to purchasing machines and raw materials, 3M also had to add enough operators for the production of masks. However, with the spread of Covid-19, many workers chose to quit their jobs and stay at home to receive government relief for fear of contracting the virus. Meanwhile, the government controls and the decision to temporarily close the city also prevented many workers from going to work at the factory. This made it difficult to secure the original size of the workforce for a medical device manufacturer like 3M. At this stage, it was extremely difficult for 3M to add new workforce. At the very least, the company needs to pay a quite large labor cost. This will reduce the competitiveness of the company's products. The end result is that the company is unable to gain excess revenue by expanding its production capacity.

2.2 Problems with the approach to supply chain management

3M has some rather obvious problems with the management of the company's supply chain. Firstly, 3M only spends a lot of energy on maintaining the relationship with the downstream customers and buyers of its products in the management of its supply chain [3]. By doing so, the company hopes to ensure the usual sales channels for its products. However, the company neglects the relationship with the upstream raw material suppliers.

In the company's philosophy, as a buyer of raw materials, the company should be in a strong position in the transaction. Therefore, maintaining the customer relationship with raw material suppliers is a waste of resources for the company. This backward philosophy has prevented the company from obtaining a stable supply of raw materials during the impact of Covid-19. It has also prevented the company from gaining excess revenue by expanding its production capacity. Secondly, 3M sees the upstream and downstream companies in the supply chain as competitors. In 3M's view, it is the company's goal to negotiate with upstream and downstream companies to minimize the interests of its rivals and maximize its own interests. This is the strategy that the company has been pursuing. However, in the modern concept of the supply chain management, companies in the whole supply chain should be in a cooperative relationship instead of a hostile relationship [4]. In the procurement process, the negotiating parties see each other as adversaries and seek to negotiate prices that are favorable to their own interests. This philosophy can make the supply chain unable to play its role. On the contrary, enterprises should see each other as partners through mutual cooperation to make the supply chain reach an optimal state. In this way, the enterprises in the supply chain can obtain the overall optimal benefits. 3M's outdated supply chain management philosophy prevents the company's supply chain management from achieving optimal performance under the influence of Covid-19, failing to help the company to achieve an effective capacity expansion and to win excess revenue.

3. SUGGESTIONS ON THE 3M INTEGRATED SUPPLY CHAIN AND INVENTORY MANAGEMENT

3.1 Aligning the production process

From the perspective of the supply chain management, the outbreak poses a supply chain risk, and the company should initiate a risk contingency management and disaster recovery plan (DRP) to deal with it [5]. In other words, companies need to assess future events and their probability, the severity of the consequences of the event (e.g. employee protection), and the level of risk. They also need to figure out which factors contribute to the risk, whether these factors are controllable (e.g. key materials, strategic suppliers), what the corresponding response strategies are, who will be responsible to, and when to complete. In response to the above risk likelihood analysis, 3M is supposed to combine the available resources with the DRP methodology to carry out the following actions: Maintaining the communication with the upstream and downstream companies to achieve a high level of synergy. The top management of the enterprise needs to communicate with each other at the same level before the start of work to understand the market supply environment and the situation of

cooperative suppliers at that time, such as the number of days available for existing inventory, the production capacity, the recovery of transportation capacity of logistics service providers, the return to work for employees, and the degree of the supply impact, so as to adjust the delivery date the enterprise orders and update the release of the demand forecast in a timely manner. At the same time, 3M should work with the downstream customers to understand the client demand and market changes, such as the information on employees' return to work, changes in demand plans, order delivery adjustments, and forecast changes.

3.2 Accelerating the improvement of the supply chain and inventory management

In the face of the epidemic, it is imperative for 3M to establish a highly integrated and fully transparent emergency supply chain collaborative management information platform. The information will be involved in each link of the emergency supply chain, such as the emergency reserve center, the emergency material supply, the medical material demand, and the logistics service providers. The information will be connected to the epidemic emergency supply chain collaborative management information platform [6]. Various departments and links in the emergency supply chain should take the initiative to effectively integrate and realize the convergence, sharing and real-time updating of information. This allows the companies to participate in the emergency supply chain to adjust the production in a timely manner according to the information released by the platform. 3M, as a mask manufacturer, has to adjust its production targets and production plans according to the downstream demand and the existing inventory information to achieve a balance between the supply and demand. The material demand unit, based on the material supply inventory data released upstream, needs to take into account both horizontal and vertical aspects, integrate the management of each link of the emergency supply chain, and direct and deploy personnel and materials to make them work together. Finally, the material demand unit should realize the delivery of the required materials to the demand location within the specified time. In addition, the blockchain technology can ensure that all demands and all operation records are open, transparent and tamper-proof, thus guaranteeing the authenticity and validity of the material circulation. With the help of the modern information technology such as Internet of Things, cloud computing and big data, a highly integrated, fully transparent, fast and efficient public information system for emergency security can be established to provide uninterrupted security to emergency security demand units and individuals.

The main purpose of the raw material procurement is to fill the reserve, and the actual procurement process is mainly for the reserve to be purchased [7]. Such a

procurement mindset will ignore the entire enterprise production line. For the product demand, the direction and process of the enterprise production will lack a deep understanding of the long term, and this lack of understanding will inevitably lead to passive procurement of raw materials, not being able to adapt to the changes in the market. In order to achieve better management, the procurement objectives should be further optimized in the future. As the main management mode for the procurement of raw materials, the supply chain management should be carried out in the form of orders. This can better adapt to the market demand. Specifically, the procurement plan should be decided according to the customer's order, so that the procurement cost of the enterprise can be reduced. At the same time, it is possible to minimize unnecessary reserves, thus reducing the large backlog of enterprise funds. In addition, departments can also make production plans based on the orders. This is helpful in enhancing the speed of the output of products.

There should also be a perfect information communication channel between the supplier and the mask enterprise, through which the transparent supervision of the supplier management inventory can be realized. In actual management, 3M companies should consider the existing actual amount of the inventory based on the sales information of the company's products, and the data should be fed back to the suppliers in a timely manner, and then the inventory management platform will make a judgment. When the amount of inventory can meet the inventory goods at disposal, the goods reserve system should send the product information to the required enterprises in time, and if it cannot meet the product disposal requirements, the reserve system should send a message to inform the relevant personnel what products to replenish.

In addition to optimizing the supplier inventory management, the internal inventory management should also be optimized, specifically by effectively addressing the communication barriers between different organizations in the company. The sharing platform should not only contain the information about the internal production line, but also about the external suppliers of raw materials. The efficiency of internal inventory management should be truly improved through the application of the information system management platform; secondly, a perfect management platform should be able to effectively respond to various unexpected factors in warehouse management. In the warehouse, the storage manager must perform inspection procedures to prevent management problems in the warehouse from reducing supply chain efficiency. At the same time, good warehouse supervision procedures can improve management efficiency of warehouse. Usually, the supervision of the storage is often a fluid process. In order to adapt to the changes in environment, managers should be adjusted according to the specific

circumstances. Finally, is the ability to update the storage classification management methods. In the development of the warehouse management, the ABC assessment method is usually to be used. It can significantly reduce the fragmentation and hidden management costs [8]. For projects whose value accounts for 70-80% of the total value, the number can account for 20% of the total number, and effective protection measures must be taken. And for general items, although the value is low, the management cannot be ignored, thus strictly preventing it from the storage risks.

4. EFFECTIVENESS OF 3M'S INNOVATIVE SUPPLY CHAIN MANAGEMENT

Through the above analysis on the optimization measures for production processes and the supply chain management, 3M will improve in the following areas.

Under the situation of Covid-19, 3M will give more consideration to and then increase the support for the interests of upstream and downstream enterprises in the supply chain. At the same time, in the study of KPI and business indicators, 3M will consider the whole supply chain from the perspective of a comprehensive consideration. For those small and medium-sized raw material suppliers with low profit margins, 3M should fully consider the financial pressure of these companies and give certain preferential treatment in terms of the payment cycle and corresponding conditions. The company will consider the interests of the related companies in the supply chain from the perspective of the whole supply chain.

In addition, 3M will take advantage of the core supply chain companies through the management of the entire

process and the mature information system. Managers need to share logistics information and COVID-19-related information with other enterprises throughout the supply chain in a timely manner to achieve logistics integration. At the same time, the company will also take advantage of the Internet and digital management to enhance the transparency of information in the entire supply chain through information technology, thus ensuring that upstream and downstream enterprises can understand the operation of the entire supply chain in a timely manner.

Additionally, 3M companies will adjust their product portfolio according to the specific conditions of the market and respond to the bullwhip effect that exists in the industry. This enable companies to better cope with the complex situation under Covid-19. Moreover, the 3M company has to share information to upstream and downstream companies in a timely manner. This will help the upstream and downstream enterprises to adjust the production scale and production cycle in a timely manner.

Through these innovative initiatives, it can be seen from Figure 1 that the 3M has continued to improve the production of N95 masks, which has now reached the maximum global production, and has doubled to more than 1.1 billion per year, or nearly 100 million per month [9]. In the United States, this company produces 35 million marks per month. Of these masks, more than 90 percent are supplied to healthcare workers, with the rest going to the industries in an urgent need during the outbreak, such as energy, food, and pharmaceutical companies [10]. 3M also produces masks in Europe, Asia, and Latin America, and its products are also used as the response to COVID-19.

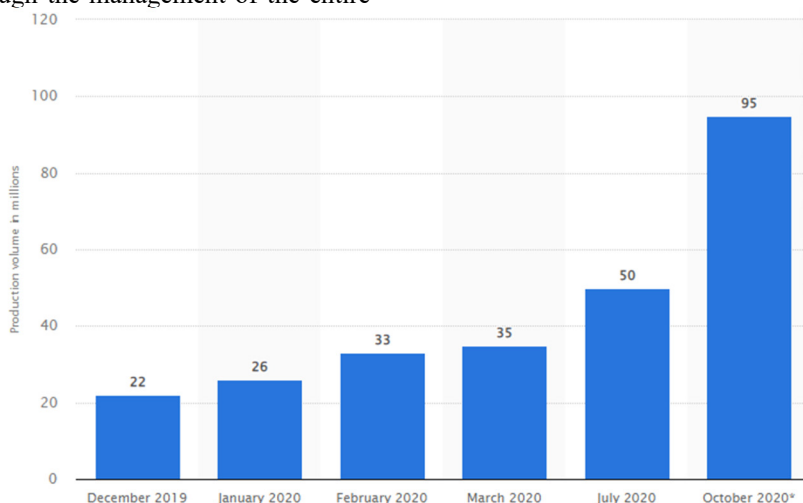


Figure 1 Monthly production volume of N95 masks by 3M in the United States from December 2019 to October 2020.

5. CONCLUSION

This paper analyzes the deficiencies of 3M, a mask

company, in the mask supply chain crisis, and different management problems that other mask manufacturers may have to improve. Ultimately, the competitiveness of

an enterprise is the ability to provide products and services to consumers at a lower cost, higher efficiency, and more satisfactory quality than other enterprises, and on this basis, achieving long-term good business performance and continuous development and growth. Supply chain management is an important source of competitive advantage and an effective way to enhance competitiveness. Given that there are many variables in the supply chain, there is a possibility for people to design and adjust from each variable in order to achieve cost optimization. From the overall perspective, it is scientific and necessary to take a systematic approach to the optimization of the supply chain.

In the case of 3M, it can be seen that the supply chain has an extremely complex nature, with its complexity, circulation, dynamics, and customer demand and crossover. By optimizing the supply chain, 3M has been able to improve the customer satisfaction while reducing the costs and improving the efficiency of the entire system from the procurement of raw materials and components to manufacturing, distribution and delivery to end users. 3M's supply chain optimization and improvement is designed to improve the customer satisfaction while reducing the cost of the entire system and improving the efficiency of each company in the supply chain. All issues in the cooperation of each enterprise and supplier in the supply chain must be approved by each enterprise and supplier, otherwise, the cooperation and the credit degree between enterprises will be uneven when the logistics relationship occurs between them. This will seriously affect the cooperation relationship between each enterprise and thus affect the efficiency of the whole supply chain operation. Therefore, choosing the right company or supplier is the prerequisite to decide whether to have a strong and stable supply chain in the investigation and decision making between the market and enterprises.

REFERENCES

- [1] W. Tian, How China managed the COVID-19 pandemic, *Asian Economic Papers*, 20(1), 2021, pp. 75-101. DOI:10.1162/asep_a_00800.
- [2] Y. Xu, G. Lin, C. Spada, H. Zhao, S. Wang, X. Chen, ... Y. Zeng, Public knowledge, attitudes, and practices behaviors towards coronavirus disease 2019 (COVID-19) during a national epidemic—China, *Frontiers in public health*, 2021, 9, 227.
- [3] A. Brink, A. Berndt (Eds.), *Relationship marketing and customer relationship management*, Juta and Company Ltd., 2009.
- [4] A. Cox, The art of the possible: relationship management in power regimes and supply chains, *Supply chain management: an international journal*, 2004.
- [5] J. Cook, A six-stage business continuity and disaster recovery planning cycle, *SAM Advanced Management Journal*, 80(3), 2015, pp. 23.
- [6] S. Nandi, J. Sarkis, A.A. Hervani, M.M. Helms, Redesigning supply chains using blockchain-enabled circular economy and COVID-19 experiences, *Sustainable Production and Consumption*, 27, 2021, pp. 10-22.
- [7] P.J. Baily, *Purchasing and supply management*, Springer, 2013.
- [8] D.S. Giné, A Renewed Approach to the ABC Landscape Assessment Method: An Application to Muntanyes d'Ordal, Barcelona Metropolitan Area, *Landscape Online*, 56, 2018, pp. 1-13.
- [9] Y. Sheffi, *The New (Ab) Normal: Reshaping Business and Supply Chain Strategy Beyond Covid-19*, MIT CTL Media, 2020.
- [10] S. Dharmaraj, V. Ashokkumar, S. Hariharan, A. Manibharathi, P.L. Show, C.T. Chong, C. Ngamcharussrivichai, The COVID-19 pandemic face mask waste: a blooming threat to the marine environment, *Chemosphere*, 2021, 272, 129601.