THE IMPACT OF COVID-19 PANDEMIC ON SUPPLY CHAIN MANAGEMENT

A dissertation submitted to the Indian Maritime University in partial fulfillment of the requirement for the award of the degree of Master of Business Administration in Port and Shipping Management

By

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MAY 2022

DECLARATION

I, **Arya E V (2005304010)** student of School of Maritime Management, Indian Maritime University, Cochin Campus hereby declare that the project report titled **THE IMPACT OF COVID-19 PANDEMIC ON SUPPLY CHAIN MANAGEMENT** submitted in partial fulfilment of the requirement for the degree of **Master of Business Administration in Port and Shipping Management** is my original work carried under the guidance of my project guide. It has not formed the basis for the award of any degree/diploma or associate-ship of any University/Institution. The information submitted is true and original to the best of my knowledge.

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CERTIFICATE

This is to certify that the report titled –**THE IMPACT OF COVID-19 PANDEMIC ON SUPPLY CHAIN MANAGEMENT**‖ submitted to the School of Maritime Management, Indian Maritime University, Cochin Campus, by **ARYA E V**, (Registration Number: 2005304010) in partial fulfilment of the requirements for the award of degree of Master of Business Administration in Port and Shipping Management is a record of project work done under my supervision.

Date: **Dr. SREEJA K**

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EXECUTIVE SUMMARY

The supply chain industry is a pivotal component and backbone of a country's economy. A well-structured and efficient supply chain infrastructure helps minimize manufacturing costs, enhances the ease of doing business, boosts customer experience and satisfaction, and most importantly, accelerates rural and urban consumption growth driven by improved market accessibility.

With the year wrapped up, an air of uncertainty looms over the economy, the COVID-19 pandemic. COVID-19 has caused widespread disruption in all economic sectors and industries. The interruptions are mostly due to the worldwide lockdown measures that governments have approved and executed as a health plan to reduce the impact of the pandemic's spread on the human population. The COVID-19 lockdown measures have resulted in production halts, restrictions on persons and goods movement, border closures, logistical constraints, and a slowdown in trade and economic activity.

This project report deals with analyzing the impacts of Covid-19 pandemic on supply chain management and identifying the challenges in supply chain management during the Covid-19 pandemic times. This report also provides solutions and recommendations to mitigate or overcome the impacts and challenges of supply chain management.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

The unforeseen spurt of Covid-19 pandemic at the end of 2019 from China, the global production hub and the second largest economy which accounts $14.34 trillion in 2019, initially appeared to be a social devastation, has become a global economic catastrophe that distressed millions of lives and livelihoods, and at the same time temporarily decoupled almost all economies from the global value chains (GVCs). Its scale and the alarming speed had pushed many economies, Emerging Market & Developing Economy - EMDEs which are either more opened to trade or deeply linked to global supply chains into steep recessions, worst ever witnessed than the Great Depression of 1929-30s. Notwithstanding unconventional macro-prudential policy supports across the board, about 80% of the global informal economy work force, engaged mainly in services, is hard hit due to lockdowns and slowdowns.

The Chinese centric supply shock and the severe demand shock from the rest of the economies emanated from the economic shutdowns have dented the sourcing (inward logistics), manufacturing / production and distribution (marketing logistics), the three pillars of global Supply Chain Management – SCM. The initial impact of pan continental economic shutdown on cross border trade, shipping, ports and logistics fraternities were severe and resulted into port restrictions, unprecedented delays in clearing & forwarding activities, congestions, which were further driven by rampant blank sailing, East – West route in particular, roll overs in Hubs, onboard space shortages, booking cancellations and lackadaisical repositioning which altogether led to a huge equipment mismatch across the economies. The persistent global economic chaos, where most of the manufactured as well as intermediate / semi-finished goods are moving in containerised liner shipping services, has emphasized economic nationalism through reshoring / near-shoring and relocation, though its economic and social implications are more substantial than the immediate job and business turnover losses. At the same time, both automation (with new labour saving technologies) and reshoring will open more space to mitigate the risks from external shocks.

Despite a slew of unorthodox fiscal and monetary stimulus measures focused on manufacturing, services and agriculture, where more than two third of the rural populations are engaged for livelihood, sectors unleashed during the initial period, the ripple effect of pandemic bottomed out the $2.88 trillion domestic economy. In order to revive and lift the domestic economy towards UN mandated Sustainable Development Goals -SDGs, the Prime Minister has unveiled ATMANIRBHAR BHARAT on 12 May 2020, wherein the $160 billion logistics which is going to be clocked to $225 billion within couple of years, has deep seated impact on keeping the vibrant economy domestically and globally competitive. Since both the cost effective supply chain reliability and service quality are cobwebbed with logistics performance, a sustainable logistic management has to play a significant role in the national economy.

1.2 STATEMENT OF THE PROBLEM

Supply chain management is one of the most essential aspects of conducting business The unforeseen spurt of Covid19 pandemic at the end of 2019, initially appeared to be a social devastation, has become a global economic catastrophe that distressed millions of lives and livelihoods, and at the same time temporarily decoupled almost all economies from the global value chains. Its scale and the alarming speed had pushed many economies, Emerging Market & Developing Economy which are either more opened to trade or deeply linked to global supply chains into steep recessions.

The statement of the problem of this study is to analyse the impact of Covid-19 pandemic on the overall Supply Chain Management along with identifying the challenges in supply chain management.

1.3 RESEARCH OBJECTIVES

The basic objectives of the study are as follows:

1. To assess the overall impact Covid19 pandemic on Supply Chain Management.

2. To identify the Supply Chain Management challenges.

1.4 SCOPE OF THE STUDY

The scope of this study is to identify or to provide solutions to how to overcome the challenges the Supply Chain process faced due to the Covid-19 pandemic.

1.5 SIGNIFICANCE OF THE STUDY

The set of operations coordinated by an organisation to buy and manage goods is referred to as supply chain management (SCM). Supply chain management is an umbrella term for procurement from suppliers and networks, as well as demand, value chain, and integrated logistics management. All parties who directly or indirectly fulfil a consumer request are included in a supply chain.

Over the past decades, the discussion around optimizing supply chains has focused primarily on cost efficiency and commercial best outcomes. However, as recent history has demonstrated, future supply chains will need to begin factoring resilience and adaptability into their calculations. Before the COVID-19 pandemic, some companies began anticipating this next evolution, but this crisis has exposed those weaknesses in the modern supply chain, such that many are looking at what to do next. Such decisions should of course not only focus on the supply side patterns, but must also consider that demand patterns may look different going forward – the key here is to have a holistic approach and ensure that many different perspectives are considered.

The scope of this thesis extends to the detailed look on the impacts of Covid-19 pandemic on the global supply chain management.

1.6 RESEARCH METHODOLOGY

This study is mainly descriptive in nature, based on review of relevant reports, studies and statistics related to various policies / programs unleashed from the Ministries of Commerce & Industry, Ports, Shipping & Waterways, which are directly downloaded from their respective web sites.

1.7 METHODOLOGY LIMITATIONS

The limitations are those characteristics of design or methodology that impacted or

influenced the interpretation of the findings from your research.

The findings of this study have to be seen in light of some limitation which includes:

- It is limited to existing Supply Chain Management models in vogue.
- Lack of previous research studies on the topic.
- Methods/instruments/techniques used to collect the data.
- Limited access to the data.
- Time constraints.

1.8 CHAPTERISATION

This dissertation is made up with five chapters:

- The first chapter – Introduction – deals with an introduction of the research topic, encompassing the background, statement of the problem, research objective, scope of the study, significance of the study, research methodology and methodology limitations
- The second chapter – Literature Review
- The third chapter – Assessing the impact of covid-19 on global supply chain industry – deals with the importance of supply chain management, overview of the pandemic and how it has caused supply chain disruption, demand of supply chain management in India, Impacts and analyzing the impacts of Covid-19 on supply chain.
- The fourth chapter – The analysis to find out the challenges of supply chain management during Covid-19 pandemic.
- The fifth chapter – Recommendation and Conclusion – includes the solutions, recommendations including structural and policy recommendations and conclusion.

CHAPTER 2

LITERATURE REVIEW

According to Mentzer et al. 2001 ―Supply Chains are a set of three or more entities (organizations or individuals) directly involved in the upstream and downstream flows of products, services, finances, and/or information from a source to a customer.‖ Supply chain management encompasses the active management of such activities and relationships with the aim of obtaining a sustainable competitive advantage and maximizing customer value through optimizing SC in the most effective and efficient ways. In order to be successful, organizations are required to carefully manage their operations by planning, scheduling, and controlling SC activities (Walden, J. 2021).

Seuring and Müller define *sustainable SCM* as ―the management of material, information and capital flows as well as cooperation among companies along the supply chain while taking goals from all three dimensions of sustainable development, i.e., economic, environmental, and social, into account which are derived from customer and stakeholder requirements‖ (Seuring and Müller, 2008). Firms emphasizing sustainable supply chain management typically have aligned financial and environmental goals, which lead to the incorporation of sustainability into every aspect of their business, SC, and partnerships, which once more protects the entire SC from commodity traps, improving financial value to the local firm and suppliers (Brandenburg et al., 2019).

Most companies have outsourced and extended many productions and SC activities resulting in a great dependency on global suppliers and complexity, which makes them especially vulnerable to SC disruptions (Walden, J. 2021). SC disruptions can be caused by different external events that are outside of the firm's control such as natural disasters (like the COVID-19 pandemic) and internal events, for example, missing contingencies or mismanagement that are within the firm's control.

Risk can be seen as the ―expected outcome of an uncertain event.‖ Important dimensions of risk in global SC are probability and impact of losses, speed, and frequency (Manuj and Mentzer, 2008). Two of the common external risks associated with SC disruptions are supply and demand uncertainties. Supply uncertainty on the upstream/supplier end refers to the ―risk of interruptions in the flow of components they need for their internal operations‖ (Walden, J. 2021). The quality of purchased goods is of great importance as much as the reliability of

estimated delivery times as well as the dependency of goods on unpredicted shortages or rise in prices. The risk of a significant and incalculable fluctuation in the demand of goods is called demand uncertainty, which organizations are facing on the customer side (Walden, J. 2021). As a consequence of greater uncertainties in supply and demand, globalization of markets, and shorter product and technology life cycles, managing risks has become more challenging (J. Xu, 2008, Handfield et al., 2020).

In the literature, global *SC risk management* (SCRM) often entails the identification, assessment, controlling, and monitoring of SC risks (Wieland and Wallenburg, 2012) and implementation of appropriate strategies with the aim of reducing one or more of the risk dimensions (Manuj and Mentzer, 2008).

Regarding supply chain management, the corona outbreak represents one of the major disruptions encountered during the last decades and is ‒breaking many global supply chains‖ (Araz et al., 2020; Ivanov, 2020, Queiroz et al., 2020); however, it was not the first crisis that the industry faced. Other examples of disruption risks are the Tsunami in Japan in 2011 and its impact on SC worldwide or other epidemic outbreaks like severe acute respiratory syndrome (SARS), Middle East respiratory syndrome (MERS), or Ebola. Research regarding SC and global logistics during those previous epidemics is numerous (e.g., Chou et al., 2004; Tan and Enderwick, 2006; Lee et al., 2009; Dasaklis et al., 2012; Green, 2012; Calnan et al., 2018). Tan and Enderwick (2006) suggest companies ‒to re-examine their supply chains to identify potential problems and bottlenecks and allow for enough slack to accommodate delays and potential problems that can arise. Such readjustments may include keeping buffer inventory and safety stock to hedge against uncertainties.‖ Queiroz et al. (2020) conducted a comprehensive literature review on the impact of epidemic outbreaks on SC and with those findings proposed a framework for supply chain management during the coronavirus pandemic. Queiroz et al. (2020) suggest sustainability as one of the main research agendas in terms of supply chain management under epidemic outbreaks. Besides the focus on sustainability, it seems important to use digital and technical ways like data analytics or digital manufacturing as ways to improve operations and supply chain management under epidemic outbreaks and pandemics. The suggested research agenda is dominated by aspects of supply chain resilience, such as recovery, ripple effect control, preparedness, and adaption.

In the field of sustainable supply chain during and after the coronavirus pandemic, studies mainly deal with the question of the localization of supply chain, general behavioral changes,

and the possibility of a transition toward more sustainability (Bodenheimer and Leidenberger, 2020; Fischedick and Schneidewind, 2020; Lopes de Sousa Jabbour et al., 2020; Sarkis et al., 2020), but also social sustainability issues (Majumdar et al., 2020). This posits further research questions regarding the future of just-in-time practices, industrial structures, and storage and connected to this energy and waste losses from excess inventory. The rebuilding of supply chain and production can be ‒an opportunity to marry the needs of equitable prosperity and climate protection‖ (Sarkis et al., 2020).

CHAPTER 3

ASSESSING THE IMPACT OF COVID-19 ON THE GLOBAL SUPPLY CHAIN INDUSTRY

3.1 IMPORTANCE OF SUPPLY CHAIN MANAGEMENT

One of the most important components of running a business is supply chain management. Many people outside of the immediate community (in research and industry) are unaware of this because the average consumer only sees the consequences. Recall how many times you got a great 'deal' at the end of the season, recall the sudden increases in gas prices due to shortages, recall the times when your e-commerce site promised availability but later could not send the required product or sent you the wrong product, or recall the times when your customised product (like a personal computer or kitchen cabinet) was not available in your favourite garments or grocery store. All of the aforementioned, as well as several other common consumer experiences, are direct results of businesses' supply chain activities.

Supply chain management has evolved from a simple logistics concept to a complex multifunctional corporate undertaking encompassing everything from procurement to demand forecasting to distribution and after-sales service since Keith Oliver, a consultant at Booz Allen Hamilton, coined the term in 1982. Because supply chain management is such a broad issue, people often define it differently based on their own personal experiences. To some, supply chain management is managing the supplier base, deciding what to outsource and to whom, and maintaining relationships with diverse vendors. Others see it as an efficient technique of moving commodities from one location to another while accounting for distribution and transportation costs. Another group of people is concerned with how information systems and inventory management methods are connected throughout the many enterprises in the distribution channel or value chain. Another group is concerned with the efficient management of fixed and variable assets essential for corporate operations. All of these classifications are analogous to blind persons defining an elephant based on its many organs. The following is a detailed definition of supply chain management. A supply chain is a collection of entities involved in the development of new products and services, the procurement of raw materials, the transformation of raw materials into semi-finished and finished products, and the delivery of these items to end customers.

Supply chain management is the effective administration of the entire end-to-end process, from the design of a product or service to its sale, consumption, and eventual disposal by the user. Figure 3.1 depicts the entire process, which includes product design, sourcing, planning and forecasting, production, distribution, fulfilment, and after-sales service.

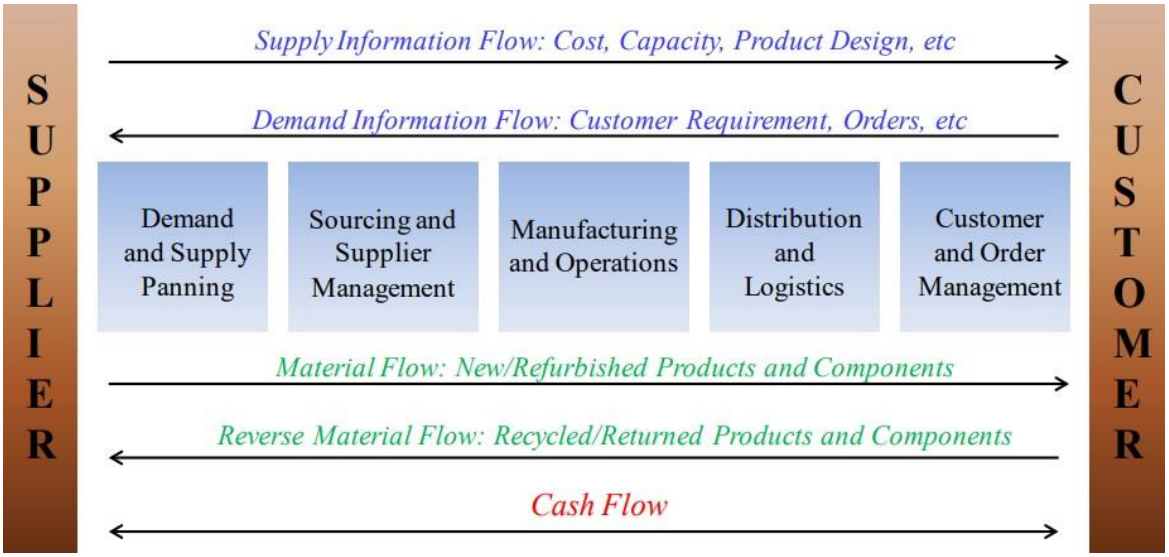


Fig. 3.1 Supply Chain Process

3.2 OVERVIEW OF THE PANDEMIC AND HOW IT HAS CAUSED SUPPLY CHAIN DISRUPTION

Shocks in the major exporting countries have always made supply systems fragile. Trade wars, pandemics like COVID-19, domestic political instability, and other shocks are among them. This vulnerability stems from obstacles that may obstruct the free movement of products and services from these exporting countries to their key import trading partners.

COVID-19 has caused widespread disruption in all economic sectors and industries. The interruptions are mostly due to the worldwide lockdown measures that governments have approved and executed as a health plan to reduce the impact of the pandemic's spread on the human population. The COVID-19 lockdown measures have resulted in production halts, restrictions on persons and goods movement, border closures, logistical constraints, and a slowdown in trade and economic activity.

On December 31, 2019, the World Health Organization (WHO) office in China received the first report of the COVID-19 pandemic, which began in Wuhan, China. There were about 22.1 million recorded cases as of August 17, 2020. Its rise in China, one of the world's major manufacturing and distribution centres, has an impact on the supply of completed and semi-finished items to nations that rely on China for trade.

China has surpassed the United States as the world's greatest exporter in the last 15 years, with annual exports of $2.3 trillion (WEF estimates). China accounts about 16% of world exports. The three greatest exporters in the world (China, the United States, and Germany) control roughly 30% of total global exports.

China also produces roughly 20% of the world's intermediate products. This has ramifications for international manufacturers who rely on the country for inputs, either directly or indirectly. For example, China supplied approximately 65 percent of India's total imported Active Pharmaceutical Ingredients (API) between 2018 and 2019. India has experienced delays in the supply, production, and distribution of pharmaceutical products as a result of the pandemic.

Due to rising global demand and export limitations for these commodities in many countries, the supply of key items such as personal protective equipment (PPE) and other medical products and equipment has been hampered.

The transportation sector, which is critical to global supply-chain activity, has remained partially shuttered as a result of the shutdown. Since March 2020, no fewer than 90 countries have implemented lockdowns, with an estimated 3.9 billion people affected at its peak in April 2020. As a result, the smooth functioning of global supply chains was hampered, which had a negative influence on global business and industrial activity.

The epidemic has had an impact on the maritime industry, which accounts for over 90% of worldwide commerce activity worth about $12 trillion. By implication, the World Trade Organization (WTO) estimates that world trade will decline by 13 to 32 percent in volume by the end of 2020. Manufacturing, retail, and construction, among other industries, have been disrupted by supply-chain disruptions.

According to the World Trade Organization, nearly all areas will see double-digit declines in trade volumes in 2020, with North America and Asia seeing the worst drops in exports.

Because of the intricacy of their value and supply chains, the electronics and automobile industries will be the hardest hurt.

COVID-19 has also highlighted the fragility of the global food supply system. According to the World Food Programme (WFP), the pandemic might cause 265 million people to go hungry by the end of 2020 (up from 135 million).

COVID-19 has enormous financial ramifications for commerce and supply chains. According to the Institute of Shipping Economics and Logistics (ISL), the container throughput index, which measures the number of persons and commodities passing through shipping ports on a daily basis, fell by 9.5 percent from 113.3 in January 2020 to 107.7 in May 2020.

In addition, the International Air Travel Association (IATA) reported that in the three months leading up to April 2020, industry-wide air cargo tonne-kilometres (CTKs) declined 15.3 percent year on year.

Further, freight quantities decreased, but a shortage of capacity increased loads and yields. COVID-19 has thus had a negative impact on marine and air cargo transportation.

World trade is expected to decrease by over 15% in 2020, according to the United Nations Organization (UN), due to drastically lower global demand and supply chain disruptions.

COVID-19 is caused a 5.2 percent drop in global GDP in 2020, according to the World Bank. This indicates that the amount of global income and wealth available to finance production and consumption fell by 5.2%. In this context, a drop in global purchasing power entailed a drop in demand for commodities and a reduction in supply chain activity.

COVID-19 resulted in job loss, lower incomes, and a drop in economic activity on a micro level. As a result, households demanded fewer products, impacting supply chain companies' performance.

3.3 DEMAND OF SUPPLY CHAIN MANAGEMENT IN INDIA

The supply chain industry is an important part of a country's economy and serves as its backbone. A well-structured and effective supply chain infrastructure reduces production costs, improves business ease, improves customer experience and happiness, and, most crucially, promotes rural and urban consumption growth by increasing market accessibility.

With the year coming to a close, the COVID-19 pandemic has cast a pall over the Indian economy. India's growth rate in the second quarter of financial year 20 was the worst in six years, at only 4.5 percent year on year. The last time India's economic growth was less than 5% was in 2013.

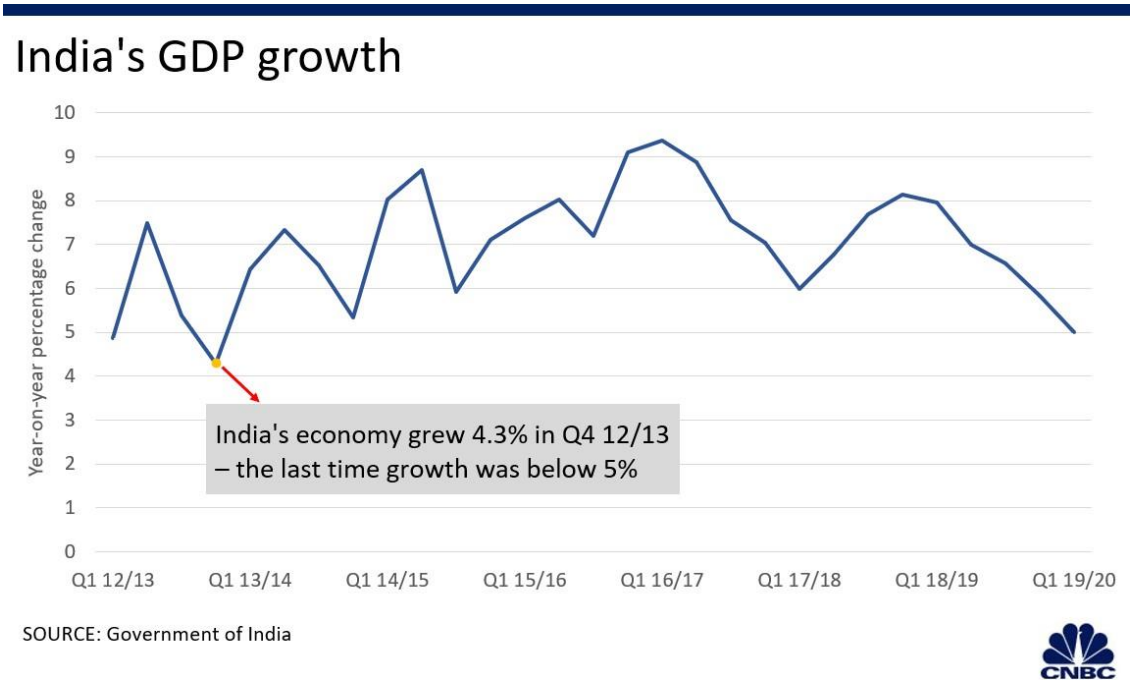


Fig. 3.2 India’s GDP growth

Increasing financial obligations and dwindling consumer confidence exacerbate the situation. Because the supply chain sector has a direct or indirect impact on all other operating sectors of the economy, even modest supply chain interruptions or failures can have a detrimental ripple effect over the whole industry. Given these uncertainties, supply chain stakeholders must identify the most significant difficulties they face and devise concrete plans to address them.

As India prepares to break free from its downward spiral, strengthening the country's supply chain infrastructure becomes even more critical. Infrastructure constraints, high raw material, labour, and energy costs, inadequate risk management, incompetent personnel, and a lack of proper technical assistance have all been serious issues for the Indian supply chain industry for a long time.

There is, however, much to look forward to in the coming years, attributed to the growing influx of capital (both domestic and foreign), the government's active efforts to improve the overall supply chain infrastructure, and increasing awareness among supply chain leaders of the importance of supply chain management.

Businesses' survival in today's economic environment and dynamic market is dependent not only on innovative and practical business strategies, but also on supply chain management.

Businesses must integrate IT with supply chain and logistics to enable proper coordination between all components of the supply chain, from sourcing and manufacturing to reaching the endpoint – the customer, as customer expectations evolve. Maintaining a balance between demand and supply in the economy requires effective supply chain management.

3.4 IMMEDIATE EFFECTS OF COVID-19 PANDEMIC ON SUPPLY CHAIN

The Indian government took immediate action after the World Health Organization declared COVID-19 a global pandemic, preventing the country from becoming a disaster to a large extent, but the entire scope of the global pandemic's consequences is yet unknown. Given the circumstances, the pandemic anticipated following consequences for India's logistics and shipping industry:

- The logistics and shipping industry's backbone is the supply chain, which is fully reliant on personnel. The lack of staff in the system as a result of the government's shutdown has brought the entire supply chain to a halt. Orders are pending while factories, enterprises, and warehouses close as quickly as possible in response to the government's lockdown. This caused supply delays and, in some situations, harm to perishable commodities in transit.
- At the moment, Social Lockdown has resulted in a significant decline in business, affecting financial flows to the industry. Due to the closure of state borders, road transporters are unable to convey goods from production units to ports, and shipments arriving in containers remain at ports, incurring daily rent on containers and storage. This is hurting first- and last-mile connection, resulting in a significant loss of supply chain participants.
- Despite the government's permission for the movement of essential commodities, just a few things are able to reach the markets. If situation persisted, scarcity of essentials

which has become a serious issue. Many units have reported that local officials are refusing to allow transportation since the classification is not clearly stated in notices.

- Another point of contention is the plan to quarantine ships at sea for 14 days before landing at the port. Whether 14 days will be calculated from the day the vessel departed the supply destination or from the date of arrival is a point of contention.
- Delays in container clearance and transportation almost certainly resulted in significant detention fees for shipping lines and CFS. While every service provider has experienced a revenue loss and it is in his best interest to maintain the tariffs, the client regarded such charges to be exorbitantly expensive, as it all adds to costs.
- The overall capacity of logistic efficiency has decreased by over 70%, resulting in freight charges that are nearly 6-8 times higher than usual. The current inefficiencies in the movement of key commodities, combined with the expanding demand gap and rising logistical costs, resulted in an outrageous price increase.
- Due to a staff shortage, waybill or challan like procedures cannot be completed, resulting in disagreements with the recipients. This made it difficult for logistics professionals to ensure that vital supplies are available.
- Warehouses are part of supply chains that are providing goods at this critical time are being run by a small number of people who are working under constant security threats and without basic necessities like food and sufficient sanitation in many units.

3.5 IMPACTS OF COVID-19 ON SUPPLY CHAIN MANAGEMENT

The COVID-19 pandemic is not the first disaster that abruptly damaged global supply chains. Several other natural catastrophes, such as the 2011 mega-earthquake in Japan, the 2003 SARS outbreak in China, and the 2004 tsunami in Indonesia, have led to shortages of parts and products. It is worth noting that the production is recovered from these disasters in a matter of weeks. However, based on the scope and magnitude, the impacts of COVID-19 are different from those of all previous events. Most of the events, such as earthquakes, tsunamis, nuclear or radiation accidents, and wars, are usually limited to specific geographic areas over relatively short periods. However, within four months of its first outbreak, the COVID-19 virus had spread throughout the planet, sending billions of people into lockdown and total confinement, and contributing to the partial or total shutdown of major economic sectors. Also, there is a complete inability to predict when this pandemic will be contained; any single infected area

in the globe is undoubtedly a high-risk area for a new outbreak. In contrast to other natural or man-made disasters or infectious pandemics, COVID-19 not only disrupted the local supply chains, but it profoundly affected global supply chains at all stages, from the supply sources to the final customers. COVID-19 has shown that businesses are interconnected through complex networks of global supply chains in which the actors at the upstream of a supply chain are seriously affected by the almost –erratic behaviour of downstream actors, essentially large companies, who experience disruptions and very sharp variations in demand. This well-known bullwhip effect is devastating for upstream actors, mainly small and medium-sized enterprises.

The severity of the impact of COVID-19 on supply chain activities differ across the following sectors:

MANUFACTURING	EXPORT AND IMPORT	RETAIL TRADE	FOOD SERVICES	LOGISTICS AND TRANSPORT
• Manufacturershave found it difficult to distribute their products. • There has been inventory buildup, increasing thecost of storage. • Producers of perishable finished goods have experienced wastages	• With border restrictions and limitations due to COVID-19, the volume ofexports and imports have reduced. • Ports have been overwhelmed by imports and exports yet to be cleared due tostaff restrictions • Warehouse sclose to the ports have	• Due to internal and external border restrictions, retailers have found it challenging to sell their products, especially, online retailers • Retailers have built up inventories and incurred additional costs of storage	• Distribution cost has become a critical line item on the financial statements of food service providers like restaurants • In situations where most compan	• Distribution companies have increased their delivery charges to cover for the drop inthe volume of activities • There has been some partnerships between traders, manufacturers and logistics/transport companies to facilitate distribution • Airlines and shipping companies have hadto lay off workforce due to high operating

andoutput losses. Due to restrictions, the cost of distribution has been high, affecting the profitability of manufacturers	remained mostly at fullcapacity dueto delay in shipping activities	• There is also the risk that retailers may be forced to sell their inventories at, or below the cost price, thus reducing profits, due to difficulties in sales and distribution.	ies have deployed work from home strategies, restaurants have had to reduce the volume of products and shift to online delivery strategies	costs and low turnover • Increased lobbying by international airlines for government to reopen the airspaceand allow them to operate amidst the lockdown.

Table 3.1: Impact of COVID-19 on supply chain activities across the different sectors

3.6 ANALYSING THE IMPACTS OF COVID-19 ON SUPPLY CHAIN BASED ON THE CARGO TRAFFIC HANDLED BY MAJOR PORTS IN INDIA

In recent years, India's maritime transport contributed about 95% and 70% of trading by volume and value. India has 12 major ports and 205 notified minor and intermediate ports. In India, the cargo capacity at major ports remained underutilized over the period. Major ports handled more than half of India's maritime transport, which declined by 10.5%−414 million tons (MT) during April–November 2020 compared with last year. The cargo traffic at non-major ports has declined by 10.8%−310 MT during April-October 2020. During the national lockdown period of April–May 2020, there has been a sharp decline in cargo traffic at both the major ports and non-major ports followed by a gradual improvement in cargo traffic since June 2020 due to a pickup in economic activity and trade both domestically and globally.

The 12 major ports in India are – Deendayal, Mumbai, JNPA, Mormugao, New Mangalore, Cochin, Chennai, Kamarajar (earlier Ennore), V.O. Chidambaranar, Visakhapatnam, Paradip and Kolkata. These ports handle about 61% of the country’s total cargo traffic.

3.6.1 TOTAL CARGO TRAFFIC HANDLED BY 12 MAJOR PORTS IN INDIA (in MT)

Financial Year	2018-19	2019-20	2020-21
Cargo handled in MT	699	705	673

Table 3.2 Total cargo traffic handled by 12 major ports in India (in MT)

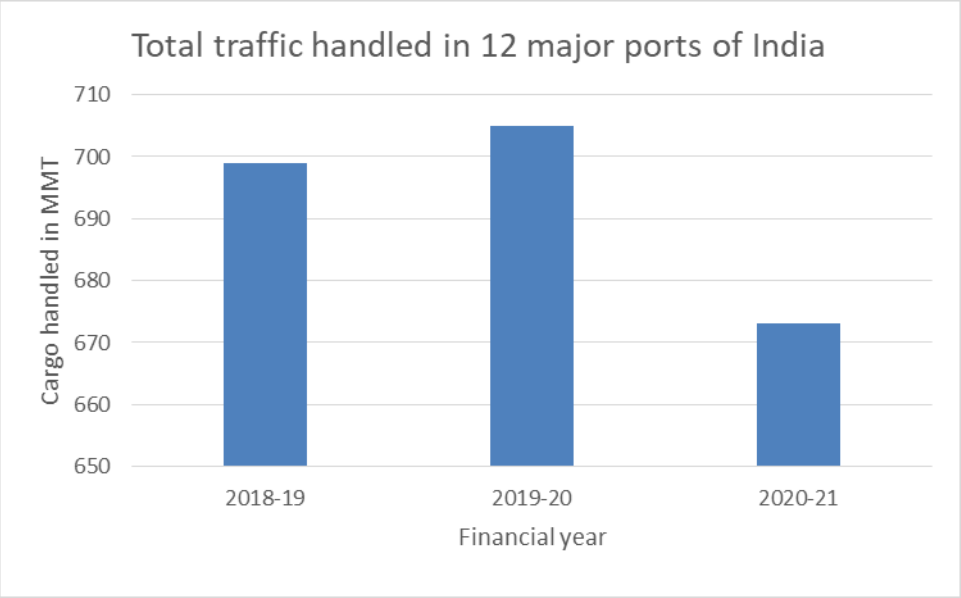


Fig. 3.3 Total traffic handled in major ports of India

- Hit by disruptions caused by COVID-19, India's 12 major ports witnessed a 4.59% fall in cargo handling to 672.60 million tonnes (MT) in the just-concluded financial year.
- These ports had handled 705 MT, 699 MT and 679 MT cargo in 2019-20, 2018-19 and 2017-18, respectively.
- Cargo handling at 12 major ports in country falls 4.59% to 673 MT in financial year 2020-21.
- The cargo traffic at 12 major ports declined considerably March onwards due to the adverse impact of the COVID-19 pandemic.

3.2 EVALUATION OF CARGO TRAFFIC HANDLED BY 12 MAJOR PORTS FOR THE FINANCIAL YEAR 2018-19, 2019-29 AND 2020-21 INDIVIDUALLY

SR.No	MAJOR PORTS	ACTUAL TRAFFIC HANDLED			PERCENTAGE OF VARIATION (2019-20 to 2020-21)
		2018-19	2019-20	2020-21	
1	Deendayal Port Authority	115.4	122.49	117.56	-4.93
2	Mumbai Port Authority	60.58	60.52	53.32	-7.20
3	JNPA	70.71	68.44	64.81	-3.63
4	Mormugao Port Authority	17.68	16.01	21.98	5.97
5	New Mangalore Port Authority	42.51	39.14	36.5	-2.64
6	Cochin Port Authority	32.02	34.03	31.5	-2.53
7	Chennai Port Authority	53.01	46.75	43.55	-3.20
8	Kamarajar Port Authority	34.49	31.74	25.89	-5.85
9	V O Chidambaranar Port Authority	34.34	36.07	31.79	-4.28
10	Visakhapatnam Port Authority	65.3	72.72	69.84	-2.88
11	Paradip Port Authority	109.27	112.68	114.55	1.87
12	Kolkata Port Authority	63.76	63.68	61.36	-2.32

Table 3.3 Traffic handled by 12 major ports

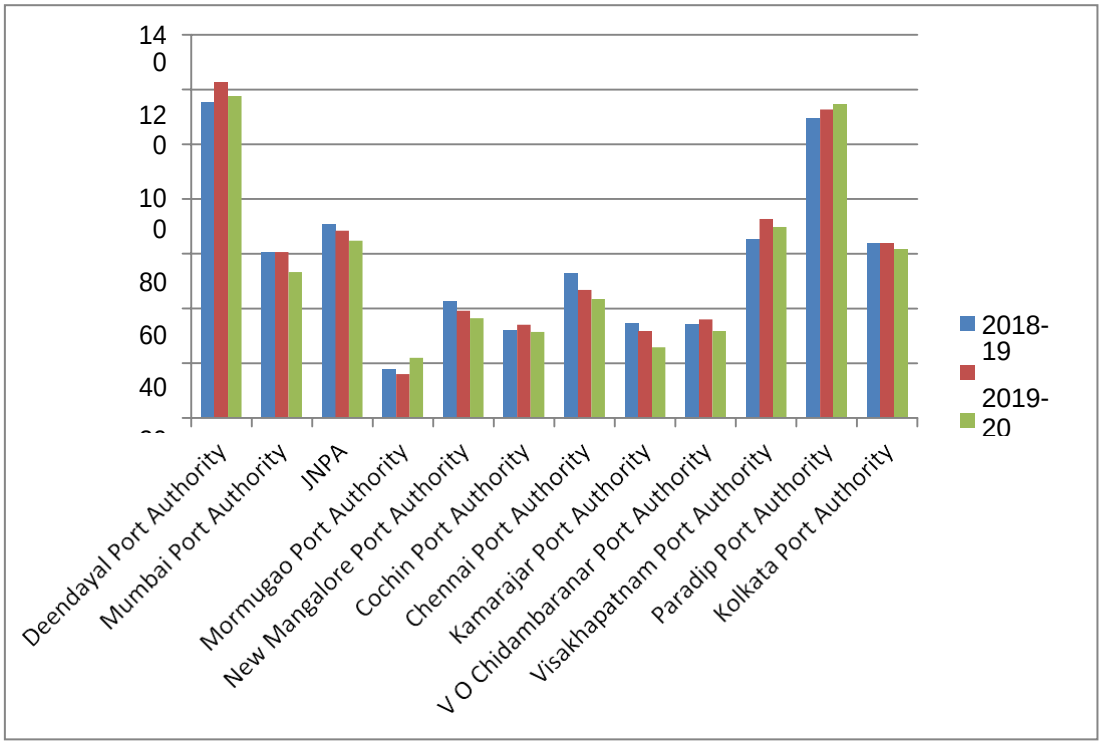


Fig 3.4 Cargo traffic handled by 12 major ports

- –Percentage variation from previous year in –traffic handled at major ports during

April to March 2021 vis-a-vis April to March 2020‖ declined 4.59%.

- In the wake of the pandemic, sharp declines were witnessed in the handling of containers, coal and POL (petroleum, oil and lubricant), among other commodities.
- All ports, barring Paradip and Mormugao (which recorded 1.65% and 37.06% increase in cargo handling to 114.54 MT and 21.95 MT, respectively), saw negative growth.
- Cargo handling at Kamrajar Port (Ennore) dipped 18.46% during April-March 2021 to 25.88 MT, while ports like Mumbai and V.O. Chidambaranar saw their cargo volumes dropping by over 10% during the said period.
- Cochin, New Mangalore and Chennai ports suffered a sharp decline of about 7%.
- JNPA saw a decline of 5.32% in cargo volumes, while Deendayal Port Authorityt and Kolkata ports logged an over-4% drop in cargo volume. Cargo handling at Visakhapatnam slipped 3.96%.

CHAPTER 4

ANALYSIS OF THE CHALLENGES IN SUPPLY CHAIN MANAGEMENT DUE TO COVID-19 PANDEMIC

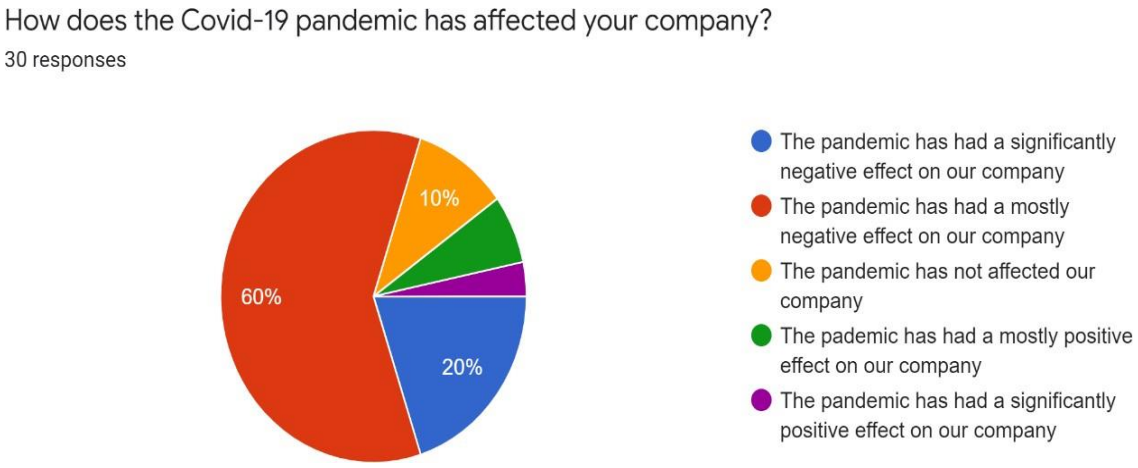
The global epidemic of COVID-19 has caused substantial obstacles to supply networks. Multiple countrywide lockdowns have continued to stifle or even halt the movement of raw materials and completed goods, hampering manufacturing. However, the pandemic has necessarily posed many new supply chain issues. COVID-19 revealed previously unknown weaknesses in some areas, and many organisations have experienced employee shortages and losses as a result of it. However, it has exacerbated and hastened issues that previously existed in the supply chain.

The following are the results of a survey done. The survey included 30 executives from companies in a variety of industries, including consumer goods, retail, medical sciences, and industrial products. The study sought to establish the various supply chain management practices that had been adopted by the various sectors of different organizations. The respondents were asked to rate their levels of agreement with various statements on a scale of 1 – 5 where 1 was strongly disagree and 5 was strongly agree.

Following the serious disruption caused by the COVID-19 epidemic, the poll discovered that businesses intend to rethink their supply chain strategy in order to become more resilient, collaborative, and networked with customers, suppliers, and other stakeholders. They will do so through increasing investment in supply chain technology such as artificial intelligence, block chain technology, machine learning and robotic process automation, as well as retraining personnel.

1. The pandemic had substantial negative effects on supply chains
   Certain sectors fared worse than others, but some life sciences companies reported few effects.

   Few other pandemics in the last 100 years have caused such widespread upheaval in trade, finance, health, and education systems, businesses, and societies. 60 percent were affected by major disruptions, with 70 percent indicating a negative impact (10 percent reported a significant negative effect, and 60 percent mostly negative).



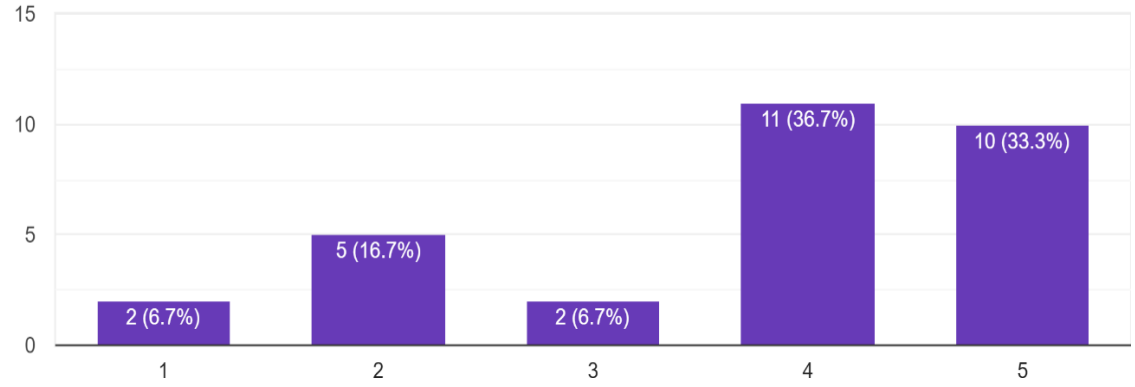
Companies often reduce their technology spending to a trickle in uncertain economic circumstances. During the COVID-19 epidemic, however, 92 percent of companies continued to invest in technology. This demonstrates the value of a digitised supply chain in assisting businesses in navigating disruptive forces and responding more quickly to fluctuating supply and demand.

Industry emerged as a clear winner during the pandemic, citing positive effects like as increased client demand and the introduction of new products. These businesses were predominantly in the life sciences sector, and the beneficial effects could be due to the importance of the items they create. Some bio sciences companies had to ramp up their efforts to develop critical new products, such as COVID-19 testing or vaccines, as a result of the pandemic.

2. Factory owners feel the future of their business is at stake as buyers cancel orders. The shipments that are ready can't be exported till local administration allows them to start the operation. Even the shipments that are at finishing stage may get damaged as they are lying open. This has put the factories under heavy losses. Due to lockdown the factories are not allowed to operate immediately, they have reduced staff and workers, which will lead to vast unemployment.

There was a massive order cancellation

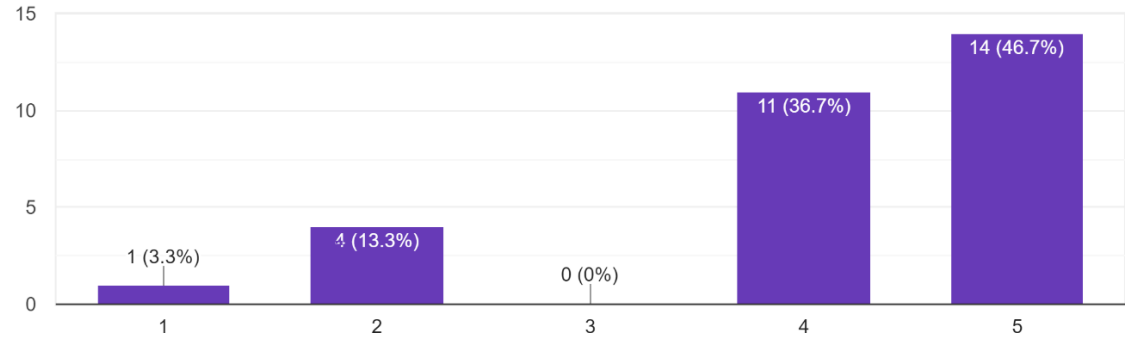
30 responses



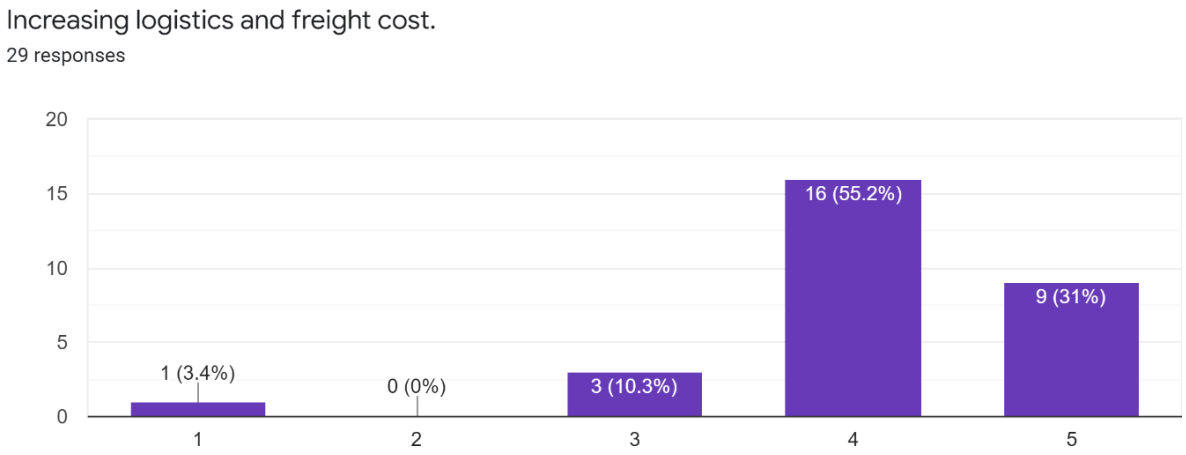
3. The acute shortage of commodities, containers, lack of on board space, huge equipment mismatch, blank sailings, port congestions.

There were a shortage of commodities.

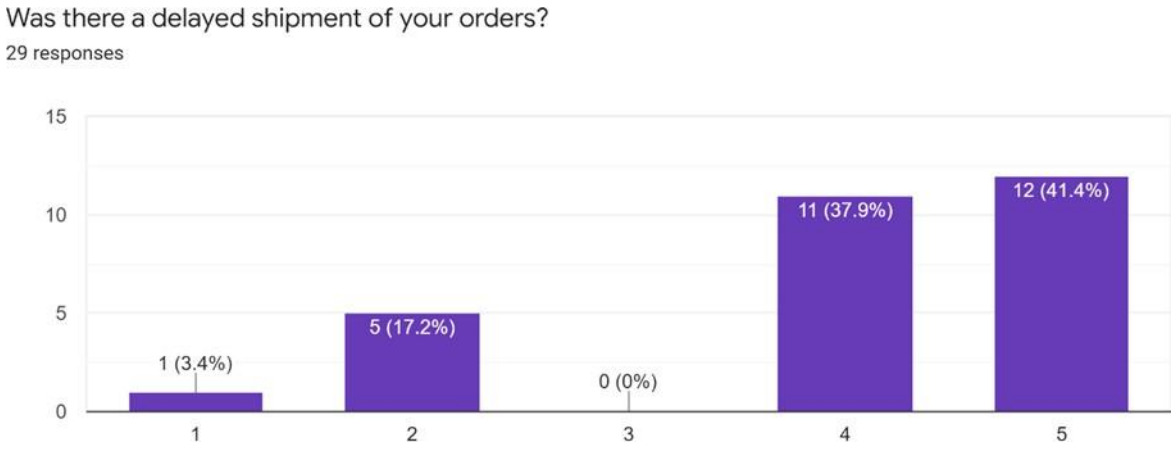
30 responses



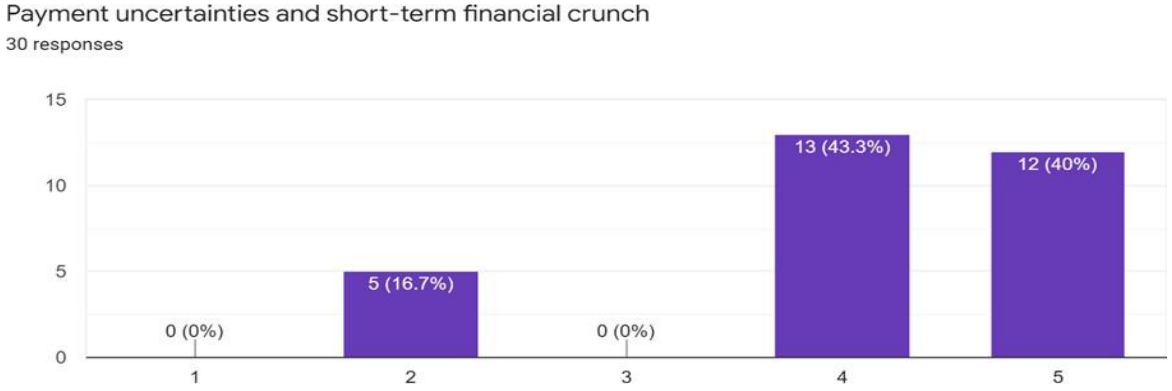
4. Increased logistics and freight costs



5. Delayed shipments



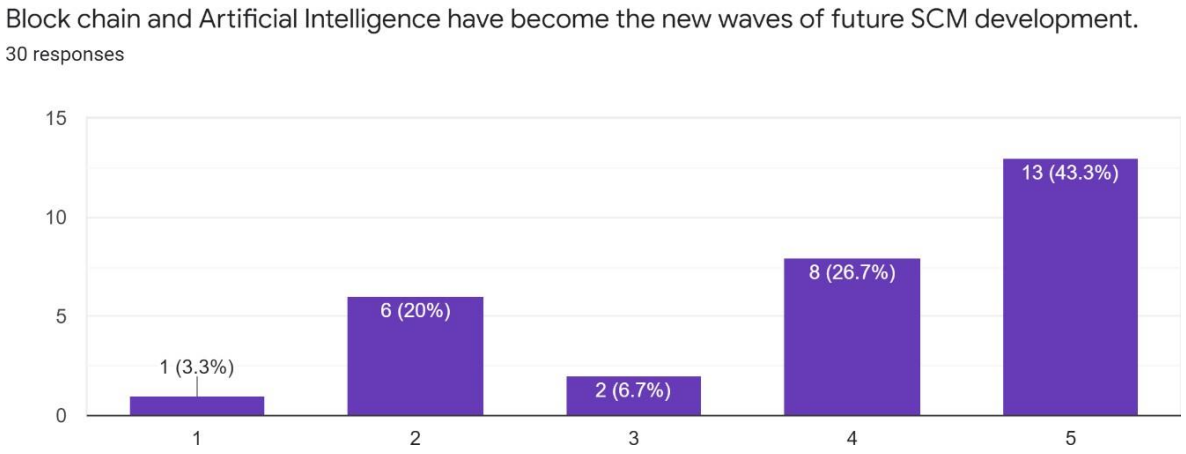
6. Payment uncertainties and short-term financial crunch



7. The future of supply chains is digital and autonomous

   The journey to digitized and lights-out operation has begun in earnest.

   Many previous patterns have been amplified by the epidemic, and supply chain is no exception: According to 44% of supply chain executives polled, the pandemic will hasten digital transformation. The digital enablement and automation race is on: The autonomous supply chain (e.g., robots in warehouses and stores, driverless forklifts and vehicles, delivery drones, and completely automated planning) is either here or will be by 2025.



   However, simply implementing digital technologies is insufficient to create a digitised, self-contained supply chain; it also requires integrated supply chain technologies that span planning, procurement, production, and logistics and operate outside of the organization's four walls. There's a distinction to be made between "doing digital" and "being digital."

CHAPTER 5

RECOMMENDATIONS AND CONCLUSION

5.1 SOLUTIONS

Addressing the current disruption in the supply chain industry, it requires sustainable and emerging solutions. Some of these are proposed below:

SUPPLY CHAIN TRANSPARENCY

Supply chain transparency, an issue many companies face, sets the stage and is a key catalyst for greater sustainability and resilience within a supply chain. Supply chain transparency isn't a new concept, but advanced capabilities are making an entirely new level of visibility possible.

SMART LOGISTICS

Every company aims to minimise costs and maximise profits; smart logistics is the key savings driver and a growth lever in the connected supply chain ecosystem. Managing and executing the physical flow of goods from the point of origin to the point of consumption is an essential part of the supply chain. Smart logistics — the next level of this coordination — connects the physical shipment and information flow between suppliers, manufacturers, distributors and customers interactively and in near-real-time, building on supply chain transparency.

AI-DRIVEN SUPPLY CHAIN MANAGEMENT

Artificial intelligence is accelerating supply chain improvements and will become the new norm as companies work towards improving supply-chain management. AI can be an enormously powerful accelerator of key supply chain capabilities, with the potential to drive efficient decision-making and build systems that can autonomously adapt to changing conditions. By applying sophisticated AI methods, such as machine learning and natural language processing, to supply chain capabilities, companies can increase transparency, improve planning and enhance logistics flows.

5.2 RECOMMENDATIONS - INSIGHTS AND STRATEGIES FOR BUSINESS LEADERS

Technology has the potential to solve the lack of visibility problem in a supply chain, right from the supply of raw materials (how and where they come from) to the manufacturers and the end-users (consumer). If executed well, better forecasting of inventory levels will be achieved, efficiency of employees, proper accountability, increased warehouse savings, etc. Logistics execution has seen a whole range of technological innovations coming into play to improve processes and activities. Examples include automated picking, drones and autonomous guided robots/vehicles in warehousing, or track and trace in transportation, etc.

BLOCKCHAIN

- The distributed ledger characteristics of immutability and traceability that comes with blockchain technology provides transparency and builds trust in the supply chain network.
- It also solves the problem of counterfeit goods for both consumers and manufacturers who can trace the products right from tier one to the last tier in the chain.
- In addition, blockchain based smart contracts can enhance faster payments once the agreed terms are met.

INTERNET OF THINGS (IoT)

- Asset Tracking: RFID and GPS sensors are IoT enabled devices which can track products ―from floor to store‖.
- Forecasting and Inventory: IoT sensors provide accurate inventories beyond human capabilities. Companies can manage stock levels more precisely, as information on the arrival of raw materials or components to production lines, or of finished goods in warehouses, are updated real time.
- Scheduled Maintenance: IoT enabled smart sensors can be used to manage planned and predictive maintenance for manufacturing leading to reduced downtime and cost savings.

ROBOTIC PROCESS AUTOMATION (RPA)

- The implementation of RPA involves automating tasks and integrating business processes across technologies and business functions.
- Manual process distribution currently slows down distribution within the country's supply-chain. Within a supply-chain, autonomous robots can decrease long-term costs; provide labour and utilisation stability; increase worker productivity; reduce error rate; reduce frequency of inventory checks; optimise picking, sorting, and storing times; and increase access to difficult or dangerous locations.
- Autonomous robots will soon become a norm in the supply chain of the future as advancements make them operate with more human-like abilities.

DATA AND ANALYTICS

- Data & Analytics are pivotal to achieving supply chain resilience. Supply chain ecosystems are generating vast quantities of data. Companies are beginning to use data networks that capture the full range of data and relationships being generated across their entire supply chain from a diverse range of sources — all the way from raw materials to customers and back.
- When companies can effectively take advantage of these diverse data streams and share data with their supply chain partners, they can reap significant benefits. In order to achieve this, they need to integrate the data into a semantic supply chain data network.
- Having access to the right data is the first step to achieving supply chain resilience. While many companies are already making use of a wide variety of data to support their supply chain decisions (e.g. operations data around components and materials or manufacturing and quality data, such as equipment monitoring).
- The potential value of data can be further enhanced when companies apply AI methods such as machine learning or deep learning. AI can significantly enhance all of the key capabilities: integrated planning, transparency, and smart logistics.

5.2.1 STRUCTURAL AND POLICY RECOMMENDATION

INTEGRATED SUPPLY CHAIN ECOSYSTEM

All relevant internal functions should be connected using one common data network, from Research and Development (R&D) and procurement through manufacturing, logistics, and marketing and sales.

TECHNOLOGICAL MATURITY

Leaders should adopt digital technologies to establish a two-way, near-real-time connectivity across the entire supply chain, as technological maturity addresses key supply-chain challenges.

PEOPLE-FOCUS

Companies must up skill the supply chain workforce or attract digital talent and manage them in crossfunctional teams. They must participate in supply chain collaboration with external partners in a wider ecosystem to speed up innovation in the supply chain.

5.3 CONCLUSION

As the impact of COVID-19 spirals across the economy, the supply chain industry is impacted by the associated challenges. Manufacturers of finished goods that are usually distributed across the value chain are unable to source for raw materials from suppliers. COVID-19 also resulted in a local lockdown that impacted wholesale, retail, and distribution operations. Consequently, COVID-19 has impacted the supply chain sector, and as a result, led to increased inflation and reduced volume of goods distributed across the value chain.

Reacting to the effect of COVID-19 on the supply chain industry, participants across the value-chain have adopted efficient measures geared at sustaining production and delivery to final consumers. Some of the innovative measures include the use of technology to take up orders from customers, strategic partnerships between producers, intermediaries and delivery companies, innovative management of inventory to avoid stock-out, etc. Most of these measures have proved to be effective and should be maintained going forward. With a huge loss impact by COVID-19 on the supply chain, critical recommendations are necessary to

mitigate these effects. First, the supply chain must be integrated to ensure a seamless transfer of goods from producers to consumers. Also, technological adoption in supply chain processes is indispensable to the survival of the supply chain industry. Lastly, upskilling of supply chain participants is critical at a time like this. For technological adoption to aid risk absorption in the supply chain industry, the people involved must be upskilled and equipped technology-wise.

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