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**Analysing Different Risk Management Approaches and Their Effectiveness in  
Enhancing Supply Chain Resilience**

Krishna Chaitanya Raja Hajarath and Jayapal Reddy Vummadi



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 Krishna Chaitanya Raja Hajarath  
 Jayapal Reddy Vummadi

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**Abstract**

**Purpose:** This paper aims to review various risk management strategies as well as measure its capability as an instrument to strengthen the chain resilience in the backdrop of the present-day economic environment.

**Methodology:** The paper utilizes well-known literature review techniques to gather and analyze the strategies including diversification, collaboration, technology adoption, and contingency planning that not only avoid supply chain risks but also create resiliency in organizations. It is focused on the root causes, effects, and aftermath of supply chain disruptions; the potential solutions to counter these problems are also evaluation by this process.

**Findings:** The study points out that the traditional risk management approaches are not enough, and suggests implementing the techniques such as mapping of the supply chain, supplier diversification and investment in digital technologies like block chain, cloud computing and cyber security. These approaches aid in boosting the supply chain resilience by providing transparency, enabling backup inventory management, and improving collaboration and efficiency within the supply chain operations.

**Unique Contribution to Theory, Practice and Policy:** The study complements the existing body of knowledge by offering a detailed overview of risk management strategies that can be implemented for the purpose of supply chain resilience. It provides with concrete suggestions on issues of diversity, the use of new technologies, and of coordination to strengthen the chains of supply against disruptions. Furthermore, the research calls for policy intervention to enable the utilization of the above-discussed strategies and increase supply chain resilience at a broader level as well.

**Keywords:** *Supply Chain Resilience, Risk Management, Supplier Diversification, Technology Adoption, Supply Chain Mapping*

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## INTRODUCTION

Risk management and supply chain resilience are the key features for any business to ensure success and desired levels of performance. The obvious implication is that risk management methods significantly affect the resilience of the supply chains, giving them a choice between disruptive events and operational implementations. Conversely, the resilience demonstrated by supply chains serves as a critical indicator of the efficacy of risk management frameworks (Um & Han, 2021). The vibrant nature of the link between the measures for risk management and supply chain resilience clearly demonstrates the inextricable relationship that should be promoted as a unified practical strategy to cope with uncertainties. Through the study of this relationship, organizations can discover useful ideas to create a strong system, which is of great value to them because it is the foundation of the strategic management to cope with unpredictable market conditions.

### Statement of the Problem

Technology is on the rise, globalization, and expansion, the supply chain is still vulnerable enough to take ruin from lack of transports, geopolitical crisis, cyber-attacks, and pandemics as well (El Baz & Ruel, 2021). The failure in investing in the risk management can bring the company significant financial losses damaged reputations or even business closure. As per the below figure 1, it is seen that Maersk risk management framework, the improvement needs environmental aspects in order to include planning, procurement and delivering the products and services in a secured manner.



Figure 1: Supply Chain Risk Management Improvement Process

Source: Maersk.com, (2024)

The cause's relating to supply chain risks can be traced to different historical events in many of which have massively disorganized the international trade. For instance, a nuclear plant disaster as in the Fukushima nuclear failure in Japan in 2011 upset the production of two key ingredients in auto as well as electronics industry resulting loses of many manufacturers worldwide (Patel, 2023). Likewise, the emergence of the COVID-19 pandemic in 2020 brought into limelight the fragilities in the global supply chains, which consequently disrupted the free movement of goods and placed much more pressure on the inventory management systems.

The purpose of this paper is to examine different risk management approaches and to assess their strength in fortifying supply chain resilience in the face of present day concerns. The second part of the research involves the scrutiny studies to be able to come up with some strength and weaknesses of various strategies such as diversification, collaboration, technology adoption, and contingency planning, positioned to avert supply chain risks as well as enhance organizational resilience.

## **LITERATURE REVIEW**

### **Recent Supply Chain Disruption**

The complexity of the global supply chains has been most prominently shown by the COVID-19 pandemic that led to trade and production disruptions globally. Problems with the large-scale spread and long-lasting legacy of the crisis arose and the inter-dependent structure of the supply chains was unveiled (Shekarian & Mellat Parast, 2021). The most prominent outcome is the impediment in the sector of manufacturing, mainly in the industries that are inward-looking and do not utilize the global production and distribution routes. According to the World Trade Organization (WTO) data, global trade witnessed a substantially lower level post-outbreak. World Trade Organization data point out that trade merchandise in 2020 fell by 5.3% equalling the greatest drop since the 2008 financial crisis (Can Saglam et al. 2021). In addition to disrupting highly infected areas, the unrest was also echoed across continents due to the worldwide imposition of lockdowns, travel restrictions, and other control approaches by countries.

Supply chain disruptions were mainly noticeable in the mentioned industries such as automotive, electronics and pharmaceuticals where diverse supply network from different countries are featured. For example, the carmakers had to overcome the closures of factories in heavily affected countries by the pandemic like China, Italy, which was the source of vital components for them. The unfolding supply interruption knocked down the other components of the supply chain leading to downstream suppliers and distributors experiencing production delays (Hohenstein, 2022).

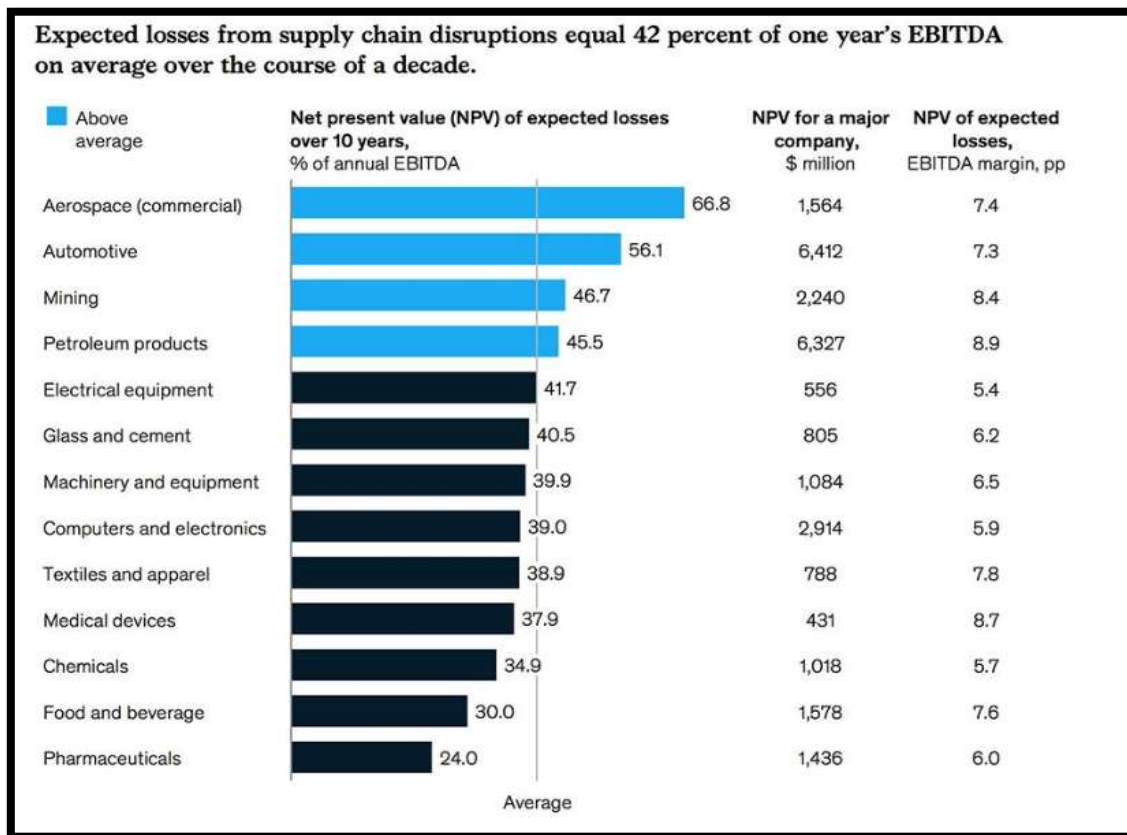


Figure 2: Expected losses from Covid Impact

Source: Sceau.org, (2023)

As per the above Figure 2, it is seen that the impact of Covid 19 has provided losses to aerospace industry and indirectly to tourism and travel which shows 66.8% of annual EBITDA. Furthermore, the pandemic also resulted to the worsening of existing problems in the field of logistics and transport. Congestion was experienced in ports while shipments were delayed or rerouted, and air freight capacity reduced without those passenger base (Ozdemir *et al.*, 2022). The logistical problems of supply chains were compounded also which due to them becoming even less efficient promptly and further increased the businesses cost. The pandemic did not only affect the manufacturing sector but also disturbed the agricultural supply chains meaning that food shortage and price volatility became commonplace in different regions.

### Economic and Operational Ramification

As far as the economy is concerned, supply chain vulnerabilities can result in crippling losses for businesses financially. The January 2021 report of the Business Continuity Institute indicates that in 2020, 73% of business had at least one supply chain disruption, which brought upon extremely negative financial effect (Patel, 2023). For instance, the Covid-19 dismissed the supply chains of the globe resulting in shortage of essential products and components estimated to have resulted in losses of trillions to the economies of the world. The fact that supply chain vulnerabilities may cause disruptions to operations, which make processes to be delayed, ineffective and in this case, customers may not be satisfied (Protolabs.com, 2023). For

example, the Fukushima earthquake in 2011 resulted in the automotive sector's supply chain's severe disruption, causing the shutdown of many key automakers due to the lack of essential components in the market.

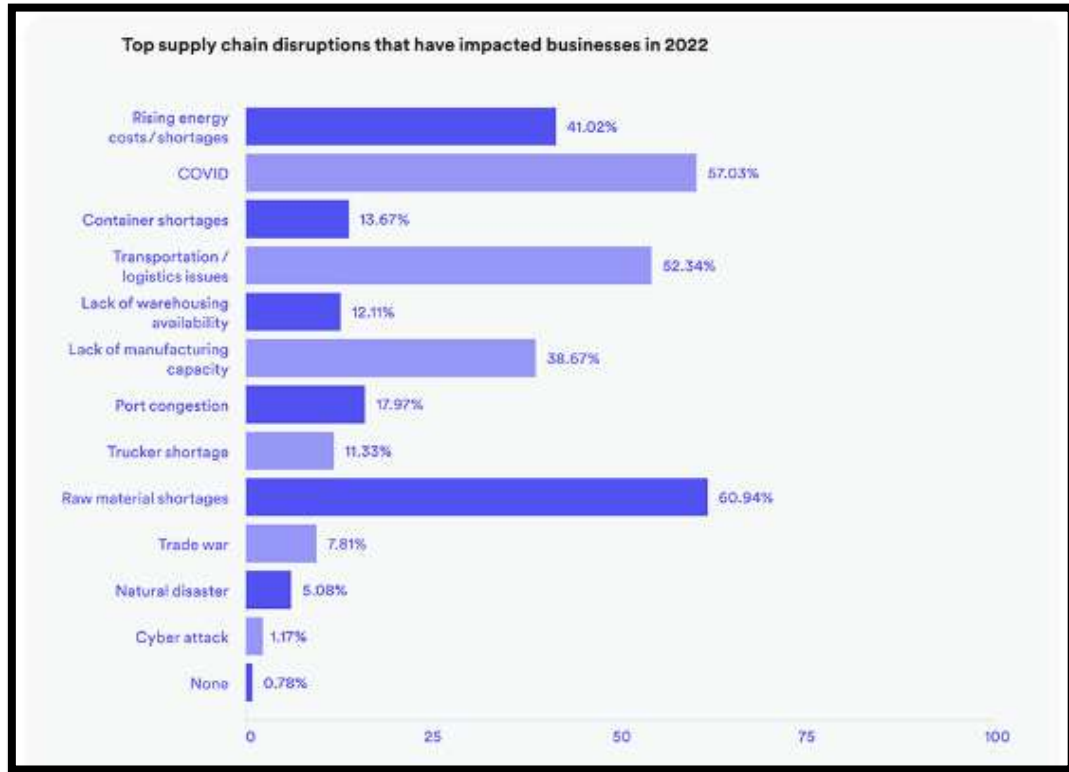
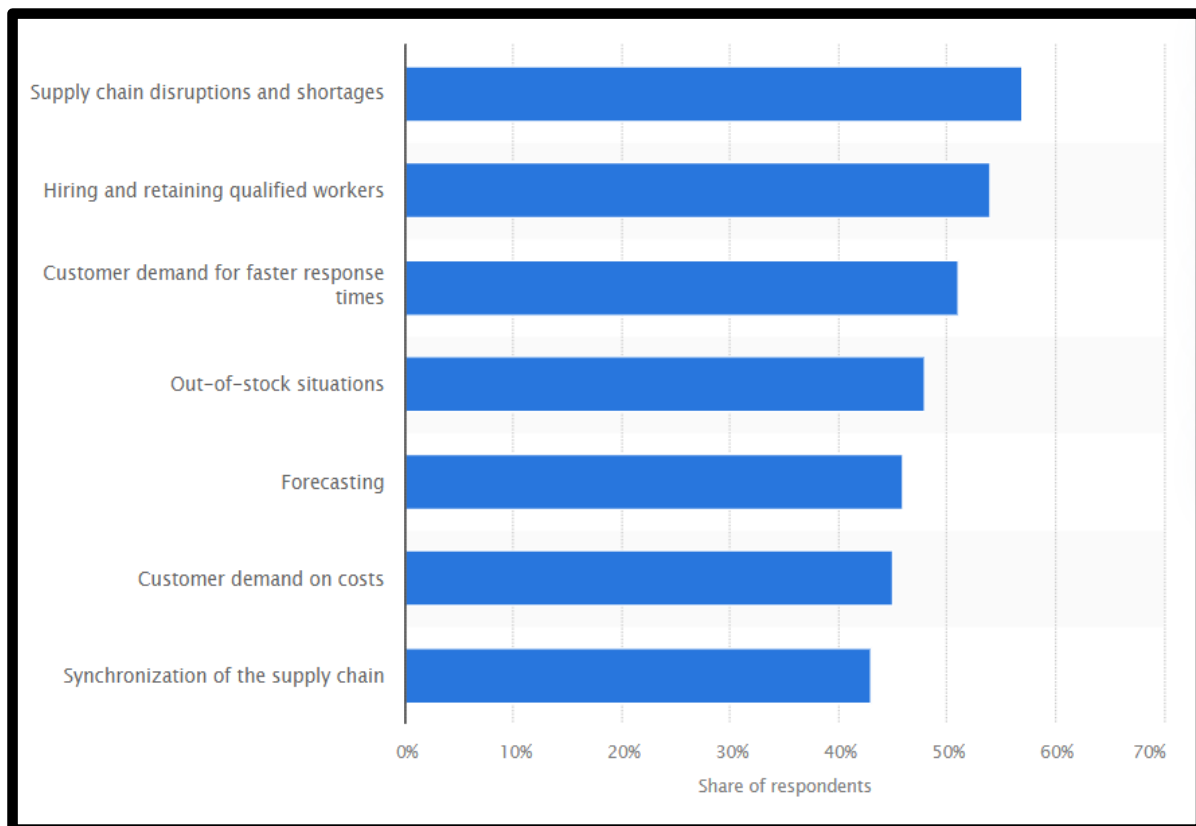


Figure 3: Issues of Supply Chain Disruptions

Source: Protolabs.com, (2023)

The above Figure 3, states that European supply chain management and companies in logistics industry have experienced high scale disruption and losses based on raw material supplies and rising costs in energy supplies. Supply chain vulnerability can thus allow the rise of particular products or leave others at a disadvantage, affecting competitiveness in the market as well. Companies endowed with supply chains resilience are higher in adapting to disruptions, hence stabilizing the market share over their competitors with vulnerable supply networks.

For example, companies that put diversification sourcing strategies and alternative route of transportation into action were able to handle the blockage of Suez Canal in 2021 and therefore disconnected their production and smooth supply (Hohenstein, 2022). With the given range of economic and operational implications, effective risk management proactively becomes the priority that is able to bolster supply chains resilience. It consists in detecting possible hazards, developing backup programs, as well as in the capacity development, which includes technologies such as predictive analytics and block chain to improve supply chain's visibility and transparency.



*Figure 4: Major Supply Chain Disruption Issues in India*

*Source: Placek, (2024)*

The above highlights supply chain challenges in India in 2021 during the covid-pandemic. It was seen that 57% of the respondents suggested that supply chain shortages and disruptions are the major issues faced by them (Placek, 2024). It is followed by 54% of the respondents responding to lack of manpower and worker's efficiency. Another major issue in this case is synchronisation of the supply chain. According to Sahu & Rao (2021), irregularities in supply chain management is a critical issue faced by several companies and industries which result in several demand-supply breakdown problems. Similar case was seen in India as highest grossing industries are often affected by these supply chain disruption. It was added that the manufacturing industry in India is the most vulnerable to supply chain issues and disruptions. Due to synchronisation of the supply chain, the manufacturing industry in India faces several backlash such as "increased costs", "reduced production output" and "declined productivity."

On the other hand, other industries such as customer services and technical industries such as electronics production and food production are heavily affected by supply chain disruptions. According to a recent report, the recent crisis in the Red Sea caused a heavy supply chain disruption in the Indian automakers industry (Economic Times, 2024). This caused a gap in satisfying consumer demands and meeting the forecasted demands supply graph of the industry. It also resulted in higher transportation costs and it reduced the profit margins of these companies. According to another recent report, the covid-19 pandemic was the most severe cause of supply chain disruption in India. It was reported that around 53% of businesses in

India were affected by this disruption in supply chain which caused a slowdown in supply chain management processes (Singhal, 2021). Major Indian companies hit by this supply chain slowdown are “Aditya Birla Group”, “Bharat Forge”, “Larsen and Toubro”, “Tata Motors” and others.

Again, this article showed that the oil and metal industries also suffered, causing a sharp decline of more than 20% compared to the downfall in 2008. On another hand, it was reported that the electronics and automobile companies such as “Godrej & Boyce”, “Bharat Electronics”, “Tech Mahindra” are affected by supply chain issues. As reported, in April 2022, due to supply chain disruption, electronics and automobile companies were unable to manufacture around 5-10% of the forecasted goods (Economic Times, 2022).

However, it can be stated that several companies were able to quickly understand the issues and tackle those. The journal article enunciated by Singh & Kumar (2020) opined that Indian companies started to invest in procurement of raw materials domestically, which impoverished their supply chain management strategy. As an example, “Larsen & Toubro” started to invest in its technical infrastructure and produce raw materials internally to become independent of global and international supply chain disruption issues. It also partnered with LSPs (“logistics service providers”). As a result, this company was able to generate more profits.

## **Theoretical Framework**

### **Resource-Based View (RBV)**

The concept of the Resource-Based View (RBV) is centred on the inner resources and capabilities of an organization that constitute the sources of competitive advantage and resilience. RBV proposes that the efficiency of risk management strategies towards enhancing supply chain resilience varies according to the specific resources and capabilities possessed by each organization.

### **Contingency Theory**

According to Contingency Theory, the best organizational structures and strategies are all context- and environment-dependent. With regards to supply chains resilience, Contingency Theory implies that the efficiency of risk handling techniques may change because of factors such as industry, geographical place, regulatory environment, and even the character of supply chains (Singhal, 2021).

### **Complexity Theory**

Complexity theory is aimed at the study of the behaviour of complex systems that have the characters of non-linearity and emergence which are consequences of interactions among the components. According to Sahu & Rao (2021), supply chains are intricate systems that feature interconnectedness, mutual dependency, and dynamic relationships between myriad of participating actors. Complexity Theory understands that supply chain resilience is built among components and stakeholders through their interactions.

## **METHODOLOGY**

### **Research Design**

The type of research design utilized in this study is qualitative literature review. The purpose of the study is to analyse different risk management measures and determine their ability to



collaborate supply chain resilience by examining and summarizing previous studies and literature.

### **Target Population and Sample**

As this is a secondary research and according to a literature review, there is no target population or sample group identified. The reading relies on the supply chain risk management research and publications such as articles, reports, and other scholarly sources.

### **Sampling Techniques**

Due to the fact that this is a literature review, the sampling methods used would be a thorough search and selecting of relevant literature from various academic databases, for example, Google Scholar and other reliable sources.

### **Data Collection Instruments**

The main data collection tool in this research is the data existing in the literature itself. The researchers have possibly done further research and got important information from the academic databases, journals, and report of other sources.

### **Data Analysis and Presentation**

The presentation of the results and the analysis are typically done in a narrative method where text descriptions, tables, figures, and visual representations are combined to effectively communicate the key insights and the conclusions that were derived from the literature review.

## **FINDINGS**

### **Root Causes of Supply Chain Disruption Issues**

It can be stated that the root causes of supply chain disruption primarily lies in international political conflicts. Agrawal *et al.*, (2020) addressed this issue and highlighted that supply chain companies were heavily affected by several global conflicts such as “Russia-Ukraine War”, “Israel-Palestine Conflict”, “Brexit”, “Red Sea Conflict” and many others. It can be stated that supply chain vulnerabilities cause long-term risks and issues causing ultimate supply chain break-down. Another article of Narasimha *et al.*, (2021) identified some more issues behind supply chain vulnerabilities. It was stated that fuel prices play a pivotal role in supply chain management and constant change and inflation in fuel prices is a major roadblock in transportation and raw material sourcing. As reported, as of February 2024, the global “fuel energy price index” was estimated at 173.23 index points, which was 100 points more than base year 2016 (Statista, 2024). This has been a critical issue for managing supply chain and transportation costs in India.

Again, lack of technical infrastructure is another major root cause. Joshi *et al.*, (2023) discussed that poor technical infrastructure can result in “Inability to track stock” and “lack of fragmentation” in supply process. This leads to poor estimation in demand-supply, leading to “Bullwhip Effect.” Labour shortage is another root cause here. As reported, in 2023, an estimated 81% of employers in India reported talent shortages (Statista, 2024). This creates a lack of productive workforce and reduces productivity of supply chain companies.

The “just-in-time inventory practices” is another major root cause in supply chain issues. The journal article enunciated by Mirabelli & Solina (2020) analysed that most companies suffer from “backup inventory” due to “just-in-time inventory practices.” This issue can be connected

to the lack of technical expertise as companies fail to estimate proper demand-supply forecasts. Supply chain managers following this strategy often fail to identify hidden expenses, causing budget issues. In addition, lack of backup investors cause delay in procurement and delivery, increasing wait time for consumers. Thus, the entire production line can be hampered by this strategy.

Lack of transparency is another major issue behind supply chain failure in India. It can be stated that lack of transparency regarding demand, supply, production and procurement can affect the entire process. Ijiga *et al.*, (2024) stated that most supply chain companies fail to project the forecast of demand-supply as companies are not transparent in terms of accurate data sharing from downstream supply chain management.

### **Effects of Supply Chain Issues on Downstream Stakeholders**

It can be stated that supply chain issues have a great negative impact on downstream supply chain stakeholders. Here, downstream stakeholders are referred to as “distributors”, “suppliers” and “consumers.” The journal article enunciated by Sahoo & Vijayvargy (2021) opined that suppliers are heavily affected by supply chain disruptions. This is because supply chain disruptions often cause an increase in supply and transportation costs. In addition, manufacturing and production costs also face an increase due to such events. This causes a decline in profit margins for suppliers. In addition, it was also stated that suppliers and distributors can face consumer outrage if supply chain irregularities cause drop in quality of products or goods.

On another hand, distributors face issues in lack of supplier reliability and challenges in inventory management. In addition, lack of transparency creates communication challenges in different levels of supply chain between supply chain managers, suppliers and distributors. This creates an overall gap in forecasting demand and production. Gupta *et al.* (2020) identified that main issues faced concurs due to supply chain disruption is delay in product delivery and lack of availability. In addition, lack of quality management is another factor that causes customer dissatisfaction for customers.

Regular supply chain issues can surge long-term issues. Biswas & Das (2020) identified “inflation” as such a long-term consequence of supply chain disruption. It was stated that shortages caused by international conflicts and production outputs often lead to inflation. Sustainability is another consequence in this case. It was seen that most companies and industries lose their economic sustainability due to supply chain disruptions. This is because rise in supply costs cause drop in profit margins and overall breakdown of business due to customer dissatisfaction caused by excessive delay and lack of quality management.

## **Discussion**

### **Comprehensive and Traditional Risk Management Practices**

The “Comprehensive Risk Management Practice” is a critical approach that uses the conventional approach of risk management. In this case, a potential risk is identified, its impact is assessed and it is thus mitigated. On another hand, supply chain companies can focus on a specific risk within a specific business area (“supply chain management” in this case) and try to eliminate that risk only. However, El Baz & Ruel (2021) stated that the comprehensive risk management policy applied by companies is often ineffective in major cases. This is because this proactive often increases complexity within the whole organisational process, which

causes delay in risk mitigation and causes several damage to the company. Again, it involves high costs which creates several budget issues across the whole organisational structure.

### **Supply Chain Mapping**

The “Supply Chain Mapping” is a critical process that involves documentati of the entire process of supply chain, it was already seen that lack of transparency is a root cause of supply chain management issues. “Supply Chain Mapping” can resolve this issue of transparency. According to Khan *et al.*, (2022), the benefits of this process is that companies can track the three-dimensional supply operations such as “end points”, “vertical” and “horizontal.” In addition, this potential solution can help in identifying relevant hidden stakeholders and their impacts, understand supplier and distributors relationship and predict accurate budget and timeline to execute the operation. “Blockchain technology can be used in this case to track the “real-time” data and to enable proper information flow through the company.

### **Diversification of Suppliers**

Another potential solution to the identified supply chain issues in this case is that companies can add a diverse portfolio of suppliers and distributors to supply and source raw materials. According to the study published by Yin & Ran (2022), diversification of suppliers and raw material sources can resolve the issues of lack of inventory management and delay in supply. It was explained that diversifying different suppliers and distributors would source the stock of backup inventory to source raw material in recession. In addition, supplier diversification can also add quality variables to supply chain organisations. In addition, the theory of “Porter’s Five Forces” can be applied in this case as adding diversified suppliers would reduce “bargaining power of suppliers”, leading to quality enhancement and cost negotiation.

### **Investment in Technology**

Investing in technology is another key solution to existing supply chain issues. It can be stated that supply chain management process can be improved with the use of different technologies such as “Internet of Things (IoT)”, “end-to-end (E2E) supply chain”, “Blockchain”, “Cloud Computing and Storage”, “Cybersecurity” and many more. As reported in a 2021 survey, an estimated 40% of industry professionals in supply chain management revealed that they have already integrated cloud storage and computing technologies in their core supply chain processes (Statista, 2022). These technologies can increase efficiency of the supply process and enable better collaboration and supply managers and suppliers. In addition, it would improve customer satisfaction and reduce delays.

### **Conclusion**

It was seen that almost 73% of the companies globally were affected by the supply chain disruptions. It can be concluded that lack of transportation availability, price increase and raw material crisis due to different geo-political reasons affect the sustainability of supply chain operations. Risk management strategies identified in this study can help to minimise the adversities suffered due to these factors and increase resilience in overall supply chain. In addition, it was seen that almost 53% of businesses in India faced the adversities of supply chain disruptions. This was because these companies were unable to control the prices and they lacked a backup inventor plan along with lack of technology to maintain the productivity.

After analysing all these facts and information, it can be concluded that different risk management approaches such as the comprehensive and traditional have direct impacts on

increasing supply chain resilience. Apart from this, other strategies such as increasing supplier diversity, developing technical infrastructure and “supply chain mapping” are also identified as critical methods for increasing resilience in overall supply chain methods. It can be related to the opening hook that “supply chain resilience” is the only possible way to withstand the constant and contemporary challenges faced by almost every industrial sector due t covid-19 pandemic. However, relating to this thesis, it can be concluded that the comprehensive and traditional risk management approach can be rejected for their potential consequences. Strength of the chosen strategies is that these strategies eliminate the core root causes of supply chain disruption by eliminating the fragilities and enable a multidimensional supply chain management with backup strategy. It can be concluded that different technologies increase efficiency and collaboration in supply operations, which increase resilience of external situations.

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