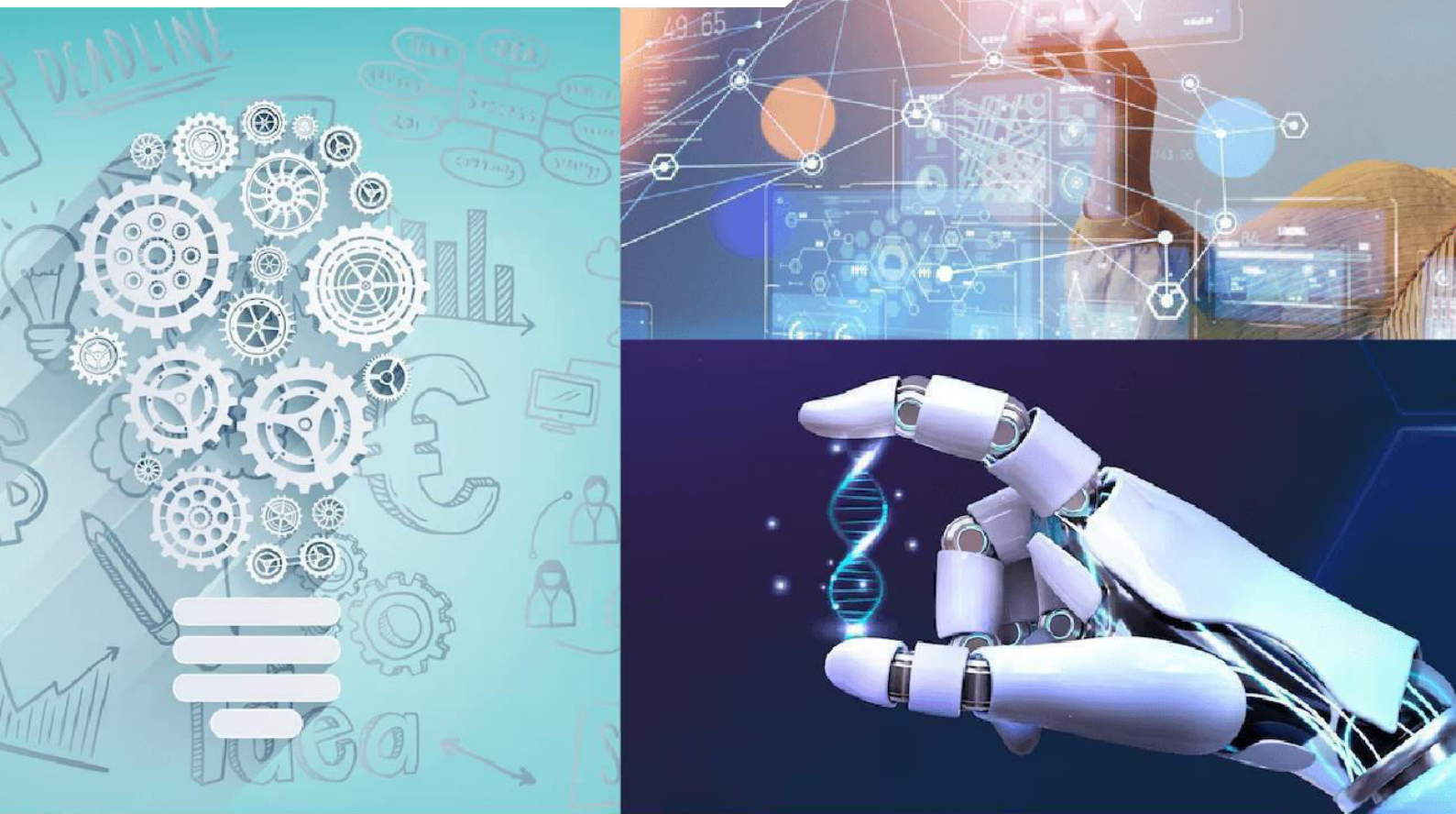




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Supply Chain Resilience in International Management: How Do Companies Respond to Global Disruptions

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ABSTRACT: The fragility of global supply chains has been revealed by the global disruptions and chain-resilience is gaining significance in international management. A pandemic, geopolitical tensions, natural disasters, trade bans, transportation breakdowns and more than you could have foreseen can pose a threat to companies that conduct business in more than one country, as these events can disrupt sourcing, production and distribution. This study explores the actions companies take at the face of disruption in the world, and the strategies companies employ to remain operationally continuous and become more resilient. The method of this study is secondary research, which is limited to secondary sources of information acquired from academic (literature) sources using the Google Scholar website. Five areas of interest (global vulnerability of the supply chain, supplier diversification and flexibility, digital technologies and supply-chain visibility, collaboration and international management, and organisational adaptation and recovery) are explored through a thematic analysis of relevant research. The results show that resilient companies are increasingly using diverse supplier networks, flexible operations, suitable inventory management, digital visibility, information sharing and cooperation with suppliers in the supply chain. The literature also shows that the importance of organisational learning cannot be overstated; companies can learn from the disruption that happened before and be better prepared to get ready in case of another disruption and to adapt their supply networks. In general, supply chain resilience is an ongoing organisational capability that demands a balance of operational efficiency and flexibility and preparedness for companies. Successful resilience requires therefore a strategic plan, technological capabilities, collaborative relationship, and adaptive management in order to cope with uncertainty in the international business environment.

KEYWORDS: Supply Chain Resilience; Global Disruptions; International Management

I. INTRODUCTION

Globalisation has allowed companies to set up complex international supply chains with suppliers, manufacturers, logistics providers and customers in various countries. These interwoven networks not only open up access to broader markets and lower cost resources but also expose them to unforeseen disruptions (Ambulkar, 2015). Technology failures, transportation issues, cyber attacks, geopolitical conflict and natural disasters, as well as pandemic outbreaks, could disrupt production, delay shipments, and drive up operating expenses. Hence, the resilience of the supply chain is an issue of great concern to international management. Supply Chain Resilience is the ability of a company to anticipate disruptions, react to them in an appropriate manner, stay operational and recover while adapting to new conditions (Belhadi, 2021). Increasingly, companies are required to build responsive and flexible supply chains instead of approaches primarily concerned with efficiency and cost reduction. Diversifying suppliers, ensuring alternative modes of transport, managing stock and storage appropriately, enhancing information visibility and developing supplier relationships and digital technologies can aid resilience. Other factors that are also pertinent to managerial decision making and international collaboration are when disruptions impact multiple markets at once (Brandon-Jones, 2014). This study is to understand the reaction of companies to the disruptions that occur in the world and investigate the management strategies, capabilities and practices that companies apply in order to keep their supply chains going, recover from disruptions, and make them resilient in the international business context.

II. RATIONALE AND OBJECTIVE

Rationale

Companies are now more vulnerable to shocks that can travel across industries and countries, as the entire global supply chain has become more networked. The world has recently seen how the sourcing, manufacturing, transport, in-stock, cost and customer service all can be impacted by one disruption. However, although companies cannot eliminate

such occurrences, their ability to prepare, respond and adapt will play a major part in their ability to maintain business continuity (Christopher, 2004). In this context, the study of supply chain resilience would be relevant to international management, as managers are required to make decisions in various markets, suppliers and regulatory environments, in a context of uncertainty. The relevance of this research is that it examines practical strategies companies can take to lessen their vulnerabilities and bolster their capacity to respond to international events. It also reflects on how flexibility, diversification from suppliers, digital technology, collaboration and contingency planning can help to inform organisational responses. This knowledge can offer valuable guidance on strategies for making international companies more efficient and resilient, while preparing their supply chains for future shocks.

Objectives

1. To examine the major global disruptions that create risks and vulnerabilities for international supply chains.
2. To analyse the strategies and management practices used by companies to respond to and recover from global supply-chain disruptions.
3. To evaluate how organisational capabilities, digital technologies and supply-chain flexibility contribute to resilience in international business operations.

III. METHODOLOGY

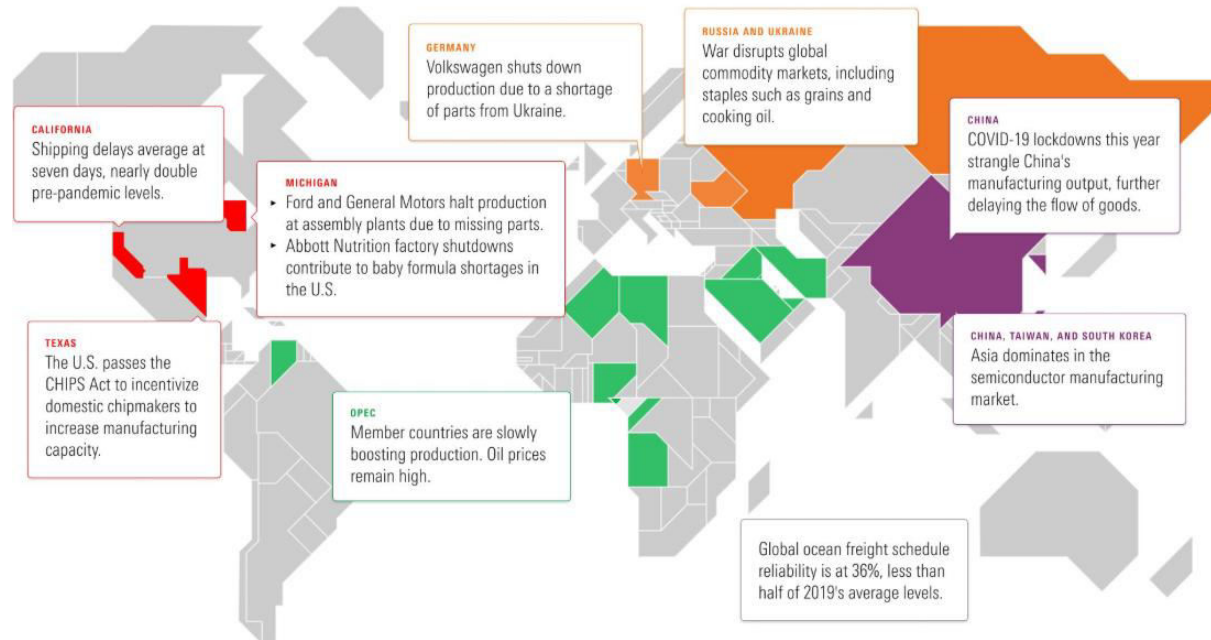
The approach used in this research is the secondary research method that aims to analyze the development of the companies' supply chain resilience in the face of global disruption. Academic repositories will be used for data collection. These keywords will be used to identify relevant peer reviewed articles from journals and academic research relating to supply chain resilience, international supply chains, supply chain risk management, digitalisation and supplier diversification, amongst other issues, that will be relevant to the research. Priority will be given to more recent and relevant academic papers, with the use of foundational studies as required to establish key concepts and theories. A qualitative thematic analysis will be applied in order to have common conclusions in the selected literature. The evidence will be presented under five themes, namely, global supply-chain vulnerabilities, supplier diversification and flexibility, digital technologies and visibility, collaboration and international management, and organisational adaptation and recovery. The results of several studies will then be summarized and compared to determine common strategies, challenges, and gaps in the research. Ethically, the research will be carried out responsibly on the basis of public academic records.

IV. LITERATURE REVIEW

Theme 1: Global Disruptions and Supply Chain Vulnerability

Companies have started to use materials from other countries, producing products there, and selling their products, increasingly, across many countries. International supply chains have become more intertwined, with companies using materials from other countries, manufacturing the products there and selling the products in other countries. The integration of international can bring benefits such as better efficiency, cost savings and access to specialist suppliers, but it can also lead to vulnerabilities when disruption in one area of the network can impact other areas (Dolgui, 2018). The supply chain can be vulnerable to pandemics, war, natural disasters, trade barriers, economic uncertainty, a shortage of labor, transportation problems, hackers, and so on. It can impact more than just the individual suppliers and lead to shortages, production delays, increased costs, and problems in meeting customer demand. The COVID-19 pandemic was a clear example of the extent of these vulnerabilities. This resulted in both labor shortages and disruptions to transportation at the same time as well as factory shutdowns and restrictions on movement (Ivanov and Dolgui, 2020). Businesses that had large reliance on specific areas or specific suppliers suffered from challenges when these areas or suppliers were impacted. Likewise, geopolitical factors and shifts in international trade agreements can affect the supply and price of materials, transport routes and manufacturing sites. Thus, the risks along international supply chains are not only limited to the operational risk but can also arise from the political, environmental and economic situation.

Supply Chain Disruptions Across the World



Source: Morningstar, Inc., Sea-Intelligence.

Figure 1: Major Global Disruptions Affecting International Supply Chains

The literature identified an issue between efficiency and resilience. The traditional approach to supply-chain management has been focused on lean inventories, cost minimization, global sourcing and very synchronized production (Ivanov and Dolgui, 2021). Such strategies may boost efficiency when conditions are stable, but when unexpected events happen, these options may be limited for companies. For instance, reliance on a single supplier or region can lower procurement costs but also expose the buyer to a great deal of risk if the supplier source is unavailable. Resilience, then, is a matter not just of efficiency now, but one of being able to absorb and deal with uncertainty. The literature thus increasingly considers supply-chain disruption a network-level phenomenon, not just an organisational event. As a result of interdependence of international supply chains, companies must have an understanding of the connections between suppliers, logistics providers, production facilities and customers (Ivanov and Dolgui, 2021). It will help the manager see these links and set up the right responses to vulnerable points. This lays the groundwork for resilience as it is not possible to respond to a risk if it is not understood or monitored.

Theme 2: Supplier Diversification and Flexibility as Resilience Strategies

Increasing the number of suppliers has been cited as a key way to mitigate supply vulnerability. Companies can have several suppliers and may be able to move products between suppliers if one has a production problem. Diversifying the geographic supply can also help minimise reliance on one country or area. Rather than focusing sourcing in one country, companies can create supplier networks in multiple countries and be more flexible when a specific country is impacted (Ivanov et al., 2019). But diversification doesn't necessarily mean resilience. If multiple suppliers are involved, there may be more work involved in co-ordinating the process of procurement and monitoring. This has to be done with a view to ensuring that alternative suppliers have adequate capacity, quality and reliability. A supplier may, in theory, be a viable option, but be unable to ramp up production in the event of a significant disruption (Ivanov et al., 2017). Therefore, companies need to build relationships and have enough information about other sources in advance of disruption, to be able to diversify effectively.

Six strategies for supply chain resilience



Figure 2: Supplier Diversification and Flexibility Strategies for Supply Chain Resilience

A supplier diversification and flexibility strategies for SC resiliency is illustrated in figure 2. Figure 2 depicts a supplier diversification and flexibility strategies for SC resiliency. Flexibility is closely related to diversification. Flexible supply chains can shift their sourcing, production, transportation and distribution when necessary. Businesses can establish alternative transportation plans, continue to have connections with different logistics companies or have production plants in different areas. This flexibility allows managers the freedom to choose the option that will be available in case of disruption of normal supply arrangements (Jüttner and Maklan, 2011). Another crucial dimension is inventory management. It is possible to have some extra inventory or strategic safety stock to prevent shortages or delays. However, a high level of stock can lead to high storage expenses, high capital needs and the potential for obsolete products. The literature thus indicates that there is a trade-off between buffer level and operative efficiency in the companies. This is determined based on the type of product, the uncertainty of demand, the reliability of the supplier and the potential severity of disruption. Overall, the diversification and flexibility of suppliers create more resilience in that they provide managers with more choices in times of disruption. A resilient organisation is not reliant on a single supply route, but rather creates alternative plans that are switched on if needed (Hohenstein et al., 2015). This strategy goes beyond just minimising costs to ensuring the supply chain is sufficiently flexible to keep going in uncertain situations.

Theme 3: Digital Technologies and Supply Chain Visibility

Digitalisation has taken on greater significance for the development of supply-chain resilience. International companies have geographically dispersed networks that makes managing all aspects of sourcing, production and distribution challenging with traditional information system (Hosseini et al., 2019). Artificial Intelligence, predictive analytics, Internet of Things devices, cloud platforms and real-time tracking can enhance visibility and deliver data on evolving supply-chain scenarios. The increased visibility helps businesses detect potential disruptions sooner. For instance, tracking transportation movements will reveal delays, and data analysis can uncover any irregular fluctuations in demand, supplier performance, or inventory levels. Predictive technologies can also assist managers to look at trends and potential hazards that may become operational issues. This can help to inform proactive, not just reactive, decision making.

IoT technology for enabling transformation in supply chain visibility

This slide represents an architecture of IoT technology assisting businesses to enable transformation in supply chain management for effective visibility. It includes various components such as data flow, networks, sensors, hardware, wi-fi, etc.

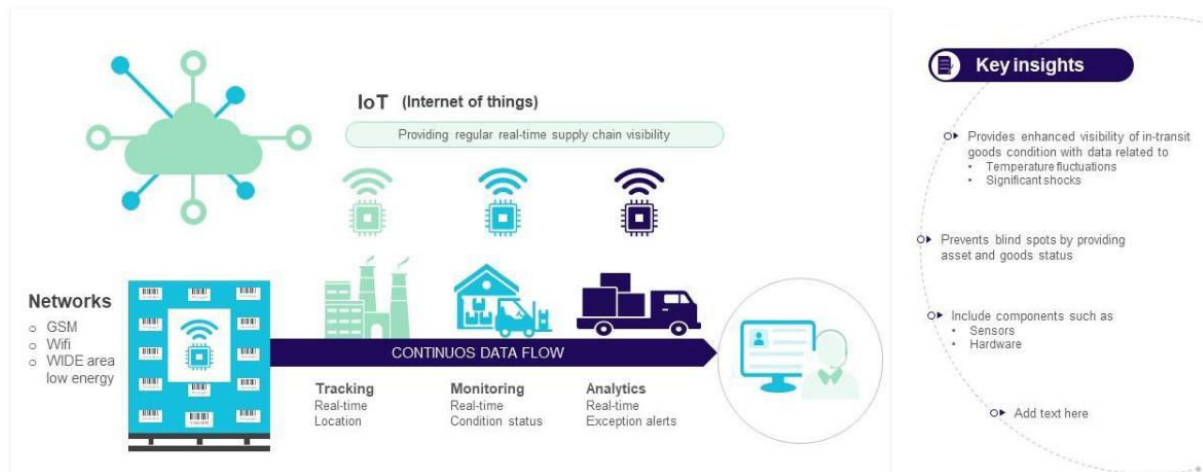


Figure 3: Digital Technologies Supporting Supply Chain Visibility and Resilience

Digital technologies can also help to enhance collaboration among supply-chain partners. Information about inventory, production plans, delivery status and demand (Revilla and Sáenz, 2017) can be shared with suppliers, manufacturers, logistics providers and retailers. Increased information flow can help minimize uncertainty and enable organizations to respond to incidents with more coordination (Ponomarov and Holcomb, 2009). In times of significant disruption, having accurate and timely information is especially critical as things can change quickly. Digitalisation also poses challenges, however. The adoption of new technologies can be costly, require specific knowledge and organizational adjustments. International companies can also be based on suppliers with different technological capabilities, which can make it difficult to integrate them. Moreover, relying heavily on digital systems may expose to cybersecurity risks and technology failures. As such, technology should not be seen as a standalone solution to overcome supply chain disruption. The literature suggests that digital resilience is tied to the way technology is embedded in the organizations' processes and managerial competencies. However, data are only valuable if the manager can make sense of them and use the information to effectively decide what to do next (Pettit et al., 2010). Digital visibility therefore can increase resilience by raising awareness, communication and speed of response, provided that there is readiness among the participants and adequate decision-making.

Theme 4: Collaboration, Relationships and International Management

Relationships with organisations are another part of the supply chain resilience. International supply chains are made up of a number of separate business entities, which may not have control over the entire supply chain. The cooperation between supplier, manufacturer, logistics and customers can thus have an impact on the ability to respond to disruptions. Resilience can be supported through strong supplier relationships; if companies communicate on a regular basis they may be more able to identify issues and agree solutions (Scholten et al., 2014). Information sharing can alert early on potential production challenges, shortages and transportation issues. Collaborative relationships can also help make adjustments to order quantities, delivery schedules or production arrangements during disruption.

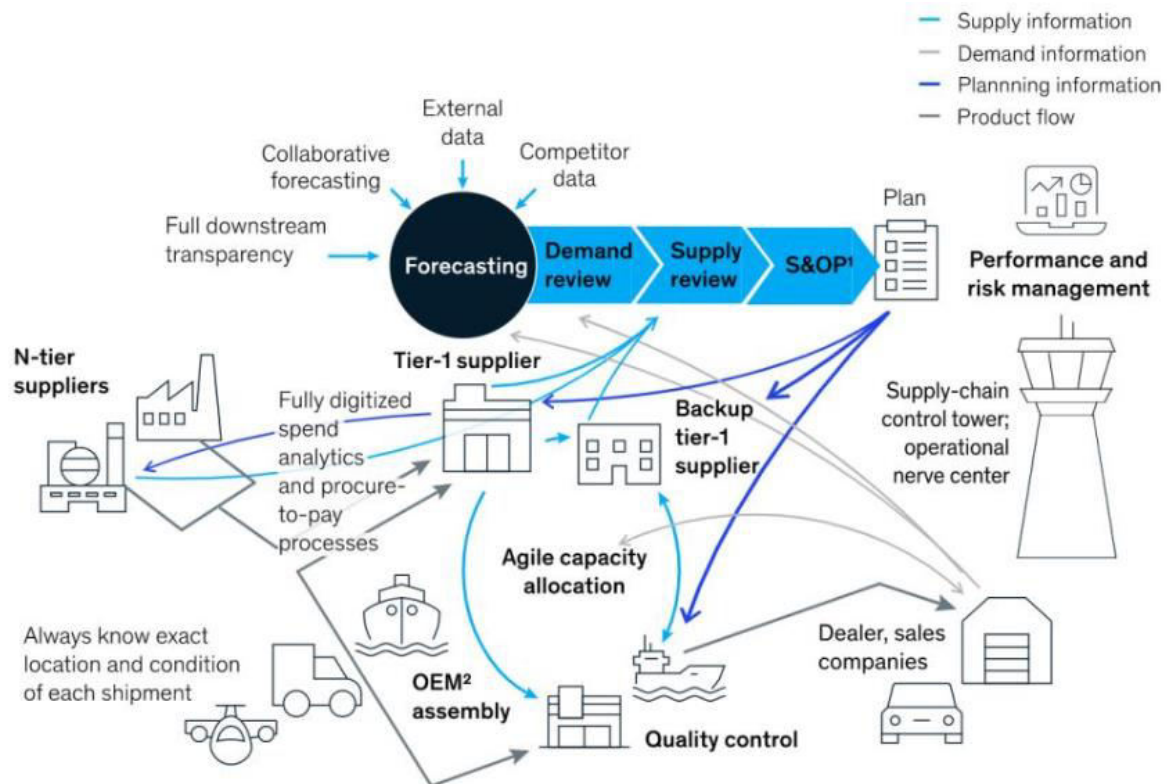


Figure 4: Collaboration Across International Supply-Chain Partners

An international supply network often requires trust, especially when organisations work in different legal, cultural and institutional environments. Established partnerships can lead to the exchange of information and the development of joint solutions instead of an exclusive interest in the organisational interests of each partner (Sáenz et al., 2018). Both collaboration and partnerships can assist with conducting a joint risk assessment and contingency planning that will allow organisations to prepare their responses ahead of disruptions. There's also the added complexity of international management, as managers need to coordinate activities across the borders. The regulations, infrastructure, labour and business conditions may vary from country to country (Sheffi and Rice, 2005). It may become necessary, then, for managers to make choices that involve two or more markets. Organisations may be able to coordinate their responses through effective communication and cross-border co-ordination. But when there is extreme disruptions, it can be hard to work together. Businesses can vie with each other for limited materials, transportation, or production. Suppliers may give preference to customers willing to pay more or have more solid contractual ties. This not only requires having supply-chain partners, but also having high quality and reliable relationships among supply-chain partners. The literature then depicts the capability to be resilient as a shared capability, not something that can be achieved at all times by one company. Companies can enhance their own resilience, as well as collaborating with supply-chain partners to boost information sharing, contingency planning and recovery. This is especially true of international management as disruptions may span across organisations and countries (Tukamuhabwa et al., 2015).

Theme 5: Organisational Adaptation, Recovery and Long-Term Resilience

One significant shift in the field of supply-chain resilience research has been the shift from looking only at the disruption response to long-term adaptation. Building resilience requires more than just 'getting back to business' after an event, but potentially also learning from the disruption and adjusting supply networks to make them less vulnerable to future events (Wieland and Wallenburg, 2013). Recovery is thus an opportunity to recognise the weaknesses and make improvements to the organisation's readiness. Businesses can respond to change in the ways they manage their inventory, technology, logistics, and production, as well as sourcing structures and locations. An organization that has been continually affected by reliance on a single geographic region may re-evaluate its sourcing and add more sourcing or manufacturing sites. In the same way, businesses can rework their distribution systems for other transportation methods if one or more are shut down (Pournader et al., 2021).

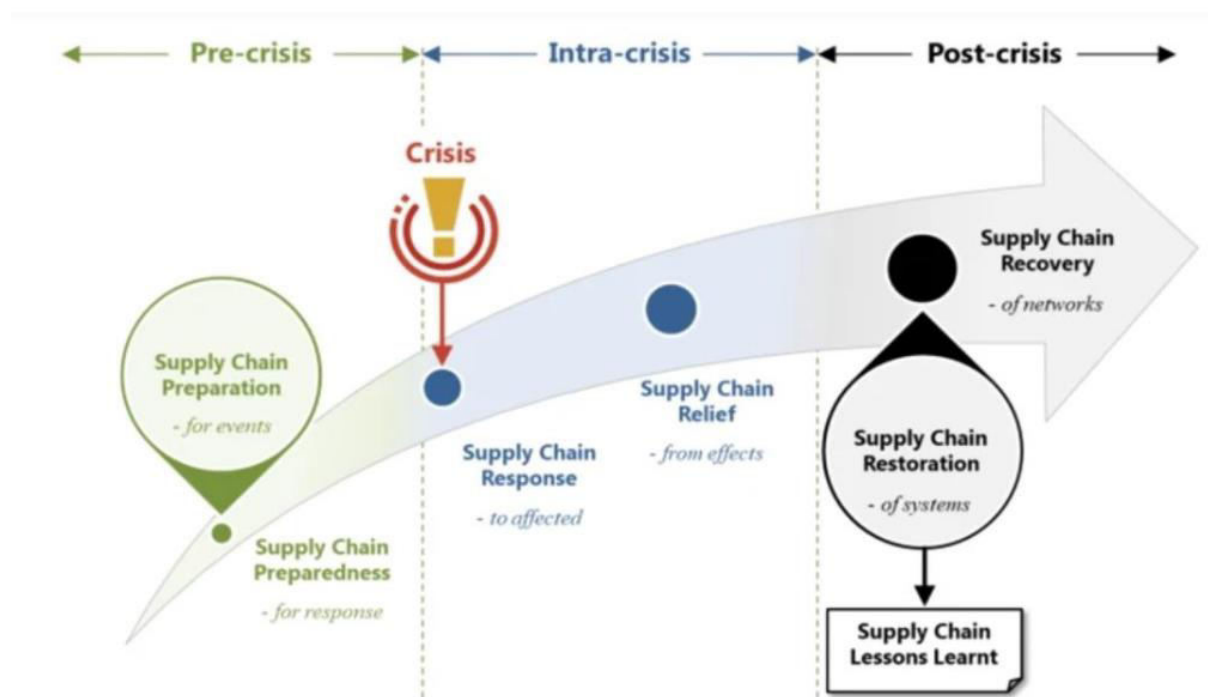


Figure 5: Supply Chain Resilience Through Response, Recovery and Adaptation

This process is in large part managed by managerial skills. When a disruption occurs, managers will be required to make decisions under conditions of uncertainty, while also having to consider other factors like cost, customer service, employee needs, and operational continuity (Queiroz et al., 2022). When regular methods or approaches are ineffective, the use of organisational flexibility can enable the company to adapt its procedure. Experiences of disruption can also be used as a learning opportunity to better plan for contingencies and enhance future response. Resilience is a balance between resilience and cost and sustainability as well as long-term resilience. There may be an increase in costs associated with building capacity, having stockpiles and using several suppliers. Therefore, companies must decide what vulnerabilities they should invest in. Unnecessary costly systems may not be commercially viable whilst very cost effective systems with none flexibility will be very vulnerable to disruption. In the literature, resilience is therefore increasingly described as a capability of an organisation to continuously function (Rai et al., 2021). Organisations need to keep on observing and assessing their environment, to learn from the disruption and adapt their supply networks. This is much more important in international management where the environment in which global businesses operate is constantly changing, from politics, economics, technology and environment. Companies need to have a mix of preparedness, quick response, recovery and organisational learning for long-term resilience. The five themes illustrate the multi-dimensional nature of supply-chain resilience overall. Risks are identified in global disruption, options are provided by supplier diversification and flexibility, visibility and responsiveness is enhanced through digital technologies, collaboration brings about coordinated action, and adaptation allows for long-term learning and recovery. These dimensions offer a framework to understand how international companies can react to the increasingly complex international disruptions (Lim et al., 2021).

V. CONCLUSION

Due to the growing development of companies' supply chains, they must become more resilient, making it an important part of international management. Supply chain disruptions may occur at any stage of the supply chain, from sourcing, manufacturing, transport and distribution, leading to significant operational and financial challenges. The research in this study shows that resilience is not only about reacting to disruption, but also about anticipating uncertainty, and then recovering well and adapting the business after disruption. There are multiple approaches that can reinforce resilience that work together. Supplier diversification and flexible sourcing offer alternative options when existing supplier relationships are not in place, and suitable inventory buffers and alternative logistics options can help ensure continuity of supply. Digital technologies provide an opportunity to enhance supply chain visibility, information sharing and managerial responses. Working with suppliers, logistics and other partners is also crucial as events often have

international repercussions that span across organisations and nationalities. Moreover, firms have the potential to build resilience in the long term by adapting to previous disruptions and rethinking vulnerable supply chain elements. In total, the concept of resilience should be considered as an ability of the organisation, which should not be a one-off reaction to the crisis. The challenge for international businesses is to maintain their efficiency and flexibility, and to be ready and adaptable on a continuous basis to evolving risk. Technological capability, diversified networks, collaboration, effective management and organisational learning can give a better base for dealing with the future disruptions in the global level.

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