

# Supply Chain Resiliency: How to cope with Disruptions<sup>1</sup>

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## Abstract

Today, more than ever, our world is facing supply chain constraints that threaten the basics of current market dynamic on all levels and in every economic field. From economic sanctions limiting commercial trade, the COVID-19 crisis, post-pandemic economic stagnation, the ongoing conflict in the Ukraine, the global chip shortage, as well as the effects of the current Israeli-Palestinian war and its impact on freight transportation in the Red Sea have all exposed the vulnerability of today's global supply chains. The purpose of this paper is to review how supply chain must be designed to ensure their flow and deliverables in complex, uncertain, and ever-changing environment. The paper will study how supply chains must be resilient by addressing current challenges through agility to meet both socio-economic and political volatilities, and sustainable through their transition to socio-ecological compliant economies.

**Key Words:** Supply Chain; Resilience; Crisis Management; Agility; Sustainability

## 1. Introduction

### 1.1. Past-Times Mentality

In either periods of capitalist economic growth or stagnation, experts have usually measured the success of any commercial operation by how far a manager was able to drive down costs and drive-up efficiency and productivity (an approach that soon paved the way to Lean Management). Waste management in general and the Just-in-Time (JIT) approach in particular became a cornerstone of commercial validation, delivery precision, and operational success (Geda et al., 2020; Chintapalli & Vakharia, 2023). Within this approach, both goods and services arrived when needed, wastes were eliminated, and costs were decreased.

### 1.2. From Global Crises to Turning Points

Since 2020, several crises took place which disrupted the commercial supply chain status quo and questioned its operational practices and paradigms. The COVID-19 pandemic, followed by the Russian invasion of the Ukraine, the global chip shortage, as well as the effects of the current

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Israeli-Palestinian war and its impact on freight transportation in the Red Sea – have set two new supply chains facts: (1) uncertainty is now a new status quo; and (2) resilience is a condition (pre-requisite) for operations continuity. Indeed, the time has come to change business orientations when it comes to supply chain management – where managers’ attention must be equally oriented towards attaining both efficiency and resilience in any supply chain operation. In other words, supply chain operations must take into account the Just-In-Time (JIT) principle as well as supply chain contingency from a Business Continuity perspective. Hence, JIT, waste management, and other principles must be rethought as shortages as well as possible trade-offs are essential elements to consider. Thus, supply chain resiliency must:

- Encompass being able to quickly and appropriately adjust to disruptions (agility), while preserving efficiencies as much as possible;
- Adapt to structural changes by modifying supply chain strategies, operations, and technologies;
- Prospect and anticipate changes in demand while taking into account several essential supply chain elements (e.g. inventory, cost, flows, tracks, transportation means, etc.) and respond without sacrificing neither cost nor quality.

### **1.3. The Aim of this Paper**

Based on the above, the aim of this paper is to focus on supply chain resiliency while reflecting on the ways that can minimize the tradeoff between JIT and planning for unexpected uncertainties as well as unpredictable and uncontrollable events. In this paper, we will try to study the essential elements that constitutes the dynamic of supply chain resiliency including its frameworks by expanding and enhancing their ecosystems and relationships, while maintaining a focus on efficiency and meeting clientele’s expectations. By understanding an organizations’ options, making calculated data-driven decisions, and maintaining communication with customers as well as other implicated stakeholders, it is possible to obtain the right balance for one’s business.

## **2. Today’s Main Causes for Supply Chain Disruptions**

### **2.1. COVID-19 Pandemic**

In 2020, a chaotic event on all levels occurred that sent its shockwaves in all supply chain direction – questioning globally agreed-upon and accepted (shared) business strategies. The COVID-19 disruption was too big to absorb given that it caused severe socio-economic disruption including the largest global recession since the great depression of 1929, widespread supply shortages which were mainly caused by supply chain disruptions (e.g. workers becoming sick, mandates, restrictions on travel means and transportation modes, restrictions affecting the

availability of staff, goods remaining at port, etc.) (Kim et al., 2022; Haouel, 2023; Ino & Watanbe, 2021; Bukhari & Zafar, 2023; Ishak et al., 2023; Ivanov et al., 2023).

## **2.2. Russian Invasion of Ukraine**

This was accentuated by the 2022 Russian invasion of Ukraine as global supply chain and shipments slowed, causing worldwide shortages and affecting commercial patterns. This large-scale invasion had several consequences (Al-Saadi, 2023; Breslin et al., 2023; Mukhtar, 2023):

- It affected the international maritime transport due to military operations in the black sea which had severe consequences on global supply chains and caused heavy losses to the world economy.
- It affected the energy prices with Europe particularly suffering from this event (40% of Europe's energy is provided by Russia).
- It affected the global supply chain of both the food and agriculture sectors as both Russia and Ukraine (when combined), account for 29% of the world's wheat market. This disruption caused food shortage and pushed up prices of wheat and corn-based food products such as bread, cereals, etc.
- On another note, it should be noted that due to the COVID-19 lockdown the world experienced a severe disruption in the semi-conductor sector due to factors ranging from shifting demand, labor shortages and even a drought in Taiwan. The severity of this issue was amplified as Ukraine supplies more than 90% of the U.S.'s semiconductor-grade neon, a gas integral to the lasers used in the chip-making process. Russia, on the other hand, supplies 35% of the U.S.'s palladium, a rare metal used to create semiconductors.
- It affected the international supply chain of raw materials, chemical products, minerals and other commodities – which in turn affected the industries of electric vehicles batteries, electronics manufacturing, construction, etc.
- Etc.

## **2.3. The Global Chip Shortage**

In 2020, a parallel crisis took place where a worldwide chip shortage affecting hundreds of industries which led to major price increases, long queues, and reselling among consumers and manufacturers for automobile, graphic cards, video game consoles, computers, household

appliances, and other consumer electronics that require integrated circuits (chips) (Kim & Wu, 2022; Cooper, 2023)

#### **2.4. The Israeli-Palestinian Conflict of 2023 and the Red Crisis**

The ongoing Israel-Palestine conflict (that started on the 7<sup>th</sup> of October 2023) is sending ripples through the shipping industry, leading international businesses to adapt their operations in the region. Three main key maritime locations will be impacted and face critical disruptions:

- The Bab-el-Mandeb strait which gives access to the red sea is currently in the spotlight as ships heading towards Israel are under attack from Yemen-based, Iranian-backed Houthi rebels. This led the US, several EU and western countries to respond by launching a naval task force to retaliate. Such a conflict has disrupted global supply chains and led major shipping companies to reroute.
- The Strait of Hormuz, a backbone for oil and gas shipping, could be affected due to current Iranian threats and western military presence in the Middle-East;
- The Suez Canal, a critical waterway for various commercial vessels, including container ships, will be affected as ships are unable to cross the red sea.

Such a complex situation will have long-term effects on global supply chains, have already increased freight-rates, unpredictable delivery schedules, and the launched the search of new suppliers in other parts of the world – which in turn significantly increased the cost of doing business in the region.

**Figure 01. Today's Main Causes for supply chain disruptions**



### **3. The Importance of Supply Chain Resiliency**

Supply chains are the backbone of the global economy on all levels and in each and every industry. With the development of both the economy and commercial services – supply chains have also developed and became global (e.g. endless number of suppliers and service providers, production and distribution centers scattered around the globe, etc.).

The socio-economic-political cycle is quite dependent on global supply chains being able to properly and accurately source and collaborate across trading partners, as well as the need to build business-to-business networks while taking into account resilience as a management approach. Indeed, in the face of uncertainty and unpredictability – organizations must be able to deliver the right products and / or services at the right place and time, to the right customer – and even out-smart and out-maneuver competitors.

It should be noted that when it comes to supply chains – disruptions (which are inevitable) will vary in terms of magnitude and impact. That said most supply chains have been designed to be cost efficient with the aim to drive down wastes (of all kinds and on all levels). However, due to the adoption of such an approach – when a dramatic-unexpected shifts in supply chains occur, managers do not have the possibility to have quick responses (e.g. lack of data, strong network, etc. to find workable alternative to keep their supply chains operational). Hence, business organizations urgently require appropriate measures to build resilience in their supply chains to quickly and efficiently adjust operations to manage through disruptions, improve business outcomes, and minimize the impact of future events before they even occur.

### **4. Structuring Supply Chain Resiliency**

#### **4.1. Context**

We have already seen how when business interruptions occur, supply chains will come under pressures, logistics limitations, substantial demand mix changes, lack of visibility into inventory count, location and capacity restraints, etc. That's why restructuring supply chains based on a resilient multi-faced approach is now a must for the future of businesses.

#### **4.2. Monitoring & Measuring Vulnerabilities**

Organizations need to implement effective systems to both measure and monitor their own vulnerabilities in terms of supply chain. Of course, each organization will have different vulnerabilities (e.g. physical, financial, political, social, reputational etc.) that are to be identified through effective and meticulous risk planning exercises. In other words, the complexity and diversity of today's supply chain risks will require smart management tools as well as the

application of new digital techniques in order to focus the entity's energy and attention on specific regions, suppliers, transportation routes, etc.

#### **4.3. Supply Chain Management Framework**

Organizations will require a structured Supply Chain Management Framework capable of incubating the adoption of resilient approach. This includes:

- The initiation of a specialized supply chain resiliency transition team;
- Initiate a plan with the aim to identify, prioritize and respond to potential disruptive events and other associated vulnerabilities;
- To draft quick responses with include supply chain transformation, business contingency plans, etc.;
- To review supplies and materials;
- The introduction of resilience metrics into supply chain KPIs;
- The conduction of regular stress tests and risks contingency responses to ensure that resiliency measures remain appropriate.

#### **4.4. Customer Centric Approach**

Even though disruptions and crises might occur – businesses must always adopt a customer centric approach and meet their expectations no matter what (as part of their business contingency plan).

#### **4.5. From Digitalization to Automation**

Within a agile approach, businesses must prioritize digitization within the context of a full-process of automizing the supply chain and ensure visibility into accurate operations management as well as to be able to detect issues before they impact both customers and the business.

#### **4.6. Access to Data**

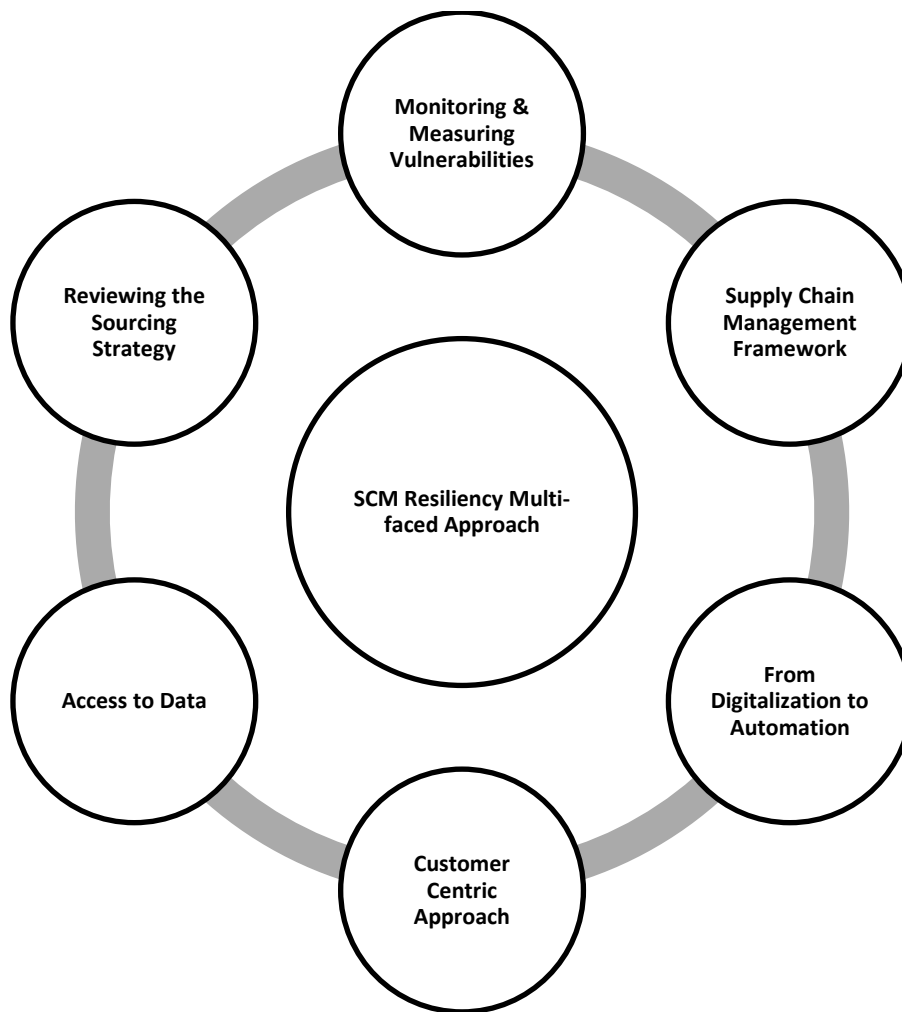
Data access (both internal and external) is an important aspect of resiliency so that the supply chain team will be able to have the necessary information when needed for better reaction and pro-action. Having access to real-times operations visibility, inventory, and workflow activities across the supply chain will enable the organization to optimize its performance, deliver customer expectations and gain a competitive edge. With access to data, opportunities can be unlocked and better decisions can be made.

#### **4.7. Reviewing the Sourcing Strategy**

Organizations must diversify their sourcing strategies to identify multiple suppliers for both goods and services, as well as to reduce their exposure by onboarding suppliers in different geographic locations (within the context of international supply chains). On another note,

organizations must strengthen their relationship with their current supplier to foster better creativity and flexibility especially when it comes to approach and mitigate disruptions (while balancing costs and risks).

**Figure 02. Proposed Supply Chain Resiliency Multi-faced Approach**



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