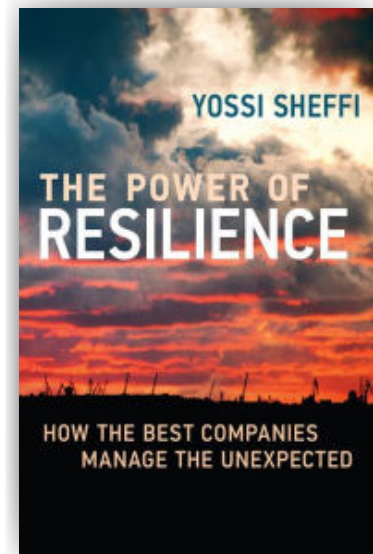


The Power of Resilience

How the Best Companies Manage the Unexpected

Yossi Sheffi

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KEY CONCEPTS

- To create resilient organizations, companies must promote flexibility through supply chain assets and processes. Preparing for unforeseen events requires a portfolio of options.
- Several trends have pushed organizations toward complex, broad, long, and fragile supply chains. These include increased trade, greater distance, longer lead times, more players, more variety, and more technology.
- Although every supply chain disruption is different, three activities are commonly associated with risk management and resilience: prevention, detection, and response.
- Each disruption has its own degree of impact, and different disruptions occur with differing frequencies. The most dangerous disruptions are those that are high impact and low likelihood.
- Risk management measures include preventing avoidable risks, developing playbooks to respond to common disruptions, building resilience for unexpected events, and improving awareness of emerging risks.
- Detecting supply chain disruption is important since it gives companies time to evaluate issues and mitigate problems. Supplier monitoring is becoming a common practice.

SUMMARY

INTRODUCTION

In today's global business world, many threats can disrupt corporate supply chains. In response, organizations are embracing risk management techniques and strategies that build resilience. In **The Power of Resilience**, Yossi Sheffi explores a variety of approaches that companies are taking to prepare for and manage supply chain interruptions.

A QUAKE BREAKS A SUPPLY CHAIN

A massive earthquake and tsunami hit Japan in March 2011, leading to large-scale destruction and the meltdown of the Fukushima Daiichi nuclear power plant. The resulting radiation worried scores of companies including Intel Corporation. Over half of Intel's assembly and test material suppliers had manufacturing locations in Japan. In response, Intel activated its Corporate Emergency Operation Center. Although Intel's Tier 1 suppliers were unaffected by the disaster, over time the company discovered that 60 suppliers in lower tiers of the supply chain were experiencing problems.

Global supply chains like Intel's are composed of five facets:

1. *Parts* that go into products.
2. *Identities* of the suppliers who make those parts.
3. *Locations* where parts and products are made, assembled, and distributed.
4. *Flows* of parts, products, information, and cash.
5. *Inventories* of materials, parts, and finished goods stored or handled in various stages of the chain.

In the end, the rise of global trade means that companies have more moving pieces stretched over greater distances and with less slack in the system.

Each of these elements provides insight into different supply chain risks. The vulnerability that Intel experienced after the Japanese earthquake was not unusual. Several trends have pushed organizations toward complex, broad, long, and fragile supply chains. These include increased trade, greater distance, longer lead times, more players, more variety, and more technology.

A CLASSIFICATION OF CATASTROPHES

Although every supply chain disruption is different, there are three activities commonly associated with risk management:

1. Prevention.
2. Detection.
3. Response.

A variety of problems can affect supply chains, including natural disasters, intentional disruptions, and creative destruction. Each disruption has its own degree of impact, and different disruptions occur with different frequencies. With regard to supply chain disruptions, the *Pareto Rule* suggests that 80 percent of events are frequent and minor, while 20 percent result in significant impacts.

Organizations typically plan for expected disruptions, but pay less attention to the highly unlikely ones. However, the most dangerous disruptions are high impact and low likelihood. To prepare for unexpected events, companies must develop *resilience*. It is also important for companies to consider *detectability*, the time between knowing that a disruptive event will take place and its first impact. To detect trends and long-term disruptions, companies must monitor their environments for changes and gain visibility into their supply chains. Risk management measures may include preventing avoidable risks, developing playbooks to respond to common disruptions, building resilience for unexpected events, and improving awareness of emerging risks.

REDUCING THE WHITE SPACE

Although General Motors (GM) had fewer links to Japan than Intel, the 2011 earthquake revealed how unknown risks can overshadow known ones. A few days after the disaster, GM estimated that 30 suppliers and 390 parts

had been affected. Company experts believed that by the end of March all GM factories would be disrupted for a minimum of seven months.

In response, the company created a crisis room led by supply chain employees. The team's daily routine focused on communication and coordinated action on high-priority issues. The crisis room team focused on five tasks:

1. Identifying disrupted parts.
2. Assessing associated risks.
3. Delaying parts shortages.
4. Reducing shortages.
5. Optimizing production during the disruption.

The group created a visual dashboard that showed which vehicle platforms were affected and when assembly plants might be shut down because of shortages. The goal was to eliminate the "white space" on the dashboard that represented the time gap during which GM would run out of parts. In the end, the company survived the crisis and the average car buyer experienced no major disruptions.

When dealing with supply chain disruptions, team members must stick to their roles to avoid impeding progress. This means giving people flexibility to solve problems, while imposing discipline so they do not disrupt the rest of the company.

[D]isruptions force companies to create ad hoc supply chains—temporary flows of products, recovery materials, and personnel that are unlike the company's workday supply chain.

CRISIS RESPONSE

The goal of disaster response activities is to reduce the impact of an event. In 2005, Hurricane Katrina hit the Gulf Coast of the United States. As the storm began to gather strength, Procter & Gamble (P&G) proactively started to track the potential threat to its operations. Half of P&G's coffee production and 20 percent of all coffee consumed in the United States was roasted, ground, and canned in the Folger's plant in Gentilly, Louisiana. Four days before the storm hit land, the company activated emergency preparations.

P&G had to restore the supply chain before the peak holiday coffee buying season began in October. The company created a command center in Baton Rouge, helping employees with counseling and interest-free loans, building a trailer village for employees, and digging a well to deliver potable water to the plant. P&G also temporarily changed policies for negotiating large supply deals, empowering procurement teams to make immediate decisions. By October, the plant was operating in full capacity once again.

THE FINANCIAL CRISIS AND THE MONEY SUPPLY CHAIN

Financial crises disrupt the flow of money and credit. As a result, it becomes difficult for consumers to purchase goods and for manufacturers to buy parts and products. The 2008 financial crisis originated in the 1990s when securitized subprime mortgages became popular. As these financial vehicles failed to produce expected profits, the system began to crumble.

In January 2008, a recession started in the United States. As demand for goods contracted, the effects reverberated and amplified upstream in the supply chain. This phenomenon is sometimes referred to as the *bullwhip effect*. As purchase forecasts became unreliable, companies turned to reactive tactics rather than proactive strategies.

Company cost cutting affected logistics demand patterns. Shippers chose smaller order sizes to avoid high inventory levels and to minimize the risk of customers not paying for their goods. At the same time, high oil prices and concerns about greenhouse gas emissions reduced demand for faster modes of transportation.

By June 2009, the recession was over in the United States. However, managing businesses during the rebound was difficult since suppliers throughout the supply chain were not prepared for growth. Companies began considering the stability of their supply bases and long-term relationships. In addition, companies' finance and supply chain departments worked more closely to improve customer compliance with payment terms, as well as supplier payment terms.

AN OUNCE OF PREPARATION

To create resilient organizations, companies must create flexible supply chain assets and processes. Preparing for unforeseen events requires a portfolio of options. This may include extra inventory, capacity, and supply sources, as well as the flexibility to change production schedules, input materials, and shipping lanes. Some companies also create disruption management tools. For example, AT&T has special truck trailers called "cell on wheels" that can provide high-capacity cellular network stations anywhere and at any time.

Flexibility and redundancy complement one another. Redundancy provides almost instantaneous coverage, but for a finite period of time. Flexibility, on the other hand, can address longer disruptions by shifting asset deployment. This, however, can take time to implement. Flexibility requires a certain degree of system-wide redundancy. Volatility in the supply chain can be managed through risk pooling, postponement, range forecasting, and business continuity planning (BCP). Cisco, for example, uses playbooks as part of its BCP. These playbooks contain templates, checklists, and other materials to help mitigate disruptions.

CAVEAT EMPTOR

When assessing supplier risk, companies often focus on critical suppliers; however, when a deep-tier supplier is disrupted, it takes time for companies to realize they have a problem. Detecting these disruptions is important since it gives companies time to evaluate issues and mitigate problems.

Strategic purchases usually include products or services that give companies a competitive edge. In this case, companies often enter into long-term partnerships with key suppliers. Relationship investments may include embedding employees at the supplier level, analyzing the supplier's financial situation, conducting audits, and providing input to the selection of Tier 2 suppliers.

DETECTING DISRUPTION

Detecting disruptions before they occur gives companies time to prepare. Unfortunately, some disruptions are difficult to identify because they reside in materials, components, companies, or interactions. Mapping suppliers and deeper tiers is helpful, but it is challenging because of the dynamic and proprietary nature of supply chains. Third-party supplier mapping services can be useful, since they gather information directly from suppliers using questionnaires.

Supplier monitoring is becoming a common practice among many businesses. Boston Scientific, for example, developed a list of 20 warning signs and trained employees to look for them during supplier interactions. This

Companies rely on a wide range of monitoring activities to detect a wide range of potential disruptions. The goal of the monitoring is "situational awareness"—relevant and timely data that reflects risk conditions that might affect the company and its decisions.

training emphasized the importance of watching for operational problems and deciding how often to conduct formal reviews of supplier risks.

Technology in the supply chain helps organizations manage risks. When data travels faster than disruptions, companies with effective listening networks can detect disruptions early and prepare to respond before the disruptions hit them.

SECURING THE INFORMATION SUPPLY CHAIN

As software and digital communications become a more integral part of global supply chain operations, companies find that they are more vulnerable to cybercrime and data leaks. Since 2004, five trends have emerged that have increased the risk of IT-related disruptions:

1. Greater outsourcing of IT infrastructure to cloud computing.
2. More Internet connectivity for industrial devices.
3. Increased use of personal devices on corporate networks.
4. More personal data online.
5. Growing reliance on Internet-connected technologies to operate global supply chains.

Corporations now face large-scale, organized efforts to steal valuable information. These threats come from hackers tied to organized crime, state-sponsored espionage, cyber warfare, and more. It is imperative that organizations take action to reduce the vulnerability of their IT systems. They can also conduct stress testing to evaluate the resilience of their IT infrastructures.

Companies can mitigate the risks of scarcity and price shocks with specific procurement practices. For short-term protection, companies can create buffer stocks.

PLANNING FOR SCARCITY AND PRICE SHOCKS

Since it is difficult for companies to change shipping distances, volumes, and modes of transportation in the short term, they are often exposed to fuel price risks. In the long term, however, shippers can change facility locations and suppliers and carriers can pursue more energy-efficient assets.

Material price risks can also be a concern for companies. One example is rare earth elements, a group of 17 metals that are used extensively in automotive, electronic, and high-tech applications. In July 2010, China decided to restrict exports of these elements.

Another source of price shocks is fluctuations in foreign exchange rates. One way around this problem is to negotiate long-term, fixed-price contracts or to use financial derivatives.

Companies can lower their exposure to risky commodities by finding substitute products. Recycling can also reduce scarcity and price risks. Recycling creates new commodity sources that are independent of the factors causing price increases in the primary supply. In many instances, recycling also consumes less energy than primary extraction and refinement. During times of short primary supply, recyclers can increase their capacity more rapidly than primary supply producers.

Managing commodity risks differs from other supply disruptions in four ways:

1. Since commodity scarcity risks are not linked to specific suppliers, dual sourcing is not a viable solution.
2. Commodity price volatility events are global, affecting all users regardless of location or supplier.

3. Risk may not be identifiable in the bill of materials because the underlying types and amounts of commodities used may not be defined.
4. Scarcity risks may result from issues outside a company's supply chain, such as demand spikes in unrelated industries.

SHIFTING ETHICS, RISING BARS

Organizations must recognize that their reputations can influence consumer demand, talent acquisition, and investor sentiment. The supply chain may harbor potential reputational risks, such as supplier labor and sourcing practices, the supply chain's natural resources footprint, and product safety issues related to ingredients used by suppliers. Intel, for example, recently took steps to ensure that its microprocessors would not contain any conflict minerals. Marks & Spencer has also implemented programs to ensure ethical working conditions at its suppliers.

If a company experiences environmental and sustainability problems, it can result in corporate social responsibility (CSR) pitfalls. Unfortunately, CSR attributes related to procurement and supply chains can be difficult to measure. Some organizations have imposed codes of conduct on their supply chains. Audits and field visits ensure compliance. In some instances, companies partner with non-governmental organizations (NGOs) to gain local insight into sustainability priorities.

Research suggests that companies may be more valuable in the long term if they take a broader view of sustainability issues rather than focusing solely on their financial bottom lines. Some countries allow forms of incorporation that have both financial and social goals. In the United States, these include benefit corporations (B Corps) and low-profit limited liability companies (L3C). The United Kingdom allows community interest companies (CIC).

The three areas of investment in risk management and resilience—detection, prevention, and response—help reduce the duration, likelihood, and magnitude of disruptions.

ADAPTING TO LONG-TERM CHANGE

Long-term shifts can lead to disruptions that affect a company's supply chain and more. Some shifts affect specific industries, while others impact multiple sectors. Companies must decide when and how to invest in responses to long-term shifts, including the aging population, climate change, and innovation.

Scenario planning is one way to think about long-term risks and strategic responses. The first step in this process is identifying the fundamental question to be addressed. The next step is creating scenarios. Well-crafted scenarios must seem plausible and generate strategic discussions about how the organization would respond to those new futures. While scenario planning does not guarantee that organizations will make the correct decisions, it can help them consider large-scale changes before committing to investments.

FOR WANT OF A NAIL

Typical supply chain diagrams resemble a fan; in some cases, however, there is a single supplier deep in the supply chain that plays a key role. In this situation, the supply chain diagram looks more like a diamond. These diamond supply chain structures can create significant quality risks since a small problem with a key supplier can reverberate throughout a supply chain.

Systemic risk in supply chains is defined as a disruption that brings an entire industry to a halt. In reality, most modern supply chains do not suffer from systemic risks since organizations have devised response mechanisms and global distribution systems can often pick up the slack when problems arise. Yet in diamond supply chain structures, supplier failure can lead to systemic risk for an entire industry.

Recently there has been growing awareness of the need for systemic enterprise risk management practices. In 2009, the International Standard Organization (ISO) published the ISO 31000 standard for risk management. These risk standards create top-down governance structures with internal feedback loops to manage risks and the risk management process as a whole.

WHY RESILIENCE?

When it comes to risk management and resilience, there are three areas where organizations should invest:

1. Detection.
2. Prevention.
3. Response.

While these elements directly address risks, they also indirectly add value to an organization. Resilient organizations invest in specific response strategies and use standards to enable flexible responses. When disruptions arise, advanced preparation allows organizations to recover faster and minimize the impact.

Early detection plays an important role in preventing disruptions. Audits can detect problems with suppliers, provide insight into country-level trends, and provide preventative value since suppliers are likely to take proactive steps to avoid unfavorable audit reports.

Prevention efforts reduce the likelihood of events that would require a response. Response capabilities help companies accept risks by building mitigation skills. Prevention and response must go hand in hand.

Resilience is preferable to insurance in four ways:

1. *Insurance offers financial indemnification.* Resilience prevents the loss of reputation if an organization does not fulfill its commitments to customers.
2. *Insurance typically covers only named hazards.* Resilience can address unknown and uncertain events and acts of God.
3. *Insurance is an adversarial transfer of risk, and payouts can be uncertain.* Resilience is an internal capability that is aligned with the business.
4. *Unlike insurance, resilience can generate competitive advantage by improving top- and bottom-line performance.*

The right level of investment in resilience will differ by company and industry. Many organizations make their investments based on what their competition has done. Resilient companies have the flexibility to identify and respond to unexpected events quickly and effectively.

FEATURES OF THE BOOK

Estimated Reading Time: 7–8 hours, 488 pages

In **The Power of Resilience**, Yossi Sheffi explores strategies that companies are using to detect, prevent, and minimize a variety of supply chain risks. Sheffi provides both cross-sectional and longitudinal insights into risk management and resilience based on interviews and research conducted by the MIT Center for Transportation and Logistics. The book includes notes and an index for reference, and would be of interest to anyone involved in supply chain management.

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