

PMG 663

Developing Supply Chain Risk Mitigation Strategies

Lecture 4

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Introduction Supply chain management is responsible for managing and controlling all material flow within a supply chain. It includes the movement of materials from suppliers to different sections in the firm, and from those sections to distribution centers or end users. The flow of materials would be affected by any unexpected event (a potential risk) that may disrupt the smooth movement. Supply chain vulnerability can also be considered a risk factor, which is defined as exposure to serious disturbance arising from supply chain risks and affecting the supply chain's ability to effectively serve the end customer market

Supply Chain Risks

Natural Disasters and Supply Chain Disruption

Developing Risk Mitigation Strategies

A Supply Chain Risk Management Software

Therefore, managing risks or disruptions becomes an essential task in an effective supply chain management. The aim of supply chain risk management (SCRM) is to identify the potential sources of risk and implement appropriate actions in order to avoid supply chain vulnerability.

A firm's business and its financial performance could be affected by supply chain disruptions

Smooth movement of materials or operations in the supply chain might be affected as well. Supply chain disruptions may cause delay in production or deliveries.

A late delivery of raw materials might stop production, raise costs by forcing a move to alternative transport, materials, or operations, raise the work-in-process (WIP) inventory, and make partners reconsider their trading relationships

Supply Chain Risks Supply chain risks can be generally categorized into internal risks and external risks.

Internal Risks Internal risks are originated from sources inside the supply chain and they usually occur in normal operations. They include machine breakdowns, late deliveries, forecast error, supplier failure, supplier quality problems, malfunction of information technology and communication systems, change in customer demand, transportation failure, human error, etc. An effective planning and scheduling is crucial to control most of those risks

Internal risks

Internal risks can be divided into:

internal controllable and internal partially controllable risks. Internal controllable risks originate from sources that are most likely to be controllable by the company. For example, the quality and cost of the products. Internal partially controllable risks originate from sources that are partially controllable by the company; for example, a fire accident in the comp

Internal risks are mostly controlled by Japanese companies via an effective and efficient planning and scheduling system. For instance, they are controlled in Toyota partly by Toyota production system. However, external risks are mostly difficult to control or impossible to prevent. Therefore, they should be taken into account as an important factor in supply chain management.

External risks come from outside the supply chain and managers have little or no control on them. They include natural disasters (earthquake, hurricane, tsunami, etc.), war, oil crises, terrorist attacks, the outbreak of disease, financial irregularities, crime, rising custom duty, etc. External risks in supply chains can be divided into external controllable risks, external partially controllable risks, and external uncontrollable risks

External controllable risks originate from sources that are mostly controllable by the supplier company.

An example of external uncontrollable risk is the Great East Japan Earthquake that occurred in 2011. It had a serious impact on Japanese supply chains that caused various production and delivery problems

For example, the selection of the next-tier suppliers. External partially controllable risks originate from sources that are partially controllable by the supplier company. For example, customer demand can be partially impacted by company's promotion plan. External uncontrollable risks originate from sources that are uncontrollable by the supplier company. For example, natural disasters such as earthquake and tsunami

Natural Disasters and Supply Chain Disruption

The Great East Japan Earthquake hit the north-eastern parts of Japan (the Tōhoku region) in March 2011, and its scale was the fourth largest in the world since 1900 and the largest in recorded history in Japan. It triggered a destructive Tsunami that reached more than ten kilometers inland. Besides its serious social effects, it had a significant impact on industries as well. It caused significant disruptions in both domestic and global supply chains by halting production at several companies and their part suppliers which resulted in significant delay in delivery of parts.

Japan has been a major producer of parts and products worldwide, and the disruption in its supply chains caused disruptions in supply chain globally. The followings are just few examples of such disruptions Japan provides 60% of the world's silicon which is an important raw material for semiconductor chips. It is also the world's largest supplier of dynamic random-access memory and flash memory which are critical raw materials for liquid-crystal displays (LCD). Right after the disaster, the prices for these components in the world market soared by 20%, showing the world's strong dependence on the Japanese supply chain

Apple faced shortages of the lithium-polymer batteries used in its iPods. The reason was that a crucial polymer used in those batteries was provided by Kureha, a Japanese chemical company, and the company had to shut its factory down due to serious damages caused by the disaster. The production sites of Xirallic pigments (paints used to give greater color intensity to automobiles' appearance) were badly damaged. The shortage of these parts caused some operational shutdowns in the plants of world's automakers including GM, Ford, and Chrysler

Two major Japanese suppliers, Mitsubishi Gas Chemical and Hitachi Chemical, provided more than 85% of the world's BT resin, which is a critical raw material for circuit boards. However, operation of some plants was suspended due to damaged infrastructure after the earthquake. After the disaster, many other Japanese large companies such as Panasonic, Sony and Fujitsu had to close their damaged plants.

Panasonic, the Japan's biggest maker of batteries, closed two plants; and Fujitsu, a personal computers and home appliances maker closed 10 plant. Renesas Electronics, a major global producer of chips to be used in automotive microcontrollers, was badly damaged. Its plant operations stopped for nearly three months, and after restarting production, it operated at only about 10% of capacity

Toyota, more than its domestic competitors, faced with supply chain disruptions. For two weeks after the disaster, the entire Toyota plants in Japan stopped completely. The problems were lack of parts, or not even knowing which parts would be missing when the plants resumed production. It is reported that it took a week for Toyota to list the 500 parts sourced from 200 locations which would be difficult to secure, and then recover to the normal production level.

Although it grasped the availability of parts up to the second tier suppliers, Toyota did not keep track of the suppliers of the third tier or further down in general. This is a period when one-of-a-kind-product companies like Fujikura Rubber Ltd., which had 1333 employees and produced rubber parts that were used in some of Toyota's cars, became well-known to the public.

These disruptions in the supply chains pushed the companies to develop (or to revise) strategies to mitigate risk in their supply chains

Prior to 2011, risks were not seriously taken into account in the supply chain of many Japanese companies. Many companies developed plans to consider the risk mitigation strategies in the supply chains after the Great East Japan Earthquake and floods in Thailand had a significant impact on their production and delivery of their products. In fact, the concept of risk in the supply chain was extended to include all parties in the supply chain, and external factors as well

For instance, Toyota revised the supply chain coordination mechanism of its production system, which considers the followings:

- Monitoring the information on all the suppliers of key parts/materials across the entire supply chain.
- Managing the inventory of key parts/materials across the entire supply chain.
- Ensuring the continuing supply of key parts/materials.
- Increasing the standardization of key parts/materials and their production methods.

Examples -Companies' strategies to avoid Disruption

- Companies should request their suppliers to develop disaster plans in order to get prepared for taking a set of actions to minimize the effect of disruption and the recovery period. This strategy could be even considered in service sectors as well. The author experienced developing “backup syllabus” requested by his university located in Tokyo short after the Great East Japan Earthquake in 2011. The backup syllabus contained a detailed plan on how to resume the course when the classes have to be canceled when a similar disaster occurs

- Having only one supplier for critical parts and materials is too risky. Thus, companies should not fully rely on single source suppliers even though they are the best in terms of cost, quality, and trust. Dual or multi sourcing for critical parts and suppliers would be a good strategy even in small scales. Regarding the dual-sourcing, one plan could be buying the majority of the parts and materials from the primary supplier, and the rest from a secondary one that is possibly located in another region. This can keep the secondary supplier operational and ready to be switched at any time

- Companies should group the suppliers geographically and identify the suppliers who are located in risky areas. As a result, buying the critical parts and materials from those suppliers should be limited and different alternatives should be planned . For instance, the area that is currently considered highly risky in Japan is Tōkai area.

The probability of a magnitude eight or greater earthquake along the Nankai Trough within the next forty years is about 80%

A Supply Chain Risk Management Software

Fujitsu Research Institute introduced a Supply Chain Continuity Assessment system in 2007. It identifies potential supply chain problems arising from contingencies and can evaluate various countermeasure analyze a firm's business continuity capabilities in cases of natural disasters and other unexpected situations

Supply Chain Continuity Assessment system features

The system has the following features :

- **Evaluating and analyzing business continuity capabilities of suppliers**

The system enables companies to perform quantitative analyses regarding the resumption of suppliers' operations, the amount of time required for recovery, damage projections, and the status of implemented countermeasures before a disaster occurs.

- **Using hazard maps to evaluate geographic risks for suppliers**

It uses the latest hazard maps with the addresses of suppliers' production facilities and offices, which makes it possible to visually simulate the expected damage that will occur during a natural disaster

- **Analyzing the impacts on the firm's own products**

Based on an evaluation of suppliers' business continuity capabilities and the results of geographic risk evaluations using hazard maps, the system enables a firm to quantitatively analyze the impact of a disaster on its own products.

For example, firms can estimate which products will be affected by production stoppages and calculate when production will resume

The SCRKeeper system

After the Great East Japan Earthquake, Fujitsu added some new feature for its Supply Chain Continuity Assessment system to reduce supply chain disruptions after occurrence of an unexpected event.

It developed the SCRKeeper system that can provide damage forecasting and assessment for the regions where suppliers are located

The SCRKeeper system features

The SCRKeeper system has the following additional feature :

- The system visualizes supply chain risk per each production part or production site of a supplier to manage the supplier's damage situation in disaster time.

It provides immediate damage status updates on suppliers.

When a disaster actually occurs, the system is immediately updated with reports from suppliers about the status of damage and the situation of their operations.

This makes it possible for firms to check on the status of their suppliers in real time and overview their damage status, so that they can quickly respond to their suppliers or select alternative suppliers

Reference

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Chapter 4



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