

Principles of Supply Chain Management
Crandall, Crandall and Chen
Instructor's Guide
Hot Topics

Chapter 2 – Supply Chains as a System
How a natural disaster can cripple a supply chain

In this chapter you learned how supply chains are actually a series of input-transformation-output (ITO) entities. An interruption at any ITO point in the supply chain can stop the movement of goods within that chain. For example, an earthquake in Asia can cause factories in other parts of the world to shut down.

For supply chain managers, a natural disaster can lead to a large-scale disruption to a company's supply resources. As a result, the company is then unable to meet the commitments it has made to its customers (Zsidisin, Ragatz, & Melnyk, 2005). Examples of natural disasters that can disrupt the supply chain include major weather events, earthquakes, floods, and even volcanoes.

Background

One of the most visible examples in recent years of a natural disaster was the trilogy of events that occurred in Japan during March of 2011. An earthquake, tsunami, and nuclear meltdown at the Fukushima Nuclear Power Plant left the country reeling in human suffering with thousands dead and even more homeless. The impact on supply chains was massive, causing disruptions in the automobile industry in need of electrical components and certain shades of paint (Shappell, 2012).

In regards to vulnerability, this particular automobile supply chain was extended, and yet concentrated in one geographic area. In terms of the extended supply chain, components made in Japan were needed all over the world. However, in terms of concentration, many companies had single-sourced their suppliers in this region of Japan, which left them open to vulnerability since no backup was readily available for certain types of goods.

Supply chain disruptions can reduce revenue, decrease market share, and threaten production and distribution activities (Healings, 2012). Ultimately, a natural disaster can inflict significant damage not only on the supply chain, but a company's annual financial report. As a result of the earthquake and tsunami in Japan, some companies disclosed they had missed earnings targets in 2011 (Dempsey, 2012).

Supply chain disruptions can also have a negative effect on stock prices. As Kumar (2009: 37) notes, "Supply chain disruptions have been found to impact negatively shareholder value by as much as 8-10% and are amplified in 'time sensitive' environments where early market introduction is critical to success." Furthermore, Hendricks & Singhal (2008) estimate that supply chain disruptions can cause a shareholder value decrease of as much as 10%.

Factors that Intensify the Effect of a Natural Disaster

On a good day, managing supply chains is challenging, but throw in a natural disaster and even the best laid plans can be upset. Furthermore, some of the practices of current supply chain managers actually intensify the effect of a natural disaster.

Consider the following:

Carrying smaller inventories. One of the main practices in contemporary supply chains is the application of JIT/Lean manufacturing principles. However, carrying lower inventories brings with it vulnerability. “Specifically, today's lean supply chains are becoming increasingly – ‘fragile’ – that is, less able to deal with shocks and disruptions that can have a significant, if not catastrophic, impact on the firm” (Zsidisin, Ragatz, & Melnyk, 2005: 46). Less inventory does lead to cost savings when operations are normal. However, because of a lack of buffers, a natural disaster can easily stop the production line quickly, which brings its own set of costs.

Single sourcing. Single sourcing is another common practice in contemporary supply chains. However, when the main vendor is hit with a crisis, the companies it supplies will be impacted as well. An interruption in the delivery schedule can cause production to grind to a standstill at affected factories.

Daily deliveries. Daily deliveries are used at many facilities that operate with lean operating systems. However, daily deliveries also imply there is little reserve stock in place. Even a minor weather event can cause a stoppage or delay in deliveries, which could lead to the shutdown of the production line in a lean system.

Automation. Another practice many companies strive for is automation in the manufacturing environment. Automation helps buffer the impact of wage increases among workers, especially when new contracts are negotiated in union environments. Automation also leads to a reduction in workplace accidents and injuries. However, as machinery and technology become more complex, the potential for equipment breakdown increases. When labor cannot be substituted for capital, breakdowns

become more serious as the production process will be highly dependent on the technology working correctly.

Hurricane Ike illustrated how a natural disaster impacted the highly automated oil refinery industry in the Gulf of Mexico. In 2008, the Gulf supplied about 20% of the nation's oil producing capacity (Lee & Thurman, 2008). When the storm hit in August 2008, refineries "shut in" operations to minimize physical damage to oil producing facilities. After the storm passed, production slowly resumed, but not fast enough to offset gas shortages in major cities such as Nashville, TN, Atlanta, GA, and Charlotte, NC.

Natural disasters are part of the supply chain manager's risk portfolio. With supply chains extending worldwide, it needs to be remembered that what goes on in one part of the world will affect operations in another part.

Questions for Research and Discussion

1. How can companies that follow JIT/lean management practices hedge against interruptions in their supply chains?
2. How has a natural disaster affected the supply chain where you work? What provisions did your company make to address the disaster?

Hot Topic References

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