Supply Chain Resilience

How Can You Transcend Vulnerability in Your Supply Chain to Gain Competitive Advantage?

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Resilience Reduces Risk

How can enterprises build supply chains that are resilient enough to withstand unexpected disruptions and help the organization to excel?

By Yossi Sheffi
To deliver products in the right quantity and at the right place and time in increasingly volatile markets, and subject to relentless cost pressures, companies have built complex supply chains that span the globe. These supply chains have enabled companies to access worldwide markets and adapt quickly to shifting demand—providing there are no serious breaks in operational performance. The problem is that the very complexity and global reach that are intrinsic to modern supply chain management; the low inventory level and lack of redundancies required to achieve efficient operations, expose companies to a wider range of unexpected disruptions. The challenge is to make supply chains robust enough not only to continue operating in this risky business environment, but also to turn this resilience into competitive advantage.

Supply chains can be disrupted in many ways. There are natural disasters such as hurricanes and earthquakes; there are accidents, and disasters perpetrated by humans such as terrorist attacks and sabotage. These dislocations are in addition to the “normal” ones that arise from the nature of global trade, such as labor disputes, border inspection delays and traffic congestion.

In cases of large disruptions, government overreaction which exacerbates the emergency adds to the disruption. For example, after the 9/11 terrorist attacks the United States government imposed restrictions on flights and the movement of goods at U.S. borders. These actions compounded the damage wrought by the attack itself. The intermittent plant closings by Chrysler in the weeks that followed and the 13 percent reduction in output at Ford Motor Company during the fourth quarter of 2001, were not the direct result of the terrorist attack. They resulted from the shutdown of the Canadian and Mexican borders for truck movements and subsequent delays because of tighter border security. The U.S. government’s reactions disrupted numerous just-in-time manufacturing systems that depended on reliable international shipping.

How can enterprises build supply chains that are resilient enough to withstand these incidents and help the organization to excel? First, (use a different word because there is no second number in the sequence) they need to define the objective. Resilience is a notion borrowed from the materials sciences, and represents the ability of a material to recover its original shape following a deformation. For companies, it measures their ability to, and speed at which they can, return to their normal performance level (production, services, fill rate, etc.) following a disruption.

Resilience can be achieved either through redundancy or through building flexibility into supply chains. The standard use of redundancy includes either underutilized capacity—which most companies can ill-afford, or the use of safety stock of material and finished goods. Such inventory can give a company time to plan its recovery following a disruption. Indeed, many companies have increased inventories when preparing for a disruption.

Extra inventory, however, is expensive to hold in particular when preparing for large, infrequent disruptions. And as demonstrated by “lean” and “six sigma” processes, it can also lead to sloppy operations that result in increased costs and reduced quality. By contrast, increasing supply chain flexibility can help a company not only withstand disruptions but also better respond to the day-to-day vagaries of the marketplace.

To build in flexibility for resilience, companies must involve many facets of supply chain design by:
- Developing the ability to move production among plants, use interchangeable and generic parts in many products, and cross-train employees.
- Using concurrent processes of product development, ramp up, and production/distribution.
- Designing products and processes for maximum postponement of as many operations and decisions as possible in the supply chain.
- Aligning their procurement strategy with their supplier relationships.

These principles create not only resilient supply chains that can recover from disruptions but also flexible supply chains that can respond to day-to-day demand changes. One begets the other, because a supply shortage and a demand spike are, at their core, a problem of supply/demand mismatch. Companies who have built their supply chains to respond to significant demand fluctuations have also built in the ability to respond to supply shortages.

How exactly do these supply chain principles increase resilience? Postponement and built-to-order operations allow for diversions of parts and semi-finished material from surplus areas and products to satisfy shortages elsewhere. Thus, with only a few days of committed orders, Dell was able to fare much better than Apple during the 1999 Taiwan earthquake, which disrupted the worldwide supply of memory and graphic chips. Hewlett-Packard (HP) sells printers all over Europe. HP often faced the problem of having, for instance, too many printers for the Danish market and not enough for Hungary. Using the concept of postponement (delaying the final configuration of a product until as late as possible in the supply chain when more accurate demand information is available) HP builds “vanilla” printers that include everything but the power supply, the wall plug, the decals, and the language of the instruction manuals. Once HP receives orders from particular countries, it adds that country’s particular power supply, plug and language materials through a clever access hole in the side of the box and sends it to the country. This creates resilience because it is much easier for HP to respond to supply/demand mismatches.

The use of a small number of commodity parts not only simplifies operations and concentrates the procurement outlays, it also creates flexibility to move the business among suppliers should one falter. When Intel’s Systems Group reduced its mix of 2,000 types of resistors, capacitors, and diodes to only 35 types, it not only simplified procurement and reduced costs but also increased Intel’s ability to respond to demand changes and supply disruptions.

Reducing time to market also means that the time to recover from disruptions is likely to be short. To this end, Lucent created a special Supply Chain Network organization in 2001. Cutting across the company’s engineering, procurement, manufacturing, distribution, and even sales divisions, the network increased the company’s agility.
The use of multiple suppliers with different characteristics allows HP to not only have redundancy but also builds in flexibility. HP's choice of supply plants for its printers division means that during ramp-up and end-of-life they can use their agile (yet more expensive) plant, but during the steady demand period of each printer, they can use the more efficient plant.

Supplier relationships are key to firm resilience. Indeed, unsound supplier relationships can pose a major threat in any business. British car company Land Rover learned this lesson in 2001 when it suddenly lost its sole source of chassis for its Discovery vehicle. Its key supplier went bankrupt, and the company eventually had to pay down some of the supplier's debts to restore supplies, suffering severe production delays in the process. The car manufacturer was unaware of the financial dealing that caused its critical supplier to bankruptcy. Such oversights are common. For example, last summer British Airways (BA) operations at Heathrow Airport in the UK ground to a halt when its ground workers staged a sympathy strike with the lay-off workers at its core supplier, Gate Gourmet. The airline was caught off guard by Gate Gourmet's actions and failed to anticipate the response of its own workers. The result was canceled flights, irate customers and negative publicity. Having a close relationship with Gate Gourmet may have alerted BA to their impending actions and their possible effect on BA's workers, giving it time to prepare and possibly stop the strike before it started. Yet Willie Walsh, the company's CEO who joined BA recently, said that the August strikes had "nothing to do with British Airways" and BA could not have seen it coming. On the other side of the Atlantic, General Motors is paying dearly for its flawed relationship with supplier Delphi Corp. The enterprise was spun off from GM in 1999, and with annual sales of $28 billion is a major supplier. Since it cut loose from its parent, Delphi has been unable to compete effectively with leaner, more efficient competitors, and recently filed for bankruptcy. GM was caught unprepared for the fall out from the failure of a key supplier.

Contrast this to the approach taken by auto company Toyota to its suppliers. The highly successful Japanese carmaker holds stock in many of its suppliers, and they reciprocate by holding Toyota shares. Respective companies are bound together by mutual interest and are committed to the long-term health of their businesses. For instance, one parts supplier, Aisin, part of the Japanese company Aisin Seiki Co. Ltd., customarily shares testing sites with Toyota to help the automaker cut costs.

A strong, stable supplier network greatly enhances market resilience, and companies can lay the foundation for such a network by forging the right links with suppliers. It is unrealistic, however, to expect such close relationships with all suppliers. Instead, companies should recognize that there are two basic types of supplier relationships and each has different demands. Core suppliers are the one on which the company chooses to depend not only for parts but also for innovation; these companies build parts whose characteristics the ultimate customers recognize. The dependency on these core suppliers requires a company to have a deep knowledge of each vendor not only because it is trying to draw on their innovation but also because the unexpected failure of one could be disastrous. Conversely, the preference may be for arms-length relationships which do not require such investment in supplier relations. In this case, the supplier network needs to include multiple suppliers so that the company can find an alternative source quickly should one of its vendors become problematic. Neither approach is right or wrong, the point is to commit to one and develop the appropriate strategy. Note, that this is not an "all-or-nothing" proposition. Dell, for example, has strong single-supplier relationships with its processors and boards vendor (Intel) and its operating systems vendor (Microsoft). By contrast, it has several vendors for components such as disk drives.

Although supplier relationships are integral to resiliency, the most important factor that clearly distinguishes between companies who bounce back from a disruption and those who do not is the corporate culture. Organizations like Nokia, Toyota, UPS, Schneider National, FedEx, Dell, and the U.S. Navy can be studied to understand the principles that make them flexible and resilient. While on the surface, companies such as Dell and the U.S. Navy may not seem to have much in common, a closer look shows these resilient companies share several common traits, especially within their corporate culture.

A flexibility culture is one where communication is pervasive and continues. At Dell, for example, executives receive production reports every two hours on their pagers, so that everybody is continuously aware of what is going on. Another characteristic of a flexibility culture is power distribution: giving even low-level employees the power to make decisions. For example, any employee on the Toyota assembly line has the power to stop the line if they notice a quality (or other) problem. Similarly, any sailor on the deck of a U.S. Navy carrier has the power (and the responsibility) to stop flight operations if they sense something wrong. At Spanish retailer Zara, young designers have the power to redesign and authorize manufacturing and replenishment of garments, based on information about which products are in the highest demand. This policy lets Zara respond to customer preferences in three weeks compared to Marks & Spencers' nine months.

Unfortunately, culture is difficult to define and even more difficult to change. But this is not an impossible task. The success of the quality movement in the 1980's and the safety campaign in the early part of the last century serve as strong examples of how corporate culture can change dramatically. Several corporate turn-around cases, like that of Continental Airlines under Gordon Bethune, also show the importance and the plausibility of changing corporate culture. Even the culture of populations can change as demonstrated by the anti-smoking and anti-drinking and driving campaigns in the U.S. These successful cases should serve as blueprints for companies striving towards resiliency, because the right culture means that the entire organization is deputized to serve as the eyes and ears of the corporate security and resiliency efforts, and can take the necessary actions to recover from any disruptions when the normal hierarchy is not operational.