KEEPING THE LINKS INTACT

World-shaking natural disasters point to the need for supply chain strategies designed to manage risk. By Merrill Douglas

When a massive earthquake and tsunami rocked northern Japan last March, they also rocked manufacturing businesses around the world.

In the U.S. and Europe, for example, automakers slowed or halted production due to lack of crucial parts produced in the quake-damaged region. In June, Sony announced a ten percent drop in first-quarter revenues, blaming it mainly on inadequate supplies of parts for LCD TVs. A shortage of toner cartridges from its supplier, Japanese electronics manufacturer Canon, hurt laser printer revenues at Hewlett-Packard (HP) in the third quarter of its fiscal year 2011.

In the aftermath of the Tohoku quake, many businesses took steps to make sure that a natural disaster would never again leave them scrambling for materials and parts. According to the Wall Street Journal, for example, HP’s supplier, Canon, seeking to protect its own end-user product lines, started to rethink its practice of single-source procurement.

Not only disasters, but other challenges as well, have spurred manufacturers in recent years to re-evaluate strategies for managing supply chains. Higher costs for labor, transportation, and key commodities are changing calculations about where to source and where to produce. Additional factors, such as volatile demand and the uncertain world economy, also complicate the picture.

RISKS AND TRADEOFFS

The risk of supply interruption is nothing new. “It came to the forefront recently because of the earthquake and tsunami, but it’s the same issue we’ve had for some time,” says L. Joseph Thomas, Anne and Elmer Lindseth Dean at Johnson and professor of operations management. Disasters stop the flow of goods, but so do more mundane events, such as delays in ocean shipping. When products travel long distances, that magnifies the uncertainty.

In managing supply chains, companies work toward several intertwined goals. They want to purchase, transport, and produce goods economically, and they want to keep inventories low. But they also want to fill customer orders promptly and bring new products to market quickly.

“For a long time, these things have not all been possible at once,” Thomas says. So companies make tradeoffs, considering variables such as labor costs, transportation costs, days in transit, the risk of a supply interruption, and the level of customer demand.

Complex ties among trading partners increase the chance of supply chain headaches. “You set up a global network, and a disruption in one node may have a substantial ripple effect all around,” says Jamie Hintlian Jr. ‘82, MEng ’85, MBA ’86, vice president, pharmaceuticals, at AspenTech, a provider of manufacturing and supply chain software in Burlington, Mass.

Supply chains are especially vulnerable today because they’re so long, says Vishal Gaur, Emerson Professor of Manufacturing Management and associate professor of operations management at Johnson. Managers might be able to see what’s happening only one or two links down the line. “I may know my suppliers, but I may not know who their suppliers are,” he says. “The earthquake and tsunami created many such surprises, where people didn’t even know that they were buying from that region.”

A natural disaster arrives with little warning. More predictable events with longer time lines create a different variety of risk. One major challenge is the rising cost of labor in the Chinese factories that produce so much of the world’s merchandise today. A related issue is
the high cost of fuel, which increases the price of transporting product from plants on one side of the world to markets on the other side.

Higher costs for commodities such as corn, soy, cotton, and steel also make life rough for manufacturers. So do the shaky economy and its effect on customer demand. Sudden drops in demand might leave a company holding too much inventory. Sudden spikes can leave it desperate for greater supply.

Bruce Stirling, MBA ’73, a supply chain consultant with the Cincinnati Consulting Consortium and former vice president, global purchasing, at Procter & Gamble (P&G), recalls when increasing demand for P&G’s hair care products coincided with a worldwide shortage of silicone, a key ingredient. P&G obtained its silicone from a single supplier, Stirling says. “We had to go to the vendor and say, ‘Yours is the only one that works in our product applications. How do we get more?’” To satisfy P&G’s demand, the vendor had to cut off supplies to some other customers, he says.

**REDUNDANCY, REDUNDANCY**

In the face of so much uncertainty, companies must map out solid contingency plans. One common strategy for controlling the contingency of supply interruption is to build in redundancy.

The process might start with product design, says Suresh Muthulingam, assistant professor of operations at Johnson. “If you have a modular design and one supplier goes down in Japan, because you understand your design you can identify another manufacturer who makes a similar component.”

Analyzing for supply risk isn’t easy. “If you make a complicated product, like an automobile, you get parts from everywhere, and you have perhaps thousands of items in the finished product,” Thomas observes. Still, a company must identify where the risks lie, define what would happen if supplies stopped flowing, and decide how to mitigate the danger.

Auxilium Pharmaceuticals in Malvern, Pa. performs exactly this kind of calculation on its products. “We look at the key items that we purchase, both the commodities and the specialized materials,” says Krista Hamilton, MBA ’94, Auxilium’s senior director, supply chain. “We do a risk evaluation and look at risk mitigation strategies, whether that’s carrying additional inventories or having multiple sources approved for use.”

Auxilium sources materials both for its own production and for use by contract manufacturers. Identifying alternative sources is a labor-intensive job that includes testing to make sure vendors’ products meet Auxilium’s requirements, Hamilton says.

Routinely buying a component from more than one vendor — rather than simply keeping a backup vendor in the wings — provides a hedge against possible shortages. “They’re making it on a regular schedule, and you know they have the capacity to increase the quantities they’re sending you,” Hamilton says.

Dual sourcing also sets up a healthy competition, says

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*Jamie Hintlian Jr. ’82, MEng ’85, MBA ’86, vice president, pharmaceuticals, AspenTech*
OUTSOURCING: A WORLD OF OPTIONS

With Chinese factory wages and global transportation costs on the rise, will fewer U.S. products sport a “Made in China” label in the future?

A study published by the Boston Consulting group (BCG) in September predicts that by 2015, U.S. manufacturers will no longer find it cheaper to make or procure products in China than at home. Rising wages in China, a stronger yuan, greater productivity in the U.S. and business incentives in certain states will make the U.S. a more attractive location for production, the study says.

In the future, companies might start sourcing in Vietnam, India, or other Asian markets where labor is still inexpensive for simple commodities such as textiles, says Bruce Stirling, MBA ’73, supply chain consultant with the Cincinnati Consulting Consortium and former vice president, global purchasing, at Procter & Gamble. But for products that require more sophisticated manufacturing processes, and for products that rely heavily on automation rather than labor, it’s a different story. “People are looking at bringing those things in this direction.” That could mean manufacturing in Mexico or Canada as well as in the U.S., he says.

Of course, many companies have not embraced the philosophy of “backshoring” — bringing production back to a company’s home turf — or “nearshoring” — bringing production to nearby countries where wages are lower than at home. The cost differential between manufacturing in lower-wage countries and in the U.S. is still too great to prompt such a move, says Ray Ernenwein ’90, MBA ’96, director of supply chain strategy at Hewlett-Packard. “U.S. corporate tax rates relative to other countries also discourage us from altering our current supply chain configuration.”

Moving production to Mexico to take advantage of that country’s lower wages while reducing transportation costs might not save a U.S. company as much money as expected, says Suresh Muthulingam, assistant professor of operations at Johnson. Those savings might be offset by the cost of importing raw materials or components to Mexican factories from overseas.

Of course, not all U.S.-based firms have embraced the philosophy of “manufacture elsewhere to sell here.”

For example, at Illinois Tool Works (ITW), a global producer of everything from auto components to power systems to cooking equipment, the guiding principle is to make products close to the customers who need them. “If you’re in Mexico, we’re in Mexico. If you’re in China, we’re in China,” says Roland Martel, MBA ’82, executive vice president at ITW in Glenview, Ill.

“Producing in Asia for Asia, producing in North America for North America, producing in Europe for Europe is a prudent thing to do,” agrees Walter Galvin, MBA ’73, vice chairman at Emerson in St. Louis, another highly-diversified global manufacturer. Emerson does ship products from one region of the world to another, but by no means does the flow run entirely from lower-wage nations to more developed markets. “We export a lot from the U.S. to China,” he says. The U.S. might suffer a trade deficit, but Emerson’s U.S. operations definitely do not. “Our U.S. subsidiaries export more to our subsidiaries outside the U.S. than our international subsidiaries export back to the U.S.”

Hintlian. “It keeps both suppliers honest in terms of the quality, pricing, and delivery performance.”

Besides sourcing from multiple suppliers, a company might avert interruptions by insisting that a single vendor produce a crucial product at more than one location. That’s what global manufacturer, Emerson, did when a supplier review determined that one of its contract manufacturers was standing in a flood plain.

“We had the supplier move 50 percent of our sourcing from that location to another one of their locations,” says Walter Galvin, MBA ’73, vice chairman of St. Louis-based Emerson. “We also had components that were critical stored at another location.” If a flood halted work at the first plant, assembly could continue at the second, and the contractor could still get the parts it needed to do the work.

Contingency strategies might also hinge on collaboration, says Gaur. He cites a case in 1997 when a fire shut a plant in Japan that produced a crucial part for Toyota. Since Toyota had only a couple of days’ worth of inventory in stock, the supplier’s disaster also halted the automaker’s production.

Toyota quickly assembled a team that included representatives of its various suppliers, Gaur says. The group developed a plan to
bring the Toyota plant back on line. “Meanwhile, they figured out whether the component could be manufactured by some of the other suppliers temporarily. They worked collectively and solved the problem very quickly.”

**MANAGING COSTS AND VOLATILITY**

Longer-term challenges, such as higher costs and volatile demand, require different mitigation strategies. The challenge of rising wages in China, for example, has prompted some manufacturers to switch production to lower-cost countries.

But for certain industries that move won’t work, says Muthulingam. A classic example is the global toy industry, which still does 70 to 80 percent of its manufacturing in China, in spite of the uproar and scrambling to get tighter reins on quality control following the lead paint fiasco several years ago.

“All the skills related to the manufacture of toys are concentrated in China,” Muthulingam says. “Even if you want to go to another place — let’s say Africa — people there probably don’t have the necessary skills.”

Higher fuel prices, combined with production costs in China, have spurred some U.S. manufacturers to bring production back home or to nearby countries such as Mexico (see sidebar). Companies may also redouble their efforts to manage transportation costs.

“We look to maximize economical modes of transportation, such as ocean vessels and trains, versus air freight and trucks,” says Ray Ernenwein ’90, MBA ’96, HP’s director of supply chain strategy.

For savings on fuel and raw materials, a company might turn to the futures markets. For instance, back when Emerson operated its own trucking fleet, the company hedged its costs by purchasing financial instruments based on the price of fuel, Galvin says. Emerson also uses the commodities markets to lock in prices on copper and other materials, he says.

Some customers want Emerson to use hedging to keep the prices of its finished products steady. Others, preferring to accept both the risks of high costs and...
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— Krista Hamilton, MBA ’94, senior director, supply chain at Auxilium

the rewards of low ones, ask for pricing with built-in material cost escalators. “It all has to be worked through the communication of what the customer wants,” Galvin says.

Enterprise-wide sourcing also may help a company manage commodities prices. At the diversified manufacturing corporation, Illinois Tool Works (ITW), each of the many business units sources most of its materials independently. But ITW is considering how to use its strategic sourcing organization to give the businesses greater negotiating clout when buying widely used commodities such as steel and plastic resin, says Roland Martel, MBA ’82, executive vice president at the Glenview, Ill. firm.

The strategic sourcing group doesn’t tell the business units which suppliers to use, Martel says. Rather, ITW uses the group as an information clearinghouse. “And they have the ability to pull together representatives from these various ITW businesses, letting them sit as a group with steel suppliers in order to get better pricing.”

Pharmaceutical companies looking to control the cost of ingredients and packaging are applying lessons they learned in earlier initiatives to control indirect spending — the purchase of office supplies, lab supplies, and other non-manufacturing items, says Hinlian. Such initiatives have yielded new practices and tools for procurement, approval, and other activities, he says. “That has carried over to the direct side of the business — relationships with chemical and ingredient suppliers, equipment suppliers, packaging component suppliers — where there is shared accountability for cost and quality, for example.”

As for volatile customer demand, one coping strategy is to make the same product in more than one country. A facility that serves a local market can double as a backup for sister facilities, ramping up production and exporting to other markets if demand abroad should suddenly surge.

**QUEST FOR THE HOLY GRAIL**

Ultimately, information technology might provide the key that companies need to match their sourcing and production to demand, says Stirling. Companies want systems that track each end-user purchase and automatically place replenishment orders for materials and packaging, exactly as needed.

Although supply chain software is growing increasingly sophisticated, that particular solution remains elusive. “I don’t know anybody who really does it,” Stirling says. But manufacturers are pushing in that direction.

“The overall objective is getting to this Holy Grail, which is ‘produce to demand’ and ‘replenish to demand,’” Stirling says. “And to build flexibility into the system so you can replenish quickly, from the consumer all the way to the oil well or the agricultural product.”

Flexibility, redundancy, integration, diversification — what these strategies have in common is the need to make substantial investments in the management of supply chain risk. “Preserving a couple of pennies sometimes is not as good for the longer-term cycle,” says Galvin. “You need to preserve your company.”

Freelance writer Merrill Douglas covers supply chain issues as a contributing editor for *Inbound Logistics* magazine.