
Ward Iyer

New Technologies Help Identify and Mitigate Risks

In 1995 an earthquake in Kobe, Japan led to the closures of Japan's two largest ports—resulting in more than $100 billion in damages to supply chains worldwide. More recently, a blue laser diode shortage caused Sony to slash projections for the PlayStation®3 launch in late 2006 by 2 million units. And just this summer, Mattel, the world's largest toy maker, announced three major recalls of Chinese-made toys in little more than a month because of excessive amounts of lead paint.

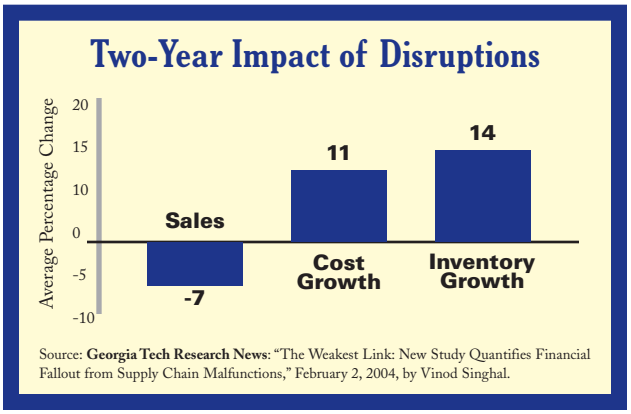
Supply chain challenges and disruptions such as these may negatively impact average operating income and return on sales by more than 100 percent for two years or more after an incident occurs. (Georgia Tech Research News, February 2, 2004, article by Vinod Singhal and Kevin Hendricks.) Perhaps that's why AMR Research finds that "Nearly 50 percent of companies intend to evaluate or deploy new technology for supply chain risk management in the next year or two." (AMR Research: "Managing Risk in the Supply Chain—A Quantitative Study," by Mark Hillman and Heather Keltz, January 3, 2007.)

All risks are not equal. They must be categorized on the basis of the severity of the impact of the risk, and the likelihood of occurrence.

To proactively evaluate and manage the risk in their supply chains, companies can employ something we call RACE: risk analysis and continuous evolution. This methodology can help companies evaluate and manage both customer demand and supply-risk factors, along with the potential impacts on company profitability and market share.

Sources of risk

Demand risk can come in the form of changing or misunderstood customer preferences, technology or competitive changes, natural phenomena or geopolitical influences. Risk related to customer preference involves unexpected changes in types of product attributes customers desire. It can also come from incorrectly anticipating the demand for a certain product. For example, a consumer electronics company recently introduced a new product targeting the surge in the MP3 player market. Its first product was very successful, with demand exceeding expectations. In response, the marketing and research teams quickly rolled out a similar model based on gut-level projections. But on this second product, they missed the mark and ended up with a warehouse-yard full of unsold inventory that had to be liquidated at a loss.



Source: **Georgia Tech Research News**: "The Weakest Link: New Study Quantifies Financial Fallout from Supply Chain Malfunctions," February 2, 2004, by Vinod Singhal.

Demand risk also results from competitive pressures, weather-related events and macro-economic factors. With shortening product life cycles and rapid innovation in technology, companies sometimes find a product is not competitive in price and features, even at the time of initial launch. This can result in write-offs or negative profit margins and no appreciable increase in market share.

Natural phenomena can also affect demand for certain products by region either positively or negatively. In the fashion-apparel industry, early spring or late winter inclement weather—even if only in certain regions—can wreak havoc on demand forecasts. This leads to excess inventory and mark-downs in areas where demand is unexpectedly low, while other product lines or regions with high demand may experience product shortages, resulting in lost sales.

Geopolitical influences in the global marketplace also have unexpected consequences on product demand. For example, recently, the political policies of Hugo Chavez in Venezuela had an indirect impact on the demand for domestic beer in the United States. While this might seem preposterous, a recent survey by Morgan Stanley indicated that rising gas prices have contributed to a decline in the growth of beer consumption in the United

RISK **CONTINUED** on Next Page . . .

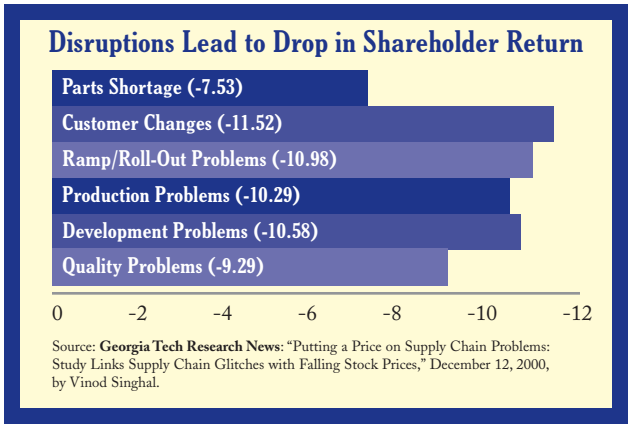
States as consumers use their beer money to keep gas in their cars! (Morgan Stanley Research North America report, May 13, 2007.)

In addition to managing and mitigating for demand risk, companies must carefully consider factors that could potentially disrupt or constrain production, logistics or the procurement of raw materials. Supply disruptions may be the result of natural disasters, strikes, terrorism, mechanical failures, research and development delays or unexpected logistics challenges, such as customs-clearance delays.

As more supply chains stretch across the globe, the complexities increase and require additional buffers of inventory and time to offset the potential impact of unexpected disruptions. Consider the difference in complexity between a one-day domestic truckload delivery from a plant in the United States to a domestic customer and an international delivery to the United States from China that may take three weeks—crossing two international borders and traveling on three or more modes of transport. All of these factors can add considerable expense and require a careful cost-versus-benefit analysis for each risk-mitigation strategy. (See article on "Total Landed Cost" in the Spring 2007 issue of this magazine.)

Phases of risk management

Even the best-managed companies can be overwhelmed by the prospect of rationally and proactively balancing the potential negative effects of risk factors against the cost and benefits of implementing risk-mitigation strategies. In fact, it quickly becomes clear that managing risk could contradict other strategic initiatives, such as reducing inventories and cutting costs. Therefore, effective risk management requires a careful consideration of the appropriate balance among customer service levels, cost and working capital within an acceptable risk tolerance.



Source: **Georgia Tech Research News**: "Putting a Price on Supply Chain Problems: Study Links Supply Chain Glitches with Falling Stock Prices," December 12, 2000, by Vinod Singhal.

In addition, all risks are not equal. They must be identified and categorized along a scale on the basis of the severity of the impact of the risk, and the likelihood of occurrence. Obviously, risks with high severity that are most likely to occur should be the first priority.

These are complicated scenarios requiring substantial computing power and sophisticated analysis capabilities. All risk-analysis approaches have two phases, even though the specific techniques used in each of the phases vary widely. The first phase of risk analysis is risk identification and consists of determining the sources of risk, the dependencies among them and the likelihood of occurrence. For example, the loss of a supply source in one location may cause a shortage of transportation capacity in a different area, where an alternate supply source is available.

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The second phase is response analysis and involves determining potential options to hedge against the risk while assessing the impact in terms of both cost and benefit.

Risk identification. The first phase of risk identification often involves variants of the Delphi method of predictive analysis. Developed by the Rand Corporation during the Cold War to predict the impact of technology on warfare, the Delphi method is a facilitated brainstorming or information-gathering process. It involves experts who participate anonymously in iterative sessions by providing predictions with supporting logic. The results from each session are reconsidered by the experts until the process converges on a relative consensus.

Next, probabilities are associated with risk factors through a wide variety of techniques. For example, historical data may provide estimates of variability in forecasts or lead times. Analysts may also use sophisticated regression models to determine errors in long-range growth forecasts. Similarly, such analysis enables planners to estimate the probability of rare events. The process results in a good understanding of potential risk factors and their probability of occurrence.

Response analysis. Once risks are identified, the response-analysis phase focuses on estimating the impact of risk factors across the supply chain. This exercise is challenging because the relationships between risk factors are not static. In other words, one decision or risk factor may impact other risk factors. In practice, techniques for analyzing risk-decision clusters fall into two families—prescriptive decision models and descriptive simulation models.

Prescriptive decision models, which include many supply chain optimization tools, are designed to prescribe an answer for a given set of inputs. The models used in software solutions are further divided into two categories: deterministic and probabilistic. Both deterministic and probabilistic models provide insight into the interaction

between risk factors and supply chain control variables by systematically analyzing different scenarios.

However, while deterministic models use a single number for each variable under consideration, the more sophisticated probabilistic models use statistical probability curves for variables such as demand patterns or the likelihood of a supply disruption. Because of the increased complexity in these probabilistic models, they tend to be limited in scope.

Descriptive models can simulate the operation of the supply chain and generate statistics as a series of simulated inputs that are provided to the model. These statistics are then analyzed to facilitate decision-making. It takes a combination of sophisticated tools and techniques to effectively determine the appropriate response to supply chain risk factors.

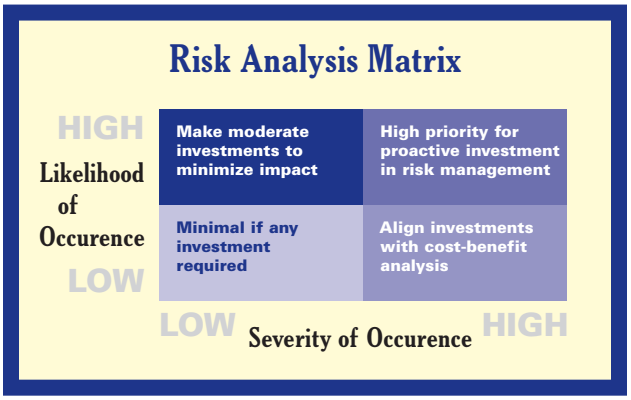
Steps to mitigate risks. Once risk factors are properly identified, analyzed and prioritized based on severity and likelihood, companies can take steps to proactively manage the risks in one or more of the following ways:

- Redesign the network strategy to take into consideration geopolitical factors in addition to cost and service factors
- Redesign supply chain or sales and operations planning (S&OP) processes
- Improve strategic sourcing and contract management
- Establish analytically supported demand forecasting and new product introduction processes
- Implement multi-echelon inventory optimization (while considering random risk factors)
- Utilize supply chain scenario planning and management
- Monitor and manage global logistics
- Transfer risk by using insurance

A case in point

One example of real-world proactive risk management is at ON Semiconductor, a global supplier to multiple electronics markets, including the fast-paced fashion industry for cell phones (see article by Ravi Vancheeswaran, ON Semiconductor's supply chain director of strategy and continuous improvement, page 36). ON Semiconductor has continuously improved its supply chain to increase market competitiveness. The company proactively manages risk through a combination of sales and operations planning (S&OP) disciplines and inventory optimization, leveraging best-of-breed supply chain planning solutions from i2 to include supply chain scenario planning.

As ON Semiconductor has discovered, a one-time risk management analysis is not enough; continuous evolution is required. An effective long-term strategy to manage supply chain risk requires an organization to be agile and responsive. Therefore, competitive companies



today must implement world-class processes and supply chain solutions that provide the ability to continuously adapt and improve across the dimensions of organizational structure, process, technology and strategy.

The technology challenge

For many companies, the most significant constraint to agility and flexibility has been information technology. Traditionally, systems to support business operations—including supply chain management—have imposed operational workflows and processes that required the business to adapt to the technology. However, when companies evolve through acquisitions, divestitures and even organic growth, they are forced to deal with multiple systems supporting different processes and technology paradigms. Proactively managing supply chain risk factors further exacerbates this challenge. As a result, a company's ability to evolve is often restricted by its technology infrastructure.

While not a panacea, new-generation supply chain solutions based on a service-oriented architecture (SOA), such as the i2 Agile Business Process Platform, can address this problem. SOA-based solutions enable a company to rapidly develop and evolve business-oriented solutions and workflows that leverage and complement existing technology investments, rather than requiring them to be replaced.

A related and complementary capability is Master Data Management, which enables the business to effectively and efficiently manage all of the data that drive a supply chain. In short, SOA and MDM capabilities are critical for supply chain solutions that can adapt to evolving business requirements in preparation for and in response to critical supply chain risk factors.

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