

From the pages of Supply Chain Management Review

18 Ways to Guard Against Disruption

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As companies increasingly adopt global sourcing and supply chain management practices, they are discovering both opportunities and challenges. On the one hand, global sourcing is lowering purchase prices and expanding market access. On the other hand, operating a global distribution channel increases the level of supply chain risk—there's an increase both in the potential for product and service flow disruptions and in the magnitude of those disruptions.

Top executives must now manage supply chain risks, just as aggressively as they manage other risks that affect business performance. In fact, a recent survey by insurance company FM Global and market research firm Harris Interactive found that 69 percent of chief financial officers, treasurers, and risk managers at Global 1000 companies in North America and Europe considered property-related hazards and supply chain disruptions as major threats to top revenue sources.¹ Recent studies also have shown that supply chain disruptions can be very costly and have the same magnitude as other types of corporate crises.^{2,3}

Managing supply chain risks is challenging because disruptions can occur for a wide variety of reasons such as industrial plant fires, transportation delays, work slowdowns or stoppages, or natural disasters. Yet, companies running lean operations no longer have the inventory or excess capacity to make up for production losses caused by such disruptions. As a result, material-flow problems can rapidly escalate to wide-scale network disruptions. Customers, however, don't care why or where the disruption occurred; they still expect the final product or service to be delivered at the right time and price. To maintain customer satisfaction, it falls on operations to handle these disruptions in real time.

To better understand supply chain risk management, General Motors challenged the North Carolina State Supply Chain Resource Consortium (SCRC) to assess the current state of supply chain risk management capabilities across multiple industries.⁴ In particular, the SCRC sought to identify best practices that companies are using to assure uninterrupted global material availability in a lean operating environment. The SCRC conducted interviews with key executives in multiple industries, hosted focus-group discussions, and participated in meetings with executives. These efforts led to the discovery of key themes and common best practices.

Some of the companies interviewed performed post-event root-cause analyses of several major disruptions and identified preventative measures that go beyond simple disaster-recovery planning or crisis response. Moreover, the actions and lessons learned from these interviews reveal that best-in-class companies are proactively seeking to build responsive and resilient supply chains that can withstand the impact of major disruptions and catastrophes—

without affecting the end customer and without incurring excessive recovery costs. It is interesting to note that other research organizations have recently published similar findings on how companies are actively applying supply risk management techniques to improve operational resiliency and responsiveness.^{5,6} Many of these techniques require advanced planning, investment, and resources—but the additional time and investment is ultimately worth it. In the dynamic global supply chain environment, the company with the most resilient and responsive supply chain will have a sustainable competitive advantage over other firms.

Four Risk Management Functions

Based on our interviews, we developed a list of 18 best practices that companies can explore to enhance supply chain operational resiliency and risk management. (See sidebar on page 49 for a list of those best practices.) These 18 practices are based on initiatives that the companies currently have in place or are working toward. However, no single company, according to our research, has realized all of the capabilities.

We classified the best practices by matching them up with the organizational functions that would typically implement or own that risk management capability. Exhibit 1 shows the four key organizational areas that already have some supply chain risk management capabilities and responsibilities: strategic sourcing and advanced procurement, supply-base management, supply chain operations management, and enterprise risk management/strategic supply chain design. Note that the matrix in Exhibit 1 divides risk management responsibility by internal or external operations on the horizontal axis and by current or future business on the vertical axis.

While these organizational areas often already have risk management processes in place, companies now need to explicitly recognize supply chain risk management as a core competency for these four groups. At the same time, it is important to note that these risk management responsibilities are interdependent, and there must be regular cross-functional, multidirectional information sharing and feedback. For example, if the real-time supply-base management group observes a type of risk event repeatedly disrupting material flow at suppliers located in a particular country, it can feed that information back to the appropriate strategic-sourcing group. Strategic sourcing will then make sure that the risk event is explicitly considered in future sourcing decisions. Similarly, the enterprise risk management/strategic supply chain design group can pass information to the real-time supply chain operations group. Such information may include, for example, material-flow hedging strategies or contingency plans that suggest the most effective response to port disruptions. In addition, the two strategic future-business groups and the two current-business operations groups must interact to coordinate risk management decisions and actions. The strategic level should handle proactive risk management, while the operational level should be responsible for reactive risk management.

Discussed below are the 18 best practices for supply chain risk management, which are assigned to the four key functional groups shown in Exhibit 1.

The Eighteen Best Practices

Strategic sourcing and advanced procurement primarily involve developing supply-market intelligence and sourcing strategies, negotiating with core suppliers, and finalizing contracts for material or service supply. Here are some of the key best practices in this space:

1. Screen and regularly monitor current and potential suppliers for possible supply chain risks. This screening can be done through self-assessment templates or internally developed risk-scoring techniques. These assessments can include risk metrics on quality, financial condition of the supplier, technology leadership, price competitiveness, location risk exposure, and shipping-mode and -route exposure. Through this analysis, companies can identify high-likelihood/high-severity potential disruptors for use in the request for quote (RFQ) evaluation process. Note that the ongoing monitoring of current and potential suppliers necessitates maintaining a database of suppliers and tracking assessment results or risk scores over time. One company in the heavy-equipment manufacturing industry that we studied uses a dynamic portfolio-monitoring approach to assess supplier risk. Each month, the company updates the key factors that give a measure of "risk/unreliability" for each supplier. Using a weighted scoring system, the company then calculates a risk score for each supplier. Over time, the risk-tracking score for a supplier may show a positive, negative, or steady trend in performance. This simple type of risk scoring has produced promising results, and the company reported that the scores seem to be a timely indicator of potential supplier failure.

2. Require critical suppliers to produce a detailed disruption-awareness plan and/or business-continuity plan. A disruption-awareness plan would describe the supplier's internal efforts to promote employee awareness of the potential for supply chain disruptions. A key part of the plan would be identifying risk management capabilities that can be executed if disruptions occur in the supplier's own supply base network.

Additionally, companies should require suppliers of critical products and services to present a business-continuity plan as part of the bid process. A business-continuity plan is typically meant to restore business operations after an emergency or disaster that causes the loss of a key facility. Several of the companies surveyed have begun initiatives for reviewing business-continuity plans as part of the supplier-selection process. Yet at the same time, they also acknowledged that maintaining such plans requires cross-functional coordination, which can be challenging.

The strategic-sourcing group can work with the chosen supplier(s) to improve those business-continuity plans, disruption-awareness campaigns, and supply chain risk management capabilities if necessary as part of the bid-acceptance contracting process.

3. Include the expected costs of disruptions and operational problem resolution in the sourcing total-cost equation. Many of the companies that we studied are beginning to track the costs of recovering from supply chain disruptions. But, these costs are not yet being communicated back to sourcing managers as input for the strategic-sourcing decision process. Several companies, however, are planning to incorporate disruption management and prevention costs into future sourcing decisions. Many companies feel that when the costs of disruption and prevention are incorporated into total-cost measures, many of their global sourcing decisions may not be as attractive as once thought. A few companies have begun tracking total sourcing cost over the lifecycle of a contract and are explicitly including cost of disruptions by tracking events and logging time, people, and money spent to manage events. Other companies have used simple "back of the envelope" calculations to begin measuring the impact of the disruption as the lost opportunity cost of not producing final units for sale.

EXHIBIT 3

Organizational Functions With Supply Chain Risk Management Responsibilities



4. *Require suppliers to be prepared to provide timely information and visibility of material flows that can be electronically shared with your organization.* Most of the companies had some level of visibility with their suppliers. Several mentioned that during a major disruption, they had suppliers fax or e-mail them the latest estimates of inventory on-hand. Yet all of the companies indicated they needed more visibility, particularly in real time. Most of the reported visibility was limited to post-event rather than pre-event.

Supply-base management deals with the ongoing day-to-day interactions with existing suppliers as well as the transport of material from these sources to domestic warehouses and points of use. Best practices include:

5. *Conduct frequent teleconferences with critical suppliers to identify issues that may disrupt daily operations and discuss tactics to minimize these issues.* A pharmaceutical company that we interviewed applied this practice quite effectively. The company divided its suppliers into regions and held weekly teleconferences with them to discuss risks and events that may affect product flows. The company clearly expected that critical issues would be discussed each week; it would not accept an attitude of "nothing new to report." These teleconferences were a useful learning experience and provided the company and its suppliers with valuable insights by enhancing awareness and supply chain event knowledge. The first best practice in the previous section (screening and monitoring suppliers) can provide both input into the teleconferences and a method for tracking the tactics implemented.

6. *Seek security enhancements that comply with the Customs-Trade Partnership Against Terrorism (C-TPAT), Container Security Initiative (CSI), and similar initiatives.* This was a clear agenda item for most of the companies, with several making great strides here. A large retailer, for example, indicated that it had moved toward using only C-TPAT-compliant logistics providers. Some companies in the consumer-electronics and semiconductor industries have reported major cost savings from reducing product theft after implementing supply chain security programs.

7. *Test and implement technologies to track containers.* Using such technology should enhance global inventory visibility. Not surprisingly, companies in military-related industries as well as in the retail arena are seeing a strong push toward radio-frequency identification (RFID) adoption. Although there are issues that still need to be resolved relative to RFID, it appears that the technology will be a valuable tool for enhancing supply chain visibility.

8. *Conduct a detailed incident report and analysis following a major disruption.*

These reports should apply root-cause analysis and/or Failure Mode and Effects Analysis (FMEA) to learn from and prevent recurrence of the event. The nuclear power industry and defense sector frequently use FMEA to learn from undesirable events, including "near-miss events." Notably, the cost of failure is quite high in terms of human life in these two industries.

9. Create exception-detection/early-warning systems to discover critical logistics events that exceed normal planning parameters. These systems can trigger managerial action to mitigate the impact of the disruption. One of the companies interviewed has a transportation system that tracks shipments through its supply chain. The company established an allowable delivery time, based on the mode of transportation, around the due date at various points in the supply chain. When a shipment exceeds the allowable time window, an automated exception report is created and an immediate investigation/action is initiated.

10. Gather supply chain intelligence and monitor critical supply-base locations. Collecting and developing real-time supply chain intelligence enables operations groups to take real-time sense-and-response actions against material-flow disruptions. A few companies have begun utilizing an *ad hoc* intelligence network of supply chain personnel to monitor global events on a daily basis, scanning news sources and Web sites for disruptions in ports, canals, and border crossings. Some also are monitoring for natural disasters affecting a region where suppliers are located. The real-time aspect of these practices poses the greatest challenge. At this time, few automated knowledge-management systems are capable of providing text summarization, information extraction, and risk-assessment decision support fast enough to enable critical maneuvering decisions. Additionally, most companies do not have a formally organized supply chain intelligence group (that is, specially trained supply chain intelligence analysts) focused on developing and analyzing such information.

Real-time operations management includes all processes from the point of delivery by the supplier. It also involves managing the inventory buffers held at warehouses, manufacturing locations, and distribution centers. Notice that we have deliberately separated internal operations management from external supply-base management to differentiate risks that are internally and externally facing. Options for improving resiliency through real-time operations management include:

11. Improve visibility of inventory buffers in domestic distribution channels at the part level. Some of the companies in the study chose to monitor inventory levels in-house, whereas others outsourced this activity to logistics providers at key distribution centers. In either case, the increased visibility assists with real-time contingency planning and risk mitigation. A key component in the contingency planning is to have in place a rationing process for when a disruption results in lower than expected levels of inventory.

12. Classify buffered material by its level of criticality. This process will help companies ensure appropriate inventory positioning (safety stock) to mitigate the risk of disruptions. For example, the military classifies inventory based on its importance to defend a nation. Many companies in other sectors have expressed a need for a similar strategy for inventory placement to improve supply chain performance. Perhaps companies could adopt an "ABC inventory strategy"—similar to the ABC costing strategy used in procurement—to determine appropriate inventory levels based on criticality of supply.

13. Train key employees and groups to improve real-time decision-making capabilities. One message came through loud and clear in the interviews: "The most important enabler of an effective disruption management system is

people!" Key personnel need to be trained and knowledgeable about disruption management. Managers and associates need to be equipped with plans and processes for handling disruptions when they occur. To accomplish this, companies need to promote a culture of disruption awareness.

14. *Develop decision-support tools that enable the company to reconfigure the supply chain in real time.* Decision-support tools and supply chain network flow systems models can help analysts rapidly assess the costs vs. benefits of different network-recovery options. By having better information available and being able to rapidly assess options, operations staff lose little time moving from planning to execution following a supply chain disruption. Many companies interviewed spoke about the need to quickly reconfigure their supply chain in response to a disruption, but none actually had this capability in place. As one of the logistics providers said, "[supply chain professionals] are fairly good at supply chain design, but when something goes wrong, we need more tools and knowledge on how to redesign in near-real time." Note that such decision-support systems could be developed to automatically evaluate some standard redesign or recovery options, once a disruption is identified. For example, some options often used in response to a disruption include switching transportation modes, using alternate routing, or shifting material-production demand to a prequalified alternate supplier.

Enterprise risk management/strategic supply chain design includes handling systemwide issues pertaining to disruptions, including systemwide supply chain redesign issues. Best practices include:

15. *Develop predictive analysis systems that incorporate intelligent search agents and dynamic risk indices.* Dynamic risk indices and intelligent agents can be employed on top of supply chain network flow systems models to monitor risk "hot spots" in the network. A dynamic risk index for a network node is similar in nature to a supplier risk score (discussed previously in best practice 1), but it is intended to assess overall risk for a specific location or transportation link. The risk score can combine subjective and objective risk information using a weighted scoring technique. Possible factors could include political risk, economic risk, labor conditions, and transportation congestion. Companies can then use intelligent agents to acquire breaking news automatically and monitor media Web sites for information related to potential problems at high-risk locations. However, because dynamic risk indices and intelligent agents are only now being developed, these types of predictive risk-monitoring systems currently fall into the "wish list" category.

16. *Construct damage-control plans for likely disruption scenarios.* Damage-control plans can be created by modeling possible supply chain disruptions and using scenario-envisioning tools. Again the military provides the best-in-class examples of this technique in action. But there are also examples from the commercial world. One retail company discussed implementing war-room scenarios to test supply chain resilience to disruptions, and a heavy-equipment parts supplier talked about using a "playbook" of damage-control plans when certain disruption scenarios occurred.

17. *Understand the cost trade-offs for different risk-mitigation strategies.* Supply chain redesign tools and models can be used to show the cost trade-offs involved in increasing inventory, using premium freight, or following a strategy like parts substitutability or manufacturing-process flexibility. A challenge here is that, in many companies, the responsibility for dealing with supply chain risks is spread across multiple business units. These organizations still operate in functional silos where, for example, purchasing may focus on lowest part cost and logistics may focus on lowest transportation cost, but no one is analyzing the cost trade-offs and total-cost model. Thus, effectively modeling cost trade-offs will require a cross-functional strategy.

18. Enhance systemwide visibility and supply chain intelligence by using improved near-real-time databases. These databases will collect daily or hourly snapshots of demand, inventory, and capacity levels at key nodes in the supply chain, including ports and shipping locations. This increased information flow to operations staff enables more flexibility in planning a response to a supply chain disruption and allows the staff to adjust the response as operating conditions change.

Deciding How to Prioritize

None of the companies interviewed has put in place all of these supply chain risk management best practices. But there is definitely a new awareness of the need to develop better risk management capabilities and responsibilities. A good place for companies to start is with the list of 18 best practices presented here. Some of these actions can be taken with a minimal level of investment and should yield immediate benefits. In fact, companies can achieve some of the capabilities through only minor enhancements to existing internal business processes. Other elements on the list, such as creating supply chain visibility systems, will require significant investment. Additional effort and business-case justification will be needed to deploy these elements.

Companies may not need to implement all 18 of the best practices to improve supply chain risk management capabilities. A few well-placed supply chain risk management activities can produce significant improvements in overall disruption management. At a minimum, they need to develop a focused, long-term plan for building supply chain resiliency and responsiveness. The plan should identify the short-term actions that can be deployed with a minimum of investment and establish a roadmap for deploying intensive project-team resources, business intelligence systems, and improved supply chain infrastructure.

Companies may want to use the best-practices list as a thought-starter to help them prioritize which supply chain risk management elements to adopt. For example, companies could develop an internal survey, based on the best-practice list, which would assess their supply chain risk management capabilities. For example, for each of the best practices, the survey participants (company employees) would rate the company's risk management capabilities on a five-point scale, like the one defined in Exhibit 2. Survey data would then be analyzed to identify strengths and weaknesses as perceived by the survey participants. The priority list for short-term and longer-term actions would then be developed based on the company's own assessment of its supply chain risk management capabilities.

As many of the companies interviewed for this article recognize, adopting supply chain risk management practices can yield continuous improvement of supply chain operations. Further, by examining risk in the supply chain, staff members gain a better understanding of supply chain structure and interdependencies. In spite of these benefits, justifying resource allocation for supply chain risk management and contingency planning may prove challenging, especially if risks seem unlikely to occur. The supply chain executives that we interviewed, however, agreed that every company will eventually have to respond to supply chain disruptions—they recognize that "dealing with a disruption is not a matter of if but when." In the end, therefore, the cost is worth it. One executive summed up this sentiment by comparing investing in supply chain risk management to buying insurance: "It's sure nice to have insurance when you have to use it, and insurance premiums are a minor expense you have to pay to gain peace of mind."

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EXHIBIT 2

Five-Point Assessment Scale

Subjective Rating	Points Assigned
We do not perform this activity	0
We perform this activity, yet significantly below the needed level	1
We perform this activity, yet below the needed level	2
We perform this activity, yet slightly below the needed level	3
We perform this activity at the needed level	4

Footnotes

¹M. Green, "Survey: Executives Rank Fire, Disruptions Top Threats," *Best's Review*, Sept. 1, 2004

²K. Hendricks and V Singhal, "The Effect of Supply Chain Glitches on Shareholder Wealth," *Journal of Operations Management*, vol. 21: pp. 501–522.

³R. Knight and D. Pretty, *The Impact of Catastrophes on Shareholder Value*, The Oxford Executive Research Briefings Series (Oxford, England: The University of Oxford, 1996), p. 22.

⁴The Supply Chain Resource Consortium (SCRC) is a university-industry partnership for documenting and disseminating supply chain management knowledge. For more information see the SCRC Web site: scrc.ncsu.edu

⁵"Continuity Planning Lessens Impact from Supply Chain Failures," *Supplier Selection & Management Report*, October 2004, Issue 04–10.

⁶B. Enslow, *Supplier Performance Management: What Leaders Do Differently*, Aberdeen Group, September 2004.

18 Best Practices for Supply Chain Risk Management

1. Screen and regularly monitor current and potential suppliers for possible supply chain risks.
2. Require critical suppliers to produce a detailed disruption-awareness plan and/or business-continuity plan.
3. Include the expected costs of disruption and operational problem resolution in the sourcing total-cost equation.
4. Require suppliers to be prepared to electronically share timely information and visibility of material flows with your organization.
5. Conduct frequent teleconferences with critical suppliers to identify issues that may disrupt daily operations and tactics to minimize them.
6. Seek security enhancements that comply with C-TPAT, CSI, and similar initiatives.
7. Test and implement technologies to track containers to enhance global inventory visibility.
8. Conduct a detailed incident report and analysis following a major disruption.
9. Create exception-detection/early-warning systems.
10. Gather supply chain intelligence and monitor critical supply-base

locations.

11. Improve visibility of inventory buffers in domestic distribution channels at the part level.
12. Classify buffered material by its level of criticality.
13. Train key employees and groups to improve real-time decision-making capabilities.
14. Develop decision-support tools that enable the company to reconfigure the supply chain in real time.
15. Develop predictive analysis systems that incorporate intelligent search agents and dynamic risk indices.
16. Construct damage-control plans for likely disruption scenarios.
17. Understand the cost trade-offs for different risk-mitigation strategies.
18. Enhance systemwide visibility and supply chain intelligence by using improved near-real-time databases.
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