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# Prepare to Bounce Back

The Importance of Incorporating  
Resilience into the Supply Chain



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## The Importance of Incorporating Resilience into the Supply Chain

In recent years, a number of events around the world have drawn widespread attention—toy recalls prompted by the presence of lead paint, food contamination, crippling natural disasters, and terrorist attacks. These unpredictable events, while rare, have significantly disrupted supply chains the world over.

However, there are less high-profile developments that can also pose an important risk to the modern industrial enterprise. First, supply chains have become fragmented and brittle. This is due in part to the rapid growth in outsourcing to partners and suppliers that are geographically distant, and in part to an increased focus on sole sourcing, whether to capitalize on price advantages or to cultivate relationships in the extended enterprise. Second, less physically obvious threats have emerged with the information age and the pressure to reduce overhead: These include the potential loss of data integrity, which can be compounded by outsourcing, and the associated loss of control over key administrative, “non-core” services such as IT. Taken together, the changes in the way modern companies operate, although driving growth in efficiency and innovation, have created new risks and increased the importance of others.

The topic of building supply chain resilience has come to the forefront numerous times in recent years, with disastrous events drawing the most significant attention to the issue. Whether the discussion is

prompted by a dramatic event or simply a function of supply chain frailty, the results often leave company executives muttering statements that start with “We should have...”

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“As the global economy has become more integrated, vulnerability to disruption of the supply chains which hold the global economy together may have increased. Resilience is no longer just about internal management.”

–*Global Risks 2008, World Economic Forum*

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Such hindsight is especially painful when similar circumstances put a better-prepared competitor at an advantage. For instance, in November 1998, Hurricane Mitch blew through Central America, destroying roads, bridges, railroad tracks, factories, and other structures. Among the businesses damaged were banana plantations, which accounted for 10 percent of the worldwide crop. Two major producers lost much of their Central American capacity, but each fared quite differently. Dole lost 70 percent of its 40,000 acres in Honduras, Guatemala, and Nicaragua, or roughly one-quarter of its worldwide production. Because the company had no strategy in place for alternative sources of supply in the region, it suffered an interruption in supply from Central America of more than a year. As a result, Dole had to take a special charge of \$100 million for the fourth quarter and suffered a 4 percent decline in revenue. Chiquita,

meanwhile, had alternate sources of supply in place and maintained a steady supply of bananas, despite losing production from its own plantations. It met volume requirements through increased productivity at other locations, such as Panama, and increased its purchases of fruit from associate producers in the region that were not damaged. Consequently, Chiquita's revenues actually grew 4 percent in the fourth quarter of 1998.

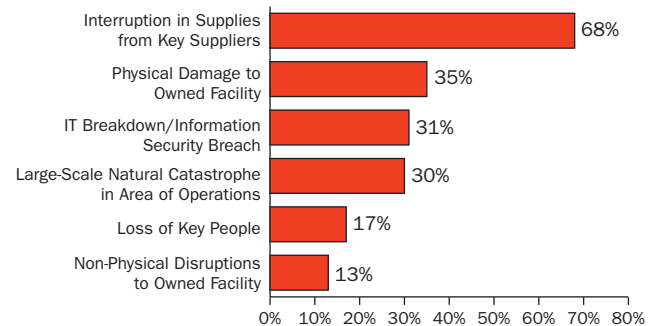
Although weather is notoriously unpredictable, people can be even more so. Think back to the case of British Airways in August of 2003: Gate Gourmet, an in-flight catering service that had in the recent past been a part of BA, fired 670 of its staff. The result was dramatic and difficult to foresee: More than 1,000 BA unionized ground staff staged an immediate one-day walkout in protest. The interruption stranded 70,000 passengers and cost BA between £40 million and £60 million (which, at the time, was equivalent to US\$70 million to \$100 million). A more holistic examination of labor risk would have led BA to closely monitor the relationship between Gate Gourmet and the union, and perhaps intervene to mitigate the tension or develop a contingency plan. Although sometimes sole sourcing is necessary, as may have been the case here, it often means that these relationships merit even more attention than in a diversified supply base. To identify this risk would have required a proactive effort by experienced BA leaders to comprehensively consider scenarios of events outside its direct control. No computer model or analytical tool could have predicted this result.

### Unearthing Concerns

A recent Booz Allen Hamilton survey asked leading supply chain executives from various industries about their company or business unit's understanding of supply chain risks (see Exhibits 1 and 2). The survey revealed that most companies, regardless of industry, recognize the factors that pose the greatest risks to their supply chain, with interruptions in supplies from key suppliers (which are exacerbated by the tendency to sole source) being the most common. However, at the same time, most firms still paint a rosy picture of their abilities to understand and plan for supply chain

### Exhibit 1

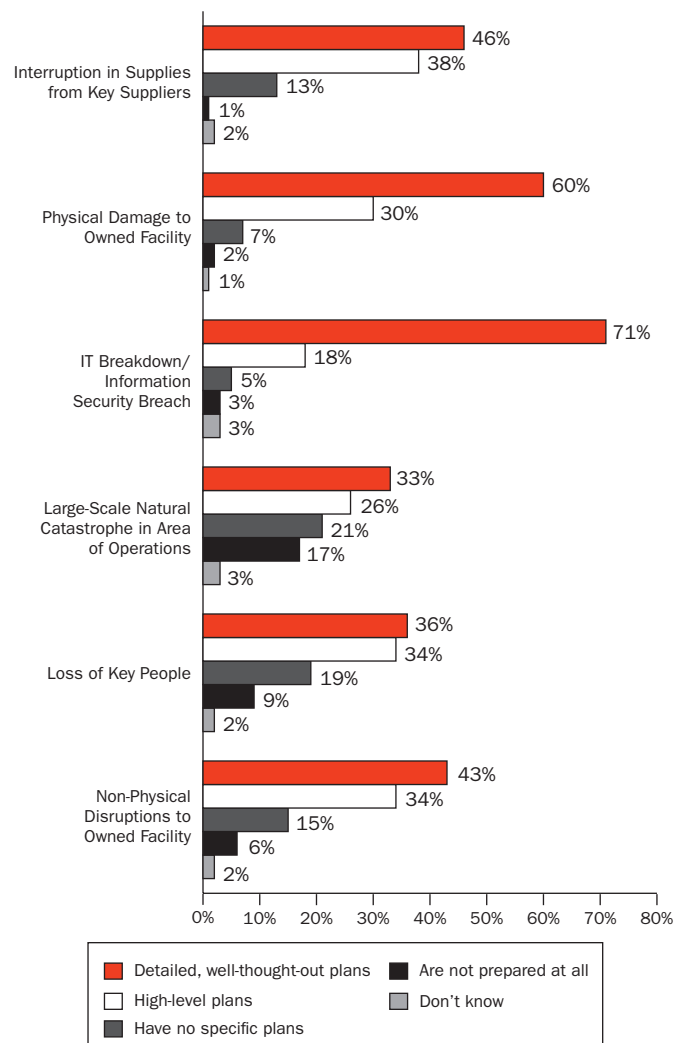
#### Greatest Supply Chain Risks to Organizations



Source: Booz Allen Hamilton

### Exhibit 2

#### Survey Respondents' Level of Preparedness for Various Risks



Source: Booz Allen Hamilton

risks. In fact, even though most respondents noted that major disruption to a prime supplier would be damaging, the majority had not implemented detailed mitigation plans for such an event.

### **Challenges in Building the Case**

In recent years, most companies have sought to maximize their supply chains' efficiency, emphasizing speed, agility, and especially cost. In fact, cost justification is the biggest issue keeping organizations from truly dedicating the time and resources needed to build in resiliency. Whereas designing for efficiency emphasizes flexible supply chains that keep costs to a minimum, supply chain resilience planning balances this view by ensuring that these supply networks are not so light and flexible that they become brittle, cracking under the pressure of unforeseen circumstances. The trouble is that activities that make the supply chain more resilient—buffer inventory, redundant sourcing, multimode logistics contingencies, and continuity planning—are often labeled unnecessary costs and equated to overinsuring business operations. But these trade-offs between resiliency measures and overall supply chain efficiency can be considered with the support of a detailed investigation of the costs and risks, supported by institutional knowledge and modeling tools.

This emphasis on efficiency is also borne out in most organizations' metrics. Although many organizations have explicit objectives and initiatives related to efficiency, such as cost and inventory reduction or the implementation of just-in-time, resilience often remains an implicit concern.

This discrepancy is hardly surprising, as it is difficult to define a set of metrics that measure protection against supply chain risk. Ultimately, the absence of disruption is the most important measure of success. However, there are metrics that can indicate a supply chain's overall resilience, such as safety stock levels, supplier lead times, and the number of sole source relationships.

### **Moving Toward Resiliency**

A successful supply chain resilience framework begins with a robust identification of risks by taking a holistic

view of the supply chain operating units and functions to uncover shared risks in the supply chain and also ensure that risk management strategies are consistent throughout. It culminates with a program to embed supply chain resilience into the corporation. Along the way, risks are accurately prioritized and measured to provide the basis for effective risk management strategies.

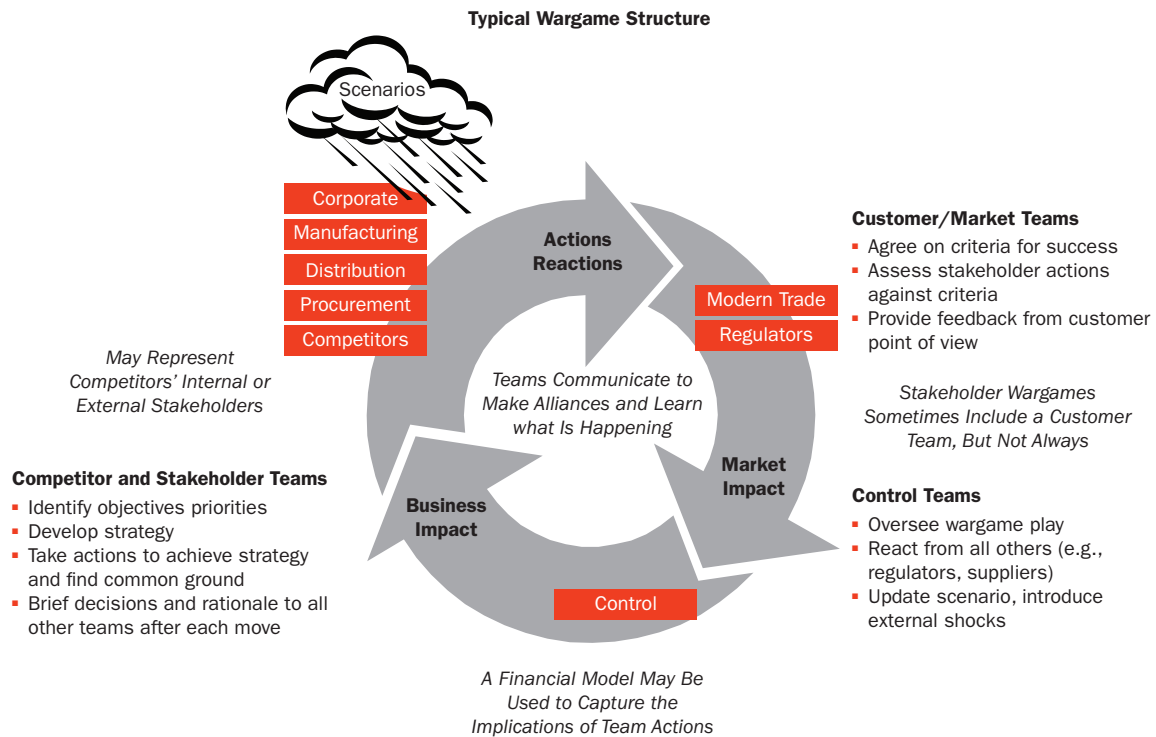
#### ***Step 1: Anticipate the Risks***

The first step is to determine the risks to the supply chain. Disruptions in today's supply chain can be caused by events as diverse as the failure of sole source suppliers, labor disputes, or earthquakes. To establish a comprehensive risk inventory, stakeholders from every point along the supply chain—procurement, manufacturing, distribution, marketing—need to be engaged and brought together to understand how their functions are integrated. Their varied perspectives help to ensure that each of the critical risk areas is uncovered.

An effective approach to this step includes the use of wargames to identify supply chain risks. More advanced than typical interviews, wargames allow supply chain stakeholders to interact and uncover deeper risks within the supply chain (see Exhibit 3, page 4). Participants' reactions to certain scenarios help to uncover hidden risks and also identify those that require complex responses with little warning, which may call for collaboration among functions or business units. In a recent wargame with an automotive manufacturer, we discovered that the recovery from certain supply chain disruptions required the collaboration of multiple functions. The fact that the company was unaware of the number of stakeholders and the level of collaboration across organizational boundaries that managing such a disruption would entail was a major blind spot, indicating significant risk exposure.

It's important to note that identifying risk is not a one-off exercise: Building and maintaining supply chain resilience requires companies to be continually aware of the risks facing the organization. Companies should consider not only recent failures and mishaps, but

### Exhibit 3 A Sample Wargame



Source: Booz Allen Hamilton

also internal circumstances with the potential to cause disruption and impair an organization's ability to deliver.

General Motors is one company that has proactively increased its risk awareness and built capabilities to support that goal. In fact, the company has sophisticated tracking of its material suppliers in close to real time, and maps the geographic location of its Tier One suppliers and sole source suppliers. In times of crisis, such as an impending hurricane, GM is able to airfreight parts to other locations to avoid any hiccups in its manufacturing operations.<sup>1</sup>

#### **Step 2: Assess the Risks**

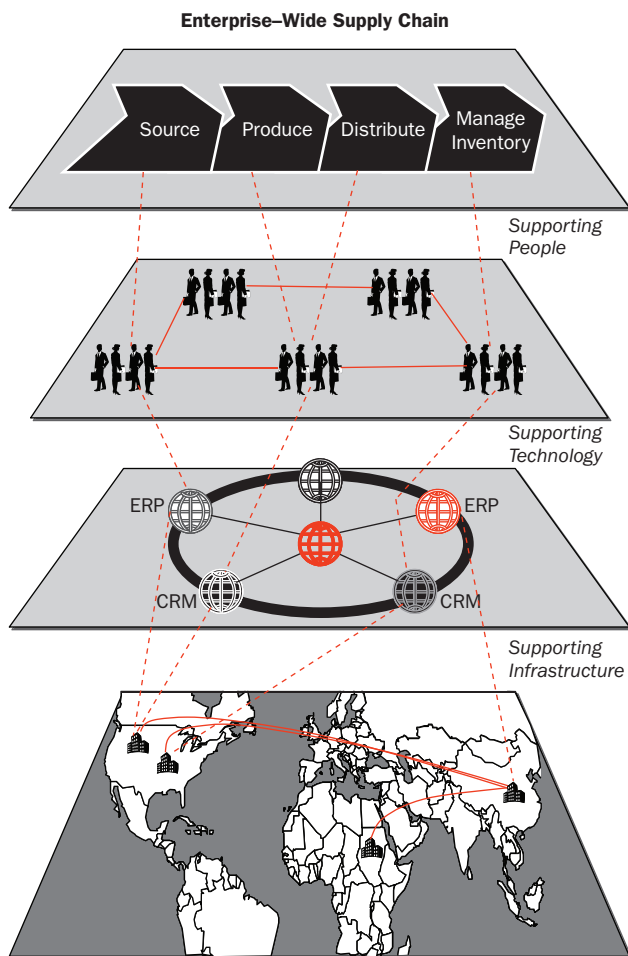
Uncovered risks should be analyzed or modeled to understand their potential impact to the supply chain and business in terms of both the likelihood of the event and the magnitude of the disruption. Aside from the mathematical models that drive much supply chain planning, physical topology models and dynamic supply chain simulations can provide new insights

into the potential impact of important risks. For example, a physical topology model depicts the links between critical supply chain systems, processes, and infrastructure to illustrate interdependencies that may not be obvious (see Exhibit 4). Understanding how this multilayered web of systems and processes supports the supply chain can provide a more robust analysis and should be a starting point for a holistic review of the supply chain.

Recently, a Fortune 50 global pharmaceutical company set out to develop an enterprise-wide risk-management and business continuity program. Its goal was to more effectively plan for and respond to operational disruptions, including disruptions in its supply chain. Building this program successfully required understanding the interdependencies among people, processes, and technologies across the enterprise. Achieving this goal required the ability to model these relationships by accurately depicting the enterprise's physical topology.

<sup>1</sup> "Business Continuity: Improving GM's Risk Profile," Effective Disruption Management Seminar, Stanford University, September 8, 2005.

**Exhibit 4**  
Physical Model of the Supply Chain



Source: Booz Allen Hamilton

The company began by developing a model to depict the relationships in its business and operating environments. The model highlighted shared resources, such as key personnel, infrastructure, and suppliers, showing these concentration points across the enterprise, including in the logistics and supply chain. By understanding these relationships, the company could evaluate the complete impact of a potential disruption—from logistics to the entire organization.

After developing an accurate depiction of the supply chain, the next step is to prioritize supply chain disruptions by characterizing the likelihood and magnitude of the outcomes they cause. In comparing risks it is important to distinguish between the event and its outcome. For example, there are many

ways that a shipping facility can become inoperable: because of a hurricane, a chemical spill, or a labor strike. But for analytical tractability, it is better to focus on the outcome—in this case, the inoperability of the facility—regardless of cause.

The likelihood of an outcome is driven both by the nature of the threat itself and the vulnerabilities of the supply chain being affected. Both qualitative and quantitative assessments can be used to estimate the likelihood of different outcomes, using relative rather than absolute metrics. The magnitude of a particular outcome is determined by the (potentially) negative effect, or effects, that a company can expect if some aspect of the supply chain is damaged, destroyed, or disrupted. These effects can include stakeholder concerns such as lost revenue, increased cost, compromised ethics, or diminished brands.

Exhibit 5, page 6, presents a representative mapping of risks to a supply chain, using both likelihood and relative magnitude as metrics. Risks mapped in the upper-right quadrant are of a higher severity relative to the other risks and should be the highest priority to be managed. This doesn't mean that risks in the other quadrants are not important or are not worth considering. All of these risks are worthy of consideration; they just may not rise to a level that warrants immediate action or senior management attention.

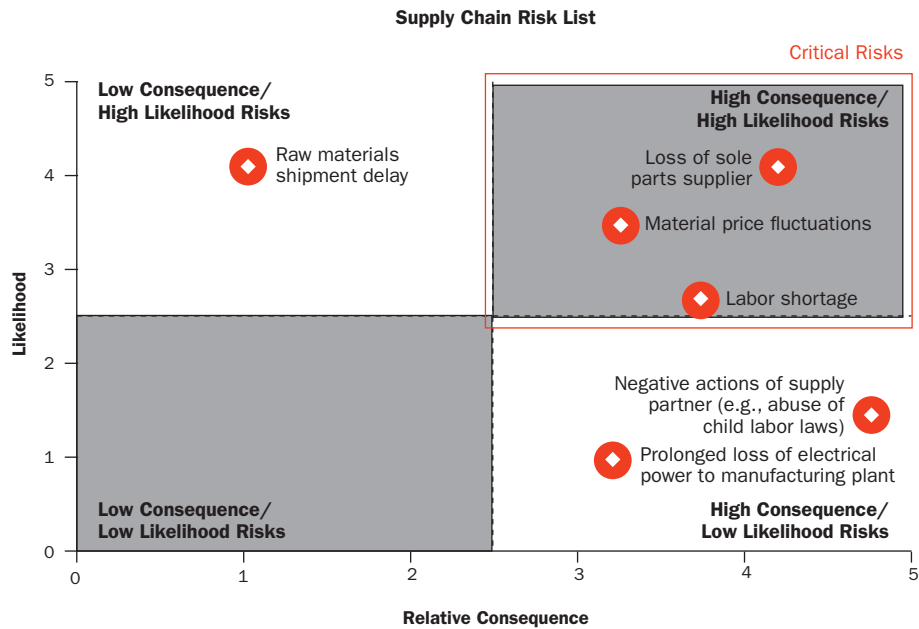
Again, risk assessment is an ongoing process. As the supply chain changes, so should risk management programs. A successful supply chain risk management program will have several elements—from understanding the supply chain's strategic risks to having adequate crisis plans. Regular testing and review are key to keeping the risk management program alive and current.

Once again, General Motors is a prime example of a company that is doing well in this regard: Its successful risk management programs include regular updates, which requires the discipline to stay on top of the data. For example, the company regularly tests its risk management programs through exercises and has even expanded to include key suppliers and competitors in the simulations.<sup>2</sup>

<sup>2</sup> "Business Continuity: Improving GM's Risk Profile," Effective Disruption Management Seminar, Stanford University, September 8, 2005.

## Exhibit 5

### Weighing Key Risks to the Supply Chain



Note: The likelihood and relative consequence of each identified risk were rated on a scale of 1 to 5 and placed accordingly in the matrix.  
Source: Booz Allen Hamilton

### Step 3: Act Against the Risks

Risk identification and risk measurement provide a baseline to start developing mitigation strategies, through a holistic view of the supply chain and a common understanding of the greatest risks for all stakeholders. Additionally, these activities also provide a basis on which to make decisions regarding risk-management initiatives.

Addressing supply chain risks will likely require several specific risk-management activities. For example, managing supplier risk may require holding more inventory stock. In our experience, though, effective long-term risk management is the result of a broad consideration of risk-management goals, rather than a narrow focus on specific risk-management activities. To illustrate, a media company recently realized that a large percentage of its critical operations were concentrated in one facility. The company's approach to reducing this risk went beyond diversifying its operations footprint; it also focused on how to engineer its operations with redundancy in mind, including putting more security controls in place,

creating awareness of potential issues when launching new processes, and creating a response team with defined roles and responsibilities to address risk. The larger risk-management goal focused on increasing the company's operational agility while building in resilience and was considered in future operational planning decisions.

Similarly, a leading consumer packaged goods firm considered several strategies to manage the potential risk of losing a key supplier. Management realized that effective risk mitigation would require both immediate and long-term solutions. They effectively filtered their choices based on the expected impact on four key metrics: supply, price, quality, and corporate social responsibility (CSR). Exhibit 6 illustrates the considerations for one risk that the company identified: the sole sourcing of a particular raw material. To determine how to best mitigate this risk, the company selected its strategies by taking into account the trade-offs among these four metrics.

The workshops and modeling exercises discussed earlier provide further insight into the best risk



**Exhibit 6**

Sample Actionable Risk Mitigation Plan

Risk	Mitigations	Horizon	Impact			
Raw Material Is Sole-Sourced	<ul style="list-style-type: none"> <li>Review current contractual arrangements to ensure contracts adequately protect company interests</li> <li>Determine if a 2–3 year long-term contract is required</li> </ul>	Short-Term Mitigations	S	P	Q	CSR
	<ul style="list-style-type: none"> <li>In the absence of a reasonable substitute, work with the finance department to build a business case to seek an equity stake in supplier</li> </ul>	Long-Term Resiliency Strategies	S	P	Q	CSR

**S** = Supply    **P** = Price    **Q** = Quality  
**CSR** = Corporate Social Responsibility

Source: Booz Allen Hamilton

management goals and activities. For example, a wargame can facilitate a discussion among supply chain stakeholders to plan potential risk management activities. Similarly, risk management plans can be verified using simulation tools that show the potential effects, in key metrics, of a change in supply chain strategy or activities. The output of a successful risk management exercise will produce both actionable risk management plans to curb immediate threats while also providing a game plan to make long-term changes that will increase the supply chain’s resilience.

**Step 4: Adapt the Supply Chain**

Implementing risk-management activities and strategies requires that processes, roles and responsibilities, and governance structure be defined in ways that allow them to remain relevant as the organization and external pressures change. Often, companies fail to adopt risk-management plans as living documents that receive regular updates when new supply chain initiatives or external threats (i.e., avian flu pandemic) appear. As new risks crop up, they need to be worked into existing risk management strategies or added as new initiatives. The success of such a change initiative requires regular review and adequate resources. Documents must have clear ownership within the organization; companies can create a new position, such as a coordinator of business continuity management, or assign the

responsibility to an existing role. The coordinator is responsible for keeping these documents alive, using a periodic review to ensure accuracy (i.e., that the right phone numbers are listed), conducting regular exercises, and realizing when the plan has become outdated due to significant changes in the supply chain or new substantial threats.

An effective use of business continuity standards helps to ensure that there is continual improvement in managing supply chain risks. Recent advancements in business continuity standards, including the British Standard 25999 from the British Standards Institution, focus on prudent risk management activities and operational effectiveness by creating a plan for recovering and restoring critical business functions in the event of their loss. Implementing such a standard, with insights into the most critical risks to the supply chain, will support long-term advancement in developing resilience in the supply chain.

**A Resilient Environment**

The mechanics of implementing a resilience plan vary significantly and depend heavily upon an individual organization’s circumstances. However, because the goal of business continuity is the same, there are undoubtedly common characteristics across all companies that offer good examples of resiliency. In our research, there are a couple of elements that are evident in successful risk-conscious supply chains.

**Sidebar: Resilience in Practice**

A Fortune 50 consumer products company recently embarked on a global effort to anticipate and then mitigate its key business risks. One of the focus areas for this effort was to develop an understanding of the risks inherent in the raw material supply chain.

To assess these risks, Booz Allen Hamilton worked with the company to develop a comprehensive qualitative assessment framework, based on a standardized methodology that could be applied to the different product categories. This framework was based on a common set of multiple risk elements (e.g., geography of supply, supplier concentration, and process technology). By applying weights and a normalized rating process across these elements, the risk assessment framework was used to develop a risk profile that covered four dimensions—supply, quality, price, and CSR. This framework was translated into a user-friendly risk assessment tool that category managers for raw materials could fill out.

The tool's analyses at that level could then be rolled up to analyze risk from different angles: How did risks to individual materials affect, for instance, manufacturing plants, products, brands, and supply geography? This information allowed senior management to look at an overall risk profile and also prioritize their efforts to address the higher-risk areas. Furthermore, having a standardized method to evaluate risks enabled the right trade-offs between resilience options and their potential cost implications and ensured that there was a common understanding across all levels of the organization. The output from the tool also allowed category managers to create both short-term mitigation plans such as increasing safety stock levels and dual sourcing and longer-term resiliency strategies including product formulation changes and new-supplier development.

*Develop a Partnership Approach* For years, people have been boasting about the benefits of partnership with key suppliers. However, in most instances, the partnership tends to end with public formalities. For true resilience, a culture of information sharing is a must, incorporating joint teams, regular tests of the supply chain that incorporate all relevant parties, and frequent conversations with suppliers to understand their concerns. After all, supply chains are only as good as the weakest link, so businesses need to know they can depend upon their suppliers.

Cisco provides a strong case study in how sharing information can minimize supply chain risks. The company, which participated in Stanford University's Effective Disruption Management Seminar following Hurricane Katrina to spotlight some of its efforts, outlined how its partnering process works and highlighted areas of success such as its tight controls in contract manufacturing. These controls mandate that the com-

pany monitors the degree to which it is using single source suppliers, establishes back-up production plans, and reviews contracts to see if risks have been taken appropriately. The company goes further with suppliers by creating transparency in its supply chain, ensuring that suppliers have adequate business continuity plans and second-source suppliers.<sup>3</sup>

*Understand the Culture* As management teams design and embrace a supply chain resiliency plan, it is important to remain cognizant of the role corporate culture plays within the organization's daily operations. For instance, although a plan may show the need for an inventory buffer, the simple suggestion would be counterintuitive to any organization based on the Toyota Production System, which touts the importance of just-in-time principles. In such cases, it's important to find a balance between developing the right plan for the culture and convincing the culture that some changes are necessary.

<sup>3</sup> "Managing Risk in an Uncertain World," Effective Disruption Management Seminar, Stanford University, September 8, 2005.

Embracing a resiliency plan dictates having the culture in place to propagate success. Although the actual balance may differ by organization, the ingredients often remain the same. First, there must be organizational acceptance, which starts at the top. Localized buy-in and subsequent activity then becomes a catalyst to truly developing a workable structure that is inculcated into the daily operations. It's also important to ensure that established incentives are not at odds with any resiliency initiatives; for instance, if teams are rewarded for running a lean operation, it may be difficult to build in redundancies necessary for a resilient operation.

### Conclusion

Creating supply chain resiliency requires more than utilizing the framework to identify, assess, and mitigate enterprise risks. The long-term success of a resilient supply chain depends heavily on the organization's ability to foster a culture of reliability that stretches across departmental borders.

The continuous drive to lower supply chain costs will continue to increase any company's risk exposure, but with some forethought, risk does not need to threaten extinction.

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