

APRIL 2012

# SUPPLY CHAIN RESILIENCY: HOW PREPARED IS YOUR ORGANIZATION?



## INTRODUCTION

The aftershocks from the devastating natural catastrophes of 2011 are still rippling through global supply chains. Companies that had believed their supply chains were secure found out otherwise—the hard way. Many organizations that were not affected see a warning sign in 2011's unprecedented global string of floods, earthquakes, tornadoes, and other events. And many are beginning to more fully understand the imperative to ensure resiliency in the critical areas of their supply chains.

In many ways, the effects of 2011's catastrophes were obvious—significant loss of life and stresses to many organizations' operations, personnel, business models, balance sheets, and equity. But beyond these direct impacts, 2011 gave a clear lesson to many risk managers and business executives: An organization does not have to be in the direct path of a storm or other disaster in order to suffer a major loss.

Such losses typically manifest in a company's supply chain, which is often an integral component of the value that a company can deliver to its customers and stakeholders. But supply chains have become increasingly complex, globally interconnected, and largely managed by third parties. And after years of focus at many organizations on cost, efficiency, and speed to market, supply chains are more vulnerable to geographically remote, disruptive events than ever before.

Although some organizations recognize this vulnerability, the truth is that many still are not prepared for a supply chain disruption. Too many organizations lack complete visibility into their supply chains and do not understand the risks they face, the tools that are available to them to mitigate their risk and improve resiliency, and the competitive advantages and bottom line benefits that superior supply chain risk management can yield.

## 2011 CATASTROPHES: HIGH FREQUENCY, HIGH SEVERITY

The cost of the 2011 events was high—insured losses for the year topped \$105 billion, according to industry estimates. According to Swiss Re, total economic losses (insured plus uninsured) from natural catastrophes in 2011 topped \$370 billion—the highest number ever recorded for a single year.

### THE MOST EXPENSIVE INSURED CATASTROPHE LOSSES IN 2011

	INSURED LOSSES <sup>1</sup> (in USDbn)	ECONOMIC LOSSES (in USDbn)	DATE (Start)	EVENT	COUNTRY
1	35.0	210.0	March 11	Earthquake M <sub>w</sub> 9.0, tsunami	Japan
2	12.0	30.0	July 21	Flood	Thailand
3	12.0	15.0	February 22	Earthquake M <sub>w</sub> 6.3	New Zealand
4	7.3	11.0	April 22	Severe storms, tornadoes	U.S. (Alabama et al.)
5	7.0	9.0	May 20	Severe storms, tornadoes	U.S. (Missouri et al.)
6	5.3	8.0	August 22	Hurricane Irene	U.S. et al.
7	2.3	6.1	January 9	Floods	Australia
8	2.0	3.0	June 13	Earthquakes	New Zealand
9	2.0	3.5	April 3	Storms	U.S.
10	1.5	2.2	April 8	Storms	U.S.

1. Property and business interruption, excluding liability and life insurance losses  
U.S. natural catastrophe figures with the permission of Property Claims Services (PCS)

Source: Swiss Re. sigma No 2/2012

The two costliest events of 2011, the Japan earthquake, tsunami, and nuclear event and flooding in Thailand, illustrate how an event in one part of the world can have a significant effect on supply chains globally.

Japan accounts for 6.4 percent of U.S. imports and 4.7 percent of U.S. exports. Although some ports remained open following the earthquake and tsunami, the closure of others in Japan resulted in a loss of \$3.4 billion in seaborne trade per day. Among the industries affected were electronics, semiconductors, automotive, shipping, steel, medical devices, solar, and energy. Unstable power lines made it impossible for many manufacturers in the high-tech and other sectors to operate for several weeks following the disaster. Multiple sources estimated that total economic losses from the event exceeded \$200 billion.

Meanwhile, flooding across Thailand in the second half of the year severely disrupted that country's manufacturing operations, and forced the closure of at least seven major industrial estates. More than 14,000 businesses temporarily ceased operations, suspending the production of cars, electronics, and other goods. In particular, a leading manufacturer of hard drives was directly impacted, which in turn affected the production of personal computers and components such as graphic chips and power supplies. Flooding in Thailand resulted in economic losses of at least \$30 billion, according to several sources.

## IMPORTANCE OF SUPPLY CHAINS: WHAT'S AT RISK?

For companies in industries from automotive to retail to technology, the ability to consistently deliver products and services quickly, reliably, and at low cost represents the bulk—or even the entirety—of their value proposition to customers and shareholders. For some organizations, their supply chains are an integral part of their brands' value.

Yet many organizations have not sufficiently protected their supply chains by making them more resilient from design and response standpoints. Most organizations competing in the global marketplace over the last several years have been driven by efficiency, low cost, and speed to market. They have adopted several strategies involving supply chains, including:

- outsourcing;
- consolidation of physical assets and suppliers;
- just-in-time manufacturing; and
- production shifts to low cost countries.

These strategies can deliver important benefits including lower operating costs; higher margins; more flexibility, with the ability to launch better products more quickly; and the potential to grab market share away from competitors. But they add complexity and sophistication to supply chains—expanding their geographic reach, creating dependencies and interdependencies (often hidden), eliminating redundancies, and forcing organizations to rely on more tiers of suppliers. All of this has meant a lack of resilience and an increased risk profile—and more vulnerability to natural catastrophes and other events.

Just as important, many organizations today suffer from a “siloeed” approach to supply chain risk management. Operations teams (including product leads, procurement, and logistics) are making strategic decisions about supply chains—such as the suppliers they use and the countries to which they outsource. Meanwhile, most risk management teams address supply chain exposures by

focusing on insurance issues such as contingent business interruption (CBI) and contingent extra expense (CEE)—and are not engaged by the operations teams for their strategic counsel. The result is a disjointed approach in which a common understanding of supply chain costs and risk management techniques is missing—and in which risk management is not playing a substantial role.

This is of particular note given that senior leaders’ expectations of risk managers have increased in recent years. More than half of C-suite respondents to a recent survey on risk management trends said they expect risk managers to increase their involvement in overall strategic planning efforts, including in areas such as supply chain. The Excellence in Risk Management survey from Marsh and the Risk and Insurance Management Society (RIMS) also found that:

- 49 percent of C-suite respondents expect risk managers to integrate deeper with operations;
- 45 percent expect risk managers to provide better quantification and analysis of risks; and
- 31 percent expect risk managers to develop a greater understanding of non-insurable risks.

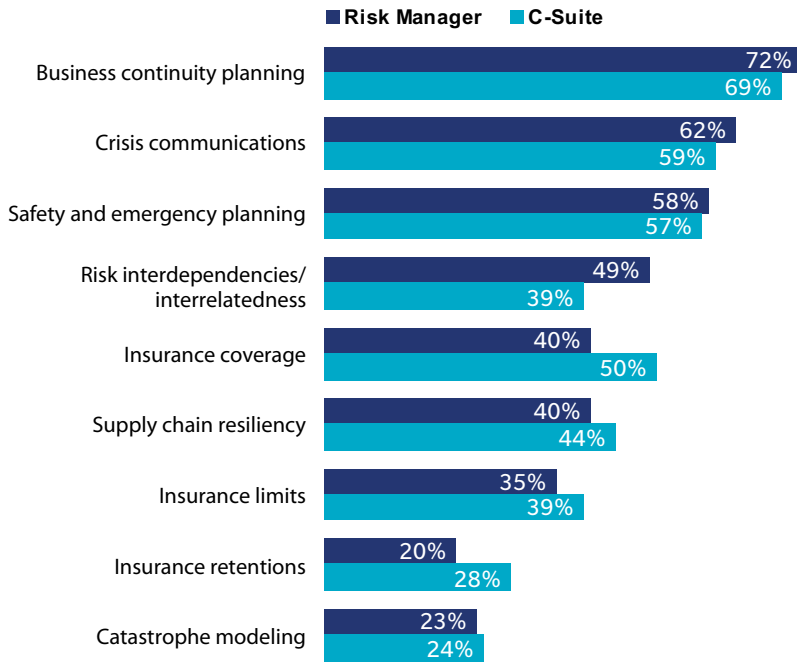
**AREAS IN WHICH SENIOR MANAGEMENT’S EXPECTATIONS OF THE RISK MANAGEMENT DEPARTMENT HAVE GROWN**



Source: Excellence in Risk Management IX, Marsh/RIMS, April 2012

Yet the same survey found that supply chain resiliency in and of itself was not top of mind for most organizations following 2011’s natural disasters. Less than half (44 percent of C-suite and 40 percent of risk manager respondents) said that supply chain resiliency would be re-examined in the wake of the catastrophes.

## AREAS OF RISK MANAGEMENT RE-EXAMINED BASED ON CATASTROPHIC EVENTS



Source: Excellence in Risk Management IX, Marsh/RIMS, April 2012

Perhaps the failure at many organizations to adequately protect their supply chains is symptomatic both of a disconnect between business leaders and risk managers and of the consequences of a relentless focus on efficiency.

## LACK OF INSIGHT INTO SECOND-TIER AND BELOW SUPPLIERS

Many organizations lack knowledge about their second- and third-tier suppliers—those organizations that provide component parts or ingredients to the suppliers from whom they make direct purchases. Through what amounts to a “trust-but-don’t-verify” approach, many organizations make broad assumptions about their suppliers’ risk management protocols—opening the door to significant disruptions and losses.

Consider this fairly typical experience of a European-based technology manufacturer with suppliers in Asia and elsewhere. The manufacturer had a rule: It would engage multiple suppliers for each of its component parts so that it did not get into a situation in which it was purchasing a component from a single supplier. In theory, this redundancy would improve the resiliency of the manufacturer’s supply chain. However, in practice, it did nothing to reduce risk because the manufacturer did not apply its rule beyond its direct suppliers. As it turned out, each of the manufacturer’s first-tier suppliers was buying from the same second-tier supplier.

Many companies expect their suppliers to manage risk to the same degree as their customers. Some organizations do not think it is their responsibility to “manage down the line,” even though a disruption further along the chain can have a substantial effect on operations and profit margins.

It is important for any organization and for all the companies that are part of its supply chain to have the same understanding of risk and of the impact that a disruption will have on delivering value. To improve the resiliency of supply chains, organizations need to drive home a risk management world view with their suppliers and ensure that they take the matter seriously. This may require adding compliance language and penalties to contracts, as well as establishing real-time event monitoring systems.

### ONLY LOOKING AT THE PHYSICAL

When organizations closely examine their supply chain risks, many focus purely on the potential physical disruptions—damage or destruction to their operations or those of their suppliers from earthquakes, hurricanes and tropical storms, and other catastrophes.

But global supply chains can be disrupted by more than natural catastrophes. Disruptions to supply chains can come about due to political and social unrest, exemplified by the Arab Spring of 2011; technology failures related to cyber attacks and other events; shortages of raw materials; or an economic downturn that puts one or more suppliers out of business.

Similarly, many organizations view the supply chain itself as being purely physical—comprising only those mechanisms that create and transport physical products and goods. But physical assets are just one aspect of how any company delivers value through its supply chain: Critical technologies, relationships, knowledge, skills, and people all contribute heavily to the flow of cash and/or goods that create and deliver any product or service, from smart phones to financial advice.

### OVERLOOKING LOGISTICS AND CAPACITY AS PART OF THE RISK MANAGEMENT PROCESS

Many organizations that otherwise have strong and effective risk management programs in place can be hampered by mistakes related to the seemingly simple issue of capacity and logistics. Consider the following two examples:

- Several Japanese auto manufacturers require a key electronic component, called a micro controller, which they had purchased from the same prime supplier for many years. When this prime supplier's main facility in Thailand was struck by flooding in 2011, the auto manufacturers looked for help from predetermined alternate suppliers, as detailed in their contingency plans. This apparently reasonable strategy had a hidden risk—each company was relying on the same risk management strategy, and the same suppliers, to meet its continuity of manufacturing objectives.

Compounding the problem, this primary supplier of micro controllers also served as the primary parts supplier to other suppliers that the auto manufacturers relied on—a reality that was not previously evident and therefore not considered in contingency plans. For several of the auto manufacturers, this competition for components diminished their supply, which extended their losses in market share and profit into early 2012, and could become even more significant if the supply imbalance is not resolved soon.

- A designer and manufacturer of high value casual shoes was launching a new product line in Spring 2011, and had completed much groundwork and marketing. When the earthquake in Japan struck, the company reached out to its Japanese suppliers to ensure that their operations were intact, and effectively dealt with any issues that those suppliers had. But the company's

unexpected Achilles' heel was its logistics capacity. A leading technology manufacturer and retailer, in an effort to ensure that its own supply chain exposures didn't affect its business, bought up significant quantities of available air freight capacity. As a result, the shoe designer's product launch was delayed.

## INSURANCE TAKE-UP AND MARKET RESPONSE

Following the events in Japan and Thailand, anecdotal evidence indicates that many insurers are starting to restrict CBI and CEE coverage. For example, insurers are:

- reducing overall CBI limits;
- requiring that insureds name/schedule suppliers;
- reducing or eliminating limits offered for indirect suppliers; and
- reducing or eliminating coverage for flood and other natural catastrophe perils.

These restrictions are occurring at a time of consistently increasing demand for CBI coverage and limits. The purchase rate for CBI insurance has increased for the 12 months since the Japan earthquake and tsunami when compared to the prior 12 months (54 percent, up from 48 percent), according to data from Marsh's Global Benchmarking Portal.

### PURCHASE RATES FOR CONTINGENT BUSINESS INTERRUPTION INSURANCE

	March 2010 to March 2011	March 2011 to March 2012
All Accounts	48%	54%
Communications, Media, and Technology	54%	58%
Energy and Mining	57%	57%
Food and Beverage	68%	68%
Life Sciences	62%	64%
Manufacturing	65%	65%
Retail/Wholesale	58%	61%

Source: Marsh's Global Benchmarking Portal

Although CBI coverage historically has been relatively easy for organizations to obtain, many insurers now are placing greater focus on the CBI risks that they underwrite, and on how they track such risks using accumulation models. Coupled with probable restrictions in the availability of CBI coverage (reductions in limits) and requirements that potential buyers provide more detailed information before coverage is provided, it is possible that CBI coverage and limits as part of "all risk" property programs may soon become insufficient for many insureds to adequately protect their exposures.

Risk managers will need to work with their operational leaders to gain a deeper understanding of their companies' supply chain risk management efforts in order to secure pre-2011 levels of CBI coverage, or to be prepared in the event that such insurance is no longer available. Working in conjunction with their risk advisors, they also will need to provide more detailed information about their supply chains to insurers.

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CASE STUDY: SUPPLIER DIAGNOSTIC FOR A HIGH-TECH FIRM YIELDS IMPROVEMENTS IN SUPPLY CHAIN RESILIENCY PROGRAM

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### The Challenge

A multinational technology firm specializing in the design and construction of industrial automation control and information solutions was considering the risks it faced from its suppliers. Like other firms of comparable size and scope, it relied on an extensive network of more than 4,000 suppliers with more than 400 considered critical, ranging from component manufacturers to distributors. As its products are highly engineered, a failure or interruption in its upstream supply chain would have significant implications for its customers and ultimately its margins and revenue.

The company had previously identified, measured, and invested in risk mitigation programs and used on-site audits, surveys, policies, and legal contracts at some suppliers. Senior management realized, however, that these steps only addressed a small percentage of suppliers. Although the company recognized the value of these techniques, it was interested in more proactive steps. However, with more than 200 product families and 8,500 products, the deployment of a deeper level of anticipatory tools and real-time monitoring systems would be expensive.

### The Marsh Solution

The company engaged Marsh Risk Consulting (MRC) to establish a more proactive and comprehensive supplier risk program—without creating an exorbitant cost driver. MRC designed a supplier evaluation system and helped the company rank its products by revenue and value, which concluded that 25 product families covering approximately 100 products brought more than 50 percent of total revenue. Within these product families, the top 50 suppliers were identified in terms of their criticality, and a more comprehensive survey was developed and administered.

MRC then designed a closed-question supplier survey process that included an assessment of continuity, sustainability, product risk, insurance coverage, governance, and management. When asked whether they have a formal program that tests their resiliency and continuity, more than 70 percent of this group of suppliers either answered “no” or declined to respond, painting a disturbing picture of the firm’s third party risk. MRC then worked with the company to develop “tiers” of supplier risk assessment, measurement, and mitigation programs based upon the individual performance against peer benchmark, an invaluable strategy for managing supplier risk on such a large scale.

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## SOLUTIONS, STRATEGIES, AND TOOLS FOR IMPROVING RESILIENCY AND RISK TRANSFER

The events of 2011 raised concerns in boardrooms, among shareholders, and in risk management circles about the true resiliency of supply chains and related risk transfer mechanisms.

Boards of directors are recognizing the urgency of this issue—given the significant value that many organizations derive from their supply chains—and are seeking a better understanding of the long-term costs of managing supply chain risk. For example, many companies are now taking a closer look at the physical placement of operational nodes (production, assembly, and warehouses) that contribute to global supply chains.

There is also a greater appreciation of how supply chain resiliency can be used as an “offensive” weapon to take market share away from competitors and to boost shareholder value. This trend will only accelerate as more investors, such as hedge funds, recognize the financial value of supply chain resiliency.

Claiming success in supply chain risk management is about more than simply having a plan in a binder. To truly achieve resiliency, traditional plans need to be re-engineered and more voices added to the supply chain risk management discussion.

Managing resiliency is not just about quickly recovering from catastrophic events; it is about avoiding or minimizing exposure to such risks in the first place. Achieving true resiliency requires organizations to use analytics and modeling and to bring together leaders from their risk management, technology, operations, and business departments.

### THE VALUE-DRIVEN/FLOW-BASED APPROACH

The strategies for managing continuity and providing greater resiliency can be divided into four broad categories:

1. insurance-driven/asset-based programs;
2. compliance-driven/functional-based programs;
3. threat-driven/event-based programs; and
4. value-driven/flow-based programs.

The first three categories, which represent most organizations’ current strategies, are not comprehensive. They take into consideration only a small portion of an organization’s total exposures, and result in risk investments that are aligned to physical resources (for example, a manufacturing plant). What they leave out are non-physical risks, such as the failure of a supplier or the lack of public infrastructure, such as roads and ports.

The value-driven or flow-based program can deliver a complete, integrated approach to supply chain risk management. Aligned with the organization’s business, this approach extends the view of the supply chain beyond the organization’s physical boundaries. Risk is viewed in the context of the value delivered to all stakeholders by a given product, product category, or product family. Industries that use this value-based strategy include those

with the most highly complex and advanced supply chains, including automotive and high-tech manufacturing.

The value-based approach begins with a clear articulation of what is of greatest organizational value. If all of an organization's capabilities were destroyed and it had to start from scratch, which market and product or service would it focus on first?

Once this priority is defined, the value and supply network to support it can be shaped. Single points of failure can be analyzed to determine the impacts at various "pinch points"—such as the number of weeks and financial impact of production being halted due to loss of an input from a strike, shortage, or natural disaster. These can then be quantified and prioritized to determine the level of investment needed to manage risk at a detailed level, such as alternative suppliers, production sites, or warehouse locations.

## ANALYTICS

Prioritization and value assessments rely heavily on analytics to determine the financial effect of a disruption. The information gleaned from this exercise helps to identify risk mitigation and financing options, and to measure the effect that various investments have against reducing exposures. Such options might include diversification of suppliers, alternate sourcing, insurance, or even a decision to exit a business. These options can be modeled to determine the effectiveness of the investment against reducing the impact to the supply chain.

In any analysis, it is important to measure the precise impact of a specific event on a global supply chain, which is subject to a range of factors that often are not considered. How each aspect of an organization's supply chain responds will determine how quickly it can recover, and to what extent its brand, reputation, revenue, and stock price will be affected.

Analytical tools can help companies understand the variables on which to base insurance and risk management decisions. A deeper examination of an organization's supply chain can help a risk manager better understand how variable impacts translate to the bottom line. For example, how much of a loss would a manufacturer suffer if two key suppliers were unable to deliver component parts for an extended period?

## INSURANCE OPTIONS

Risk managers have historically looked to CBI and CEE insurance as a way to mitigate financial risks associated with loss events that affect their suppliers and customers. CBI reimburses insureds for loss of net profits and necessary continuing expenses resulting from an interruption of business due to insured physical loss or damage at a customer or supplier location(s). CEE reimburses insureds for the additional expenses over and above normal operating costs to avoid or diminish an interruption of business following insured physical loss or damage at a customer or supplier location(s). The cause of the interruption—a fire or an earthquake, for example—must be from a covered peril and must result in physical damage that inhibits the third-party supplier or customer from being able to supply or receive the insured's goods.

CBI and CEE, however, do not cover the increasingly frequent disruptions that many organizations face that are not related to physical damage. For example, the eruptions in 2010 and 2011 of Iceland's Eyjafjallajökull volcano caused little physical damage to insured property, yet air traffic was interrupted, leading to significant disruptions and delays in the

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### CASE STUDY: SUPPLY CHAIN ANALYTICS DRIVES MANUFACTURER'S RESILIENCY PLANNING CHOICES

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#### The Challenge

A leading global manufacturer and wholesale distributor of precision-engineered products sought to expand its position in the U.S. market through a series of acquisitions. Completing the deals allowed the firm to satisfy its strategic objectives, but it inherited inefficiencies from multiple supply chains. The company realized that effective supply chain consolidation would be critical for continued growth.

After conducting a detailed internal study, the company concluded that the most cost-effective solution would be to consolidate its operations into a "mega-center" style distribution hub close to its corporate headquarters in North America. However, this single point of distribution would create significant resiliency risks through the potential for either human-caused or natural disasters. A significant business interruption at the proposed center could have catastrophic implications for customers in North America. The most obvious solution to the risk was to build a second distribution center, but the costs were daunting and the potential risk during a reconfiguration of the distribution network were severe. The client approached Marsh Risk Consulting (MRC) with its central question: Could a business case be built for (or against) making an investment in a second distribution center?

#### The Marsh Solution

MRC saw early on that the client needed a customized solution focused on business intelligence and analytics. The client needed to better understand the risk/reward of its optimization strategy, so MRC collected and modeled volume, cost, and throughput data in conjunction with catastrophic failures and time to recovery cycles for the two proposed centers. Additionally, MRC helped the firm rate and rank its product families based on value (revenue, cash flow, strategic importance, and brand visibility). With the product families ranked, MRC was able to show the net effect of the investments versus the risks mitigated. As a result, the company decided to build a second distribution center.

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transport of goods and services into and out of Europe. Following the events of 2011 in Japan, many buyers of CBI and CEE came to realize it often is restricted to first-tier suppliers, meaning that CBI or CEE resulting from damage to “indirect” second- or third-tier suppliers will not be covered.

Emerging supply chain products are considerably broader than CBI and can offer additional protection. In addition to indemnifying for business interruption and extra expenses resulting from physical damage to a supplier (typically excess of “all risk” program CBI and CEE limits), supply chain insurance products also offer insureds protection against non-physical interruptions to their supply chains, such as strikes, riots, ingress/egress, service interruption, pandemics, and more. Such coverage can be tailored to an insured’s unique supply chain exposures.

#### COMPARISON OF SUPPLY CHAIN-RELATED INSURANCE COVERAGES

RISK	GLOBAL SUPPLY SECURE® (GSS)/ SUPPLY CHAIN INSURANCE (SCI)	TRADE DISTRIBUTION INSURANCE	CYBER RISK	PRODUCT RECALL	CONTINGENT BUSINESS INTERRUPTION/ BUSINESS INTERRUPTION
Loss of Supply	√				√
Inability to Provide or Obtain Service	√				√
Political Upheaval	√	√			
Pandemic (GSS)	√				
Supplier Site/Infectious Disease (Zurich SCI)	√				
Terrorism Disrupting Transportation (GSS)	√	√			
Natural Disasters	√	√			√
Labor Stoppages/Strikes	√	√			
Improper Placement or Cargo Holding		√			
Theft	√				√
Unanticipated Supply/ Supplier Constraints	√				
Pollution and Contamination	√				
Delivery Delays	√	√			
Cyber Attack/Theft, IT Loss, Virus/Hacker			√		
Product Recalls and Resolutions				√	

Note: a check mark above indicates that coverage is typically offered in these areas. Global Supply Secure® is a registered trademark of Chartis.

Insureds should review all of their options carefully with their insurance advisors. Whichever product(s) an insured decides to purchase, it is imperative to provide underwriters with complete, accurate, and thorough data in order to differentiate its risk profile from other

companies. The most successful organizations will be those that make insurance decisions as part of a broader approach to supply chain risk management that optimizes risk investments against the value of the business, product, or service to the organization.

## CONTINUOUS MONITORING AND IMPROVEMENTS OF SUPPLY CHAIN

Effective supply chain risk management entails more than a simple, one-time gap assessment or prioritization exercise. It requires continuous monitoring and improvement that go beyond the company's borders. An organization should ask itself these key questions:

- Are we—in conjunction with our partners—continuously evaluating, evolving, and improving our resiliency programs?
- Are we collecting business intelligence about our single points of failure, including the maximum financial, brand, strategic, compliance, liquidity, and asset impact at each point?
- Are the people, infrastructure, and suppliers that we depend on managing their risk to our expectations, at a minimum?
- Are we monitoring, in real time, our most critical supply chain dependencies?
- Have we created a collective culture along our supply chains that is risk conscious, intelligent, and motivated?

The most resilient firms can answer “yes” to all of the above questions. One high-tech manufacturer, for example, monitors the threats to its supply chain in real time. By deploying a multi-tier real-time threat monitoring service, it is able to identify disruptions to its upstream second- and third-tier suppliers for its most critical, mapped supply chains. As an event unfolds, it is immediately notified and able to quantify potential downstream impact (for example, which customers are specifically affected) so that it can deploy the appropriate resources and establish greater resiliency. When a catastrophic snowstorm in 2008 shut down transportation networks in China, this organization not only immediately alerted management to the impending threat, but linked the effects of the storm to the contract manufacturers and suppliers that would be impacted; the products it produced; the downstream customers that would be affected; the estimated daily financial loss; and the contingencies that needed to be activated (based on pre-event planning).

In another example, a life sciences organization uses predictive modeling by constantly probing key stakeholders in its supply chains with a series of predetermined risk-related questions. The responses are fed into a decision model, and subsequent questions are generated and forwarded to other stakeholders. The data is aggregated and evaluated, and the logic determines whether a substantial risk issue is inevitable.

## THE RESILIENCY ENDGAME

Organizations must be confident in the capabilities and resiliency of their supply chains. The lessons learned over the past several years from natural and human-caused disruptions demonstrate that supply chains cannot be taken for granted and that old approaches to risk mitigation and risk transfer require an upgrade to meet today's challenges.



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