APICS INSIGHTS AND INNOVATIONS

UNCOVERING CHRONIC DISRUPTION IN SUPPLY CHAIN AND OPERATIONS MANAGEMENT

APICS SUPPLY CHAIN COUNCIL

ABOUT THIS REPORT

Sudden, acute supply chain disruptions—such as those caused by natural disaster, civil unrest, or financial calamity—are highly visible and typically get the attention of organization management. However, visible supply chain disruptions are not the only disruptions supply chains face.

Chronic disruption occurs with little notice and is neither obvious nor pressing to management. Its causes and consequences are hard to see, making it easy to underestimate the damage it causes. In the drive toward supply chain excellence, this folio spotlights chronic disruption and recovery from its effects. It discusses the definition, causes, and solutions of chronic disruption, along with research about supply chain professionals' responses to this type of disruption.

This report was developed by APICS Supply Chain Council, a foundation that advances supply chain and operations management and innovation through research, education, and publications. APICS SCC maintains the Supply Chain Operations Reference (SCOR®) model, the supply chain management community's most widely accepted framework for evaluating and comparing supply chain activities and performance. **For more information, visit apicssupplychaincouncil.org.**

UNCOVERING CHRONIC DISRUPTION IN SUPPLY CHAIN AND OPERATIONS MANAGEMENT

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UNCOVERING CHRONIC DISRUPTION IN SUPPLY CHAIN AND OPERATIONS MANAGEMENT

Chronic disruption reduces the benefits of supply chain co-destiny.

The *APICS Dictionary,* 14th edition, defines co-destiny as "The evolution of a supply chain from intraorganizational management to interorganizational management." Interorganizational management considers all partners in the supply chain, which reduces the chances for chronic disruption because causes, risk factors, and solutions are visible to more individuals. Co-destiny tends to be the direction of highperformance supply chains.

Chronic disruption likely is plaguing or has plagued your supply chain, and you might not even know it. APICS recently examined this newly defined phenomenon in order to assist supply chain and operations management professionals in their day-to-day tasks and as they seek to enhance their company's supply chain strategy.

Supply chain chronic disruption is defined as low-to-moderate disruption that features one or more of the following:

DISRUPTION {

- is persistent
- is difficult to permanently eradicate and routine tactical solutions are ineffective
- has root causes that are not always visible to all supply chain stakeholders
- that is abnormal but becomes tolerated over time

Supply chain chronic disruption is common but not well understood. Part of the reason it is not well-known is that most supply chain disruption research only covers acute disruption, such as sudden events. Another reason is that it is difficult to fix chronic disruption and it often is not entirely visible to stakeholders. Companies frequently tolerate chronic disruption, which may lead to supply chain performance problems.

The APICS body of knowledge covers core components of chronic disruption such as strategy, risk frameworks, supply chain synchronization, and supplier relationship management. Achieving supply chain and operations management excellence means detecting and eliminating everything that interferes with optimal efficiency, including supply chain chronic disruption.

73%

More than 73 percent of respondents to an APICS survey reported experiencing chronic disruption in their careers.

Causes of Chronic Disruption

Often, there are internal, soft causes for chronic disruption, and these are hard to measure. Survey respondents reported the following causes of chronic disruption at their organizations:

- Accountability is placed solely on the supplier(s)
- Inability to communicate actual demand
- Inactive stakeholders
- Inadequately defined requirements
- Lack of manpower or trained manpower
- Lack of updated information technology
- Management that does not correct existing problems
- Procurement professionals performing tasks better suited to accounting professionals
- Short-term financial pressures
- Under staffing
- Management that is not well-informed or trained

APICS 2013 Chronic Disruption Insights and Innovations

Recognizing chronic disruption enables supply chain and operations management professionals to improve supply chain strategy and risk management. Awareness of risks due to chronic disruption helps develop improved perspective, not only with suppliers, but with internal performance challenges. Eliminating chronic disruption usually requires improvements in strategy, policies, processes, and procedures.

Preventing and remedying chronic disruption requires the evaluation of on-time delivery patterns and improved use of vendor quality notifications systems. In addition, professionals should examine the bigger picture, both internally and externally, to discover what is enabling chronic disruption, or any other risk. Due to the complex nature of most supply chains, it is often difficult to differentiate chronic disruption from other disruptions. Chronic disruption demands consideration of supply chain disruptions that are tolerated over time and the resulting costs of those disruptions.

Using Chronic Disruption Knowledge to Advance

- Addressing chronic disruption helps position a professional as one who can solve issues others cannot.
- Knowledge of chronic disruption requires seeing internal and external root causes in the big picture of the supply chain and forming effective solutions that go beyond ordinary tactics. This makes the professional rare and valuable in an organization.
- Knowing the risks and circumstances that enable chronic disruption and the value of avoiding these risks will enable professionals to make valuable contributions at their organizations.
- As professionals achieve the rewards of just-in-time and lean practices, they should also reduce the risks that chronic disruption poses.

Managing Chronic Disruption Through Best Practices

Improve relationships with suppliers, particularly in the areas of risk management, and long-term or strategic planning.

Increase supply chain communication and information sharing, particularly when experiencing unexpected or unstable demand.

Look for root causes and enabling conditions both internally at your organization and at the supplier when supplier difficulties arise. Increase the visibility of these causes and enablers at both organizations.

Increase supply chain flexibility (for example, in terms of supplier variety and location).

Consider potential group purchasing organizations.

Evaluate the possibility of alternative components and services.

Watch for the appearance of chronic disruption risk factors. These factors might include ordering rare or difficult-to-produce goods or services, or use of suppliers that find your orders challenging, such as payment, delivery, or logistics areas.

Build awareness among stakeholders of the possibility of chronic disruption developing.

KEY SURVEY FINDINGS

1 Variable demand, forecast, and logistical errors are common causes of chronic disruption. An acute disruption, such as an earthquake, can trigger later chronic disruption, where no chronic disruption existed previously.

2 Inefficient supply chain strategy and design are a significant cause of chronic disruption challenges. Strategy and tactical execution of strategy assist in resolving chronic disruption.

3 Lack of visibility is a problem, but root causes are not always evident. Supply chain and operations management professionals and procurement professionals often can spot issues related to chronic disruption before other team members, and it still may take weeks or months to notice.

4 Changing supply chain strategy, finding substitutes, and making substantial changes to supplier or partner standards are commonly reported solutions to chronic disruption. However, approximately 36 percent of respondents report that current chronic disruption challenges in their supply chains have not been resolved.

Questions for Discussion

Use these questions to help assess the role chronic disruption plays in your organization:

Is supply chain chronic disruption occurring at your organization?

If supply chain chronic disruption is occurring at your organization, does it have the visibility it needs to be addressed?

Respondent Profile

1/2 of those surveyed have spent more than 12 years in a supply chain or operations management role.

83% of respondents were part of a business unit with a formal supply chain strategy role.

>73% of respondents reported experiencing chronic disruption at some point in their careers.

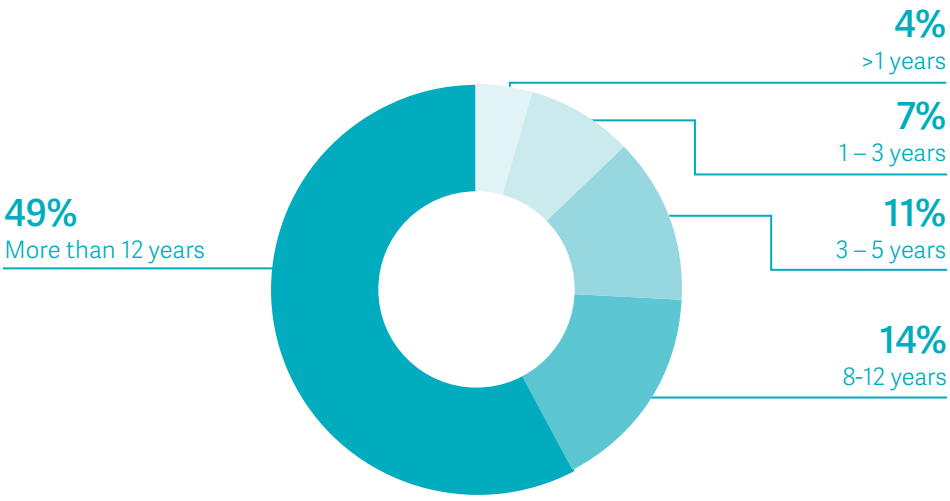
1/4 of respondents indicated that their organizations generally take more than a few months to recognize that they are experiencing chronic disruption.

~43% of respondents were part of an organization where, over time, chronic disruption became expected and/or tolerated.

35% of respondents' organizations formally included chronic disruption in their risk factors.

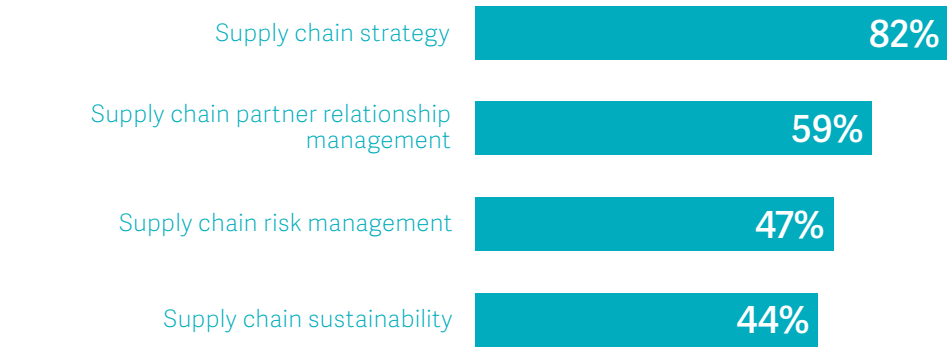
Length of professional employment

Respondents were asked to indicate the amount of time they have been a supply chain and/or operations management professional.



Supply chain roles

Respondents were asked to indicate the supply chain role(s) of their business units.



Alignment with strategy

Respondents were asked to indicate how well-aligned their supply chains are to their business unit strategy and vision.

Poorly aligned	2	3	4	Moderately Aligned	6	7	8	9	Very well aligned	Average rating
2%	3%	10%	7%	27%	11%	16%	16%	5%	3%	5.77

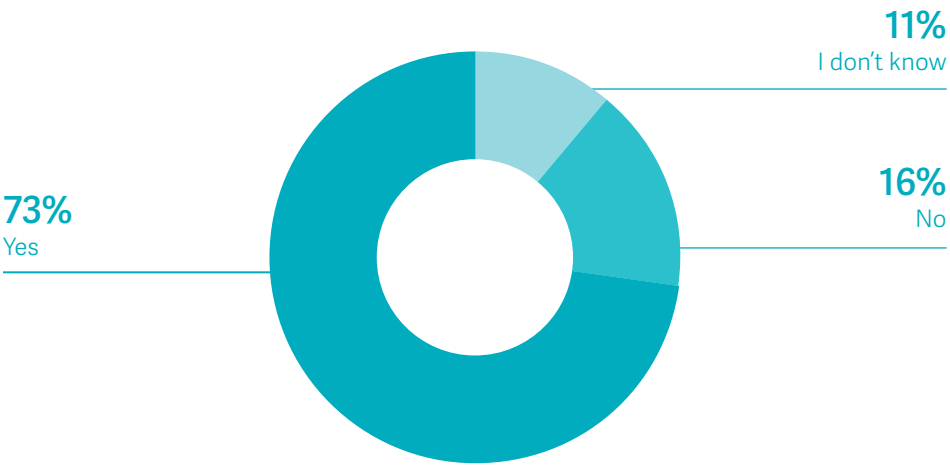
Disruption frequency

Respondents were asked to indicate how often their organizations experience persistent, unsatisfactory performance from their supply chains.

Never	2	3	4	Sometimes	6	7	8	9	Always	Average rating
<1%	5%	11%	12%	34%	12%	10%	12%	2%	2%	5.35

Chronic disruption experience

Respondents were asked whether or not they have experienced supply chain chronic disruption (persistent disruption that substantially degrades but does not inhibit supply chain function, and that does not respond to traditional remedies) at any point in their careers.

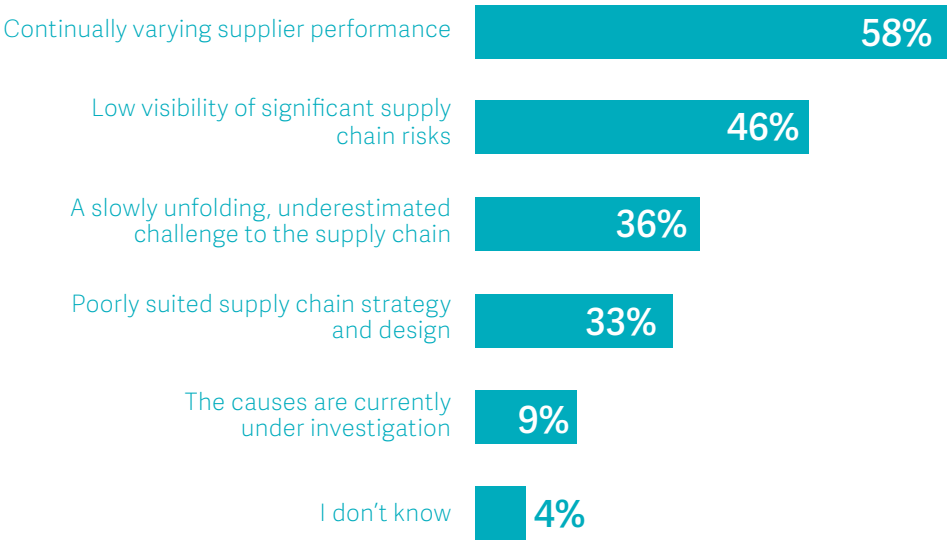


Characteristics

Respondents were asked to characterize their last chronic disruption occurrences using one or more of the provided answer choices.

Causes

Respondents were asked to identify the cause(s) of chronic disruption at their organizations.



Chronic disruption resolution

Respondents were asked to identify way(s) their organizations typically resolve chronic disruption.

37% We have not yet resolved it

33% We found substitutes for components, products, or services associated with chronic disruption

29% We substantially changed our suppliers or partner standards, metrics, or contracts

27% We changed or updated our supply chain strategy

24% We increased supply chain diversity or flexibility in terms of asset locations, partners, or practices

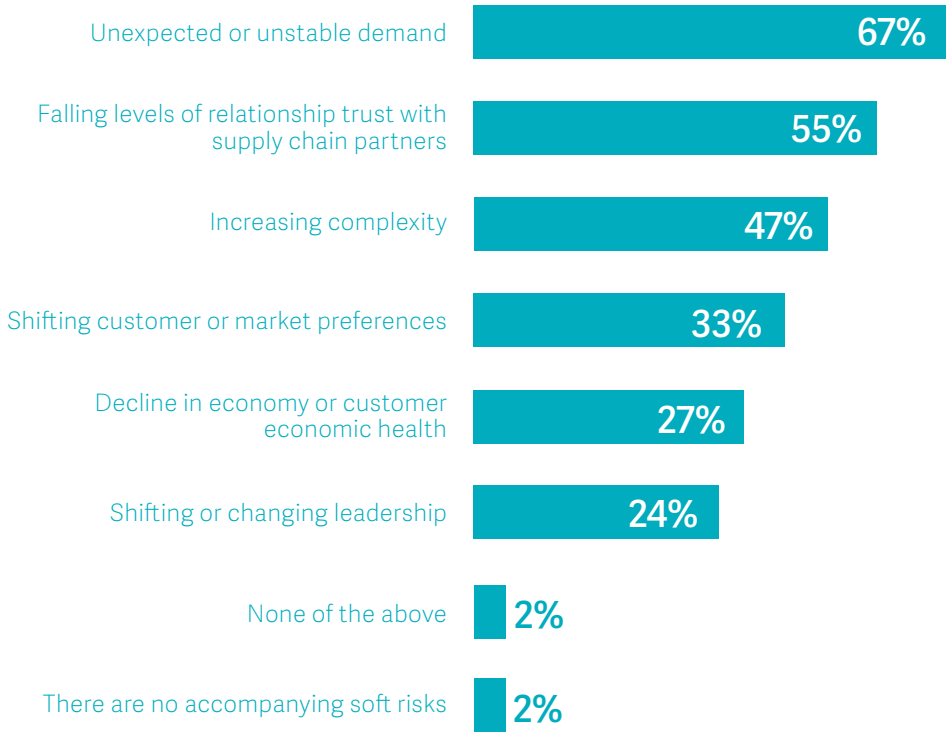
20% Senior management elevated and resolved the issue at that level

20% We substantially changed our logistics or distribution functions or practices

2% We no longer serve markets or customers associated with chronic disruption

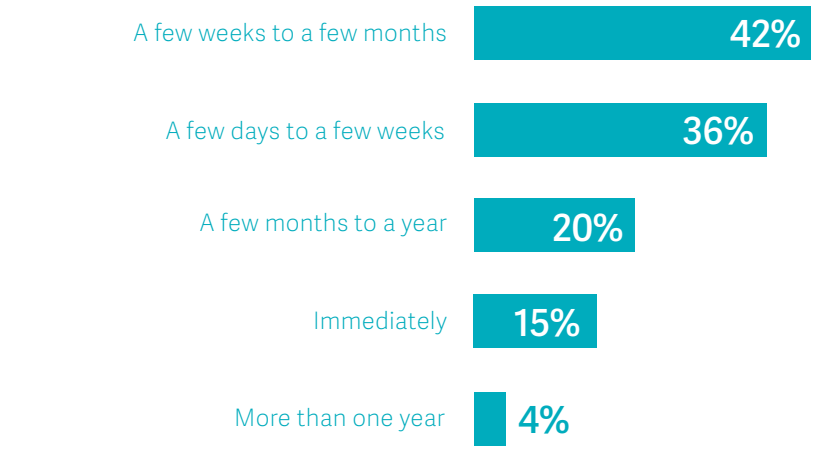
Associated soft risks

Respondents were asked to select the soft risks (risks that are difficult to precisely define or measure) that accompany chronic disruption.



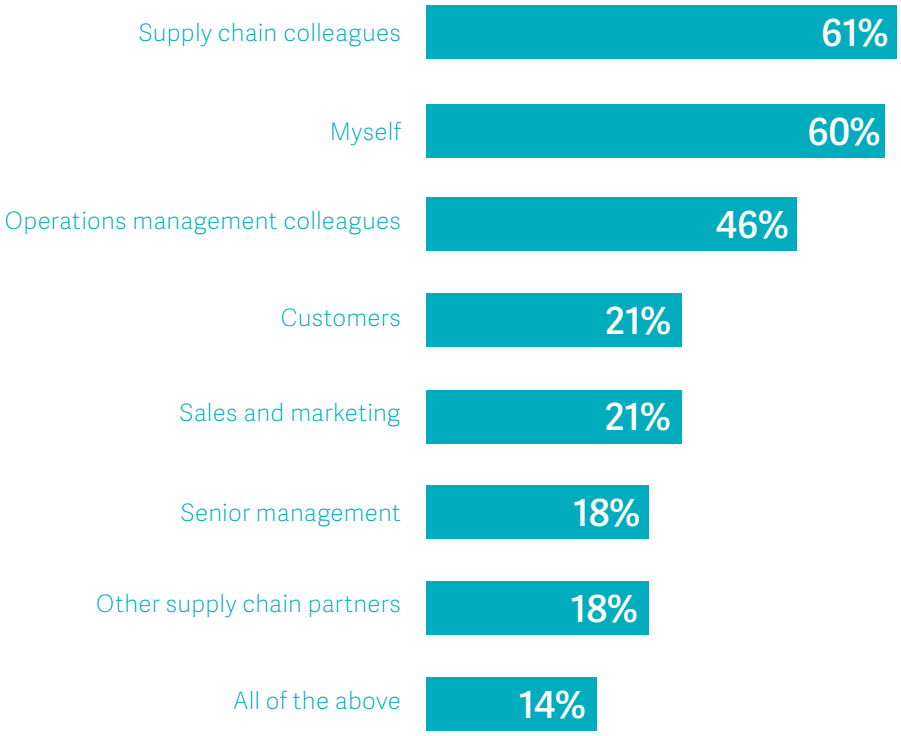
Response time

Respondents were asked to indicate the typical amount(s) of time passed before recognizing an occurrence of chronic disruption.



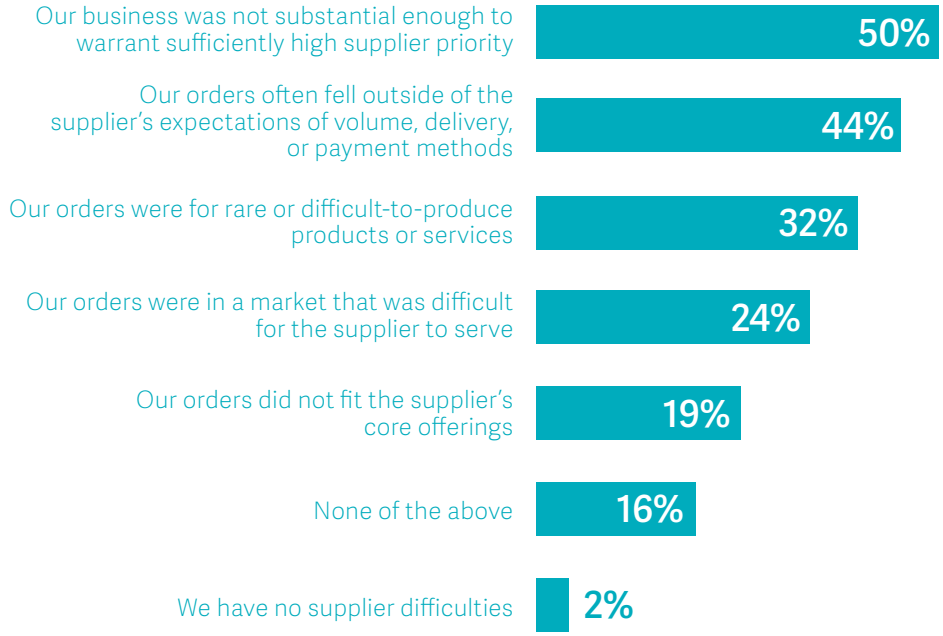
Chronic disruption recognition

Respondents were asked to identify who generally recognizes occurrences of chronic disruption.



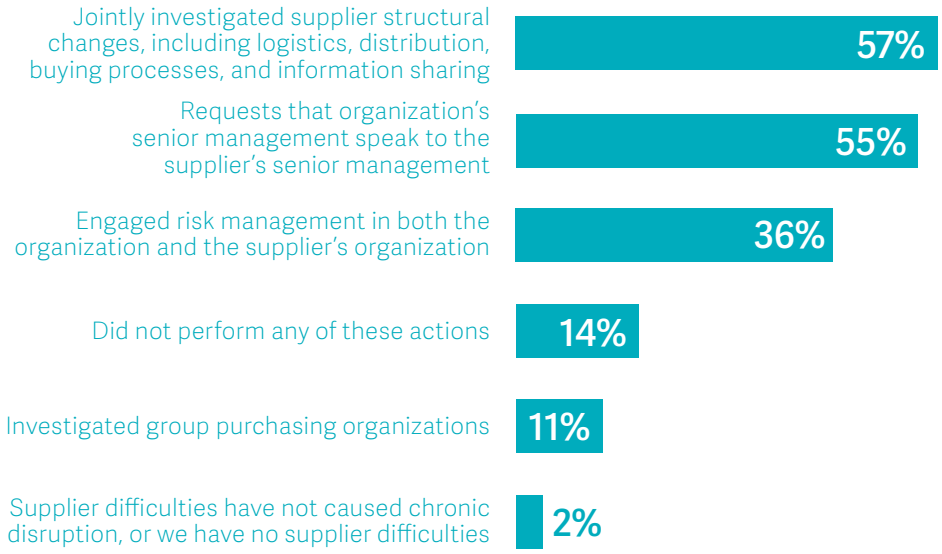
Supplier difficulties

Respondents were asked to identify their experiences with supplier difficulty.



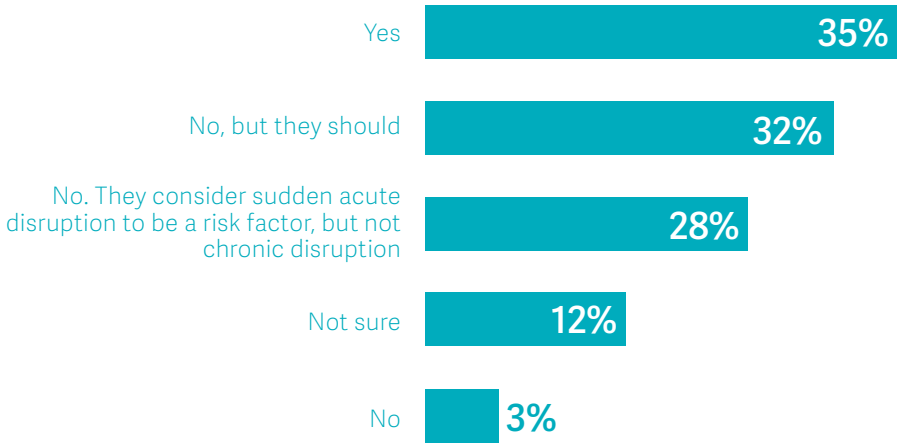
Responses to supplier difficulties

Respondents were asked to select their response(s), if any, to supplier difficulties.



Risk management consideration

Respondents were asked to select all applicable responses to whether or not their organizations' risk management functions formally consider chronic disruption to be a risk factor.



Chronic disruption versus routine difficulties and performance variations

Respondents were asked to identify good methods to distinguish between chronic disruption and routine difficulties or performance variations.

58% Chronic disruption involves more complex causes and consequences than routine difficulties

35% Length of time—routine difficulties resolve themselves in the short-term

32% Routine difficulties have routine solutions; chronic disruption does not

27% Routine difficulties are visible to most everyone, and chronic disruption is not very visible

10% There are no good ways to distinguish chronic disruption from routine difficulties; there are too many variables and complexities involved

Visibility

Respondents were asked the following question: Does the challenge of chronic disruption have sufficient visibility throughout the industry?

Definitely not	2	3	4	Perhaps	6	7	8	9	Definitely yes
<1%	2%	16%	7%	43%	11%	9%	6%	1%	4%

APICS POINT OF VIEW

CHRONIC DISRUPTION IN THE SUPPLY CHAIN

An examination of how low-to-moderate disruption influences and degrades the supply chain.

Defining chronic disruption

Chronic disruption is persistent and degrades, but does not halt, supply chain operation. It is not resolved using traditional disruption solutions. Chronic disruption usually includes one of the following elements:

- The root causes tend not be obvious to most supply chain stakeholders.
- The disruption becomes tolerated over time.

Chronic disruption persists because it presents a low profile to many supply chain professionals. Supply chain performance may be unsatisfactory, but not unsatisfactory enough for definitive action (which is usually the case with acute supply chain disruption), or the solution to eliminating the chronic disruption is not apparent and the disruption remains unaddressed.

There are many causes of chronic disruption. There may be a slowly unfolding, underestimated challenge to the supply chain; continually varying supplier performance; poorly suited supply chain strategy and design; or low visibility of significant supply chain risks. No matter the cause, addressing supply chain chronic disruption is the responsibility of every supply chain professional. While external causes often appear to trigger chronic disruption (such as an underperforming external supplier), there are often internal causes (such as internal procedures that create short notice to suppliers). Even if an external supplier is entirely the cause, and no internal causes exist, the supply chain professional makes improvements to recover supply chain performance.

A hypothetical example of chronic disruption creeping in

Located in a small nation, LocalCo is seeking to become the national leader in its industry as a business unit of GlobalCo. GlobalCo is a large enterprise headquartered in a large, distant nation. LocalCo is obligated by its corporate sourcing policies to source about 100 critical stockkeeping units (SKUs) from distant plants owned by GlobalCo. These suppliers see LocalCo as a minor, low margin customer, and often give it low priority in product shipments. This results in a persistent problem for LocalCo's home market because it cannot get enough product at the right time. Despite efforts to optimize inventory levels, order points, safety stock, etc.—in short performing all the traditional remedies for this situation—nothing has worked. It is not clear what to try next.

Yet complaints from LocalCo distribution and retail partners are harming the downstream supply chain and LocalCo's revenue. LocalCo's supply chain management does not know what to try next. They would much prefer to use quality local suppliers but cannot due to firm corporate sourcing policies. A common back office expression, "We just have to live with this problem. What else can we do?" comes up with most every customer complaint.

From a chronic disruption perspective, there are internal and external causes. The external causes are lack of performance from distant supply partners. The internal causes involve LocalCo's poor supply chain configuration and lack of alignment to its strategy.

This illustration of a vertical sourcing challenge is but one example of chronic disruption.

SUPPLY CHAIN CHRONIC DISRUPTION IS COMMON, BUT NOT FULLY VISIBLE

Most survey respondents reported that the challenge of chronic disruption is that it does not have sufficient visibility. Using a scale of 1 to 10 to assess visibility (1 meaning definitely not, 5 meaning perhaps, and 10 meaning definitely yes), only 11.8 percent selected numbers 8 to 10. Perhaps was the most common response, highlighting the difficulty of tracing this issue.

73% of APICS members and customers who have experienced chronic disruption in their careers. Based on a 2013 random sample of about 15,000 APICS members and customers, 73 percent reported they have experienced chronic disruption in their careers.

Chronic disruption is not visible to risk management practice, either.

Supply chain colleagues themselves are likely to notice that chronic disruption is occurring. But they cannot count on other stakeholders within their organizations and their partners with being aware. While 61.3 percent of supply chain colleagues recognized chronic disruption occurring, only 17.8 percent answered "senior management;" 20.9 percent answered "sales and marketing;" and 17.4 percent answered "other supply chain partners" were focused on the issue.

Causes of disruption found in most supply chains

Chronic disruption does not rely on rare or unusual risks causes to develop. Common, everyday challenges can also help cause chronic disruption. For example, survey respondents reported multiple causes of chronic disruption such as continually varying supplier performance (57.6 percent); low visibility of supply chain risks (46.2 percent); and a slowly unfolding, underestimated challenge to the supply chain (36 percent).

75%

APICS Members and customers who do not or are not sure that their organization's supply chain risk management function formally considers chronic disruption as a risk factor.

Why common challenges trigger chronic disruption in some supply chains and not in others may depend on the unique combination of risk challenges present in each supply chain. Every supply chain has its own distinct arrangement of complexity, management performance, and capability to detect, resist, and respond to disruption. Where chronic disruption manages to embed itself, supply chain management may not notice as it becomes embedded, or is not able to find and address the root causes of chronic disruption in time to prevent it.

The cycle of tolerance

Because of its lack of visibility and the lack of clear solutions, supply chain chronic disruption can persist long enough to become tolerated.

- Once tolerated, common tactical means of simply managing chronic disruption, such as increasing safety stock or altering inventory boundaries, gradually become their own ends.
- This shifts focus away from eliminating chronic disruption and toward working with its symptoms rather than seeking to eliminate its root causes.
- Priorities, budgets, and activities begin to target short-term to medium-term challenges.
- The result is increasing loss of situational awareness and loss of alignment to supply chain and business unit strategy.
- Embedded behaviors that cope with, rather than eliminate, chronic disruption complete a cycle of tolerance for chronic disruption.

This situation may remain until broken either by deliberate chronic disruption risk management action, or by more severe consequences—such as substantial customer dissatisfaction or business losses triggered by chronic disruption. Even when these events occur, it may not be clear what to do next.

Detection and elimination

When asked how long it typically takes to recognize chronic disruption is occurring, 41.7 percent reported a few weeks to a few months, while 25 percent reported a few months to more than a year. When asked how chronic disruption is typically resolved, 36.6 percent responded that they have not solved it yet. For those who did solve the disruption, finding a solution was not immediate.

Among respondents who did solve the disruption, the most common solutions included

32.9% Found substitutes for components, products, or services associated with chroninc disruption

28.8% Substantially changed suppliers or partner standards, metrics, or contracts

26.7% changed or updated supply chain strategy

STEPS TO DEFEAT CHRONIC DISRUPTION

Successfully detecting and eliminating chronic disruption tends to follow a five-step process:

1. Detect supply chain chronic disruption using underperformance "is–is not" analysis.
2. Define chronic disruption's causes and enabling risks and impacted stakeholders.
3. Break the chronic disruption tolerance cycle using visibility of costs, strategy, and competitive disadvantages.
4. Create and execute your chronic disruption solution: allies, plans, and projects.
5. Follow up using long-term strategic plans and persistence.

STEP 1

DETECTING SUPPLY CHAIN CHRONIC DISRUPTION

APICS research shows that detecting chronic disruption often takes between a few weeks to a few months. Because chronic disruption often is slow to reveal itself; may resemble other types of disruption; is difficult to detect (stakeholder awareness is usually low); and is caused by common supply chain challenges, it is essential to accurately determine if chronic disruption is the actual culprit.

Chronic disruption is persistent disruption that degrades, but does not halt, supply chain operation. It contrasts other types of disruptions that

- respond to traditional, tactical remedies
- interrupt, not merely degrade, supply chain
- do not persist and become a chronic problem

For example, hurricane season storms that disrupt production tend not to be chronic disruption because such storms tend to resolve with traditional disruption measures. Or, storms may halt the supply chain and not merely degrade its operation.

Nonetheless, because chronic disruption often creates tolerance for less than ideal performance, it may appear to be routine at first in terms of supply chain performance variation. Even so, there are two methods to uncover chronic disruption.

Method 1: Supply chain underperformance analysis

Unexplained underperformance or persistent difficulties could be a sign of chronic disruption and should trigger supply chain underperformance analysis. If supply chain professionals are aware of what to look for, this analysis may reveal chronic disruption.

Method 2: Chronic disruption detection questions

- What do we tolerate as acceptable or routine variation of supply chain performance? When did this become acceptable or routine? Over what length of time? How do current results compare to results from three months, six months, and twelve months ago?

- What risks might enable or promote continuing supply chain underperformance? Can we detect them in our analysis? Do we suspect risk is present even if this risk is hard to measure?

- Are we experiencing disruption and underperformance problems now that are slow to resolve? Are traditional disruption solutions effective? If underperformance currently exists, do we endure it because we see no clear solution to actually eliminate it?

If these questions lead you to suspect supply chain chronic disruption is occurring (rather than another cause), work through steps 2 through 5.

STEP 2
DEFINING CHRONIC DISRUPTION'S CAUSES, ENABLING RISKS, AND IMPACTED STAKEHOLDERS

It is all too easy to blame chronic disruption on one or more underperforming suppliers. However, even when a supplier seems to be the only cause, there are likely other causes. Chronic disruption frequently has both internal and external causes.

A supply chain professional is responsible for the performance of the supply chain even if an external supplier appears entirely at fault for producing chronic disruption. For example, a supply chain professional may replace a poor performing supplier with a better one. Nonetheless, the ability of the supply chain professional to replace poor suppliers depends on internal capability and management authority. Internal causes such as poor leadership, excessive short-term performance measurement, and poor supply chain design are all examples of internal causes of chronic disruption. Internal causes are usually difficult to see. APICS research identified the following common internal causes of chronic disruption:

- use of supply chain strategies and tactics that do not align with each other
- ongoing unstable, unpredictable demand
- use of suppliers that are a poor fit for the needs or strategy of a company
- a string of acute disruptions that have occurred in the recent past

Soft risks and chronic disruption

Soft risks help enable chronic disruption to develop. They are genuine risks, but are difficult to measure precisely. Soft risks commonly accompany, enable, and promote chronic disruption.

Examples include:

Shifting markets – changes to the size or location of markets, or demand, which reduce responsiveness or service standards

Changing economic or competitive conditions – previous practices becoming uncompetitive

Increasing complexity

Changing leadership

Falling levels of relationship trust with supply chain partners – slower, more formal, proof-required actions.

Soft risks increase uncertainty, reduce trust, and add complexity to plans, goals, and partner relationships. These difficulties create and promote chronic disruption by reducing effective prevention, detection, and management of supply chain disruption in general—including chronic disruption.

Soft risks typically have internal and external components. External components of soft risks involve a third party's responses, behaviors, perspectives, and priorities. Internal components of soft risks include an organization's perception and awareness of third party and environmental changes, responsiveness to challenges and problematic trends, and overall management leadership.

Because of their internal and external components, soft risks tends to lack visibility. Soft risks lacking in visibility tend to evolve gradually, without calling undue attention to themselves. Their consequences appear simply to be a "cost of doing business."

Look specifically for enabling internal and external soft risks. Identifying these risks may eventually become part of the solution to eliminating chronic disruption. For additional information about supply chain risk, please see APICS Supply Chain Risk and Risk and Reward folios.

In order to find specific causes for chronic disruption, begin by

- establishing a list of probable internal and external root causes and soft risks
- identifying stakeholders most involved or affected.

Use these findings to create a stakeholder team to investigate the causes and their risks behind an example of supply chain chronic disruption. With this team, use one or more root-cause analysis tools. Some tools may include:

Cause-and-effect diagram
A tool for analyzing process dispersion. It is also referred to as the Ishikawa diagram and the fishbone diagram. The diagram illustrates the main causes and sub-causes leading to an effect (symptom). The cause-and-effect diagram is one of the seven tools of quality. (Source: *APICS Dictionary*, 14th Edition.)

The five whys
The common practice in total quality management is to ask "why" five times when confronted with a problem. By the time the answer to the fifth "why" is found, the ultimate cause of the problem is identified. (*APICS Dictionary*, 14th edition)

Current reality tree (CRT)
A logic-based tool for using cause-and-effect relationships to determine root problems that cause the observed undesirable effects of the system. (*APICS Dictionary*, 14th Edition). It usually starts with a list of symptoms or problems called undesirable effects (UDEs), and seeks to connect them through a chain of cause and effect reasoning that finally leads to a root cause or causes. A chart may display the relationship from UDEs down to the root cause. The chart, roughly shaped like a tree, shows the root cause as the base of the tree. CRT is one of thinking processes found in the theory of constraints.

Stratification analysis
A statistical tool for determining root causes in which observed historical data are separated by particular characteristics to determine the effect of each characteristic upon the observed results. (Source: *APICS Dictionary*. 14th Edition)

Prioritizing causes, risks, and supply chain partners and suppliers

With the causes of chronic disruption identified, you can link those causes to the supply chain stakeholders, partners, and suppliers most impacted by those causes. As a starting point, sort suppliers, causes, and risks into common categories (such as component, logistics, labor, supplier relationship, currency risk, and so on). The following tasks help carry out the remaining steps:

- Prioritize suppliers, causes and risks in Pareto principle terms A, B, and C.
- Map your supply chain and overlay these risks and causes on the map.
- Look for a Pareto A priority group to start with: A supplier, A cause, A risk.
- Document the causes, risks, and probable outcomes of chronic disruption to the supply chain and its stakeholders.
- Document the costs of the disruptions in terms of expense, lost revenue, inventory expense, lost opportunity to advance strategies, serving the customer, and challenging competitors.
- Document the ongoing enablers of chronic disruption. What causes us to tolerate chronic disruption rather than eliminate it? It may be lack of awareness, visibility, and lack of a clear solution.

STEP 3
BREAKING THE TOLERANCE CYCLE FOR CHRONIC DISRUPTION

This step strips away chronic disruption's key enabler: lack of visibility. Chronic disruption and its many negative consequences all along the supply chain may come as a surprise to some supply chain stakeholders. Even where chronic disruption is visible, stakeholders may not realize how widespread tolerance for supply chain chronic disruption can become. Tolerance of chronic disruption occurs for many reasons, such as

- forecast history that starts to reflect chronic disruption as "normal" performance
- lower performance becoming 'normal' both upstream and downstream in inventory, ordering, and responsiveness

- disruption that is virtually invisible to customers, senior management, and other departments. They may call for plans or activities that actually worsen chronic disruption even in a desire to improve business processes.

Tolerance develops in a self-reinforcing cycle as the organization adapts, expects, and accommodates chronic disruption. Typically, organizations begin to accept lower performance in areas such as

- processes
- expectations
- inventory levels
- service levels.

This creates tolerance for chronic disruptions in hidden and not so hidden ways—such as in buying/planning and scheduling tasks. As the cycle develops, lack of accountability and invisibility of this chronic disruption embed themselves.

The supply chain professional remains responsible for ridding the supply chain of chronic disruption even if other stakeholders do not require it. The goal is to break the tolerance cycle where possible in the organization and in supply chain partner relationships. This is done by making

- chronic disruption and its causes visible
- the tolerance cycle visible
- full costs of chronic disruption visible
- commitments among stakeholders to address root causes, not symptoms of chronic disruption.

Consequences of chronic disruption

To achieve reward or profit, all businesses must face risk. A business unit's strategy or vision statement will, implicitly or explicitly, describe the rewards and risks the business must face in order to succeed. Yet not all risks deliver a desirable reward. Chronic disruption increases risk while decreasing reward. Identify the risks your supply endures where you suspect chronic disruption might be occurring. Do they deliver a necessary or desirable reward in exchange for enduring such risk? If not, they may cause or compound chronic disruption. In this case, do not treat such risks as routine. If you are encountering

- high variation in supplier order delivery and quality
- bullwhips
- difficulty forecasting demand
- rising real costs without tangible benefits
- persistent lack of compliance, you may be enduring risk with no useful reward due to chronic disruption.

Outline causes, costs, and enablers and follow up with a high-level solution plan. Inform stakeholders. At this point, you may still encounter tolerance for chronic disruption. Ask your stakeholder team (created in the Step 2—Defining chronic disruption's causes and enabling risks and impacted stakeholders) the following questions:

- Is your business receiving a suitable reward for the risks—both hard and soft—that the supply chain endures?
- How well does the current supply chain actually support business unit strategy and vision?
- If you suspect chronic disruption, how widely shared is this suspicion?
- How visible are the causes and consequences of chronic disruption across the organization?

Internal and external costs of chronic disruption

Stakeholders may at first seek to blame external causes, such as external suppliers, for chronic disruption. Help them discover both internal and external causes of chronic disruption (for example, with questions about Pareto A-level suppliers). Ask your stakeholder team created in Step 2 the following questions:

FOCUS
INTERNAL AND EXTERNAL CHECKS—SUPPLY CHAIN A SUPPLIERS

Internal Questions
Could your business make business easier for your A suppliers, using improved forecasting and communication?
Does your business take the time to develop good supplier relationships? If not, what stops it? Is this a good reason?
Is your purchasing, procurement, supply chain management, and risk management tightly aligned to business unit strategy? Are there silos? Inefficiencies?
As your business discusses and plans changes and new products, do you include each A supplier's perspective and the supplier's reality at their planning and operational level? Do you provide the time aand information they need?
How well aligned are your joint logistics and procedures to maintain the flow of products, finance, and information?
Does your business pursue short-term tactics and plans that harm the long-term working of the supply chain?
Do your responses to these questions suggest areas for improvement?

External Questions

How critical is your business to each of your A suppliers?

How well do you really know your A suppliers? Who are their suppliers? Who else does the A supplier serve?

How much information-sharing occurs between your business and your A suppliers?

How do your A suppliers tend to make decisions when there are conflicts and competing priorities?

In light of chronic disruption, what A supplier contract language and key performance indicators (KPI) descriptions need improvement?

High-level chronic disruption solution development

With answers to these questions, chronic disruption visibility in

- specific causes and consequences
- tolerance cycle
- costs

should become clear to a wider base of potential stakeholders. From this position, a stakeholder team can begin to draft an outline for a recovery solution, which considers chronic disruption costs and consequences, internal and external causes, and all potential stakeholders.

STEP 4
CREATE AND EXECUTE YOUR CHRONIC DISRUPTION SOLUTION

Creating and implementing solutions to chronic disruption may involve a broad range of stakeholders and tasks.

Building and implementing a solution based on root causes and extensive buy-in can seem overwhelming. But supply chain managers generally have access to an array of problem-solving solutions. These solutions include finding allies. Starting points for finding allies and project support include identifying

- those most directly impacted by chronic disruption
- all supply chain risk managers
- senior management with strong leadership ability in operations and supply chain areas.

To engage your allies, request their help in ways that leverage their key responsibilities or strengths. For example:

- Request your senior management talk to the supplier's senior management about prioritized strategic supply issues.
- Connect your supply chain risk manager with the supplier's to focus on supply chain risks that enable chronic disruption.
- Investigate with the supplier useful changes to logistics, distribution, finance, and buying and planning. Small changes across many domains can add up to effective systemic improvement.

Propose specific solutions to specific root causes of chronic disruption and work to create acceptance of the solution. For example, suppose one chronic disruption root cause is the restriction that our organization can only use suppliers owned by its parent corporation and that

- our orders are not large enough to warrant priority among available suppliers
- our orders are not part of these supplier's core offerings
- we are in a market difficult for these suppliers to serve.

In this example, a specific solution might include one or more of the following:

- substantially change our logistics or distribution functions or practices
- find substitutes for components, products, or services associated with chronic disruption
- substantially change our suppliers or partner standards, metrics, or contracts
- increase supply chain diversity or flexibility in terms of asset locations, partners, or practices.

If many allies become involved, tactical goals and priorities may change to accommodate everyone, but the purpose of eliminating chronic disruption should remain everyone's core focus. Be alert to allies who want to add other goals that could risk diluting the effort of conquering chronic disruption.

Problem-solution models and methodologies

Define, measure, analyze, improve, control (DMAIC) is a six sigma methodology commonly used to eliminate defects and improve business processes. It may provide an intuitive framework for outlining a chronic disruption solution.

Define – Clearly describe the opportunity, goal, scope, timelines to eliminate chronic disruption.

Measure – Use metrics and measurements for performance improvement such as past supply chain performance measurements (recorded before chronic disruption) that may offer a baseline to reveal performance gaps.

Analyze – Validate and select the specific targeted root causes to address. You may have previously identified multiple root causes, but a solution plan may focus on just a few. These tend to be root causes that have biggest impact.

Improve – Test, implement, and enhance the solution plan as it proceeds. This calls for innovation, creativity, and updating the plan.

Control – Sustain the solution plan and keep execution on track. This includes business processes, training, documents, and reports, as needed.

Research revealed that solutions to chronic disruption include:

- changing or updating our supply chain strategy
- senior management elevating and resolving the issue at their level
- substantially changing suppliers or partner standards, metrics, or contracts
- substantially changing logistics or distribution functions or practices
- increasing supply chain diversity or flexibility in terms of asset locations, partners, or practices
- finding substitutes for components, products, or services associated with chronic disruption.

Solution plan approach examples

Design and implement a good-to-better-to-best relationship path with targeted A Suppliers. The value for both organizations includes volume, price, service, quality, responsiveness, and innovation. Develop knowledge on how the A supplier and your organization actually perform their decision-making, handle conflicts, and prioritize decisions in terms of challenges and bottlenecks. Follow up on opportunity to improve interoperability and information sharing, as well as better anticipate other organizational needs. These efforts should help build trust, leading to valued, protected, long-term relationships willing to invest in changes needed to eliminate the causes and enablers of chronic disruption.

Project management

As chronic disruption solutions usually involve substantial effort or change, break down the solution in terms of supporting allies and specific projects. This will help create understanding among stakeholders and decision makers, many of whom need to weigh the opportunity cost of addressing chronic disruption against other uses of allies and resources.

As with all projects, good project management is essential. Based on findings from the APICS Project Management Report be certain to

- ensure senior management sponsorship
- clearly plan and identify tasks, responsibilities, and timelines
- avoid scope creep

Integration of the chronic disruption solution plan among all stakeholders, tasks, and processes helps ensure its effectiveness. Consider assigning someone to represent chronic disruption solution plans in activities such as

- risk management
- sales and operations management (S&OP)
- strategic planning
- master scheduling

STEP 5

LONG-TERM STRATEGIC PLANS AND ACTIVITY

Be persistent in completing chronic disruption solution plans and projects. Even if you see early improvements, it is important to follow through. There may be partners and other stakeholders across the supply chain who, formally or informally, still expect chronic disruption to occur. It may take considerable time and sustained activity to overcome chronic disruption as an embedded expectation. It also may take time for forecasting tools and decision management resources—factors that rely on past history—to show improvement.

Suggested long-term follow-up actions

When the chronic disruption solution focus on Pareto A suppliers and partners from Step 2 is complete, evaluate the need for similar efforts with B or C suppliers. Chronic disruption prevention and early discovery can benefit from business intelligence profiles of past supply chain general risk and disruption.

Consider:

- building up a history of major supply chain disruption that isolates each disruption's
  - internal and external causes
  - frequency of similar disruption
  - common and unique characteristics of each disruption
  - potential to cause chronic disruption
- developing improved, more sensitive early warning signs of chronic disruption.
- enhancing discovery and recovery from minor disruptions that could lead to chronic disruption, such as non-acute bottlenecks, falling service levels, and single points of failure.

Overall supply chain strategy

Tight alignment of supply chain strategy and tactics—where supply chain strategy defines realistic supply chain goals, plans, priorities, and tactics—

helps create a supply chain resistant to foreseeable disruption risk. Developing and executing supply chain strategy means evaluating current reality compared to past decision in areas such as:

- make-buy
- mix of supply and suppliers
- locations of facilities
- information system strategy
- long-term metrics, KPI, and contract language

In contrast to this evaluation is a "default" supply chain strategy. This type of strategy is not purposeful, and usually follows the path of least resistance. Default supply chain strategy is at risk for chronic disruption. Supply chains that work well on paper but no longer work well in actual business practice are at risk of chronic disruption.

When evaluating your current supply chain strategy keep in mind that

- supply chain disruptions, whether chronic or acute, may be a sign of a less than optimal supply chain strategy, or implementation of that strategy.
- as organizations grow, products change, and new markets develop, strategy may need updating.
- your current supply chain strategy must be analyzed in terms of trade-offs and priorities. How does chronic disruption factor into strategic decisions?
- poor supply chain responsiveness makes disruption easier.

CONCLUSION

If you suspect the existence of chronic disruption, look for its causes. In some cases, the cause of chronic disruption may seem immediately clear. For example, a single-source supplier no longer values your business because you are too small, too distant, or from a market that no longer interests the supplier. Yet there are often less obvious internal causes to address before you can successfully eradicate chronic disruption. Look for

- lack of situational awareness
- poor leadership
- weak alignment of strategy and tactics across the organization

- management silos
- tolerance for sub-par practices, processes, procedures

With the cause of chronic disruption clearly established, build and carry out your solution:

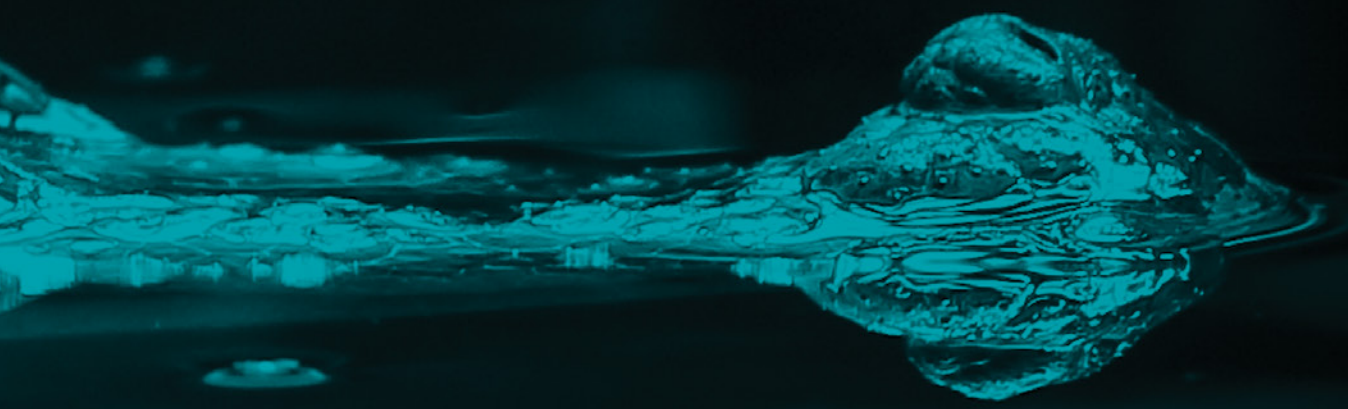
- Engage stakeholders and allies
- Break the tolerance cycles that sustain chronic disruption
- Use good project management practice for long and complex solutions
- Carry out long-term and strategic plans and activity

Chronic disruption solution checklist

- Look for internal and external causes and enablers.
- Avoid addressing only symptoms of chronic disruption, ensure solutions directly address root causes.
    - Maintain an accurate big picture
    - Keep a united front. Continue to look for ways to engage allies and management leadership.
- Prioritize and focus on Pareto A supply chain partners first.
    - Supply chain maps of risk and disruption
    - Warning signs and triggers
- Minimize consequences of disruption at your organization.
    - Break unproductive cycle of tolerance
    - in your organization
    - in relationships
- Be persistent
    - Follow through on your solution plan even after initial improvement starts to appear.

PERSPECTIVES FROM *APICS* MAGAZINE

APICS magazine is an award-winning publication featuring innovative ideas and real-world strategies for inventory, materials, production, and supply chain management; planning and scheduling; purchasing; logistics; warehousing; transportation and logistics; and more. Visit apics.org/magazine to view current and archived issues and to learn more about the magazine.



PERCEPTIONS OF PERIL

Evaluating risk management in supply chains

By Richard E. Crandall, PhD, CFPIM, CIRM, CSCP

Supply chain risk management has become a concern for all types of organizations. As businesses move to loosely coupled networks of customers and suppliers spread over wide geographic areas and diverse business environments, the likelihood of potential disruptions increases.

Organization leaders have a responsibility to manage these risks and minimize the negative effects. However, as reported in a recent APICS study, "Supply chain risk management is still at an early stage of maturity and… there are gaps at the organizational management level and the supply chain and operations management level" (APICS 2011). The study found that 72 percent of organizations do not have a risk management role or position, and almost one-third have practiced risk management for no more than five years.

Another survey found that 85 percent of surveyed companies suffered at least one supply chain disruption during 2011, with the following being the major causes: adverse weather (51 percent), unplanned information technology or telecommunications outage (41 percent), transport network disruption (21 percent), and earthquake or tsunami (21 percent) (Veysey 2011).

GENERAL CATEGORIES OF RISK

The number of articles on risk management has increased rapidly over the past decade, which is typical of new programs. The literature provides a variety of discussions about risk management in supply chains. Writers present specific, but somewhat limited, snapshots of the total supply chain risk management mosaic. Spekman and Davis (2004) looked at the dimensions of risk, which included

- flow of goods and services
- flow of information
- flow of money
- security of internal information systems
- risks with relationships forged among supply chain partners
- corporate social responsibility and the extent to which supply chain members' reputations and images can be tainted by actions of another member engaging in improper activities.

At about the same time, Cavinato (2004) identified risks and uncertainties in supply chains as

Physical – the actual movements and flows within and between firms

Financial – the flows of cash between organizations

Informational – the processes and electronic systems, data movement, access to key information, and capture and use of data

Relational – the appropriate relationships between a supplier, the organization, and its customers for maximum benefit

Innovative – the processes and linkages across the firm, its customers, and its suppliers, as well as resource parties for discovering and bringing to market product, service, and process opportunities.

Supply risks

George A. Zsidisin (2003) organized risks in supply chains in a classification scheme that considers elements along the supply chain: the internal product, the market, and suppliers. He included three types of supply risks—item, market, and supplier characteristics—and compared how they are affected by higher – and lower-perceived risk.

Hunter et al. (2004) examined the importance and probability of risk. They extracted strategies as shown in Table 1.

New product development risks. While creating new products is usually viewed as an opportunity to enhance a company's competitive position, it also carries with it a number of risks, as shown in Table 2 (Khan, Christopher, and Burnes 2008).

Table 1: Risk strategies and characteristics

Strategy	Result	Characteristics
Low risk importance and low risk probability	Disintermediation	• Nonessential substitutable products • Many potential suppliers with little variation in capabilities • Product specifications that are easy to develop
Low risk importance and high risk probability	Re-intermediation	• Nonessential substitutable products • Many potential suppliers with difference in capabilities • Product specifications that are moderately easy to develop
High risk importance and low risk probability	Strategic diversification	• Essential differentiated products • Many potential suppliers with similar capabilities • Product specifications easy to develop
High risk importance and high risk probability	Relationship development	• Essential differentiated products • Many potential suppliers with variation in capabilities • Supplier capabilities that are difficult to assess • Product specifications that are difficult to develop

Table 2. Potential risks in new product development

Level of risk	Types of risks
Critical	• Product proposition does not meet customer needs • Space planning fails to drive profit
High	• Quality fails to meet standards • Supply base strategy is inappropriate • New product results in loss of leadership • Poor availability due to internal planning
Medium	• Store environment fails to attract new customers • Unsuccessful at attracting and retaining the right employees • Poor acceptance of corporate brand • Communication efforts do not attract target customers • Supplier cost savings not achieved • Poor supplier performance • Inappropriate and inadequate training for sales teams
Low	• Competitors copy products and sell at a lower price • Market doesn't accept target price
Very low	• Information technology system doesn't provide adequate management information • New selling channels not attaining anticipated reach

OUTSOURCING RISKS

Kremic (2006) compiled a list of risks that could result from outsourcing activities, which include

- unrealized savings or hidden costs
- less flexibility
- poor contract or poor selection of partner
- loss of knowledge, skills, or corporate memory
- loss of control of core competencies
- power shifts to suppliers
- supplier problems (poor performance or bad relations, opportunistic behavior, not giving access to best talent or technology, and so on)
- loss of customers, opportunities, or reputation
- uncertainty or changing environment
- poor morale or other employee issues.

Turbulent environments risks

In an expanded perspective of supply chain risks, Trkman and McCormack (2009) developed the following classification scheme. Supplier attributes include financial performance, human resource factors, operational factors, culture, and relationship factors. Supply chain strategy and structure involves supply chain type (lean, agile, or hybrid), supplier types, business structure, and geographic location. Endogenous uncertainty encompasses market turbulence, new products, price sensitivity, level of competition, demand swings, new customers versus repeat, and technology turbulence. And exogenous uncertainty deals with continuous items (interest rates, gross domestic product, commodity prices, and the like) and discrete events (such as terrorism, disasters, and strikes).

Risk management paradigms

That risk management is becoming more important in most organizations is exemplified in an article in Strategic Finance, the journal for management accounting. The author summarized the difference between traditional financial risks and contemporary business risks. (See Table 3.)

The involvement of management accountants in risk management should help integrate the allocation of the necessary resources to prevent or mitigate risks, with operations management formulating their identification and strategy. The variety of risk categories described shows the wide range of risks in supply chains.

Actions to mitigate or prevent risk disruptions

Table 3. Evolution of risk management

Old paradigms of risk	New paradigms of risk
• Ad hoc activity • Treasury, audit, and controllership functions • Risks hidden in silos • Risk management prevents bad things • Enterprise resource management is a consultant's program • No return on investment in risk management	• Continuous activity imbued in culture • All management, especially accountants • Risk discussed cross-functionally • Risk management creates opportunities • Enterprise resource management is a business imperative • Positive return on investment in risk management

There are also myriad actions to mitigate or prevent risk disruptions.

Matching mitigation strategies with category of risk. In addition to identifying types of risks, it is important to develop some actions to prevent or mitigate the extent of the risk effect. Chopra and Sodhi (2004) explained this as follows:

Disruptions – driven by natural disaster, labor dispute, supplier bankruptcy, war, terrorism, or dependency on a single source of supply

Delays – resulting from high capacity use at the supplier, inflexibility of supply source, poor quality or yield, excessive handling at border crossings, or change in transportation modes

Systems – caused by breakdown of information infrastructure, system integration or extensive systems networking, or e-commerce

Forecast – due to inaccurate forecasts as a result of long lead times, seasonality, product variety, short life cycles, small customer base, or information distortion

Intellectual property – driven by vertical integration of supply chain and global outsourcing and markets

Procurement – the result of exchange rate risk, percentage of a key component from a single source, industry-wide capacity constraint, and length of contracts

Receivables – affected by the number of customers and financial strength of customers

Inventory – because of the rate of product obsolescence, inventory holding cost, product value, and demand and supply uncertainty

Capacity – resulting from cost of capacity and capacity flexibility.

The authors recommend that companies use stress testing to understand and prioritize supply chain risks. This involves what-if scenarios that enable people to focus on the supply chain one link at a time and identify possible disruptions. As a result of the analysis, companies will be better able to design mitigation responses should the disruption occur.

Chopra and Sodhi also identified a number of strategies to mitigate the effects of risks:

Increase capacity. Focus on low-cost, decentralized capacity for predictable demand; build centralized capacity for unpredictable demand; increase decentralization as cost of capacity drops.

Acquire redundant suppliers. Favor more redundant supply for high-volume products and less redundancy for low-volume products, and centralize redundancy for low-volume product in a few flexible suppliers.

Increase responsiveness. Choose cost over responsiveness for commodity products and responsiveness over cost for short life cycle products.

Increase inventory. Decentralize inventory of predictable, lower-value products and centralize inventory of less predictable, highest-value products.

Increase flexibility. Support cost over flexibility for predictable, high-volume products and flexibility for low-volume, unpredictable products; centralize flexibility in a few locations if it is expensive.

Pool or aggregate demand. Increase aggregation as unpredictability grows.

Capability. Select capability over cost for high-volume, high-risk products and cost over capability for low-value commodity products; centralize high capability in flexible sources if possible.

The need for strategy

In one of the early articles about the need to develop stronger supply management, Peter Kraljic (1983) outlined an approach to shaping the supply strategy.

Phase 1. Classification of purchased items

- Strategic (high profit impact, high supply risk)
- Bottleneck (low profit impact, high supply risk)
- Leverage (high profit impact, low supply risk)
- Noncritical (low profit impact, low supply risk)

Phase 2. Market analysis

The company compares its own bargaining power with that of its suppliers by assessing the supply market, the availability of strategic materials, and the relative strengths of existing suppliers.

Phase 3. Strategic positioning

Consider the areas of strengths and vulnerability, using the following strategies:

Where the company is stronger than its suppliers, exploit that strength.

Where the suppliers are stronger than the company, diversify supplier base.

Where the company is equal to its suppliers, balance the relationship.

Phase 4. Action plan

Based on the foregoing analysis, a company should develop strategies for dealing with volume, price, contractual coverage, new suppliers, inventories, production, substitution, value engineering, and logistics.

Kraljic cautions: "Few companies today can allow purchasing to be managed in isolation from the other elements of their overall business systems. Greater integration, stronger cross-functional relations, and more top-management involvement are all necessary." While he was writing before the surge of interest in supply chains, it is apparent that he anticipated the evolution from an internally focused procurement to an external dependence on widespread supply partners.

Building confidence through collaboration

Spekman and Davis (2004) stressed the need for trust building among supply chain partners to reduce risk. Christopher and Lee (2004) echo this theme and point out that lack of confidence can lead companies into a risk spiral, where the risk increases and confidence erodes. With increased confidence, companies are able to substitute information for inventory, thereby reducing costs and creating a positive reduced risk spiral.

Perception versus reality

Zsidisin and Wagner (2010) ask: Do perceptions become reality? They believe operations managers have a good understanding of risks and their potential impact on the business. If managers perceive risks exist, they are likely to take actions to prevent or minimize the impact if those risks actually occur. If they take appropriate action, the negative impact of the risks will be reduced.

The authors write: "Understanding the source of risk is important for creating a tailored strategy for reducing the occurrence of supply disruptions, such as the use of flexibility in order to create resiliency from risk that originates from extended supply chains. When risk stems from forces outside the control of supply chain participants, it is imperative to insulate themselves, at least in the short-term, from the effects of a disruption occurrence by using practices that create redundancy in the supply chain" (Zsidisin and Wagner 2010).

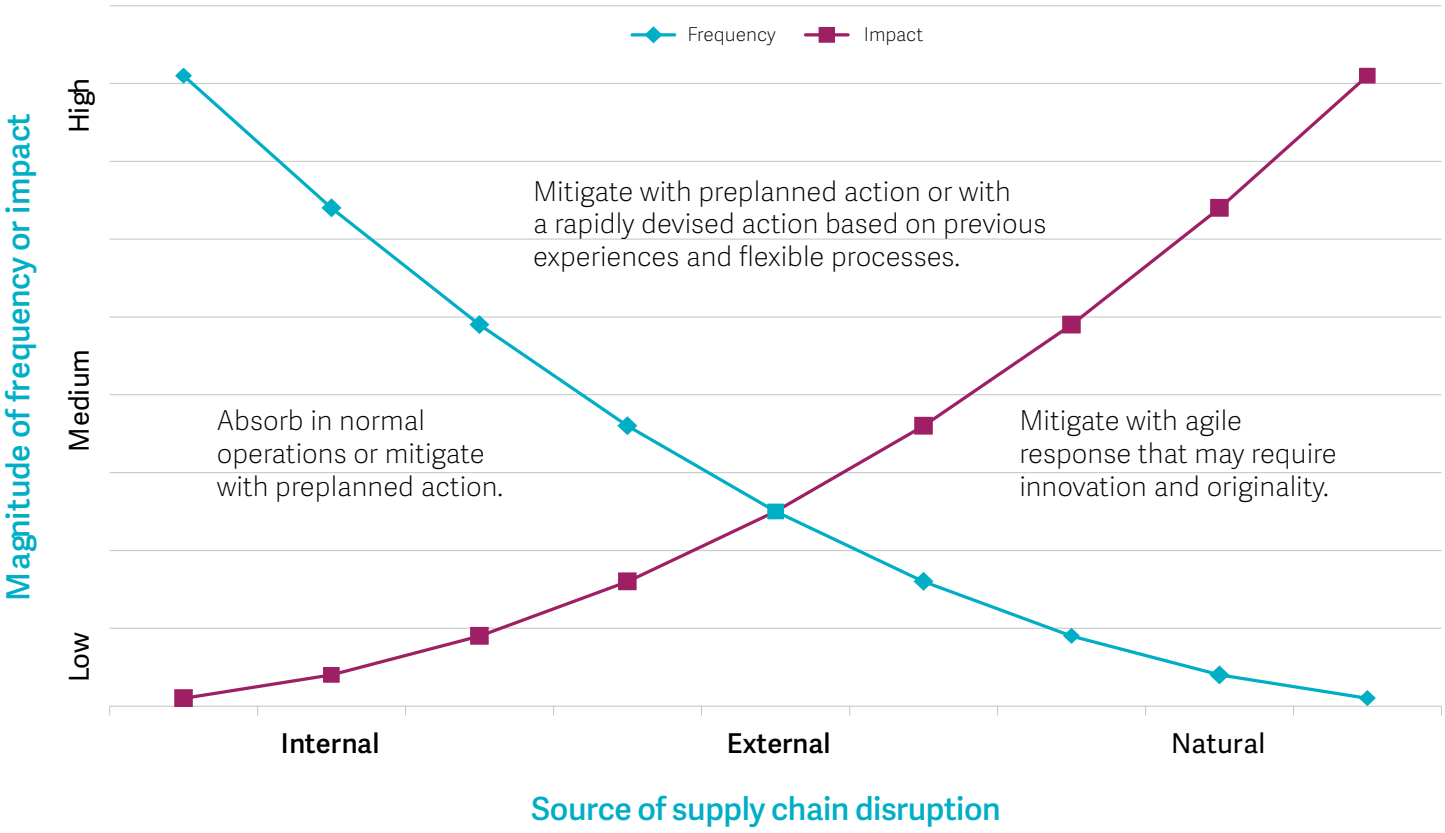
Figure 1 provides an overview of a proposed model. The horizontal axis shows a progression from internal causes on the left to external causes in the center to natural disasters on the right. The vertical axis shows a progression from low impact at the bottom to medium impact in the center to high impact at the top. Internal risks of disruption carry a high frequency of occurrence but a low potential impact. Natural disasters have a very low frequency of occurrence but a very high potential impact. Disruptions from external sources fall somewhere between internal and natural disaster disruptions in both frequency and impact.

Internal risks can be described as follows

Low-impact, high-frequency, expected, minor disruptions. In normal operations, more closely linked supply chains are designed to minimize disruptions. However, they may also be the most adversely affected should a disruption occur. If lean production practices are used throughout, there is little buffering with inventory or excess capacity. Therefore, a disruption will have a greater negative impact. Disruptions during normal operations can be identified and planned for; therefore, they should have limited effect on the supply chain's operation.

Medium-impact, moderate-frequency, anticipated, moderate disruptions. The introduction of new projects or major events can introduce greater risk. The mandate by Walmart to use radio frequency identification by suppliers introduced disruptions that probably could have been anticipated, but which represented more deliberate planning to accommodate.

Figure 1: Frequency and impact of supply chain risks



High-impact, low-frequency, low-predictability, major disruptions. A final category of risk in supply chains occurs when participants opt to remove themselves from the supply chain. A customer may find another supplier or a supplier may go out of business. Product recalls or noncompliance with government regulations also can represent unanticipated, major disruptions.

Operating in an open system environment also presents an array of external supply chain disruptions. While some of these changes can be anticipated, their timing and magnitude often cannot. Their disruptive impact can range from minimal to major. While they represent uncertainty, a firm must consider their potential impact and develop flexible processes in order to cope with their eventuality.

Competitors. Competitors introduce new products, change prices, launch major advertising initiatives, and buy suppliers. Operations management professionals should identify the most likely moves by a competitor and plan an appropriate response.

Economy. Recent fluctuations in the United States and global economies caused many companies to rethink their strategies about outsourcing, new product launches, investment in added capacity, and other resource-intensive decisions. These are "new normal" times; decisions that worked well during growth periods no longer do.

Technology. Technology continues to be a source of progress; unfortunately, it also introduces disruptions in normal supply chain operations. Information technology can be especially disruptive when it introduces major changes in processes and inter-organizational communications, such as electronic data interchange on the internet or cloud computing.

Government. Federal governments can change tax incentives for environmentally friendly investment; strengthen the enforcement of product tracking; or require health care insurance for all employees. State or local governments can change the sales tax rate, restrict waste disposal, heighten recycling requirements, or increase incentives for new business startups. Governments move slowly and in somewhat uncertain paths, but their impact can be significant.

Environment. The direction and timing of the environmental sustainability movement are uncertain. However, it appears that its impact will be a major opportunity or threat to many establishments.

Society. Cultural and generational differences abound. Buying habits, especially in the e-business age, are changing rapidly. Decisions about investments in brick-and-mortar retail stores and malls are brain-twisting in their variations. Executives know the future will not be like the past, but are struggling to determine how to use that knowledge.

Natural disasters

Yuva (2010) provides a summary of natural disasters occurring throughout the world during the last decade, using data from the Center for Research on Epidemiology of Disasters, as shown in Table 4.

The total indicates some type of natural disaster occurs on the average daily. While some have greater impact, any could be disruptive to a supply chain. The recent earthquake in Japan and flooding in Thailand and the Philippines are dramatic evidence that these kinds of natural disasters can have a significant effect on supply chains. Firms must be agile enough to quickly adapt to these unpredictable, yet not unexpected, occurrences.

Table 4. Number of natural disasters occurrences by type

Type of Disaster	Average 2000–2008	Year 2009
Flood	178	147
Storm	108	84
Mass movement, wet (avalanches)	18	30
Earthquake (including tsunami)	30	22
Extreme temperature	22	22
Drought	17	10
Wildfire	15	9
Volcano	6	2
Mass movement, dry (landslides)	1	1
Total	392	327

CONCLUSION

Designing and implementing an effective supply chain is difficult, even without the threat of disruptive risks. However, good risk management is a requirement in this age of extended and complex supply chains.

INSURANCE FOR YOUR BUSINESS

The value of risk prevention—even if you never need it

By Dave Turbide, CPIM, CIRM, CSCP, CMfgE

The longer and the more links in the supply chain including partners, transportation modes, and handling points—the greater the opportunities for a disruption. Further, if any sources depend on a single resource or geographic area, the effect of a disruption is multiplied.

These facts are self-evident, but many companies still find it a challenge to identify supply chain risks and develop strategies for dealing with those risks. However, businesses that strive to reduce risks, put in place mitigation strategies, set up recovery plans, and have resources ready to go when needed fare better than companies that haven't made such arrangements. Perhaps the biggest barrier can be stated as follows: There is no measurable return on risk management investment until or unless a disaster occurs.

Remember the Y2K computer problem? During the buildup to the calendar change from 1999 to 2000, companies spent untold money and resources to repair software, replace systems, and otherwise take positive actions to avoid any issues caused by the two-digit date field found in many applications. Overall, these efforts were successful, and there were no significant problems reported when January 1 arrived.

It didn't take long, however, before pundits started questioning the value of that investment. Many experts said there wasn't really a Y2K problem to begin with. However, there actually was a serious potential risk. It was through considerable effort and investment that the disaster did not cause significant harm to businesses of all sizes, in all industries, all over the world.

Writing checks you can't cash

When risk prevention works, the value is in cost avoidance. This is a difficult phenomenon to see and measure. Even with a successful mitigation plan, there still are losses and costs involved; however, they are significantly reduced, which also is difficult to perceive. And, if the disaster never happens, it's easy to conclude that the effort was wasted.

Risk managers are challenged to justify their value to the organization and explain the benefits of not having to use the products of their work. It takes recognition at the highest levels of management that risks exist, that there is a cost associated with these risks, and that preparation can mitigate the expense. Executives must be willing to budget for risk management and continue to support risk management efforts even without any clear return—and still be satisfied when the mitigation strategies are not forced to come into play.

Effectively, risk management should be viewed, justified, and funded in the same way as insurance. Companies purchase insurance often because they have to, but also because it's clear it would be disastrous to go without it. Risk management is exactly the same.

A significant number of companies that are hit by a serious suply chain disruption go out of business with in a few years. Survival rates are greatly enhanced by enacting risk prevention measures, such as multiple sourcing, geographically distributed supply bases, amd plans that can speed recovery in the event of a disruption. This is why you must not think of risk management as an investment that may or may not pay off. Rather, think of it as life insurance that for you business. And aren't you happier knowing that you're protected?

There is no measurable return on risk management investment until or unless a disaster occurs.

Dave Turbide, CFPIM, CIRM, CSCP, CMfgE, is a consultant, writer, educator, and subject matter expert. He has authored six books, published hundreds of articles, and is president of the APICS Granite State chapter. He may be contacted at dave@daveturbide.com.

YOUR RESILIENT SUPPLY CHAIN

Lessons in reducing exposure and mitigating risk

By Mohanish Makharia, Gerhard Plenert, PhD, and Ramanan Samkumar

When designing supply chains, the focus often is on optimal use of resources, offshoring and outsourcing non-value-added activities, institutionalizing Just-in-Time systems, and investing in technology. While these new business models have resulted in more efficient and responsive systems, the supply chain risk profile has been altered significantly. Many corporations are left vulnerable. Caught unaware, even the most successful global organizations can suffer major loss of revenue, market share, and consumer trust.

Real-world response

Cisco rode the technology wave in the 1990s to become the market leader in the network component business. When the tech bubble burst, demand slowed significantly. Cisco did not have the capability to track the inventory of products across its geographically spread supply system. Business leaders had no experience managing a downturn. Systems were designed for high responsiveness and high inventory buffers. Lack of tracking capability resulted in significant inventory accumulation—which, in a bust market, led to the eventual write-down of $2.2 billion in 2001 alone.

Broadly defined, a supply chain disruption is an unusual spike or steep fall in either demand or supply, leading to a vast imbalance. According to Jossi Sheffi, director of the MIT Center for Transportation and Logistics, "The essence of most disruptions is a reduction in capacity and, therefore, inability to meet demand."

Based on limited success of prior launches, Apple acted conservatively while launching its PowerBook. But the market received the product well, and Apple was caught with a supply-side shortfall. The company had $1 billion in unfulfilled orders, which resulted in loss of consumer confidence and a huge hit to its stock price.

Sumitomo Metal Industries was the sole source of brake shoes for Toyota's domestic cars in 1995 when the Kobe earthquake struck. Sumitomo's operations suffered, and Toyota—working with a lean manufacturing system that had no buffers—had to halt production. Toyota lost the opportunity to produce 20,000 cars, costing an estimated $200 million in revenue. Similarly, during Japan's recent tsunami and nuclear crisis, the automaker had to delay the launch of two models and suffered an estimated production loss of 140,000 vehicles.

Following the September 11, 2001, tragedy, Walmart executives noticed a significant increase in the sales of US flags, lapel pins, and other patriotic objects. The world's largest retailer immediately locked up all available supply resources, leaving stores such as Kmart and Target out in the cold.

Why do some companies do so much better than others in times of disruption? The answer lies in the ability to detect the disruption and swiftly act upon it. While these events cannot be predicted accurately, their major impacts can be narrowed down to one of five areas, including

- supply failure
- manufacturing operations failure
- logistics failure
- information and technology failure
- workforce unavailibility

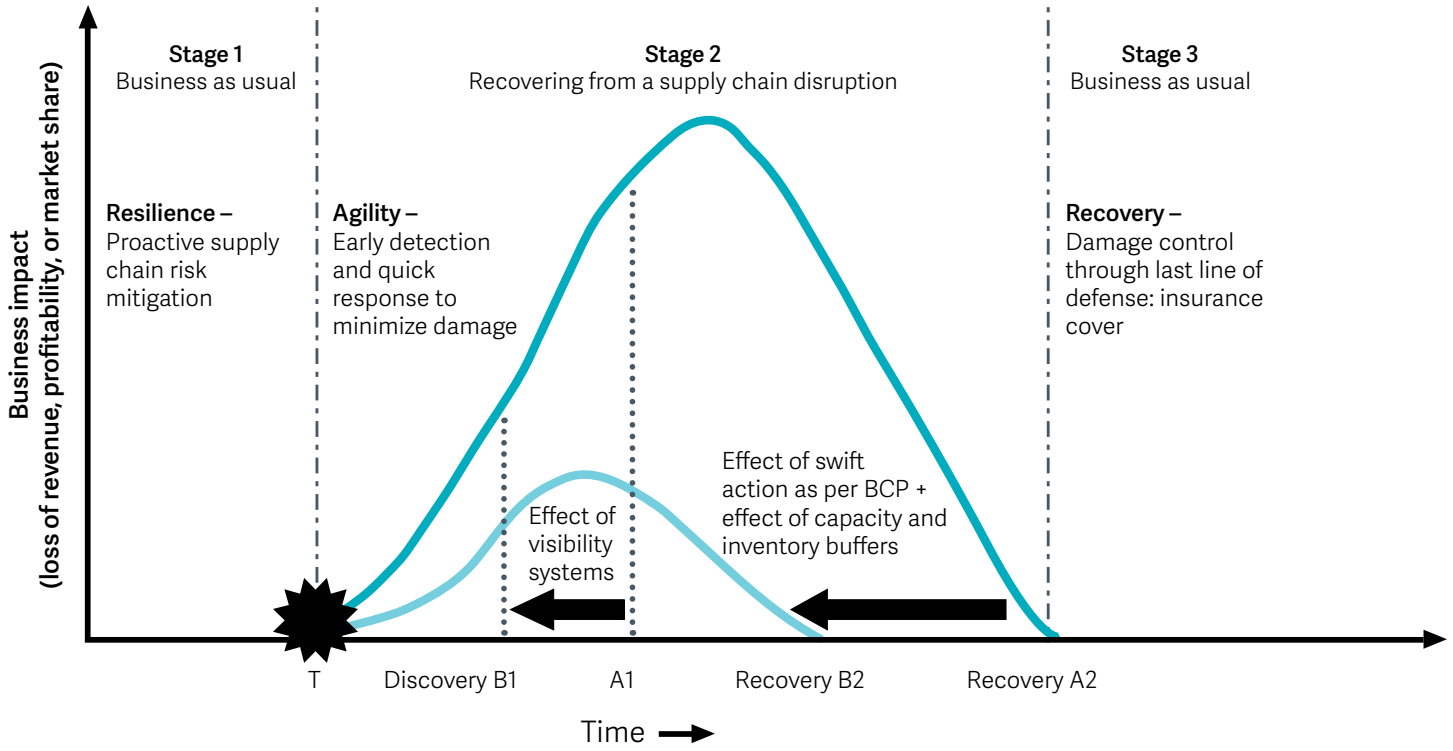
While operations and supply chain managers focus on efficiency and responsiveness in traditional "business-as-usual" environments, they should be flexible enough to quickly switch their operation scenarios to adjust for disruptions. A scenario-based strategy for disaster-proofing with a focus on consequences will not only minimize damage to the bottom line, but also can help score wins over debilitated competitors.

What is a resilient supply chain?

Disruptions happen for various reasons, and the nature and timing of their impacts also fluctuate. A labor union problem can be anticipated, but a terrorist attack is completely unforeseeable. A fire in a factory can halt operations immediately, while the outbreak of an epidemic in a supply zone could have subtle consequences that will take more time to set in. Companies with resilient supply chains—and those that take proactive risk-mitigating steps—can anticipate issues more effectively than their peers and delay and minimize the end results.

In Figure 1, company B has instituionalized a business continuity plan and invested in visibility systems for early detection of disruptions; company A has not. When a disruption occurs at point T, company B is able to discover it at point B1 and recovers from the disruption rapidly, minimizing the impact. Company A detects the disruption only at point A1 and takes a longer time to recover.

Figure 1: Supply chain risk mitigation framework



Effective business continuity plans enable users to assess the vulnerability of the company to supplier and manufacturing operations failures, logistics failures, workforce unavailability, and information and technology disruptions. They also help create accurate what-if scenarios and assess the capability to respond to disruption. When creating a business continuity plan, it's necessary to engineer a clear, actionable contingency plan for failures of any supply chain pillars. Also make sure to identify key thresholds for executing risk-mitigating decisions, such as sourcing from alternate partners, channels, and manufacturing and distribution systems. Disasters that ultimately lead to chaos often result from misaligned company departments and functions. In such situations, centralized decisions based on real-time information from all sources are crucial. It's essential to institutionalize a contingency management team that will direct all actions during times of disruption. This team must be comprised of senior people who can exercise influence over the various decision makers of the company.

Philips was a major supplier of semiconductors to Nokia and Ericsson in 2000 when a fire at a plant in Albuquerque destroyed chips for millions of cell phones. Nokia immediately set up a troubleshooting team to assess the full impact and find alternatives. They rapidly sourced three of the five affected chips from within their existing supplier network, with a five-day lead time. A senior management team also worked out a deal with Philips to help source the remaining two parts. With these efforts, Nokia was able to make all customer shipments in time.

Unfortunately, Ericsson took weeks to respond to the situation and, by that time, lost most of the market capacity to Nokia. The impact was devastating for Ericsson, which took a $2.34 billion loss in its mobile phone division, due to not only component shortages, but also a poor product mix and marketing failures.

How to prepare for supply chain disruptions

In addition to a successful business continuity plan, there are further essential steps to effective risk mitigation.

Technology. It's important to invest in information systems that improve real-time visibility of used and spare capacities and inventory in the entire system—including those of suppliers. Institutionalize supply chain intelligence systems, including exception-event-planning systems designed to discover incidents that cross the threshold of normal operating parameters. Employ the power of social media for early detection of disruptions. Dell, known for its pioneering work in supply chain, uses social media to interact with customers, thus enabling it to improve reaction time and be more responsive to market needs.

Flexibility. Standardize components as much as possible to derive aggregation benefits and reduce overall inventory and engineering costs. In a volatile market, attempt to postpone the customization of a product until after receiving the customer order. Identify the next-best alternatives as backups for the most vulnerable supply chain nodes.

Sourcing. Supply chain decisions should not be made on the basis of traditional costing models, but rather, on the total cost of sourcing equations that are adjusted for the expected value of supply chain risk.

Testing. Conduct regular mock drills for likely disruption scenarios to evaluate preparedness.

Critical components and supply chain nodes. Segment inventory in levels of criticality based on unit cost, sourcing, manufacturing options, and lead time to restock. Maintain progressively higher buffer levels for critical segments.

Supplier selection and monitoring. Screen critical suppliers based on their risk scores, and mandate the selected ones to institutionalize a realistic business continuity plan. Test the relevance and dependability of suppliers' plans. Conduct regular meetings or teleconferences with key suppliers to get their opinions and feedback on potential disruptions.

Supply chain intelligence. It is vital to keep an eye on each country or region for threats and trends that will affect the supply chain: weather, port and transportation worker strikes, fuel prices, currency exchange, inflation, labor rates, pending legislation, political elections, natural disasters, and more. Constantly monitor the supply chain for exception events and assess their potential impacts. Watch supplier quality, raw material price, and market demand variations. Finally, employ historical data for operations planning, and avoid certain regions in certain times. For example, Florida ports are subject to hurricanes from June to November. Perishables or other time-sensitive goods may need to exclude South Florida ports from their distribution networks through these months.

As can be seen from the disruption cycle in Figure 1, efforts can be classified in three phases:

- Proactive steps before the disruption occurs—building a resilient supply chain, addressing all identifed disruption impacts, and investing in early-warning systems.
- Reactive steps when the disruption has occurred and been detected—acting with agility to expedite recovery.
- Post-recovery steps—performance reporting, reevaluating the supply chain, and recovering losses through insurance claims.

While the strategic vision must take a top-down trajectory, operational activities need to be implemented from the bottom up. Based on the efforts required before, during, and after a disruption, Figure 2 presents a comprehensive framework to build a resilient supply chain.

Figure 2: Resilient supply chain framework

	Proactive: plan for disruption	Reactive: minimize damage	Post-Recovery
Strategic	• Conduct enterprise-level supply chain assessment • Make risk adjustments to total cost of sourcing equations • Design actionable business continuity plans covering all failure scenarios • Identify authorities for decision making during disruptions • Invest in improving capacity and inventory visibility	• Paradigm shift with less emphasis on efficiency and more emphasis on business continuity • Sanction supplies from reliable alternative sources and employ alternative transport modes and manufacturing facilities in case the preferred options fail (risks associated with the alternate sources should be divorces from those borne by primary sources)	• Re-evaluation of the supply chain to assess the following parameters - Effectiveness of the business continuity plan - Effectiveness of early disruption detection systems - Validity of total cost of ownership/ sourcing equations - Resilience of the supply chain to future disruption
Operational	• Supplier selection based on - Risk-adjusted total cost to source - Suppliers business continuity plan strength • Identify alternate suppliers with different operating conditions • Maintain higher buffer levels for critical components • Continuous monitoring of supply chain for disruptions • Backup of information systems	• Diagnose all the impacts to the supply chain once a disruption has been identified • Invoke the business continuity plan to ensure safety of employees and continuity of operations • Take swift action to employ available capacity within the organization and supplier network • Constantly monitor the situation	• Prepare a disruption report that covers failure points as a result of disruption, cause and effect analysis, and comparative analysis of disruption performance through industry banners • Systematic loss reporting to mitigate issues through insurance coverage as a last line of defence
	Before the disruption	During the disruption	After the disruption

Minimizing the damage

When a disruption has been detected, a rapid shift from an efficiency-maximizing scenario to one based on maintaining business continuity is critical. Senior management must be involved. The business continuity plan needs to be invoked and risk mitigation strategies operationalized. Once the impacts of the disruption are assessed, customer commitments should be reevaluated in the new demand-supply scenario.

The frequency and severity of supply chain disruptions has increased tremendously in the past two decades. A resilient, flexible, and scenario-based supply chain provides a competitive edge: It is not a choice, but a business imperative.

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