GETTING SMART ABOUT RISK MANAGEMENT

By Dirk de Waart

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The risk of supply chain disruptions is growing—and so is the financial impact of such disruptions. What's needed is a systematic approach to operational risk management that can help smooth out supply chain bumps and protect profitability. The "SMART" approach offered here responds to those needs. It's specific, measurable, actionable, realistic, and time-phased.

In the global economy, the impact of disasters—natural, geopolitical, economic, or financial—magnifies the impact of operational risks. This fact has grown in significance in recent decades. The number of natural disasters has almost tripled since 1970, according to the Center for Research on the Epidemiology of Disasters, and the cost of those disasters has increased tenfold, reports a leading insurer. Man-made disasters such as terrorist attacks have increased by 50 percent over the same period.

At the same time, supply chain disruptions are being exacerbated by recent strategies aimed at reducing costs. The outsourcing and offshoring of manufacturing operations have greatly increased reliance on outside vendors, and extended supply chains have created more opportunities for outside events to disrupt the flow of materials. Although lean operations and just-in-time manufacturing have been successful at reducing inventory levels and costs, these practices have also taken away the traditional buffer against supply chain risks. And more companies are reducing their rosters of suppliers—sometimes even shedding second-source suppliers for critical materials.

The impact of supply chain disruptions is substantial. One study of more than 800 companies that announced a supply chain disruption between 1989 and 2000 found that these disruptions resulted in 33 to 40 percent lower stock returns relative to the disrupted companies' industry peers. Share-price volatility in the year after the disruption was more than 13 percent higher when compared with volatility in the year before the disruption.

Most supply chain executives understand that external risks and their own cost-reduction initiatives bring greater risks of supply discontinuities. Yet increased awareness has not translated into a wholesale change in behavior. *Purchasing* Magazine's 2004 survey of purchasing executives found that only half of all respon-

dents reported monitoring supply chain risks "often," while 30 percent said that they monitored risk "rarely." A similar AberdeenGroup study of procurement and supply chain executives found that less than half of businesses have procedures or systems in place to assess and respond to supply chain risks, even though 80 percent of the respondents had experienced supply outages within the past two years. Apparently, a supply-side miss or near miss is not sufficient reason for companies to start implementing active supply chain risk programs.

However, support for supply chain risk management is coming from an unexpected corner. Financial executives in many companies have started to become concerned about operational risks. Consider the following:

- In a recent global study of 600 financial executives, the respondents identified supply chain risk as having the greatest potential to disrupt their companies' revenues.
- In a CFO Research Services survey of 247 top financial executives, 38 percent said that their corporations were exposed to too much unmanaged supplier risk.
- According to the National Association of Corporate Treasurers, 75 percent of financial executives believe a major disruption would cause sustained damage to their companies' earnings or threaten the continuity of their operations.

PRTM's recent experience confirms the growing influence of the finance department. In companies that are starting to develop risk management programs, these initiatives are usually driven by the CFO or treasurer.

In addition to minimizing risks, risk management programs can result in bottom-line savings by reducing purchase-price volatility. Consider the case of Hewlett-Packard (HP). Six years ago, HP was unable to obtain sufficient volumes of flash memory cards. As a result, the company was unable to ship about 250,000 printers. In addition, HP was forced to sign fixed-price contracts with unfavorable terms. Subsequently, HP put in place a comprehensive risk man-

agement program that not only reduced supply chain disruptions but also resulted in annual procurement savings of more than $100 million by better managing both demand and supply risks.

Aware of the risks of disruption, some companies have started to increase inventories of raw materials and finished goods. While that response can mitigate the impact of supply-side disruptions, it does nothing to reduce supply-side risks. In fact, increased inventory exacerbates another kind of risk—the financial risk of obsolescence. Therefore, companies across many industries are looking for a more effective way of managing raw-material risks.

It is no easy challenge. The problem with most of the approaches being used to identify and manage supply chain risks is that they are either too simplistic or unrealistic. The simplistic approaches identify risks by assigning them subjective values—classifying them as "high," "medium," or "low," for instance. The result of such work is not very discriminating, and it is certainly not conducive to making important investment decisions about risk mitigation. On the other end of the spectrum are approaches that sound good on paper but are unrealistic to achieve. Some of these approaches suggest that a company map all of its suppliers, understand all the processes that suppliers use, and even track the materials back through the supplier's supplier to the ultimate source. But how practical is that? Even in an organization that purchases only 200 items with an average supplier bill of material of 50 components, this exercise requires mapping 1,000 individual supply chains.

Extended supply chains create more opportunities for outside events to disrupt the flow of materials.

What's needed is an approach that allows for sound financial decisions but is pragmatic in nature.

A Pragmatic Response to Managing Risk

Based on our experience helping clients reduce operational risks, PRTM has developed an approach that works well. It measures and prioritizes the risks of sourcing raw materials, components, and subassemblies—one of the major supply chain risks that companies face. We have dubbed this approach "SMART"—the acronym that describes its five sequential stages:

- **Specific:** Be specific about what contributes to raw -material risks in the company and identify the unique risk and impact attributes.
- **Measurable:** Quantify the risks and their potential impact on the business.
- **Actionable:** Move from studying risks to mitigating them. Pinpoint the risks that will have the most severe impact on the business and define initiatives to mitigate them.
- **Realistic:** Understand what resources are required to mitigate risk and prioritize the initiatives to address resource constraints.
- **Time-Phased:** Develop actionable implementation plans with clear roles and responsibilities.

The SMART approach has a number of proven benefits. It makes risk management a measurable and analytical process rather than a subjective, opinion-based idea. It is rigorous yet pragmatic in that it identifies high-priority risks without cumbersome probability modeling. It is scaleable, repeatable, and transferable to other risk areas of the organization. And, most importantly, it drives the organization to reduce operational risks. Here's a more detailed look at each stage.

Specific: Define Risks

The first step in any risk management process is to classify the company's risks along two dimensions: the risk (or probability of an adverse event) on one dimension and its impact on the other. The impact tells us what will happen if this event takes place. We can therefore prioritize risks based on their probability as well as their impact. Mapping them on a two-by-two "risk impact matrix," with high risk and high impact in the upper right-hand box, it is easy to pinpoint the priority risks at a glance.

But how do we identify the high-priority risks that are both highly probable and most likely to severely damage the business? The first step is to identify the "object" to which the risk relates and the "attributes" that determine the risk and impact of each object relative to other objects.

The choice of objects makes this approach flexible and applicable to different types of risk. In the case of raw-material risk management, the objects will be the individual materials, identified by their part numbers. If we are measuring information systems risk, the objects could be the business applications that the organization is using.

An attribute is defined as a measurable element that contributes to the magnitude of the risk and impact. The attributes therefore will allow us to rank objects in the risk-impact matrix. Some attributes are industry-specific while others apply to any supply chain. An example of the former is the number of Federal Drug Administration (FDA) warnings given to a supplier in the biopharmaceutical industry. An FDA-related supplier shutdown is always preceded by one or more FDA warning letters. Therefore the number and nature of a supplier's FDA warnings indicate the raw-materials risk.

Attributes are also specific to the business risk being measured: For information-systems risks, attributes to consider may include the level of IT customization, the duration of support from the vendor, and so forth. Moreover, to manage

raw-materials risks, we need to distinguish between supplier-specific and material-specific attributes. The former relate to attributes that are indicative of a supplier's financial stability and its ability to supply materials on time and in the right quality. Material-specific attributes address characteristics of the material itself, independent of the supplier. For example, material with a short shelf life poses a greater risk to the organization than long-lived materials because there is a higher likelihood of spoilage. Exhibit 1 shows some generic supplier and material risk attributes and impact attributes. Different industries will have additional industry-specific attributes.

We are measuring both supplier and material risks because they are related. All the materials supplied by a high-risk supplier can be considered risky: If the supplier defaults, the company will not receive any of the materials from the supplier in question. The reverse is not true, though: A high-risk material does not automatically make the supplier risky.

EXHIBIT 1

Supplier and Raw Materials Risk and Impact Attributes

Example of Supplier Risk Attributes	Example of Material Risk Attributes	Example of Impact Risk Attributes
• Quality Rating • Financial Health • Physical Location	• Number of Sources • Demand Increase • Shelf Life	• Where Used • Lead Time • Inventory

Measurable: Quantify Risk and Impact

The objective of this stage is to quantify the relative risk and impact attributes for each of the objects. We are not interested in absolute measures; we want to know which objects are riskier than others and which will have the largest impact on our business. This phase can be completed in four steps: define data sources, collect data, normalize data, and calculate risk and impact.

To define the sources of data, companies can use publicly available information such as suppliers' financials as well as internal data (for example, to categorize the raw material by "where used").

Data collection can be a laborious task, depending on the number of objects and the number of attributes. To make the task more manageable over the long term, it's necessary to determine the frequency of the updates required. Data that is easy to acquire and changes frequently should be updated most often (for example, inventory information which changes in real time and is usually easy to gather from standard reports). On the other hand, financial information for private companies is difficult to get and usually changes only once a year.

The next step is to normalize the data for each attribute. We recommend using a 0-100 scale (where 0 represents the lowest risk and 100 the highest) to provide sufficient spread in the data to assign a risk score. It is important to consider these risks with the assumption that all other attributes are equal. For example, material that is sole-sourced will be assigned a higher risk score than dual-sourced material—all else being equal. One can argue that sole-sourced material from a large, healthy supplier is preferable to material that is dual-sourced but has a very short shelf life and quality issues. At this point, however, we need to focus on each attribute in isolation.

The final step is quantifying the risk and impact of each material. Since the risk and impact of each material is represented by all of its attributes, we can now translate the combined value of the attributes into the risk scores determined in the previous step. (See Sidebar on "Risk Scoring Methodology.") (Of course, it's also possible to apply weighting factors to each attribute to vary their importance. However, we recommend caution with this approach since it reintroduces subjectivity into the model.)

Now that each material has a risk and impact score, we can graphically plot each material on a grid to determine which materials should be prioritized for risk mitigation (see Exhibit 2). Our experience is that between 10 and 20 percent of raw materials fall into the high risk-high impact quadrant.

Actionable: Define Risk Mitigation Initiatives

The greatest challenge in risk management is not in identifying the risks but in mitigating them. Most organizations are reluctant to spend resources on activities with an uncertain return. Risk mitigation is one such activity. Yet it can be critical to preserving profits. To convince management to move forward with mitigation, it often helps to quantify the impact of a supply disruption. For example, at one large automotive manufacturer, the cost of downtime at one assembly plant is $5 million per day. A large-scale disruption of 20 days would cost the carmaker hundreds of millions of dollars.

Having identified the high-priority materials, we can

EXHIBIT 2

Risk Impact Grid

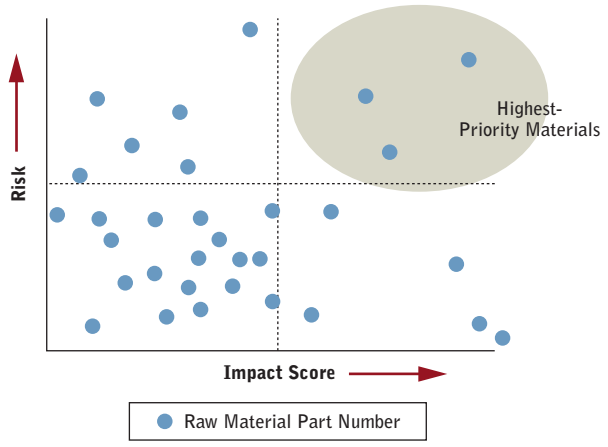
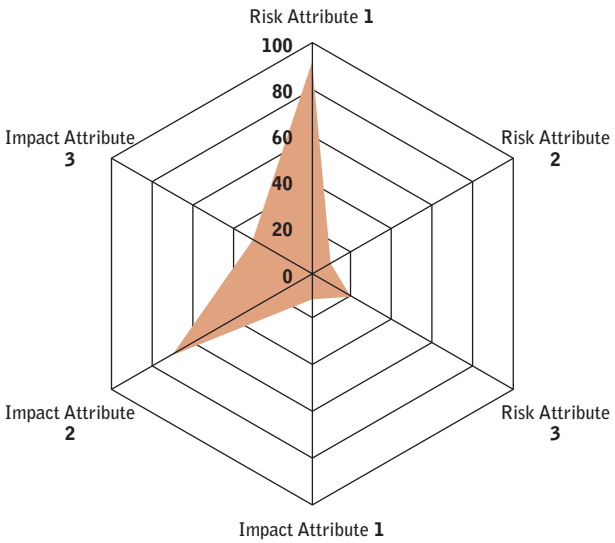


EXHIBIT 3

Risk Profile



now outline specific risk-mitigation activities for them. If there are only a few materials in this category, an initiative can be defined for each. But if there are many—more than 100, say—it's wise to combine them in groups based on the same risk profile. At one company, we started off with more than 200 types of raw material that were considered high priorities and consolidated them into 18 distinct initiatives over five commodity groups. It's possible to depict the risk profile graphically, as shown in Exhibit 3. The risk profile identifies why a material or group of materials is considered risky. In this example, it shows that the material is characterized mostly by risk attribute 1 (for example, sole-sourced) and impact attribute 2 (for example, lead time).

The risk profile will determine what mitigation activities should be considered. For example, if a material is currently sole-sourced, the following mitigation activities can be considered:

- Qualifying a second source.
- "Insourcing" some of the material demand.
- Identify alternative materials.

A simple matrix may help guide the decision-making process (see Exhibit 4). Some mitigation levers affect only the risk while others can help reduce the impact. For example, helping a poor-quality supplier overcome its quality issues can reduce the risk associated with a supply disruption due to material rejections. However, another common lever, such as increasing inventory, does nothing to alleviate the inherent risk of the material or supplier. What it does do is buffer the company against supply disruptions, thereby reducing the impact of disruption. (The "near misses" are not reported so it's difficult to tell how often a company has been helped by its inventory buffers.)

Now that the mitigation options have been outlined for each material or group of materials, a team of cross-functional executives must come together to decide on the appropriate actions to take. Information not captured in the analytical modeling will determine the final recommendation. For example, for materials that are single-sourced, a recommended approach may be to qualify a second supplier. However, if the material in question is going to be phased out soon, the expense of finding and qualifying a second source may not be warranted.

Realistic: Understand Resource Constraints

This is where senior management makes trade-offs among

Example of Risk Scoring Methodology

For simplicity's sake, let's assume we have two materials, one risk attribute (number of sources), and one impact attribute (lead times). Material A is single-sourced and is running lead times of 60 days; material B, dual-sourced, is out to 200 days.

First we need to define a simple scoring methodology for each attribute. Since sole-sourcing is high-risk, we give it a score of 100. Single-sourcing gets a score of 50; dual-sourcing, 25. Then we give scores for lead-time impact: 100 points for maximum lead time (capped at 300 days for purposes of our scoring) and 25 points for a minimum lead time (30 days).

Using our scoring metrics, material A gets 50 points for being single-sourced and 33 for its lead time, while material B gets 25 points (dual-sourced) and 72 points for its longer lead time. Combining the scores for each material, it's easy to see that material B gets the highest score even though dual-sourcing, at first glance, might seem like the safer option.

EXHIBIT 4

Isolating Which Mitigation Levers Work Best

Mitigation Levers	Supplier Risk			Material Risk			Impact		
	Attribute 1	Attribute 2	Attribute 3	Attribute 1	Attribute 2	Attribute 3	Attribute 1	Attribute 2	Attribute 3
Lever 1	X				X	X		X	
Lever 2									
Lever 3		X		X			X		X
Lever 4									
Lever 5		X				X		X	
Lever 6									
Lever 7	X			X					X
Lever 8				X		X			X
Lever 9		X					X		
Lever 10								X	
Lever 11			X				X		
Lever 12	X			X			X		

Return on Risk Mitigation Investment

Investment in risk mitigation consists of the resources consumed in mitigating the risk. The return on this investment is measured by a lower level of risk, lower impact, or both. Naturally, for a given commitment of resources, the greater the reduction of risk, the higher the return on investment.

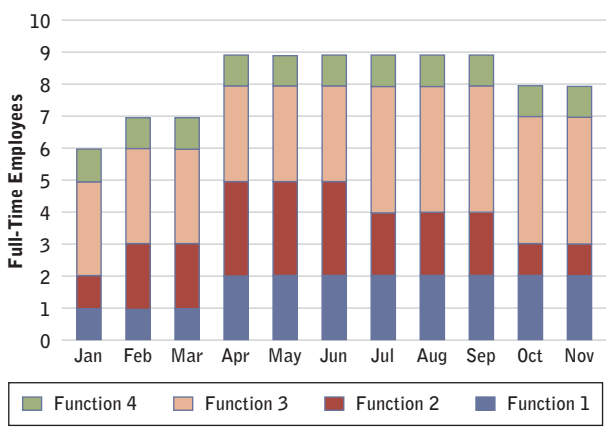
Since our methodology has allowed us to quantify risk and impact on a comparative scale, we can use the same scale to determine the comparative return on investment. For example, suppose we have two materials with the same "risk-impact ratio"—in other words, with comparable levels of risk. Item A has a high risk and low impact because it is single-sourced but used in only one product. Item B is multi-sourced but used in many of the company's products; it is low-risk but has a wide impact.

Then let's assume it would cost $100,000 to qualify a second source for item A; under our scoring model, this would reduce its risk score by 50 percent. Now say we replace item B in 20 percent of the products in which it is used with an even "safer" item, with the result that B's impact score drops from 100 to 80. However, it costs $200,000 to make the replacement in terms of redesign, new engineering documentation, and manufacturing pilots. Upshot: Item B has reduced its risk by only 20 percent but incurred mitigation costs twice those of item A. Clearly the return on investment of the risk mitigation initiative for item A is much higher than for item B.

the different risk management initiatives. Any change initiative requires a realistic execution plan along with assurances that the required resources are available and confirmed. In the case of risk mitigation, these resource requirements include man-hours, capital, and expense.

Man-hours should be distributed over time and assessed for each functional area. An easy way to express resource requirements is by means of a loading chart (see Exhibit 5). This chart allows all the functions involved to review the requirements over time and compare them to other commitments.

EXHIBIT 5



Inventory is typically a major component of the capital requirement, simply because it mitigates the impact of supply chain risks. In general, the inventory needed is determined by the material demand during the time required to recover from a supply chain disruption. But inventory is an expensive way to mitigate risks. It should be used for this purpose only when the senior management team treats it as an essential part of the mitigation initiative.

Finally, the expense budget should be based on incremental cost only—that is, over and above normal operations. For example, the cost of contractors to execute some of the risk initiatives might be financed from this budget.

The senior management team, consisting of the leaders of all functions affected by the mitigation initiatives, should review the resource requirements, identify bottlenecks, and prioritize the initiatives accordingly. One method to help with the prioritization is to compare the different initiatives based on their returns on investment. (See sidebar on "Return on Risk Management Investment.")

Time-Phased: Lay Out the Timeline

Once the functions' leaders have signed off on the agreed-upon initiatives and made the requisite resources available, it's time to develop detailed plans for the initiatives selected for implementation. Those plans are more than a formal exercise in project planning. They serve as a "contract" between the functional departments and the organization. Because of the cross-functional nature of most of these initiatives, an independent party (internal or external consultant) is usually tasked with managing the project to completion.

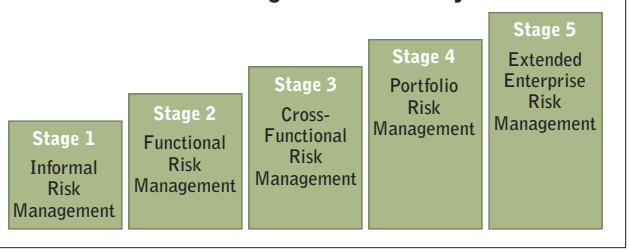
The Five Stages of Risk Management Maturity

So how would you assess your company's stance on risk management? We view companies' progress through five stages of maturity. (See Exhibit 6.) The undeveloped stage—stage 1—is where risk management is not defined and a "gut feel" approach is the norm.

In stage 2, risk management plans are created at a functional level but are not comparable across functions. In stage 3, risk management becomes a well-defined, repeatable process. The methodology used to measure risk allows for a cross-functional comparison of risks. (The SMART approach, even though developed for measuring raw-material risks, allows for a consistent and comparable definition of risks.) At Hewlett-Packard, risk management is truly cross-functional: Procurement, finance, sales and marketing, and the supply chain all work together to identify and manage risks.

EXHIBIT 6

Risk Management Maturity



The next phase involves developing a portfolio of risks. Resources are strategically allocated across different risks and risk management moves away from an annual event and becomes an integral part of the operation. At one company, for example, we identified a large number of materials which had been single sourced for years even though there were multiple qualified suppliers.

The problem with most of the approaches being used to identify and manage supply chain risks is that they are either too simplistic or unrealistic.

This situation had introduced a self-induced risk. With the help of a simple report that identified these materials and some training for the buyers, the company was able to drive a change in behavior and institutionalize a process to reduce risks.

The final stage is achieved when risk management practices are extended to suppliers and customers. Risks are monitored in real time and the focus shifts from risk mitigation to risk avoidance. Although some financial services firms have advanced to this stage, we have not seen any examples in the industrial world that exhibit stage 5 risk management practices.

It's worth noting that to achieve true enterprise risk management, a governing organization needs to be put in place. Even though this risk management function can have many forms, it needs a minimum set of requirements to be successful:

- Clearly articulated vision.
- Well-defined scope, agreed to by a senior management team.
- Small but effective organization that is viewed as a "center of excellence" by the company.
- Clear responsibilities vis-a-vis functional organizations.
- Executive management support and visibility.

Of these factors, executive-level support is arguably the most important. We know of a network equipment company with well-established risk-management practices where the support comes from the senior vice president of operations. At biotech leader Amgen, CEO Kevin Sharer is the champion: he has publicly defined risk management as one of the five corporate goals that trickle down to specific goals for each functional area.

The road to mature risk management practices is not without bumps. Measuring risks usually involves a fair amount of analysis and time. Information has to come from different functions. Risk management is not an activity with an immediate return, and the risk management team requires continued reinforcement and support. Mitigating risks requires further investments in time and money. Making the business case for these investments requires the support of the CFO or the CEO.

The final challenge is to define repeatable processes to maintain the momentum so risk management doesn't become just another of those initiatives that capture management's attention for a couple of quarters before being eclipsed by the next quarter's most urgent issues.