

SUPPLY CHAIN RISK MANAGEMENT PLANNING

Risk management doesn't have to be complex. This practical, easy-to-implement framework supports decision-making and risk management.

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In early 2020, the tragic onset of a global pandemic dramatically raised the visibility of supply chain risk management (SCRM). The sudden disruptions to everyday life, businesses and supply chains worldwide brought on by the coronavirus forced an almost instantaneous rethinking of supply chain operations, management and risk across all industries.

In this article, recognizing the heightened importance of risk management, we illustrate practical, easy-to-implement SCRM frameworks and analyses to support supply chain decision-making and management. We begin with a short review of the types of risk that firms must assess in creating their risk management strategy. This review provides context for the frameworks that we will introduce. After this brief review, we then turn to the focus of the article and present several illustrative SCRM frameworks and analysis templates.

Risks to consider

When constructing a supply chain risk management strategy, a firm can assure that it undertakes a holistic view of all potential threats by first evaluating general categories of risk, and then considering specific individual risks. Why take this two-step approach? The danger of immediately focusing on a few specific known risks to a firm before first performing a broad review across all risk types is that immediately diving into specifics may cause some less obvious, but important risks to be overlooked. Hence the need for a two-step approach. Figure 1 presents nine broad categories of generic risks (column 1), and offers examples of each category of risk (column 2).

FIGURE 1

Summary of risk types, sources and strategies

Type of risk	Sources	Illustrative alternative strategies
 Supply risks	Disruption of supply, inventory, schedules, and technology access; price escalation; quality issues; technology uncertainty; product complexity; frequency of material design changes	Multiple sourcing, operational flexibility, risk sharing
 Operational risks	Breakdown of operations; inadequate manufacturing or processing capability; high levels of process variations; changes in technology; changes in operating exposure	Maintain duplicative or excess capacity, high levels of maintenance
 Demand risks	New product introductions; variations in demand (fads, seasonality, and new product introductions by competitors); chaos in the system (the bullwhip effect on demand distortion and amplification)	Postponement, risk sharing with customers, high levels of safety stock
 Security risks	Information systems security; infrastructure security; freight breaches from terrorism, vandalism, crime, and sabotage	High investment levels in security technology, minimize sourcing and firm-owned infrastructure in less stable geopolitical environments, high levels of physical security investment
 Macro risks	Economic shifts in wage rates, interest rates, exchange rates, and prices	Currency hedging initiatives, diversification of product lines
 Policy risks	Actions of national governments such as quota restrictions or sanctions, as well as actions of regional and local government entities	Avoid significant investments in perceived unfriendly international markets, invest heavily in lobbying practices
 Competitive risks	Lack of history about competitor activities and moves	Defensive product line and entire company mergers and acquisitions, acquisition of key competitive personnel, first to market approaches
 Resource risks	Unanticipated resource requirements	Conservative balance sheet approach including high cash balances
 Natural risks*	Tornadoes, tsunamis, hurricanes, fires, pandemics	Avoid facility location in geographies subject to frequent earthquakes, tornadoes, and hurricanes

*Natural risks have been added to the original eight types of risks noted in Manuj and Mentzer (2008).

Source: Manuj and Mentzer (2008)

Note that these risks range from those over which a firm has direct control (e.g., the operational risk of “inadequate manufacturing” capacity or capability), to risks such as tornadoes and hurricanes (natural risks) which a firm cannot control. Because we cannot extensively explore risk types, sources and SCRM strategies in this short article, we provide additional references at its end for readers interested in pursuing these topics in depth. However, a careful reading of Figure 1 offers sufficient background for our purposes here.

We close this introduction of supply chain risk by reviewing column 3 of Figure 1. This column displays common strategies often employed to mitigate the threat of each risk type. For example, a heavily utilized supply risk strategy consists of employing multiple sources to procure individual products or materials. While using more sources rather than fewer sources generally reduces the opportunity to minimize acquisition costs, it also lessens a firm’s dependence on any single supplier.

The need to understand this type of risk mitigation trade-off (i.e., cost versus level of vulnerability) leads to the primary question this article addresses: *What are practical frameworks and analyses a firm can utilize to assess the level of risk it faces on its supply chain?* A firm that accurately evaluates its risks through well-structured and regularly updated SCRM frameworks, positions itself to make sound, well-informed decisions as to the level of risk mitigation efforts and investments it should undertake.

In the following section we offer several examples of how firms can evaluate risk from the perspective of a hierarchical SCRM framework. We assume that the example firm has completed the process of identifying all possible generic risk types it may face, and now is assessing several very specific risks. We focus on supply risks and demand risks for illustrative purposes, two of the risk types described in Figure 1.

Disaggregate and prioritize individual risks

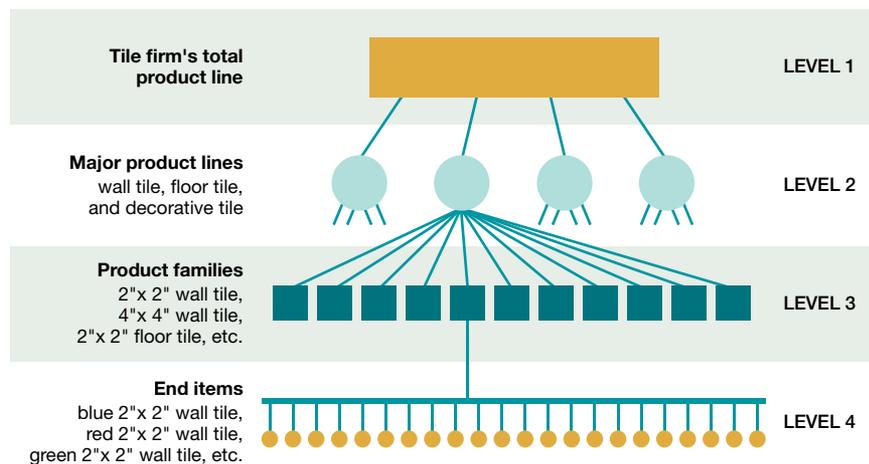
When evaluating a particular risk (e.g., the uncertainty of demand), disaggregating the components of the risk—in

other words, viewing it hierarchically—provides guidance to better understand and address the risk.

Demand risk. For illustration, let us consider a fictitious, multinational ceramic tile manufacturer headquartered in the United States, seeking to understand its vulnerability to volatility in demand for its products, and to craft a strategy to protect itself against the volatility. Figure 2 displays the product line hierarchy assumed for this example.

The firm can utilize this product hierarchy to prioritize and organize its risk management approach and strategy.

FIGURE 2
Firm’s product line



Source: Authors

Figure 3 displays an illustrative template a tile manufacturer can employ to analyze demand risk factors at the highest sublevel of demand, namely, the product line level. Note that the first column of the figure contains assorted measures that offer perspective on the relative importance of the product line, its domestic versus international mix, the number of major competitive products each product line faces, the firm’s historical ability to forecast demand accurately and the marketing department’s perceived level of control to influence demand.

At the bottom of the first column, note that the template has three rows of descriptors where across each row decisions can be displayed depending on the measures analyzed above. Briefly, these decisions include the relative priority of the product line to the firm, a decision whether a common or separate risk mitigation strategy should be used for each

FIGURE 3

Product line demand analysis

Measures	Product line		
	Wall tile	Floor tile	Decorative tile
Percentage of global sales			
Percentage of U.S. sales			
Sales (\$000)			
Unit sales (000)			
U.S. vs. international percentage of sales	U.S.		
	International		
Number of major competitive products			
Marketing's ability to influence/control demand*			
Historical forecast accuracy percentage			
Decisions			
Priority†			
Common** or separate strategy			
Responsible person††			

- * Based on a scale of 1 (very low) to 5 (very high)
- † Priority of product line
- ** Same or separate strategy for all product lines
- †† Who in firm is responsible for this?

Source: Authors

product line, and who is responsible for the risk mitigation strategy for a product line. Figure 3 provides examples of analytic measures and decisions; however, the appropriate components for this template must be customized on the basis of an individual firm's operating environment. Whatever the appropriate composition of measures and decisions utilized by a firm, the important point is that a firm must employ a rigorous analytic framework, as illustrated in Figure 3.

After completing its analysis at the product line level, the tile manufacturer would next perform a similar analysis at the product family level (i.e., at the next lowest level of product disaggregation). Figure 4 presents a template similar to the one previously shown in Figure 3. At the product family level, many firms, including tile manufacturers, may have tens

FIGURE 4

Product family demand analysis

Measures	Product families														
	Wall tile					Floor tile					Decorative tile				
	2x2	4x4	6x6	8x8	12x12	2x2	4x4	6x6	8x8	12x12	2x2	4x4	6x6	8x8	12x12
Family's percentage of product line's sales															
Percentage of global sales															
Percentage of U.S. sales															
Sales (\$000)															
Unit sales (000)															
U.S. vs. international percentage of sales	U.S.														
	International														
Number of major competitive products															
Historical forecast accuracy percentage															
Decisions															
Priority*															
Common† or separate strategy															
Responsible person**															

- * Priority of product family
- † Same or separate strategy for all product families in the product line
- ** Who in firm is responsible for this?

Source: Authors

to hundreds of individual families. Thus, it becomes very important at this level for a firm to determine the optimal level of its analytic efforts. For example, below some threshold of sales dollars or percentage of total company sales, the benefits of a significant analytic evaluation of a product family may be negligible. Thus, at the product family level, only selective analytic work may be required.

Finally, analyses conducted and decisions made at the product line and product family levels can be extended to the end item level if necessary. For many firms, this is not necessary; however, some firms may have one or several end items that represent a major portion of total sales, or hold strategic importance for the firm. In such cases, selective analyses and individual end item strategies may be required. For example, a manufacturer may produce one or more end items exclusively for a key customer such as Walmart. Consequently, the end item may have greater long-run strategic importance to the manufacturer than just its current sales contribution (i.e., the end item may hold special intrinsic value to the relationship with the customer). Thus, a risk mitigation strategy such as maintaining higher inventory levels than normal or some other strategy for the particular end item may be warranted.

Supply risk. Figure 5 displays a typical production and supply network for a large-scale manufacturer. There exist, of course, numerous variations on this structure such as in the auto industry that often utilizes multi-echelon, company-owned manufacturing plants (e.g., a

network of component plants supplying final assembly plants).

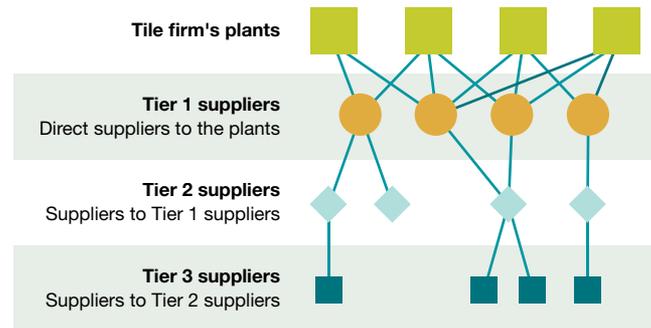
However, regardless of a firm’s manufacturing infrastructure, typically it will have several tiers (i.e., echelons) of suppliers. As depicted in Figure 5, suppliers who ship materials and components directly to a plant represent the “Tier 1” suppliers, while Tier 2 and Tier 3 suppliers fulfill material and component requirements of Tier 1 and Tier 2 suppliers, respectively. This hierarchy of plants and suppliers offers a logical framework for decomposing a firm’s supply risk analysis.

As Figure 6 illustrates, beginning with its own plants, a manufacturer must evaluate numerous variables to assess the relative risks to its operations that each plant faces. Based on its analysis, the firm develops measures that facilitate this evaluation. Then, as shown at the bottom of the first column in Figure 6, the firm establishes the priority or ranking of each plant’s risk level; whether a plant requires a unique risk mitigation strategy or whether a common strategy across several plants will suffice; and, finally, who is the person responsible for overseeing all risk mitigation-related efforts at a plant.

The manufacturer completes this process for each of its plants, and then performs similar analyses beginning with its Tier 1 suppliers, and ultimately all pertinent echelons of suppliers (e.g., Tier 2 and Tier 3 suppliers).

Clearly, for a firm with hundreds or thousands of suppliers, a judicious selection of which suppliers require a thorough evaluation must occur. It is entirely possible that in some cases, a Tier 2 supplier may require more

FIGURE 5
Firm’s manufacturing and supplier network



Source: Authors

FIGURE 6

Manufacturing plants' analysis

Measures	Plants			
	Plant A	Plant B	Plant C	Plant D
Percentage of global sales				
Percentage of U.S. sales				
Sales (\$000)				
Unit sales (000)				
U.S. vs. international percentage of sales	U.S.			
	International			
Potential capacity (units)*				
Potential capacity (sales \$)*				
Current utilization rate (%)				
Number of direct suppliers				
Number of direct single-source suppliers				
Number of suppliers from local country				
Number of foreign suppliers				
Geopolitical risk level in local country†				
Quality, stability of suppliers**				
Decisions				
Priority††				
Common*** or separate strategy				
Responsible person†††				

* Based on optimal utilization rate (e.g., 85%)

† Based on scale of 1 (low) to 5 (high)

** Based on scale of 1 (low) to 5 (high)

†† Priority of plant

*** Same or separate strategy for all plants

††† Who in firm is responsible for this?

Source: Authors

scrutiny (and may pose a greater risk) than a Tier 1 supplier. Alternatively, some firms may find they have few, if any, Tier 2 or, particularly, Tier 3 suppliers, who warrant a comprehensive review. In general, it is simply not feasible or economically prudent to rigorously evaluate all direct and indirect suppliers. A high-level hierarchical analysis, as illustrated in this section, provides the foundation to determine the level of analytic effort a firm should expend on its individual suppliers and plants. The appropriate and most insightful measures often vary by firm, industry,

and country. However, the basic analytic approach outlined here offers general guidance that all firms can employ in their SCRM evaluation, and, ultimately, their strategy development process.

Figure 7 displays a sample of the typical measures that a manufacturer would develop to ascertain the risk level associated with each of its Tier 1 suppliers. Again, the appropriate measures and the analyses required to derive these measures will differ by firm, industry, and country. However, Figure 7 illustrates the types of business insights that a firm must generate

FIGURE 7

Tier 1 suppliers' analysis

Measures	Tier 1 suppliers			
	Supplier A	Supplier B	Supplier C	Supplier Z
Percentage of global plant purchase (\$) provided by				
Percentage of purchase (\$) by local country plant(s) provided by				
Number of other suppliers who provide same products (materials) as				
Perceived ability to add new suppliers rapidly for products supplied by supplier*				
Geopolitical risk level in local country†				
Quality, stability of suppliers**				
Decisions				
Priority‡				
Common*** or separate strategy				
Responsible person‡‡				

* Use scale of 1 to 5, with 1 being easy, 5 being very difficult and/or requires long lead time
 † Based on scale of 1 (low) to 5 (high)
 ** Based on scale of 1 (low) to 5 (high)
 ‡ Priority of supplier
 *** Same or separate strategy for all suppliers
 ‡‡ Who in firm is responsible for this?

Source: Authors

to formulate a strong risk assessment and prioritization approach to its supply risk.

Additional analyses would next be developed at the Tier 2 and Tier 3 levels. As similarly noted in the previous demand risk example, an important part of the supply risk process consists of the manufacturer determining the optimal breadth and depth to which it should undertake this analysis. The Tier 2 and Tier 3 levels may have hundreds or even thousands of very small indirect suppliers. Clearly, therefore, a firm must judiciously allocate the amount of resources and time expended in evaluating many of its indirect, and in some cases, direct suppliers. At the same time, a manufacturer must be alert for any potential critical single or scarce resource suppliers hidden in their lengthy lists of indirect and direct suppliers.

Finally, with respect to supply risk, it is important to recognize that this represents an area where a manufacturer can help themselves immensely by building good relationships with their key suppliers. If a firm develops

a strong relationship with a Tier 1 supplier based on trust, shared goals and mutual benefits, then the firm can comfortably delegate to this key Tier 1 supplier a significant portion of the supply risk analysis of that supplier's own direct and indirect suppliers (i.e., the Tier 2 and 3 suppliers of the manufacturer). Thus, cultivating strong relationships with its direct suppliers allows a manufacturer to lower its own level of effort required to evaluate Tier 2 and Tier 3 suppliers.

For example, assume that a manufacturer chooses to collaborate with a key Tier 1 supplier on its internal product and production design processes. This will facilitate a better understanding by the Tier 1 supplier of how their components meld into the finished goods manufacturing process. Besides the potential manufacturing efficiency benefits

that a collaborative process may generate, this approach will also strengthen the manufacturer's knowledge of, and trust in their Tier 1 supplier, and vice versa. Hence, the manufacturer may more confidentially entrust the risk review of some Tier 2 and Tier 3 suppliers to their Tier 1 supplier.

Hierarchical policy risk. In the previous section, we utilized demand risk and supply risk to illustrate a hierarchical approach for dissecting the components of a specific potential threat. The other high-level types of risks described in Figure 1 can similarly be disaggregated to facilitate a thorough evaluation and understanding of a risk type. As one brief final example of this approach, we consider government policy or regulatory risk. Figure 8 presents a hierarchical perspective on the governmental and quasi-governmental entities that create and administer laws, policies and regulatory requirements which govern a firm's operations.

Clearly there are tens of thousands of domestic and international governmental municipalities and regulatory bodies, and a firm will frequently need to consider only a small subset of these entities. However, employing the hierarchical perspective conveyed by Figure 8 will enhance the success of a firm in identifying those laws, regulatory bodies, and governments that require particularly close attention. For example, in the United States, a firm may determine that addressing a particular regulatory concern at the federal level may obviate the need to do so at the state and local levels, or vice versa.

Standardize methodologies

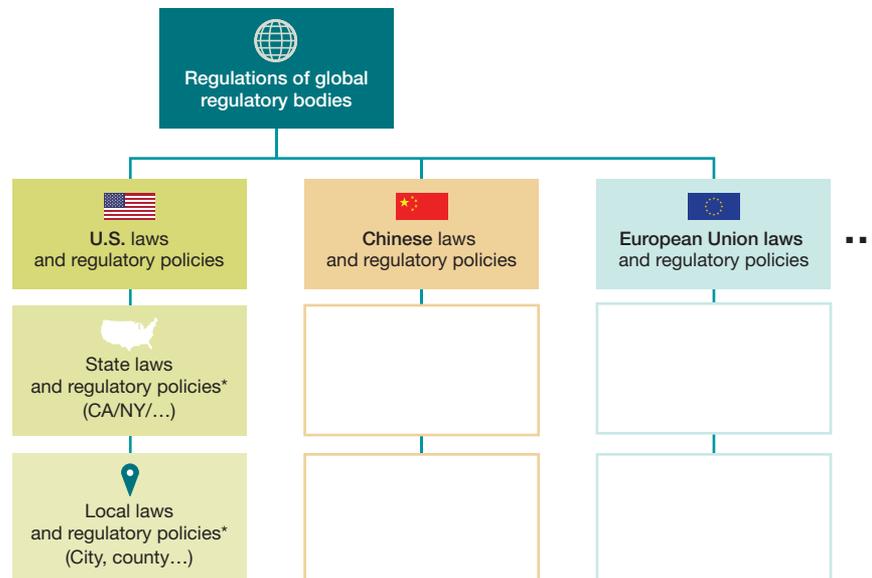
It is important to create standard SCRM business methodologies that can be repeated regularly. In short, a firm should establish a standard decision support infrastructure that it regularly updates and enhances. The types of frameworks and analyses illustrated in this article to support SCRM efforts represent decision support tools that a firm should develop and maintain as a regular business process. Investing in these SCRM frameworks and analyses will greatly enhance a firm's ability to

assure resilience and continuity in its operations, at all levels of the supply chain.

This article has focused on techniques that firms can enlist to identify, evaluate and prioritize supply chain risks. The actual development and implementation of strategies to mitigate or insulate a firm against a potential risk follows after the evaluation process, and is beyond the scope of this article. However, the reader interested in a comprehensive review of real-world case studies and guidance on strategy development and implementation is referred to the references listed below. For a more detailed discussion on supply chain risk identification processes, types, sources and analytical frameworks presented in this article, the reader is referred to "Supply Chain Planning: Practical Frameworks for Superior Performance, Second Edition," which served as the basis for this article. ☺☺

FIGURE 8

Hierarchy of entities that create regulatory policies and laws



* The level of detail that requires evaluation will vary by firm and country. Clearly there are tens of thousands of governmental municipalities and regulatory bodies that a large multi-national firm may come under the jurisdiction of.

Source: Authors

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