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Managing Risk in the Supply Chain—A Quantitative Study

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by Mark Hillman and Heather Keltz

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The Bottom Line

Adoption and spending on supply chain risk management initiatives will increase sharply in 2007, driven by several key business initiatives.

Executive Summary

As firms race to incorporate global sourcing strategies, integrate contract manufacturing relationships, and deal with the increasing number of events that can cause supply chain disruption, managing risk in the supply network is an increasingly critical capacity. At stake are billions of dollars of stock market capitalization, market share losses from failed product launches, or even the possibility of going out of business because of an inadequate understanding of the magnitude of supply chain risks.

As a result, supply chain risk management (SCRM) is emerging as a critical supply chain management discipline. To understand the key trends and drivers of supply chain risk, AMR Research conducted an in-depth field study of 89 executives to discuss the evolution of SCRM (see Appendix A for our methodology). The scope of this Report is to analyze the results and findings of the field study and discuss some of the market drivers of SCRM. It will be followed by several articles and Reports that dig into case study examples of SCRM in practice by major corporations for risk mitigation and competitive advantage.

Key findings

- SCRM is an increasingly important initiative for supply chain and operations professionals. 46% of firms plan to implement or evaluate SCRM technology in the next 12 to 24 months.
- Supplier failure and continuity of supply is the No. 1 risk factor for 28% of the firms surveyed.
- One-third of firms say they have dedicated budget line items for SCRM activities.
- 54% of firms plan to increase their budgets for SCRM over the next 12 months. Of those firms, the average spending increase will be 17% year over year.
- The top areas of application spending to support SCRM are sales and operations planning (S&OP), inventory optimization, business intelligence/supply chain analytics, and supply chain visibility/event management applications.

The SCRM imperative

Uncertainty and risk are part of doing business. As firms move to leaner operating models and increasingly leverage global sourcing models, uncertainty in both supply and demand is growing along with supply chain complexity. As a result, managing risk in the supply chain—from analyzing the supply network for vulnerability and risk exposure to ensuring supply for new product launches—is on the rise (see Table 1).

Table 1: Trends driving awareness of SCRM

Business trends and challenges...	...Punctuated by external events
Leaner supply chains	Enron and Sarbanes-Oxley compliance
Global sourcing	9/11 terrorist attack
Higher customer expectations	SARS and avian flu threats
Complexity and interdependency of supply base	Asian tsunami and Hurricanes Katrina and Rita
Volatility and variability of demand	High-profile business failures and disruptions
Increased commodity costs and tighter logistics capacity	

Source: AMR Research, 2007

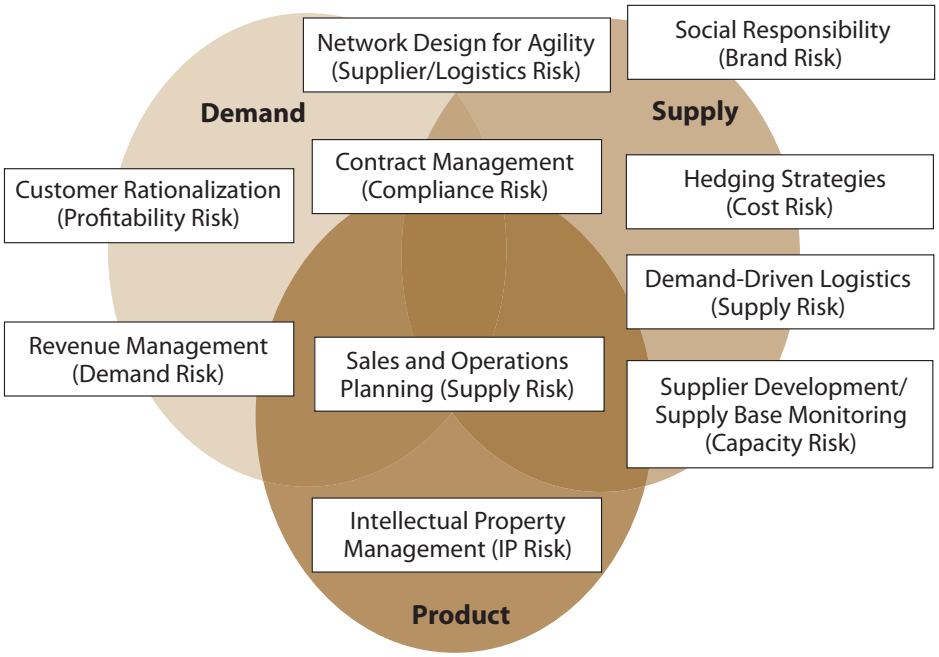
The last several years have seen the increasing use of lean and Six Sigma approaches to reduce inventory and waste in the supply network. However, as firms increasingly want to retain cost competitiveness, global sourcing has become the norm. The increased variability because of global sourcing—in the form of longer or more variable lead times, or more variable product quality, for example—combined with more lean supply chains has left many companies more exposed to supply chain disruptions. Alternatively, it has forced them to combat variability with more inventory, negating many of the expected cost benefits of global sourcing. Understanding and managing the portfolio of risks facing supply networks today is critical to maximizing business performance.

SCRM defined

Increasingly, AMR Research clients inquire about a range of risk and risk management issues. To help clients with a framework for understanding the breadth of supply chain risks as well as strategies to address them, we published "Supply Chain Risk Management Strategies," Part 1 and Part 2. In the articles, we defined risk management and SCRM:

> *Risk management is the process of measuring or assessing risk and then developing strategies to manage the risk. These strategies can involve the transference of risk to another party, risk avoidance or mitigation, and channel risk sharing. SCM risk assessments balance the probability of demand, the likelihood of reliable supply, the most effective allocation of resources, the probability of success of new product introductions, market conditions, and the opportunity costs of alternative decision paths.*

Figure 1: Supply chain risk management strategies



Source: AMR Research, 2007

A framework for SCRM

There are numerous risk management models in practice across several industries, many with roots in finance and portfolio theory. Within SCRM, we see three basic elements of building an SCRM strategy :

- **Visualize and understand risk**—The first steps companies struggle with are getting a handle on risk. Common questions include: *What risks are relevant to our business? What risks can I get visibility to? Is there risk I am blind to, unable to mitigate, or unable to measure?*
- **Measure the impact and likelihood**—Once risk elements are identified, they need to be scored on the likelihood of occurrence, and the impact needs to be quantified. High-impact, high-likelihood issues need to be prioritized first.
- **Prioritize and take action**—Finally, the portfolio of risks needs to be balanced against the risk tolerance of the firm. Firms continually must trade off between *I can live with that risk* and *I cannot tolerate that risk and will spend money and resources to mitigate or eliminate that risk*.

For some firms, this has meant investment in specific mitigation plans with particular suppliers based on an analysis of the impact of a supplier failure, diversification of sources of supply, and modifying sourcing strategies to be more risk aware (see "Securing the Supply Chain—Another Element in Managing Supply Chain Risk" for more on this).

State of the SCRM market

A couple of trends have increased awareness of SCRM as a competency and area of focus. Many firms have just come through a period of intense focus on regulatory compliance audits driven by mandates like Sarbanes-Oxley Act (SOX) compliance. This compliance audit work has exposed process and control gaps in many financial processes, so these concerns are known to executives.

As a result, audit and finance professionals are starting to ask: "Have we applied this same level of analytical rigor to assess our supply chain and operations practices or extended this to business continuity planning or to our key supply chain partners?" This line of questioning has expanded the view of what risk means for professionals who had traditionally focused within the silo of finance. As a result, we see some SCRM programs being driven by top-down, corporate-wide enterprise risk management (ERM) or governance, risk management, and compliance (GRC) initiatives.

The majority of our recent inquiries from clients on the topic of SCRM are on initiatives driven from the bottom up by functional groups—most often supply chain, operations quality, or manufacturing, and sometimes supported by finance team members—responding to specific imperatives.

For example, they may have experienced a recent supplier failure, or may be considering a shift to greater use of outsourced manufacturing. For others, they simply need outside help to develop a framework for thinking about supply chain risk and finding a way to tie the supply chain/operations view of risk management into a broader ERM or corporate risk management framework.

These two trends are helping promote an increased awareness of SCRM as a competence, inspiring the evolution of frameworks and supporting technology to help solve the problem.

Other key trends in SCRM

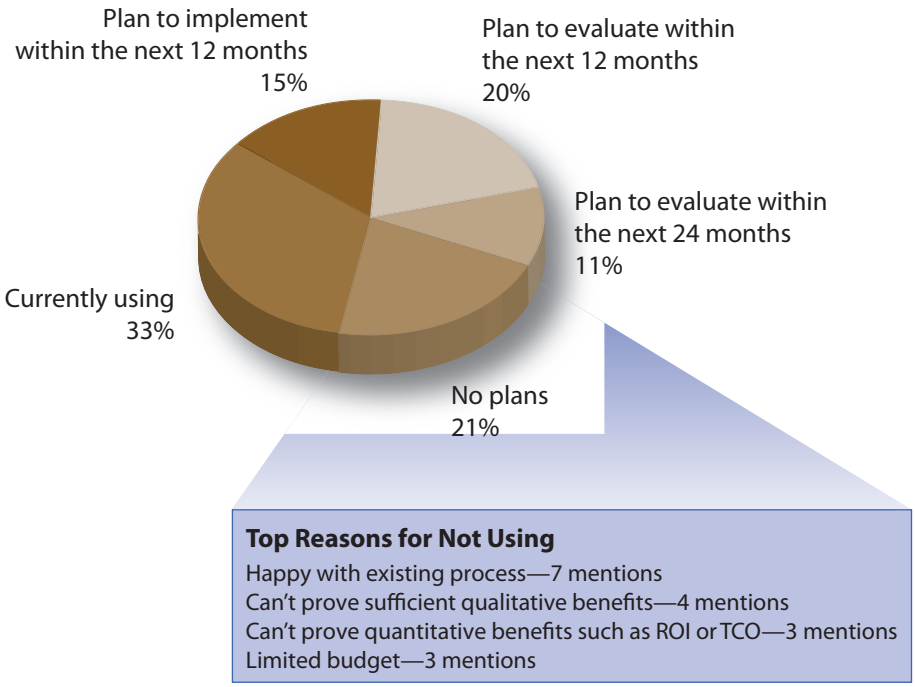
Our research has uncovered more observations about this market. Here are some highlights:

- **Awareness of SCRM is increasing, but it's an emerging category.** The reasons for more awareness vary from a recent supplier failure or quality problem, to a missed product launch because of lack of material or supply capacity, to the increasing weight of industry regulations such as compliance mandates. In addition, more advanced firms recognize the value creation aspects of managing risk, and are focusing on the upside of reducing risks rather than just mitigating negative, value-destroying risks. These firms view SCRM as a competitive differentiator.
- **There is dedicated funding for SCRM initiatives, and spending will rise.** Supply chain and operations groups are generally driving these efforts. 54% of firms report that spending on SCRM technology and services has increased from 2005 to 2006. The average budget growth rate from 2005 to 2006 was 17%.
- **Although reliability/continuity of supply is the top overall driver of SCRM initiatives, drivers vary significantly by industry.** According to survey respondents, key risks on the rise include managing commodity cost increases and managing strategic risk.
- **There is no single SCRM application or set of technologies on the market today.** Rather, existing SCM applications are being used for SCRM as new tools are being developed. In the absence of risk-specific applications and platforms, vendors are building risk considerations into traditional supply chain applications. The risk mandate may be relatively new, but the supply chain management processes that companies use to address risk tradeoffs are mature and will endure. The difference today is that risk management is reaching the core of SCM planning models, exposing the value of a more strategic, long-term, and probabilistic way of thinking.
- **Many firms in discrete manufacturing and high-tech industries lag the overall sample in terms of SCRM adoption.** Pressing drivers like better managing supplier failure will make discrete manufacturers adopt SCRM at a faster rate than other industries over the next 12 to 24 months.
- **Retailers indicate a higher level of current adoption of SCRM.** The focus of retailers primarily on logistics failures indicates that much supply risk has been pushed upstream to key suppliers and distribution partners. Retailers plan to spend less and implement less in the area of SCRM in the next 12 to 24 months.

SCRM adoption

The overall data shows that one-third of firms are currently using some form of SCRM technology and services. In addition, nearly 50% of firms plan to implement or evaluate SCRM technology in the next 12 to 24 months, indicating that penetration is relatively low and interest levels are quite high (see Figure 2). Here, the 80/20 rule very much applies—80% care about and are focused on SCRM, and 20% don't.

Figure 2: Current deployment of SCRM adoption



Q: Which of the following best describes your company's overall use of SCRM?

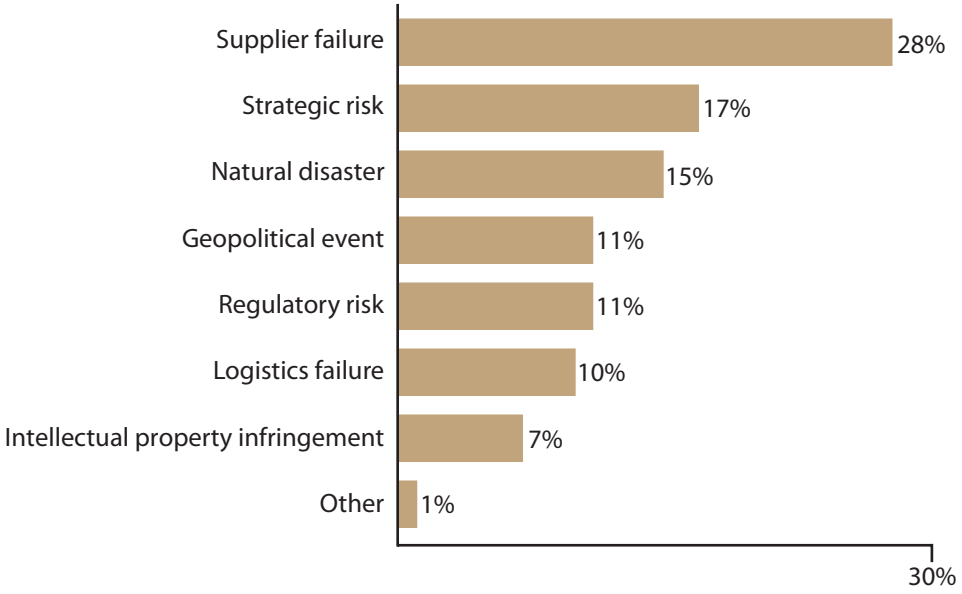
Percentage of responses, n = 89

Source: AMR Research, 2007

Major supply chain risk factors

Participants in our survey see a broad set of risks that pose a potential threat to their businesses. These risks vary by industry segment, but many are shared. Regardless of industry, supplier failure is the top issue that firms worry about (see Figure 3).

Figure 3: Risk factors—most potential threat



Q: In your opinion, which category of risk poses the most potential threat to your organization?

Percentage of responses, n = 89

Source: AMR Research, 2007

After supplier failure, the No. 1 concern across industries differs:

- High-tech and consumer electronics manufacturers, which deal in markets with short-lifecycle products coupled with high demand and supply variability, focus on strategic risk: the ability to hit product launches successfully and sell the right product to the right markets.
- Retailers fear logistics failure because much of their risk management responsibility has been pushed upstream to key suppliers and distribution partners. As a result, supply failures are often blamed on logistics issues and logistics hiccups.
- Different still are chemical firms. With memories of the disruption caused by Hurricane Katrina fresh in mind, they fear natural disasters and the resulting impact on network resiliency, maintaining supply continuity, and specialized compliance/ regulatory and hazardous materials handling risk issues.
- Consumer goods manufacturers are feeling the increasing encroachment of regulation, such as FDA regulation for food manufacturers and trade funds management for SOX compliance.

Table 2: Risk factors—most potential threat by industry

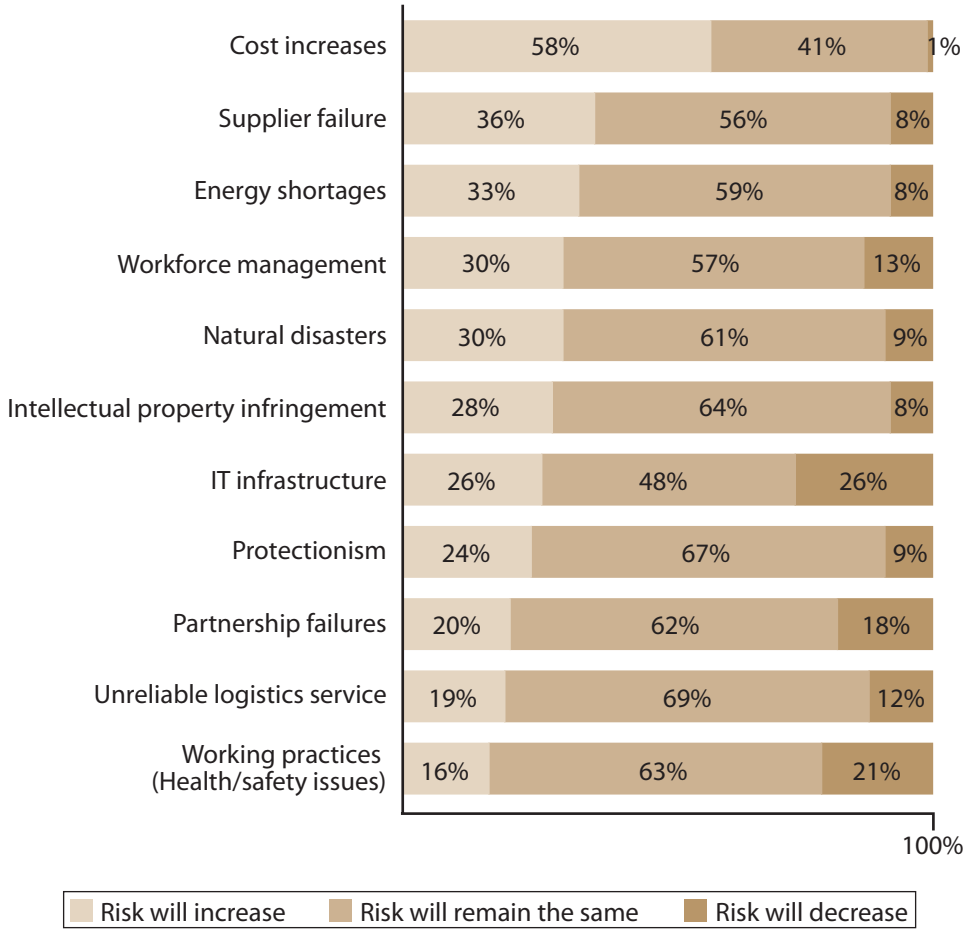
Factor	Overall	Chem.	Retail	High-Tech	Auto	A&D	Pharma	Con-sumer Goods	Ind./ Dis-crete
Supplier failure	1								
Strategic risk	2								
Natural disaster	3								
Geopolitical event	4								
Regulatory risk	5								
Logistics failure	6								
IP infringement	7								
Other	8								

Source: AMR Research, 2007

Q: In your opinion, which category of risk poses the most potential threat to your organization?

For many companies, it's not just a matter of managing today's pressing risks, but in managing situations that are likely to arise because of circumstances beyond their control. What are firms most worried about? In a world of rising commodity prices and tighter labor markets, 58% of firms see cost increases rising and threatening the business. Other top-of-mind issues are the growing risk of supplier failures, unstable energy markets, and finding enough talented labor.

Figure 4: Risk factors—increasing or decreasing in 2006



Q: Across your entire supply chain, does your organization believe that the level of supply chain risk in 2006 is increasing, staying the same, or decreasing in each of the following areas?

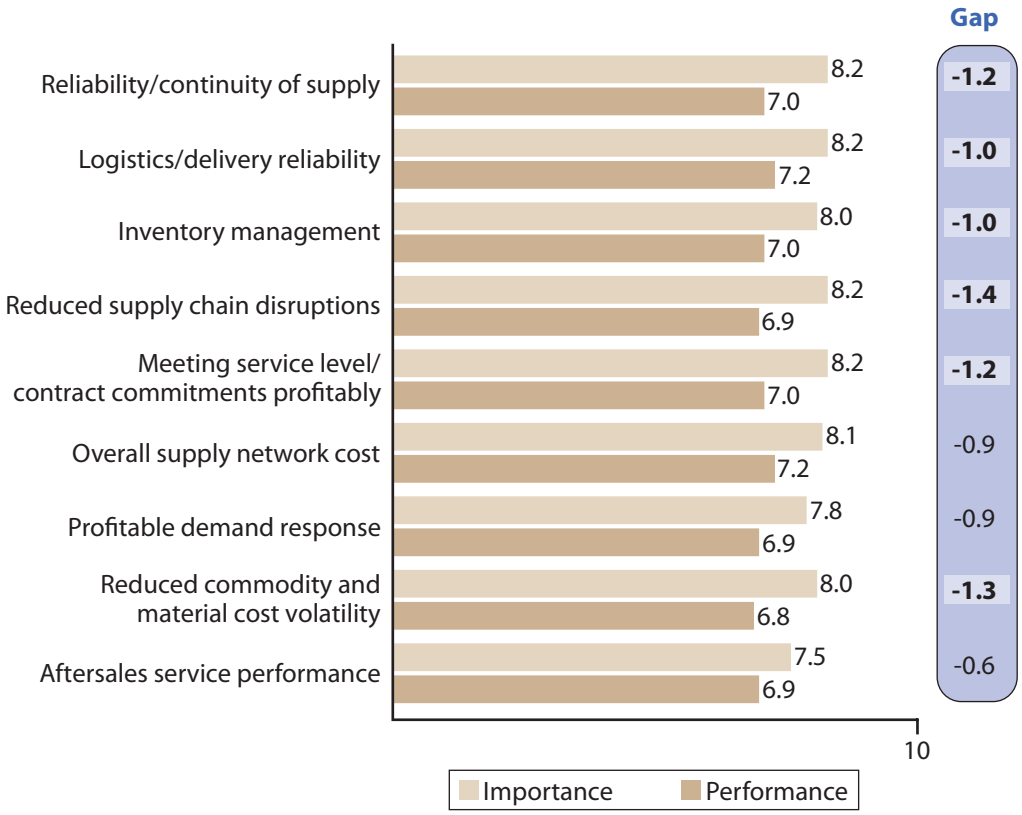
Percentage of responses, n = 89

Source: AMR Research, 2007

SCRM performance gaps and business drivers

SCRM programs are being driven either by reaction to major failures and a need to remediate them, or as a result of broader corporate awareness and sensitivity to risk often exposed as a result of compliance audits and initiatives. The survey data shows that the largest gaps in performance for companies are in reducing supply chain disruptions, reducing commodity and material cost variability, reliability/continuity of supply, and meeting service level/contract commitments profitably.

Figure 5: Drivers of SCRM adoption—performance gaps



Q: How satisfied are you with the success of your SCRM system in addressing these business issues? (1 = not at all satisfied / 10 = extremely satisfied)

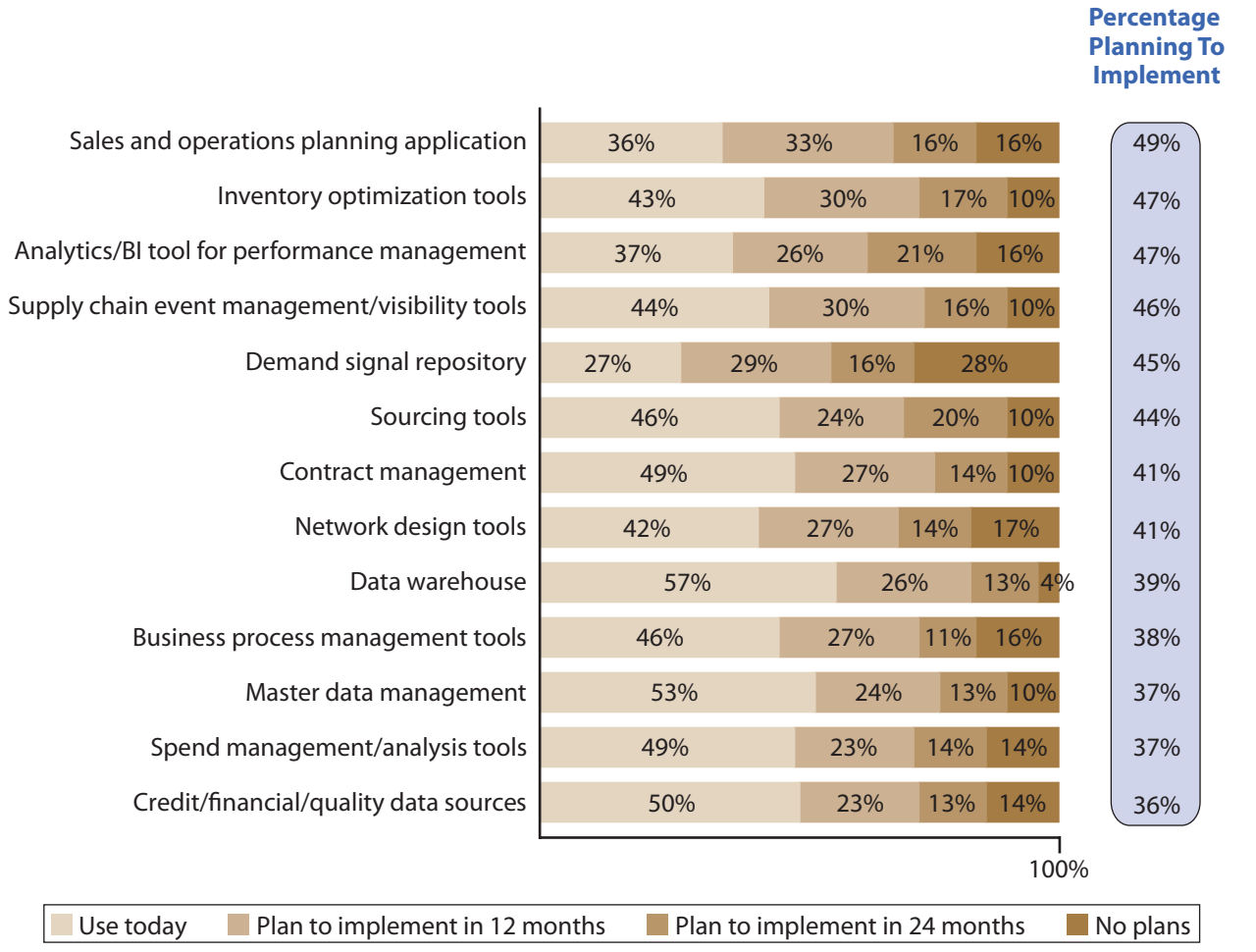
Percentage of responses using SCRM, n = 29

Source: AMR Research, 2007

Technology enablers for managing supply chain risks

In both quantitative and qualitative interviews, AMR Research has seen a broad array of technologies offered in support of SCRM projects and initiatives. Indeed, the data shows that a wide variety of technology and applications will be purchased and used to support SCRM efforts. S&OP is one logical category. Firms struggle with implementing a process to provide a cross-functional view of the range of possible demand scenarios and the likely range of supply availability from which to drive a risk-aware enterprise plan that recognizes the ranges of supply and demand uncertainty. There's also an increased focus on inventory optimization to deal with the risk of out-of-stocks or to buffer against the increased risk of supply disruptions from extended global supply chains.

Figure 6: SCRM adoption—deployment of SCRM components



Q: Which of the following potential SCRM components do you use today or plan to implement?

Percentage of respondents with SCRM initiatives, n = 70

Source: AMR Research, 2007

Scenario planning analysis for risk assessment

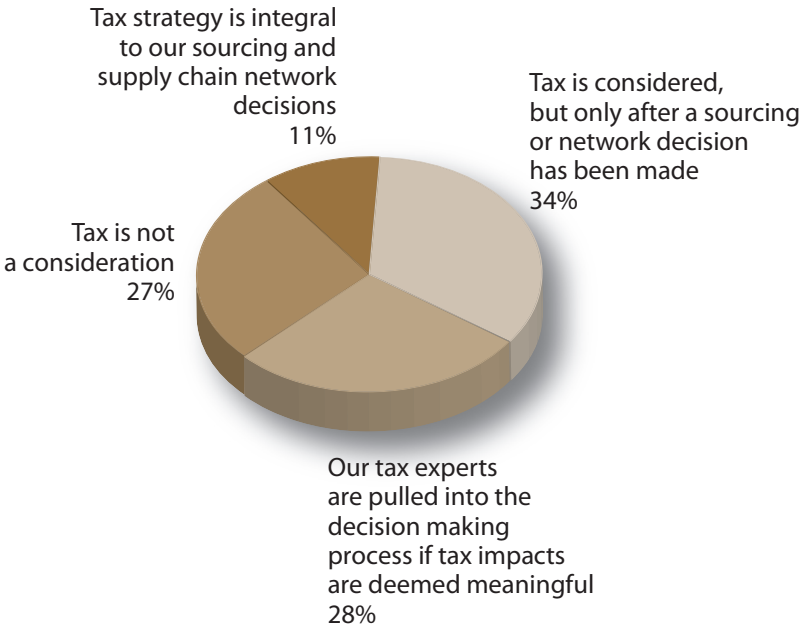
The role of supply network design and optimization tools is evolving. We have observed a movement from the use of network design tools for infrequent, long-range decision making, such as locating manufacturing or distribution capacity given long-term demand expectations, to new use cases, such as helping companies understand, model, and cope with increasing levels of uncertainty in the network.

For example, more advanced users are using network design tools to conduct detailed sensitivity analysis and scenario analysis, model network scenarios for new product introductions, or model the effects of competitor actions on the network. This forces users to find ways to model uncertainty by using traditionally deterministic network design tools. However, the growing user need has also encouraged the development of a new set of tools that recognizes the increasing levels of uncertainty inherent in today's global supply chain networks to better model and account for uncertainty, or leverage simulation techniques as part of network design and optimization processes.

One critical use case is modeling the effect and impact of tax in the supply network. Tax issues have arisen as a risk factor—and area of opportunity—in global supply chain management. As global sourcing has increased in prevalence, executives are required to make assumptions about tax and cost structures by geography as part of the total-delivered-cost view of sourcing. Modeling taxes, in addition to all the other data to be considered, from labor rates, material cost projections, and logistics costs to more difficult-to-model factors like opportunity costs and assumptions for inventory to buffer against supply variability, is a daunting challenge. The degree of uncertainty with relation to tax regulation is also dramatic, and subject to difficult-to-predict geopolitical and regulatory sea changes.

It's clear from this survey sample that state of the art does not include the consideration of tax (see Figure 7). The greater incidence of global sourcing increases the exposure to changes in tax rates, but tax optimization is still relatively rare in network design. If tax is considered, and the data shows that it is usually after the fact, the supply chain tail wags the tax dog.

Figure 7: Tax implications of network design decisions



Q: What role does tax (transfer pricing, excise, VAT, etc.) play in your sourcing/supply chain network design decisions?

Percentage of responses, n = 89

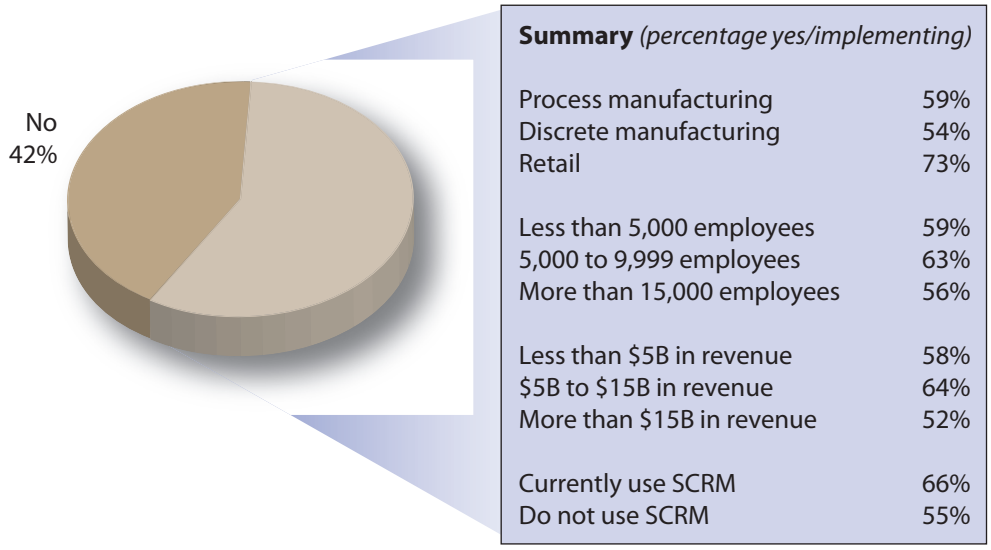
Source: AMR Research, 2007

Sensing and responding to supply chain performance … and risks

A key element in dealing with supply chain risk goes beyond documenting the likelihood and impact of risks, but also getting visibility to risks when they occur and translating that risk information to key decision-makers so that they can evaluate and act on the information.

More than 40% of companies indicate that they do not employ, nor are they implementing any form of real-time supply chain analytics (see Figure 8). Indeed, many of the early vendor approaches to developing applications for SCRM are built on supply chain event management (SCEM) principles and focus on early warning indicators and dashboards for monitoring and managing risk elements.

Figure 8: Use of real-time supply chain analytics



Q: Does your organization employ real-time analytics in your supply chain operations?

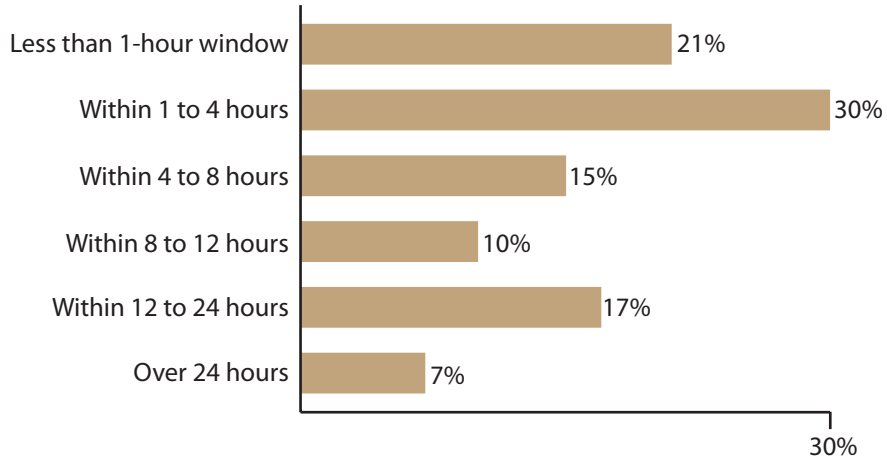
Percentage of responses, n = 89

Source: AMR Research, 2007

Another interesting conclusion from the survey is what firms define as real time. Most connotations of real time suggest immediacy. For example, in manufacturing real time is often measured in seconds or milliseconds. However, in our survey, amazingly, 34% of firms define their company's notion of real time as eight hours or more. In other words, one-third of companies view real time as longer than a working day (see Figure 9).

The converse is also true. 66% of firms define real-time information—especially in the context of data to support analytical decisions—as within a working day. Although in some supply chain planning domains where longer term decisions are being supported, an eight-hour lag in access to information for decision-making may present a negligible risk. However, it's clear that a more literal interpretation of real time is required to, say, promise a customer order, or assess and understand the impact of a supply chain event and its impact on the organization's supply chain risk profile.

Figure 9: Supply chain environment—defining "real time"



Q: Which best describes how your company defines "real time"?

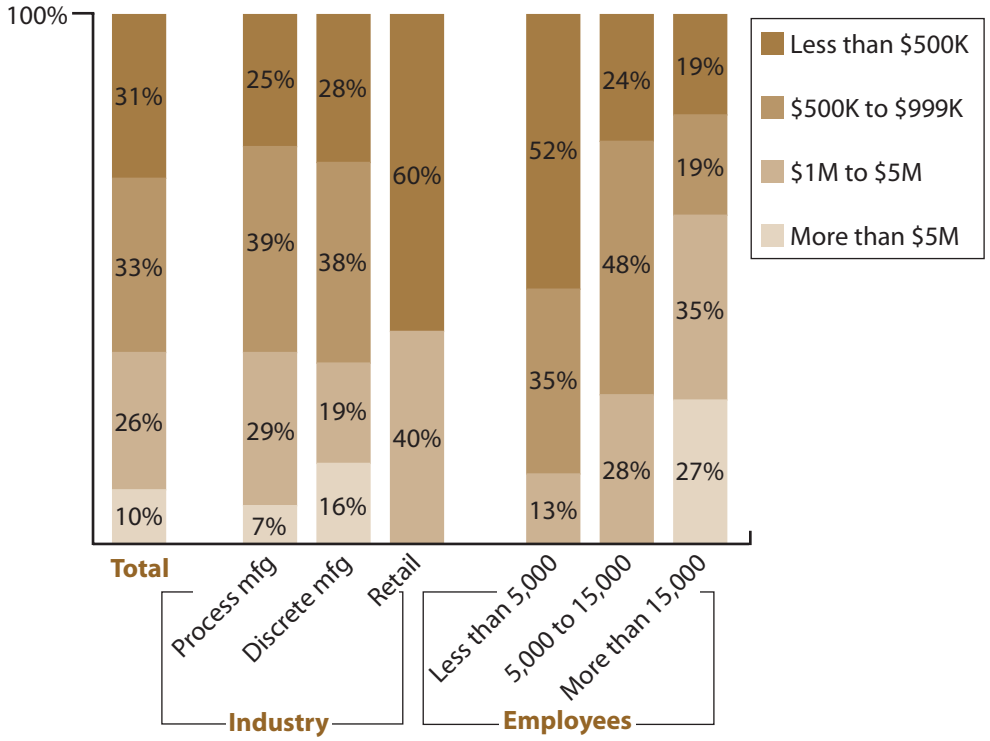
Percentage of responses, n = 89

Source: AMR Research, 2007

Spending on SCRM in 2006

Given the backdrop of increasing supply chain risk imperatives, and the need to improve visibility and decision making, spending intentions in SCRM are high. In general, firms are putting money where their mouths are. 10% of firms will spend in excess of $5M in services, technology, and personnel to support SCRM efforts. Large companies (firms with $15B or more in annual revenue) will invest more in SCRM work than smaller organizations. Interestingly, manufacturing firms look relatively similar in their spending profiles, whereas retailers indicate lower spending levels.

Figure 10: SCRM investments—2006 spending



Q: Approximately how much do you plan to spend on SCRM-related activities in 2006 (including auditor support services, software and infrastructure technology, personnel time and materials, business process change, etc.)?

Percentage of respondents that have SCRM initiatives, n = 70

Source: AMR Research, 2007

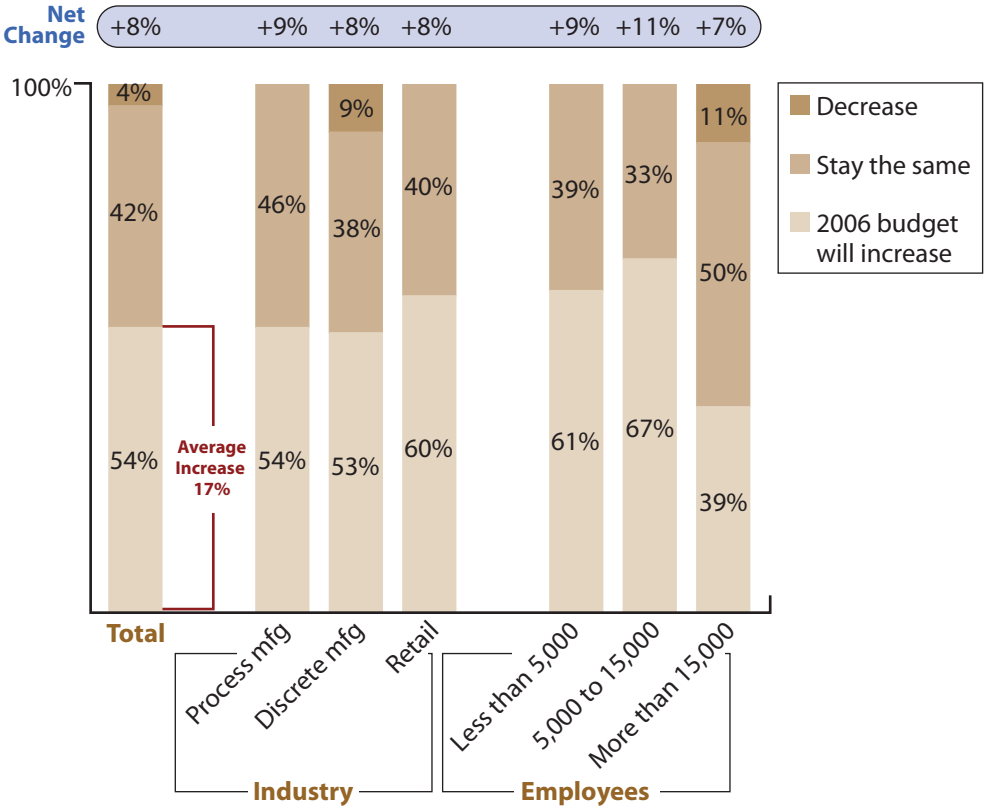
Breakouts of the data by vertical show that retailers that responded to our survey claim to be further along in their SCRM efforts and are less likely to be evaluating or planning to implement SCRM technology in the coming 12 to 24 months. This finding is underscored by the fact that their spending intentions are low in comparison

to other survey participants. Meanwhile, discrete manufacturing firms, especially in categories like high-tech, heavy industrial, A&D, and automotive, indicate that their current deployment is lower and their near-term implementation intentions are higher. As a result, they intend to spend larger amounts of money in SCRM-related activities.

Spending growth in 2007

Spending growth expectations are high—some of the highest growth rates we've seen in the application space. This is in part due to the fact that SCRM as a category is both new and emerging. It also indicates that SCRM is an increasing priority and spending plans are matching the perceived importance of solving the problem. In fact, 54% of firms intend to increase their spending on SCRM in 2007. The average expected SCRM budget growth rate across all company sizes is 8%. For firms that indicate their budgets will grow, their average spending increase will be 17%.

Figure 11: SCRM investments—2006 change in spending



Q: How do you expect your SCRM budget to change compared to 2006?

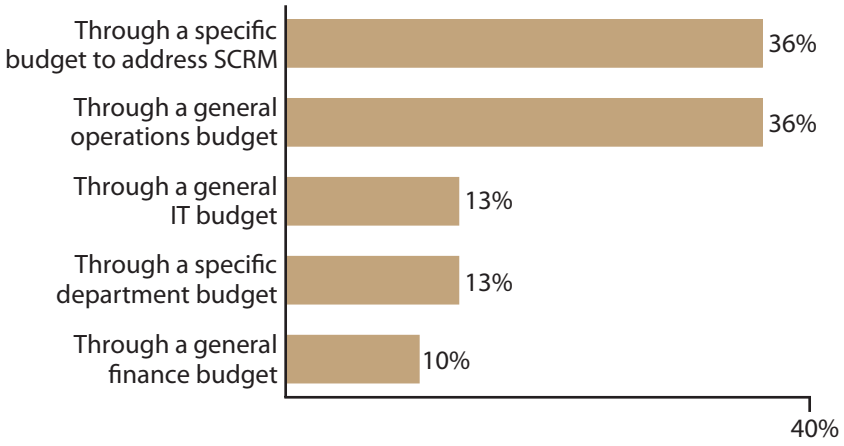
Percentage of respondents that have SCRM initiatives, n = 70

Source: AMR Research, 2007

Funding for SCRM initiatives

Surprisingly, more than one-third of firms indicate they already have some sort of budget earmark dedicated to SCRM. Add to that another 36% of firms that will fund SCRM through a general operations budget, and it is clear that operations groups currently hold the purse strings for core SCRM initiatives (see Figure 12).

Figure 12: SCRM investments—funding for 2006 initiatives



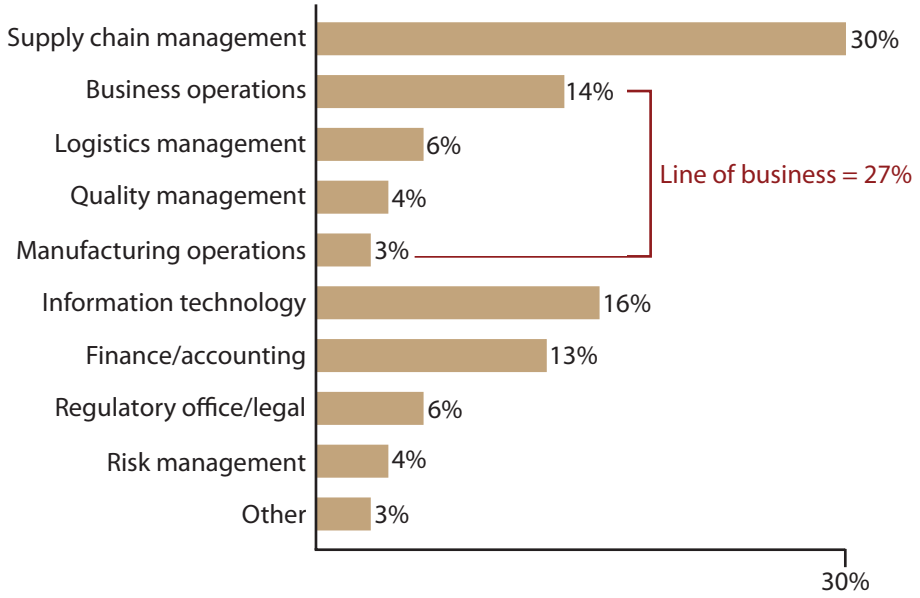
Q: How will your company fund your SCRM initiatives in 2006?

Percentage of respondents that have SCRM initiatives, n = 70

Source: AMR Research, 2007

As Figure 13 shows, it's also supply chain management and line-of-business (LOB) owners who are driving the investment in SCRM. It's strikingly similar to the first waves of compliance investments we saw in 2003–2004.

Figure 13: SCRM investments—technology decision makers



Q: Which department within your organization owns the initiative in regard to the purchase of SCRM applications?

Percentage of respondents that have SCRM initiatives, n = 70

Source: AMR Research, 2007

Conclusion

The field of SCRM has finally come of age. Firms plan to invest nontrivial sums in addressing a variety of supply chain and operational risks, and operational risk is a critical element of broader programs related to GRC or ERM. Although the category is emerging, some firms are beginning to refine their practice of SCRM principles to the point that they are able to exploit risk to competitive advantage by taking calculated risks. Technology vendors and service providers are in turn developing services and solutions to help clients achieve SCRM initiatives. Firms that successfully seize the opportunity will gain competitive advantage.

Appendix A: Methodology

In April 2006, AMR Research conducted a study among 89 U.S. manufacturing and retail companies. The objective of this study was to investigate the current state of SCRM encompassing an evaluation of what current risks organizations are seeing in their supply chains, as well as to examine what companies are doing now and in the future to help manage and mitigate those risks. Through screening questions, respondents were qualified and only eligible to participate in the study if they were part of the evaluation for SCRM technology and services purchases.

Our sample was representative across the United States, spread across the following industries and company sizes:

Industries

- Process manufacturing = 32 interviews
- Discrete manufacturing = 46 interviews
- Retail = 11 interviews

Company size

- Fewer than 5,000 employees = 33% of sample
- 5,000–14,999 employees = 27% of sample
- 15,000 or more employees = 40% of sample

Acronyms and Initialisms

A&D	Aerospace and defense
BI	Business intelligence
ERM	Enterprise risk management
FDA	Food and Drug Administration
GRC	Governance, risk management, and compliance
IP	Intellectual property
LOB	Line of business
ROI	Return on investment
S&OP	Sales and operations planning
SCM	Supply chain management
SCEM	Supply chain event management
SCRM	Supply chain risk management
SOX	Sarbanes-Oxley Act
TCO	Total cost of ownership
VAT	Value-added tax

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