

# **Top Business Requirements for Supply Chain Solutions: The Data You Need, Making Sense of It, and Being Proactive**

*by Michael Galluzzi  
Supply Chain Manager, Constellation Program  
National Aeronautics and Space Administration (NASA)*

July 28, 2009

You can't turn on the news these days without hearing of the economic crisis. Consumers are spending less, so sales are down. Therefore, companies are struggling to pay the bills, honor their pension obligations, and keep the lights on while supporting their customers and attempting to secure additional sources of revenue. Some companies are cutting jobs, and others are closing their doors for good.

The consequence of this grim picture is a dwindling industrial base. Research and development (R&D) companies are innovating less or disappearing altogether. The slowdown in the U.S. economy—that everyone agrees will rebound eventually—is creating a “gap” in the supply chain. What will happen when people start buying cars again or the need for commercial airplanes rebounds, and the companies who previously supplied auto and aircraft manufacturers' just-in-time inventory are gone?

## **Mind the Gap: NASA's Experience Is Relevant beyond Aerospace**

The manufacturing and revenue gap that the automotive, heavy machinery, commercial aerospace, consumer electronics, clothing/apparel, retail, and many industries now are facing is similar to the gap that NASA is about to enter between the retirement of the space shuttle in 2010 and the launch of the first Constellation mission in 2014.

In addition to the 4- to 5-year period during which NASA will not require its suppliers to maintain an active manufacturing program for its products, NASA's demand will drop. The Constellation Program has a reduced flight rate when compared to the Space Shuttle Program—two launches per year compared with an average of five launches per year for shuttle flights since 1981. This reduced demand will have an obvious impact on suppliers' profitability. For suppliers whose sales to NASA represent a small portion of their revenues, chances are good that they will terminate those products. Such planned obsolescence will create diminished manufacturing sources and material shortages.

The difference between NASA and the commercial manufacturing sector is that NASA's gap was predictable, while the economic downturn was unexpected. Because NASA saw what was coming, the agency has been able to plan accordingly and has been doing so for the past 2 or 3 years. Therefore, NASA understands that effectively managing its industrial base and supply chain is essential to managing any gap—regardless of whether it is caused by a program transition or a weak economy. Effective supply chain management (SCM) solutions involve:

- Identifying suppliers who may shut down a product line that is critical to a program or product
- Determining what factors are contributing to (increasing) the shutdown risk

- Proactively managing that risk
- Leveling demand for a supplier's goods or services both across the enterprise and over time

To coin a term, it is “-ility-centric” sustainability, reliability, maintainability, and affordability.

NASA has worked hard to identify which suppliers support its various programs and products as well as the relationships between these suppliers, to quantify product shutdown risks during the gap between the Space Shuttle and Constellation Programs. Through collaborative demand forecasting, NASA has adjusted and proactively managed demand elasticity between these two critical space programs.

Similar activities are occurring in other industries as well, according to a June 2009 study, *Flexibility in Times of Crisis—2009: An Extended Edition of PRTM's Global Supply Chain Trends 2008—2010*. Based on feedback from more than 75 global manufacturing and service companies, PRTM's survey found that three-fourths of the respondents had helped at-risk suppliers, with just under half of them providing financial support through revised payment terms or risk financing.

Now more than ever, NASA and industry are facing similar gap-based challenges and employing similar strategies to manage their supply chains. NASA has insights based on several years of experience that can guide SCM solution providers as they expand programs to help customers “mind the gap.” New solutions must include software tools to collect and analyze supplier stability data and enable collaborative demand forecasting. Such tools will provide the staging ground for a cultural revolution that recognizes the importance of supplier risk and demand leveling throughout the entire product lifecycle.

### **Requirements for Effective SCM Solutions**

For manufacturers to effectively manage their industrial base and supply chain, SCM solutions must include comprehensive data about the suppliers—data that come from multiple, disparate internal and external sources. Then the software tools must properly analyze these data to show the manufacturer how everything fits together and help identify options for reacting to and/or preventing critical supplier retention issues.

However, such risk mitigation strategies are short-term, perhaps even stop-gap, measures. Truly effective SCM solutions require a proactive, systematic, and enterprise-wide move to collaborative demand forecasting and integration of supplier stability indicators throughout the entire product lifecycle. For most manufacturers, such solutions will require a significant cultural and mindset change.

### ***Data Gathering: Understanding Supplier Viability***

To fully understand supplier stability, SCM software must gather several key data.

- **Suppliers' financial stability:** Gathering basic financial information about suppliers is an essential component of effective SCM software. Data should come from a basic audit of each supplier's financial situation: What is the company's ratio of current assets to current liabilities (i.e., current ratio)? What is its net profit margin? What is its cash flow situation? If it is a publicly traded company, what is its

price-to-earnings ratio? Effective SCM solutions should enable manufacturers to evaluate this information against industry benchmarks and identify problems when they are still potential and not actual.

- **Suppliers' revenue diversity:** The diversity of a supplier's customer base and product line has a dramatic impact on supply chain risk. If the manufacturer represents 5 percent of the supplier's sales but the remaining 95 percent goes to one other company, then that company's demand will affect the supplier's stability. Similarly, if the product that the manufacturer purchases represents only a small fraction of the supplier's business and its demand decreases, the supplier might choose to discontinue the item, disrupting the manufacturer's supply chain.
- **Suppliers' demand rate:** Current and pending procurement orders factor into supplier stability and should be included in SCM solutions, along with projections for manufacturing, operations, repair and replace, and failure analysis last-need dates. Demand rate data can be used to project the supplier's future revenue streams, profitability, and liquidity, which in turn may affect product quality as unprofitable suppliers look for ways to cut corners.
- **Suppliers' functional capabilities across all tiers and products:** Approximately 75 percent of R&D dollars are spent at Tiers 2 and 3.<sup>1</sup> Understanding the various tiers that any given supplier participates in is critical because that supplier is a customer of another supplier. Suppliers of sub-components and sub-systems are dependent on the success of their own suppliers who support their build. For example, Supplier A might be in Tier 1 for product line X but also in Tier 2 for product line Y and in Tier 3 for product line Z. If Supplier A goes out of business, product line X is affected and so are the higher tiered suppliers for lines Y and Z that Supplier A supports. It is essential that SCM software capture the tiers where every supplier is "playing" and who is supplying whom, allowing the manufacturer to see where vulnerabilities exist and fully understand its risk exposure.
- **Suppliers' geographic distribution:** The importance of geographic distribution—or clustering—of suppliers was clearly demonstrated when Hurricane Katrina hit the Gulf Coast. Multiple oil refineries became disabled and gas prices skyrocketed. The timing of natural and man-made disasters is uncertain, but supply chain risk clearly increases if, for example, several key suppliers are located in southern California when an earthquake strikes or in the Midwest during an unceasing rainy season. Effective SCM software notes geographic factors.

#### ***Analysis: Making Sense of the Data***

Clearly the supply chain is a tapestry of multifunctional, interconnected threads, and effective SCM solutions can help enable each thread to be understood individually as well as in relation to the entire tapestry. To move to the next level, SCM solutions must truly enable enterprise-wide supplier risk management and collaborative demand forecasting so that buying power can be pooled and demand leveled across the entire enterprise.

PrimeSupplier, developed at NASA's Kennedy Space Center, is an early-generation version of such a tool (see sidebar below).

---

<sup>1</sup> *Defense Industrial Base Assessment: U.S. Space Industry – Final Report*, Department of Defense (through the Under Secretary of the Air Force) and the Space Industrial Base Council, August 31, 2007.

### PrimeSupplier: A Holistic SCM Analysis Tool

The PrimeSupplier software was developed as a next-generation hybrid supply chain management solution. Using product line- and enterprise-demand data as well as industry financial benchmarks, this advanced software application forecasts economic influences on product and supplier viability throughout a product life cycle. PrimeSupplier software helps identify at-risk suppliers by providing a holistic assessment of suppliers' total economic stability—accounting for product-specific and enterprise-wide demands and general economic conditions. The tool provides a complete view of suppliers' economic viability, coupled with the ability to simulate changing demands and conditions:

- A **Simulation Console** enables users to quickly examine impacts of product line changes on the entire supply base.
- An **At-a-Glance View** shows the “Top 10 Highest Risk” and “Top 10 Lowest Risk” suppliers.
- The **Financial Simulation Dashboard** displays the impact of changes in purchase order dates to gap funding, profit margin, and overall financial stability.
- The **Programmatic Simulation Dashboard** shows the impact of changes in last-need dates and purchase order dates as they impact supplier stability.
- A patent-pending **Configurable Weighting Algorithm** provides a holistic view of economic and product or product line stability across the entire supply chain.

For more details, see <http://www.fuentek.com/technologies/Primesupplier.htm>

Managing supplier risk begins with understanding supplier commonality in terms of functional capabilities—whether a supplier designs the subcomponent, makes it, tests it, repairs it, or performs some combination thereof. The analysis must break down the functional “silos” and seamlessly integrate manufacturing resource planning (MRP) to allow risk to be understood in terms of cost, schedule, and quality. The analysis also must examine supplier stability risk across the lifecycle of a product—from the early stages of design engineering and testing to manufacturing, operations, repair, and eventually phase-out/termination.

In addition to enabling effective supplier risk management, such an approach has another advantage. New-technology insertion occurs on a quasi-planned basis within the structure of a process, not as an unexpected “exception” that occurs “on the fly” when the shelf-based inventory runs out and the supplier no longer makes the product. The result of collaborative mitigation is a lean, agile, flexible, and adaptive structure that allows for fluctuations in product design and consumer desires.

When the SCM solution analyzes the full range of data (outlined in the previous section) in a comprehensive, cross-functional manner, the manufacturer can begin to explore options for reacting to (or preferably preventing) critical supplier stability and retention issues. Simply put, sometimes the manufacturer must help keep its suppliers afloat, whether by leveling its demand, providing stop-gap funding, or accelerating purchase orders. Failure to do so may result in supply shortages, product obsolescence, and/or lack of R&D innovations—all of which can and will compromise the manufacturer's own products and bottom line.

This enterprise-wide visibility into the overall health of the supplier also provides an early-warning indicator for possible quality problems with supply bases. As suppliers face revenue shortfalls, cuts are inevitable. Historically speaking, these types of cuts often lead to quality issues, as engineering and manufacturing teams are challenged to do more with less. Knowing which suppliers are struggling enables supply chain managers to proactively perform quality audits with those suppliers.

This more comprehensive approach to managing supplier risk gives the manufacturer the information needed to take effective action to mitigate any potential problems. In some cases, the solution is relatively painless and simply involves leveling demand across products. For example, NASA was able to stabilize and retain a critical Tier 2 Constellation supplier by proactively identifying (via PrimeSupplier) a contract funding gap and accelerating a purchase in another program to carry the supplier in the interval until the Constellation Program's next purchase.

Collecting essential data and performing a detailed analysis that enables proactive risk mitigation should be the end-game for the next generation of SCM solutions. However, truly revolutionizing supply chain management lies beyond these SCM tools. In fact, the revolution will be a cultural one led by the manufacturers themselves.

### ***Being Proactive: Creating a Culture Change among Manufacturers***

As the SCM tools for data gathering and analysis evolve over time, a parallel evolution must occur in the manufacturer's organization—that is, recognition of the importance of supplier stability throughout the entire life cycle of a product. Rather than allowing product departments to work independently, manufacturers must develop a cohesive strategy whereby product teams collaborate to level demand and collectively mitigate obsolescence and other risks.

SCM solutions can be designed to facilitate this collaboration, particularly by making supplier stability information and product quality data easily accessible from the desktop. However, a tool is no good if no one uses it. The critical element is a shift in the engineers' mindset, so that SCM becomes a key part of the design process. When engineers design with commonality and keep supplier stability in mind, then the "manufacturing readiness level" can be integrated into the technology readiness level (TRL) equation. SCM vendors who can enable this cultural revolution within their customer organizations truly will become enterprise solution providers.

### **Replacing Sawtooth Procurement with an S-Curve**

The overall goal of collaborative demand forecasting and supporting SCM solution software is to help minimize the wide spectrum of procurement activity. Procurement often occurs on a schedule that resembles the sharp peaks and valleys of a sawtooth: a manufacturer buys spares from its supplier and keeps them on a shelf so that they are handy in the event of failures. When the inventory dwindles down, procurement is triggered, creating a "spike" for the supplier. Now, manufacturers (employing SCM tools and collaborative demand forecasting) will be able to create a gentle S-curve of strategically placed procurements, eliminating the variance and gaps that so greatly affect supplier stability.

## Summary: Requirements for Effective Supply Chain Management Solutions

### **Data Gathering: Understanding Supplier Viability**

- Financial stability (current ratio, net profit margin, cash flow, price-to-earnings ratio)
- Revenue, customer, and product line diversity
- Demand rate
- Functional capabilities across tiers and products
- Geographic distribution

### **Analysis: Making Sense of the Data**

- Enterprise-wide supplier risk management
  - Understand supplier commonality in terms of functional capabilities
  - Integrate risk mitigation throughout the lifecycle of a product
  - Stabilize and retain critical suppliers
- Collaborative demand forecasting
  - Pool buying power, level demand

### **Proactive Manufacturers: Creating a Culture Change**

- Recognize importance of supplier stability throughout a product's entire lifecycle
- Develop cohesive strategy to collectively mitigate risks
- Make supplier stability and product quality data easily accessible from the SCM solution desktop

The goal of SCM solutions is not to point out the weak, vulnerable suppliers so that the manufacturer can avoid them. Rather, in many cases, the best option is to direct more work to those suppliers—via new procurement and production or expedited procurement—so that they are still operating when the manufacturer needs them. Furthermore, by knowing who in its supply base is “hungry,” a manufacturer can negotiate a better product price. Essentially, effective SCM solutions can help stimulate the free market and enhance competition.

What if SCM solutions not only focused on the full supply chain across all tiers, all products, and all characteristics but also interfaced with procurement and enterprise resource planning (ERP), MRP, and the engineering desktop? Then, manufacturers could design products from the ground up with supplier stability in mind. Supply chain managers could proactively monitor and mitigate supplier risk and retention issues in real-time, collaborate across the company to level demand, and forge the strong supplier partnerships that are required for a healthy supply base.

That would put a supply chain solution truly on the cutting edge.

# # #