



From Planning to Control: Improving The High-Tech Supply Chain

A Valdero White Paper

“Companies have [long] been considered the highest order, but the 'Net brings the *supply chain* to the highest order.”

-- *Raymond J. Lane, General Partner, Kleiner Perkins Caufield & Byers*

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Introduction – The Failed Promise of Supply Chain Management

Supply Chain Management (SCM) is the number one strategic priority for manufacturing executives, according to a recent US Bancorp Piper Jaffray study. That's not surprising when you consider that supply chain solutions were supposed to curb the patterns of inventory excess and shortage that typically cost companies millions, sometimes billions of dollars. But the reality of SCM differs dramatically from its promise. Consider some widely reported high-tech supply-chain snafus from 2001.

- Cisco Systems wrote off \$2.5 billion in excess inventory owing to poor management of its myriad outsourced contractors.
- Micron Technology wrote down \$260 million of memory products inventory, representing 32 percent of revenue.
- In his testimony before congress in February 2001, Federal Reserve Chairman Alan Greenspan said that overbuilding of inventories by U.S. businesses and failure to anticipate downturn in demand, despite significant investment in supply chain management technology, has greatly exacerbated the ill effects of this country's economic slowdown.

SCM appears to be failing in its core mission of helping high-tech manufacturers control inventory. But why?

The short answer is that the typical high-tech supply chain, for which the majority of SCM solutions were developed, has evolved from an internally-owned function with a small number of players to a widely dispersed, largely outsourced function, with dozens or even hundreds of participants across the globe. Communication and visibility across this broad community have become the biggest manufacturing

challenges for today's high-tech OEMs. At the same time, high tech markets have been driven by ever-shrinking product lifecycles that leave little room for delays and problems caused by changes in the extended supply chain.



Clearly, SCM must evolve to address the needs of the extended supply chain. In order to effect that evolution, however, we must first better understand the problems that high-tech manufacturers face in managing the extended supply chain.

Emergence of the Extended Supply Chain

The expected life of a high-tech product is now nine to twelve months, according to Hau L. Lee, director of Stanford University's Global Supply Chain Management Council. In many cases, this expected life is shorter than the lead-time required to respond to a significant shift in demand for the product.

User demand for faster, more powerful technologies has shortened product lifecycles dramatically in the last two decades, decreasing manufacturers' opportunity to make profits on new products and forcing them to accommodate multiple product generations in their planning and production cycles. This acceleration has been accompanied by falling prices and smaller margins, especially on mature product categories where differentiation lies in new features and marketing rather than in the core product functionality.

As a result, high-tech companies have increasingly turned to contract manufacturers (CMs) as faster, more cost-effective channels for procuring parts and producing products. These CMs can offer both economies of scale and access to less expensive labor pools as well as specific manufacturing expertise. Moreover, by taking over production of a company's core product lines, they allow OEMs to focus on *differentiating* their products through the creation of new features and more effective marketing campaigns. The result of this outsourcing has been the creation of broad virtual manufacturing networks that often span the globe.

Despite their economic justification, these extended supply chains have created new barriers to productivity because they increase the complexity of communication between participants. Manufacturers and their supply chain partners typically handle communication across the geographically dispersed supply chain using a variety of means: e-mails for regular interaction, faxes for exchanges requiring documentation or real-time input and phone calls for emergencies. Although there may be some sharing of information systems, the number of participants and their varying business requirements makes widespread installation and integration of a "single" information system impractical.

As a result of the many parallel mechanisms that make up supply chain communication, decision making, visibility and control are spread over many players, introducing more possible points of error, delay and problems, and effectively limiting companies' ability to identify and respond efficiently to changes in the supply chain. The effect of this complex communication scenario, in many cases, is distorted demand information, excess inventory levels, idle manufacturing capacity, higher costs for fixing problems, and increasingly unhappy customers.

The Need to Know

Information is the grease that allows the extended global supply chain to run smoothly and efficiently. Every organization in the supply chain needs information from the others. The primary CM needs order and forecast information from the OEM manufacturer and parts availability from its suppliers. Parts suppliers also need forecast and order information, and they may need availability information from *their* suppliers. Meanwhile, as the head of the extended supply chain, the OEM manufacturer needs all of that information and more, including input from its own Advanced Planning System (APS) and its Enterprise Resource Planning (ERP) system, as well as internal demand forecasts, to name a few.

The challenge for the manufacturer is that, while each of these enterprises is, theoretically, focused on the same goal – say, delivering a finished PDA to the U.S. market – their status as discrete participants in a larger process means they very likely have different operational procedures, communication styles and technical environments. With that in mind, their ability to integrate activities, data and timetables sufficiently to effect the kind of tight communication and action necessary to act as a single unit can be hard to orchestrate.

Supply chain partners typically meet their communication challenge by cobbling together a piecemeal system consisting of meetings, phone calls, voice mail, faxes, one-to-one e-mail messages, manually maintained spreadsheets, spreadsheets circulating as email attachments, and hand-annotated reports. While information eventually gets through, the disjointed nature of the communication results in duplicate efforts, inaccurate information, delayed action and inability to identify and prevent even the most predictable supply chain problems – problems that ultimately impact revenues.

For instance, in order for a manufacturer to accept a large order from a new customer, it can be vital to know what its suppliers have in inventory this period and expect to have next period. In order to accurately forecast revenues for the quarter, the OEM needs to know what its major suppliers have shipped or are planning to ship to customers. In order to avoid liability for excess parts ordered on its behalf, a manufacturer must have access to its suppliers' order information. Just as important, all of this information must be current and accurate. The inability to get up-to-date figures in any of these cases can result in lost business opportunities, poor financial performance affecting a company's stock price or significant write-offs for obsolete or excess inventory.

Control and the Bottom Line

High-technology firms are particularly vulnerable to these risks because they typically have short product lifecycles, high margins and short delivery times. The time delay in supply chain communication is all the more critical because of the unique nature of high-tech products – that they are iterative and inter-dependent. Specifically, the “version” system adopted by high-tech manufacturers means that many “new” products are, at their core, old products with new features. Moreover, they act as stepping-stones, both technically and from a market perception standpoint, to new versions of the same product. Their inter-dependence stems from the fact that high-tech products are usually part of a larger technology picture and, as a result, must be designed to work with other products and systems from other manufacturers. Many companies have turned this inter-dependence to their advantage, perfecting the interoperability of their products for market advantage.

These unique characteristics mean that delays, overstocks, undersupply or problems with engineering changes affect not only a company's customers and revenues, but its entire ecosystem of partners, developers and channel suppliers.

Suffice it to say that the barriers to responsiveness presented by the knowledge and communication limits of an *ad hoc*, extended supply chain present some serious business risks:

- Profit lost to excess and obsolete inventory
- Revenue lost to unexpected fulfillment demands or incorrectly managed allocation
- Customers lost because of unforeseen shortages or mismanaged expectations
- Market share lost to competitors who are more responsive to customers' service and product-sophistication demands
- Production time lost to extensive planning cycles intended to compensate for operational uncertainties
- Partnership opportunities lost because of inability to deliver on time or in sufficient quantities.

The impact of the discontinuous supply chain goes well beyond a company's immediate customers and partners, and even beyond the revenue line in its annual report. Since supply chain problems translate directly to a company's revenue growth, now more than ever, they affect company stock prices and valuations.

For example, Sony Corp., riding high on wildly enthusiastic reception of its PlayStation2 game console, ran into a financial and public relations nightmare when, owing to an unspecified parts shortage, it warned in late 2000 that it would be unable to meet initial demand for the console. Following its PlayStation2 snafu, Sony's shares fell 9% from \$109 to about \$99. A month later, they were down another 16%.

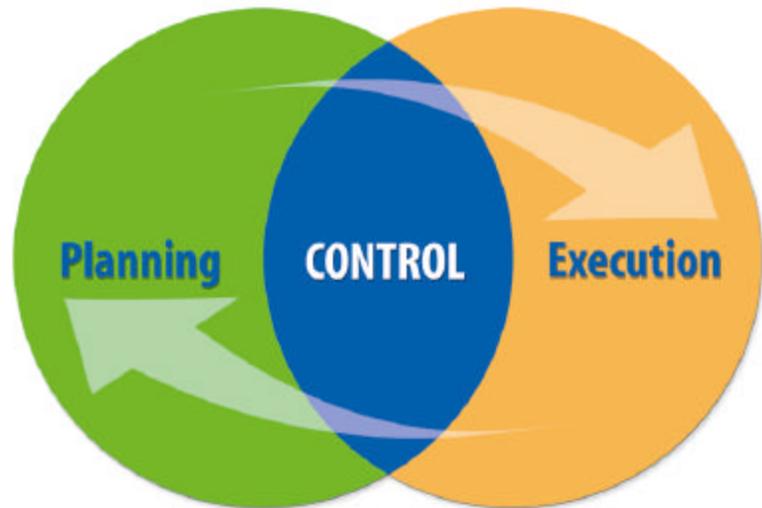
In the same quarter, IBM reported a decline in revenues from its AS/400 systems owing to component shortages. Wall Street analysts viewed the news as a significant missed opportunity on IBM's part. Despite the fact that the company grew net income, its poor revenue growth resulted in a loss of 16% in share price the day after the announcement.

In this era of skittish investors and skeptical markets, a company's ability to effectively manage the production and delivery of its products has become a critical point of credibility.

Why Current Approaches Don't Work

If the examples of supply chain problems above tell us anything, it's that the essence of effective supply chain management is not in planning or even in knowing where the problems are. All of these companies are world-class organizations, presumably with sophisticated, dedicated mechanisms for planning and monitoring the production process, and yet still they lost millions to supply chain problems. While other companies may be writing off less, the fact remains that median companies generally spend from *two to three times more* to run their supply chains than best-in class companies – that is, the top 20 percent of companies. Inventory-carrying costs alone typically consume 1.5 to 2.5 percent of revenue in any industry.

The key to effective supply chain management is in closing the gap between day-to-day changes in the supply chain and companies' ability to recognize and respond to them. Specifically, companies must be able to *identify* these changes as they occur, to quickly *understand* their potential impact and to *act* immediately to deal with them. At the same time, companies must have a means of leveraging the broader base of corporate knowledge, best practices, supply chain history and established processes while evaluating these changes in order to choose the best course of action.



APS and ERP

While APS and ERP systems offer companies the ability to plan and manage their resources, they're not designed to provide the real-time input and actionable information necessary to respond to a constantly changing supply chain. Furthermore, in addition to requiring a significant up-front investment – often in the millions of dollars -- these enterprise-wide systems require a great deal of custom integration in order to work seamlessly within an OEM's environment. Finally, while ERP systems provide marvelous insight into the financial impact of events in the supply chain, they don't provide insights into or control over the events themselves.

Manufacturing Execution Systems

The current crop of MES solutions is similarly limited. As we discussed, MES systems, while excellent at collecting information and keeping track of resources vs. inventory vs. deliveries, are not designed to handle the myriad “exceptions” that are part and parcel of extended supply chain operation. In fact, attempts by established SCM vendors to identify, alert and manage events have failed miserably because of the complexity of wide-scale technology integration. More promising on this front are new technologies that use the Internet as a common platform for information access, communication and collaboration.

Business Intelligence

Business Intelligence (BI) has emerged in recent years as potential means for companies to capture and understand information from diverse sources in order to better respond to and anticipate business trends. But broad BI solutions lack three critical elements necessary to gaining control over the supply chain: 1) the context of specific domain expertise 2) ability to leverage the broader base of corporate knowledge to guide companies to appropriate action and 3) a real-time component. As a result, they require a great deal of custom programming and integration in order to create performance indicators and a control station that map to the manufacturing customer’s specific needs. Moreover, they offer “hindsight” views of business conditions – essentially, they tell the story after it is too late to do anything about it.

Supply Chain Event Management

One promising category of new technologies, known as Supply Chain Event Management, offers significantly more insight into major changes in the supply chain than the established crop of supply chain solutions. Unfortunately, while they can flag possible problems, they offer little in the way of “intelligence” to help supply chain managers or operations professionals determine the most effective response in the context of their existing business environment and objectives.

Ad Hoc Communication

Each of the technologies described above has its limitations, and each is further limited by a lack of effective communication and continuity between it and other supply chain technologies. As a result, the extended supply chain typically requires significant user effort and ingenuity for sharing information. So inventory numbers from an ERP system may make the rounds as a faxed report. Supply vs. Demand reports from an advanced planning system may be exported into an Excel spreadsheet that is shared via email and edited by users. E-mails and calls may supplement all of these activities with vital information that is not captured by any of the supply chain systems. Clearly a platform that supports easily integrated communication and collaboration must be at the core of any supply chain control system.

Requirements for Control

Beyond planning, beyond management, beyond reporting, what manufacturers need is a system that gives them better control over their supply chain. To offer control, a system needs to provide visibility into the current state of the supply chain, proactively signal when key events or circumstances occur, offer analysis-in-depth, and incorporate the best industry and proprietary knowledge in the suggestions it includes with the results of each analysis. A new breed of Supply Chain Control (also known as Supply Chain Process Management) solutions is emerging to meet this need.

Visibility

Visibility into the supply chain has two components: first, an effective supply chain control system should provide a means of easily aggregating data from disparate sources such as ERP systems, APS systems, contract manufacturers and key suppliers. Second, it must actively and continuously monitor the supply chain, allowing manufacturers to see changes and problems as they occur. Although the commonly used weekly reports showing what has already happened in the supply chain are generally viewed as management tools, they are really historical documents, since they convey the supply chain's recent past rather than its present. Such real-time information exchange is the key to effective supply chain control, as it gives companies the opportunity to react within very tight timeframes to fix a situation or lessen its negative impact.

Notification

Monitoring

Despite the value of real-time, continuous information from the supply chain, it would be impractical to expect companies to monitor every single change as it happened. For this reason, an effective supply chain control system must offer an easily usable system of notification that allows the user to identify a subset of events and conditions to be monitored and offers an always-on visual indicator that the user can understand at a glance.

Monitored conditions can include anything with a significant bearing on the business, such as a drop in excess inventory or a rise in delivery-date rescheduling. These monitors must have the power to evaluate large amounts of operational data and detect subtle-but-significant changes. As the state of the extended supply chain changes, the system periodically reevaluates the monitor conditions and updates the status display.

Alerts

In addition to monitoring key conditions and events, supply chain control requires the ability to alert the user to critical events or conditions requiring immediate action.

Alerts are occurrences of specific supply-chain events, such as on-hand inventory rising above a particular figure or falling to zero at a certain holding location. The system should issue alerts within its interface and also deliver them by email or pager, if necessary, assigning them to high-, medium- or low-urgency categories. The result is that a supply chain manager can, from anywhere, know of any significant supply chain event that happens at any time.

Analysis

Depth-of-understanding is the key to proactive control. The optimum supply chain control solution should include analysis tools to interrogate each operational aspect of the extended supply chain and allow the supply chain manager to examine the state of the entire chain at any time. These analysis tools must readily adapt to each customer's particular supply chain, combining each organization's unique characteristics with the system's data-analysis engine and tabular and graphic presentation capabilities, creating a "window" into any corner of the current supply chain.

In the real world, however, analysis is only as good as the reality it represents. For this reason, a supply chain manager needs the ability to extend analysis of a situation into "what-if" scenarios, drill down into key data and representation of trends.

What-if

Supply chain control tools must offer analysis of operational factors in multiple ways in order to allow companies to understand the impact of alternative solutions. For instance, if a key part suddenly becomes unavailable from a supplier, a what-if analysis of customer history, supplier inventories, delivery commitments and order size can allow a company to a) find comparable parts with another supplier to fill outstanding orders, b) make shipments in stages to fulfill the most urgent customer needs or c) satisfy the order requirements of its best and biggest customers first.

Drill-down

Supply-chain data has depth. It can run to many levels of information, all of which may contribute significantly to proactive control.

A supply chain control solution's scenario tools must be designed to "drill down," as necessary, through every level of information present in an analysis. For example, being able to find an inventory quantity is useful, but expanding it to see the quantity by finishing state, by business unit owner, and by physical location—is even better.

Trending

Supply chain data is periodic. Perceiving subtle changes in data over various time-spans can be difficult, although it is very often the key to excellent operational control.

The control solution's scenario tools must be designed to break out appropriate periodic data into comparable units that reveal important trends. For example, it can be far more profitable to know by how much an order-backlog average is drifting week-over-week than simply knowing where it is today.

Recommendations

The automation on which businesses rely to help speed and simplify complex manual processes is limited because it lacks context, specifically the best-practices knowledge, individualized business rules, industry expertise and corporate goals that constitute the corporate knowledge base. Clearly, decisions about how to respond to changes in the supply chain must be able to leverage this depth of knowledge in order to manage exceptions, gray areas and unclear calls.

For this reason, the optimum supply chain control solution must offer recommendations with its analyses. For example, when running a scenario concerning Days of Supply, the results of the analysis should be accompanied by recommended figures such as numbers for Quantity on Order or Days on Hand. These recommendations need to arise from built-in business rules based on industry and in-house practices. Using such recommendations, companies can guarantee consistency and high quality of the decision-making process in the supply chain.

Taking Stock of Your Supply Chain Performance

Operations and supply chain experts agree that any attempt to gain control over the supply chain should focus on total system performance, rather than a department or a specific function. By successfully closing the supply-chain-control gap, companies can achieve dramatically better results from their supply chain activities:

- Decreased contingency and excess/obsolete inventory
- Lower operating costs
- Fewer or no shortages

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- Reduced latency and reaction time
 - Improved customer responsiveness
 - Accelerated overall performance
 - Improved customer satisfaction

But implementing a control solution across the entire supply chain is no easy task. In order to understand the potential to improve their processes, supply chain and operations professionals must answer some preliminary questions.

- 1) *Liability*: How much excess or obsolete inventory is in your supply chain right now? How do you allocate risk for that inventory? Can you break down your inventory liability by month? By week? How effective is your current method of response to demand changes in reducing your financial liability?
- 2) *Visibility*: Does your organization have visibility into demand patterns and supplier activities that could affect the bottom line? Do you have the ability to manage the supply chain according to changes in demand and supply?
- 3) *Shortages and Allocations*: Do you have “upstream” and “downstream” visibility into variables affecting supply and demand? How effective is your “supply demand match”? How do you weigh customer needs and priorities against CM capabilities and revenue requirements to make the optimal decisions about allocating inventory in case of a shortage?
- 4) *Mix Management*: How soon before each demand period must you forecast? How close would you like to be in order to forecast more accurately? Do you have the ability to slice and dice customer demand information in order to develop very accurate forecasts that provide meaningful guidance to CMs?
- 5) *Collaborative Commitment Reconciliation*: How do you arrive at Build Plan commitments with your CMs? Can you seamlessly communicate changes with your CMs? Are you able to effectively track that process and communication for purposes of future planning, contextual decision-making and CM performance assessment?

Conclusion

Despite the dramatic failure of supply chain management systems to protect companies from the cycles of excess and shortage that lose them money, predictions for SCM growth remain rosy. AMR Research predicts the market will grow from \$6.7 billion in 2001 to \$21.1 billion in 2005. International Data Corp. is even more confident, with predictions that SCM will grow to over \$30 billion by 2004. Nevertheless, almost three quarters of U.S. manufacturers surveyed recently by the National Association of Manufacturers saying they are trying to aggressively *cut* supply chain costs to boost profitability.

According to *Electronic Business News*, even companies struggling to thrive during the current economic weakness feel that they can't afford *not* to invest in effective supply chain management tools. AMR Research concurs, as conversations with its customers indicate that, despite the initial expense of implementing supply chain solutions, the tighter cost control they're experiencing as a result is "the right medicine for ... [weathering] a zero-growth environment."

Perhaps the most compelling argument, however, is *Red Herring's* assertion that some experts estimate new supply chain control technologies could reduce excess inventories by some \$30 billion. Freeing up that kind of money for businesses to reinvest in growth could act as a significant boost to the economy.

Today's market slowdown offers companies an opportunity to reassess and realign their internal processes for maximum impact, with the goal being to develop an efficient, cost-effective manufacturing machine that will be able to keep pace when the economy turns around. Powerful solutions to the challenge of gaining control over the supply chain are here today. The companies that take advantage of these solutions and make the commitment to implement them across the entire supply chain will be here tomorrow. Will yours?

About Valdero

Valdero Corporation is a leading provider of enterprise-class software solutions in the area of supply chain control. Valdero's seasoned professionals have deep, real-world supply chain expertise, and every Valdero application has been designed to deliver the knowledge that is critical for gaining more control and visibility over your supply chain.

We invite you to explore further and learn how Valdero can help you fundamentally improve the way you run your business. Visit us at <http://www.valdero.com/> or call us at 1.650.691.4490.