Supply Chain Management Extends the Reach of Small and Mid-Sized Manufacturers

By implementing advanced supply chain management strategies, companies such as Eurotherm and Sigma-Aldrich are integrating retail channels with manufacturing, driving demand for the point of sale, and eliminating inventory buffers in the distribution chain.

Marty Weil

While it's not unreasonable to label the 1990s "the decade of Enterprise Resource Planning (ERP), a hot topic in manufacturing as it approaches the new millennium is increasingly supply chain management (SCM). There are compelling reasons for this shift. Small companies have seen industry giants like Ford and Intel blaze the trail in terms of configuring seamless supply chains with customers and suppliers. These essential chains that allow the manufacturer to make decisions and plan for the future are based on something much more tangible and accurate than transaction-based projections.

For those unfamiliar with the concept, SCM encompasses the use of information technology to impart automated intelligence to an ever-growing network of cash registers, delivery vehicles, distribution centers, factories, and raw material suppliers. The aim is for each player in the supply chain to conduct business with the latest and best information from everyone else in the chain, guiding supply and demand into a more perfect balance. The purpose is to move product from the point of origin to that of consumption in the least amount of time and at the smallest cost. SCM helps managers do such things as integrate retail channels with manufacturing, drive demand for the point of sale, and eliminate inventory buffers in the distribution chain.

The advantages of a strong SCM strategy can be seen in UK-based Eurotherm, a mid-range instrumentation manufacturer, and St. Louis, MO-based Sigma-Aldrich, a manufacturer of research-grade chemicals. These two manufacturers provide good examples of what can be achieved in small- and mid-sized companies when cutting-edge supply chain techniques are implemented.

"What's driving this movement," said Tom Clarkson, IBM's segment executive for small and medium-sized businesses in the process industries, "is velocity. The pace of change in business is increasing exponentially, and manufacturers need an information infrastructure able to keep up with this, if they're to survive and flourish."

Meeting customer demands for on-time delivery of high-quality, low-cost, made-to-order products is no easy task in such an environment. While ERP systems have taken manufacturers much of the way, it is largely internally focused and cannot fully support an extended supply chain. In the process of creating a virtual supply chain, there's an explosion in the requirements for new

kinds of information, as well as for timeliness and access.

Further, the link must cut across at least two levels of the supply chain — beyond immediate customers and suppliers. This means not only sharing information, but also linking processes across the chain.

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Chain of Tools

Several management disciplines contribute to supply chain optimization efforts, including forecasting, distribution management, production planning, transportation planning, and supply-chain optimization.

SCM software helps managers find opportunities for improvements in these areas, far beyond what even the most experienced manager can glean through intuitive insight. Supply-chain optimization software allows management to look at the relationships among the various elements of the SCM plants, distribution centers, points of sale, as well as raw materials, relationships among product families, and other factors to synchronize supply chains at a strategic level.

In 1997, according to industry research leader AMR, the SCM software market grew in excess of 50 percent, driven by the leading supply chain planning (SCP) vendors, which grew at a rate better than 90 percent.

What is generating this kind of growth? While this market has been around in one form or another for more than 15 years, the related concepts and technology had been relegated to logistics functions as enterprise applications for financials, and manufacturing took center stage. More telling, however, than the good fortunes of a couple of hot software vendors is the interest by the mainstream business community. Most small to medium-sized manufacturers now recognize that mastery of the supply chain is a key to market dominance in the future.

Empowering Small- to-Mid-Sized Manufacturers

Extended SCM empowers small and mid-sized manufacturers with the ability to see across the spectrum of their supply and demand chains. Such vision enables a global grasp of transaction and planning systems, both internal and external, allowing for much tighter control of all aspects of the manufacturing process. A pharmaceutical company, for example, will want the ability to trace not only all constituent elements for regulatory reasons, but also any process or recipe alterations that may have an impact on the company's own decision making.

Here lies the key benefit of SCM: the ability to plan across the total range of a company's activity and then to make the adjustments needed to optimize the results. This process demands sophisticated programs that can track and analyze the effects of disparate interactions, such as source materials from different suppliers; production sites, capabilities, and utilization; as well as transportation ramifications. With a supply-chain infrastructure in place, even small companies will be able to optimize intricate strategic and operational planning on an ongoing, real-time basis.

The end result is faster, more accurate, and reliable response — greatly enhancing customer loyalty. Many companies that have implemented this strategy are enjoying cost savings through less waste, more efficient use of labor, and significantly reduced inventories, as well as resource utilization and throughput improvements. For instance, Eurotherm, an instrumentation manufacturer based in the UK, had a product build time of up to a full day prior to implementing an SCM solution from DataWorks (San Diego, CA), a supplier of ERP/SCM software. At Eurotherm, a 20- to 30-day delay from order enter to delivery frequently produced configuration errors. Further, inter-company transfers that were difficult and time-consuming often created delays in supplier shipments, distribution, and inventory turns. DataWorks implemented the following ERP/SCM solution for Eurotherm: a distributed-system WAN (Wide Area Network); remote/local product configuration; distributed electronic order entry; demand flow production; flexible data warehouse management; and Internet track and trace with DHL and facilities management. The result was a product build time reduction of one to two hours, and a reduction in delivery time to less than three days from order entry. The ERP/SCM solution also allows for: automatic, accurate inter-company transfers through distributed order entry; same-day kanban replacement delivery from suppliers and remote sites; no customs delays; and significant reduction in inventory.

Hot Links

From an enterprise view, one can't forget that the fundamental goal is to make money. The supply chain represents a shift in focus from reengineering costs out of processes to driving revenue growth within a reasonable cost model. It's easy to lose sight of the fact that a process only exists to support a revenue stream — and business ought to be focused on growing that stream.

One business with a clear focus is Sigma-Aldrich (St. Louis, MO), a $1.1 billion company that primarily manufactures, purchases, and distributes research-grade

chemicals to hospitals, universities, and other institutions worldwide — often in quantities as small as a millimeter or a milligram. One division, SAF, also supplies chemicals in bulk to multiple industries. Sigma-Aldrich has international distribution centers in Australia, Japan, Mexico, Canada, and Israel, as well as throughout Europe.

For more than 20 years, Sigma-Aldrich performed forecasting on a custom mainframe that was based primarily on annual prediction. The system was accurate only about 25 percent of the time, and a large problem was the complete lack of stock visibility in overseas distribution centers. If headquarters shipped inventory overseas, the system calculated it as a customer sale, which meant that Sigma-Aldrich was often buying stock long before it needed to.

Recognizing the importance of accurate forecasting and product visibility throughout the supply chain, Sigma-Aldrich sought research alternatives to its existing system. After a thorough evaluation, the company selected Logility Value Chain Solutions. In a benchmark forecasting exercise based on actual demand data, the SCP system achieved a 50 percent forecasting accuracy — not just on the top-selling products, but across the board. "This across-the-board accuracy, was important to us because of the profiles of our sales," said Larry Lux, director of corporate finance at Sigma-Aldrich. "While we don't have a lot of dollars invested in the very slow sellers, the volume of products is quite large. So even replenishing these products one month early will add significantly to inventory and have little effect on service improvement."

Sigma-Aldrich uses the SCP software to analyze product movement and to segment its inventory into top, middle, and low-volume sellers. For products with a high degree of demand volatility, "we'll use a minimum one-month safety stock, no matter what the forecast says," Lux continued. "Customer service is still the highest priority."

He added that the firm is shooting for a fulfillment rate of 99 percent. In addition, Sigma-Aldrich now has the data to measure service levels more accurately. "We're looking at back orders from two perspectives: forecast errors and leadtime errors, which occur when we don't receive the product until after its scheduled receipt date," said Lux. "By imposing a discipline on purchasing and sales decisions, the system forces us to examine leadtimes closely and make them more accurate."

After a three-stage, phased implementation that includes links to the mainframe's legacy data, Sigma-Aldrich is already seeing a general reduction in inventory — with the exception of strategic stockpiling — along with lower reorder points. "We order products later in the cycle than before, based on better product forecasts and stock visibility," said Lux.

Sigma-Aldrich has moved from international forecasts at a central location and is providing its international subsidiaries with SCP data for them to forecast their own demand. The first two locations went online in late 1996. All major European locations are now online. Those forecasts will be integrated into inventory planning and Distribution Resource Planning (DRP).

According to Michelle Silvers, director of marketing at Logility (Atlanta, GA), efficient SCM is crucial for any size company to maintain competitiveness. If a manufacturing company can closely predict not only what to make but also how much to make and when, they can stay ahead of the competition, she said. Logility recommends the following strategies to improve SCM:

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- Break down the barriers between functions within the company. One-number planning, in which every department and function (such as manufacturing, marketing, sales, transportation, inventory control, forecasting, and warehousing) has access to the same information, is crucial. One-number planning allows for a complete view of the supply chain, rather than being limited to the optimization of only one function. For example, transportation may have created the lowest-cost route, but at what cost to delivery times? Manufacturing may have one forecast for product, but

SCM Impact

Efficient supply-chain management provides several benefits to manufacturers. For example, Logility's customers have reported the following results from implementing SCM software:

Area of Measure	Impact
Forecast errors	Reduced 10 to 40 percent
Service level	Improved average 12 percent
Inventory	Reduced five percent to 60 percent
Customer Approval Rating	Increased by 97 percent
Distribution costs	Reduced by 15 percent
Obsolescence costs	Reduced 80 percent

Figure 1. *Source: Logility.*

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if a marketing promotion creates higher demand, how will they be prepared to meet that demand?

- Utilize Internet technology for collaborative planning. One of the most exciting options for small and mid-sized manufacturers is the ability to use the Internet to speed planning and provide remote forecasting. Not only is this a low-cost option (typically, a site only needs the browser and an Internet service provider, rather than needing to purchase many copies of expensive software and hardware), but it also provides real-time access to speed delivery times, it speeds data transfer, and it reduces errors.

Vision Thing

The true benefits of SCM come when companies look beyond their own world. The nature of this vision creates a particular challenge for those serving the chain — each company's perspective is different, and the supply chain means different things not only to different markets, but different things to those within the same market.

Consider the vision of the virtual enterprise. Unlike the traditional ERP model, which is serial and transactional, the extended supply chain is global and collaborative. It's like the difference between a line and a sphere. While two companies may be points on the same line (that is, the serial perspective), the sphere (that is, the global perspective) is defined by its center point, the company itself. And while there may be significant intersection among them, no two spheres will be exactly alike. This illustrates the essential challenge of supply chain solution providers.

As segment executive for small and medium-sized businesses in the process industries, IBM's Clarkson is keenly aware of this: "There's a world of difference among 'supply chain' definitions," said Clarkson, "which is why those providing supply chain solutions must put themselves in their customers' perspective, as opposed to coming to the table with 'something in the can.'" He added, "In my opinion, process manufacturing has tended to lag behind discrete in its 'expenditures' of information technology across the enterprise to help in the competitive business environment. This is particularly so as it relates to ERP and supply-chain issues."

Big Strategies, Small Companies

It's no secret that some small and mid-sized process manufacturers tend to make their capital investments in facilities, equipment, and supplies — hard goods — at the expense of starting slowly in developing SCM tools. "While supply-chain management strategies for small-to-mid-sized manufacturing companies do not differ significantly from those of larger manufacturers, the approach to managing the supply-chain differs significantly," said Tom Kirkham, director of business development at McHugh Software International (Waukesha, WI), a supplier of supply chain software. "Small-to-mid-sized manufacturing companies must focus on the lessons learned by the larger manufacturing companies. Many larger manufacturers have taken a 'big bang' approach to managing their supply chain and have invested large amounts of money in implementing, in the following order, ERP systems, advanced planning and scheduling systems, and logistics execution systems (LES) as a means to increase their supply chain efficiency. Many of these companies have not received the expected ROI within the appropriate time frame from these types of systems. At smaller manufacturers, these financial resources often do not exist, so the supply chain must be optimized in bite-sized components to achieve a quick ROI and fund subsequent changes."

Kirkham continued, "Many small-to-mid-sized manufacturing companies are still operating their supply chain as a series of departments, such as purchasing, transportation, and distribution, to name a few. The first step must be to empower a team of individuals to focus on the development and optimization of your supply chain. The various pieces of the supply chain must be operating as a unit to accomplish any significant gains in cost savings or customer service."

Kirkham added, "Once a dedicated team is in place, focusing on the execution aspect of your supply chain will result in the fastest, most significant ROI and service improvements. The quick implementation of an LES product suite will provide cost and service improvements by providing accurate and timely information between distribution and transportation organizations, as well as incorporating labor management standards and measurements. This will allow organizations to manage order changes more effectively, reduce inventory levels and costs associated with carrying excess inventory, increase inventory turns, increase labor efficiency by effectively managing personnel, and improve customer service by increasing delivery accuracy and speed. Additionally, costs will be saved through effective consolidation and rating of shipments to customers."

Kirkham continued, "By streamlining the execu-

tion aspect of the supply chain, small-to-mid-sized manufacturing companies may then use the ROI dollars to reinvest in ERP systems and advanced planning and scheduling systems. These systems will allow the company to continue to refine and improve upon supply-chain efficiency."

According to Clarkson, the supply chain issue has rapidly become the dominant focus for small and mid-sized process manufacturers looking for a competitive edge: "Over the past four or five years, ERP has been the dominant word in the industry; what we're going to find as we get close to the year 2000 is that most manufacturers will have made a major ERP decision. This has led to a rethinking of how they do business — of the technology and infrastructure required to support their businesses in the new millennium — and very quickly their questions are honing in on, 'How do I successfully compete in an environment where the business dynamics (such as divestitures, mergers, buyouts, break-ups) are changing so rapidly?' The answer to that question is increasingly seen as extended supply-chain management."

Without the benefit of large and sophisticated MIS staffing, small and mid-sized manufacturers are increasingly looking to outsource system building and management to partners who can help them to make the right choices and then execute those choices as an ongoing part of business. "To me," said Clarkson, "this is very much like building a house. Every house is different — defined by the homeowner. When you're ready to build, you have the guy who builds the foundation; then you have framers, people who do electrical, plumbing, roofing, and so on. With supply-chain building, you may have one ISV (independent software vendor) for supply planning, one for demand planning, one for plant scheduling, one for logistics, and one for ERP. You need the very best expertise to secure the links that empower the virtual chain."

Developments to Watch

According to Chris Jensen, a director at DataWorks, advanced planning and scheduling (APS) is now considered one of the most important advances in SCM strategies. A recent AMR market study agrees: "There can be little argument that APS was one of the hottest markets for enterprise applications ..." "For the first time," said Jensen, "manufacturers have planning tools that can absorb vast complexities to produce optimal plans. More importantly, APS leverages the planner's knowledge with responsive decision support tools rather than enslaving the user with an endless barrage of exception messages. APS technology is literally changing the way manufacturers plan. APS optimizes the use of resources across the current network of suppliers, customers, manufacturing locations and distribution centers. It is helpful for locating new facilities within an existing supply-chain network and determining the optimal way to fulfill customer demand. What-if analyses can be performed to test the impact of closing or moving facilities on profits and customer service levels."

Technology is a major driver as small and mid-sized manufacturers move toward extended SCM. The ultimate expression will be in electronic business, and much of the technology necessary for this — Java, CORBA (Common Object Request Broker Architecture), Internet collaboration tools — is available or will be available soon.

The advance of information technology has provided great opportunities for new ways in which materials can flow through the supply chain, as well as new forms of financial flows across the chain. Inventory is being replaced by information in this era. EDI (electronic data interchange) and Internet usage have started to make transactions across the supply chain paperless, more efficient, and more accurate — leading to greater coordination of supply and demand.

As we pass into the next millennium, greater coordination of supply and demand will be a de facto requirement for manufacturers to sustain and grow their businesses — regardless of the markets in which they compete. In the age of electronic commerce, all markets can be global markets.

The momentum begun at the end of the 20th century by the broad-scale implementation of ERP solutions — first by large multinationals, eventually by small and mid-sized entities — will become broader and deeper as it extends across the supply chain, changing the way we do business as the value of information access and exchange moves from the MIS domain to that of cultural knowledge.

Leveraging Legacy Systems, Other Changes to Come

What will be the nature of this change? For manufacturers, the individual or individuals responsible for SCM will be increasingly powerful in the manufacturing setting. Planning and control will be more centralized,

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and many traditional seats of power (such as plant managers, regional managers) will find their authority eroded as local knowledge becomes global knowledge. The lines between internal and external distribution will blur, as companies off-load distribution to third-party suppliers with better economies of scale. Product development, time-to-market, and markets themselves will continue to be condensed in terms of space and time, as technological infrastructures enable essentially instantaneous recording of, analysis of, and reaction to activity.

For software vendors, the componentization of applications will quickly become the standard. Users — each with their own specific definition of the chain — will demand best-of-breed solutions for the optimization required to maintain a competitive edge.

Essential to effecting this change will be the system integrators — those that can build the new links efficiently while assuring that they properly leverage the legacy systems already in place. Those with the deepest roots in the vertical manufacturing markets, the broadest links to the specialized solutions provided by ISVs to control the supply chain, and the greatest access to and understanding of the technologies needed to design, implement, and maintain infrastructures, will prove to be invaluable as manufacturers reach outside themselves to gain a strong foothold in this new commercial world.

Manufacturers that come to understand the value of chain optimization and act upon that understanding will ultimately see their whole supply chain improve significantly. Those that are concerned only with their own performance measures and who pursue the local optimum may get good short-term results, but the result will not last.

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