Leading life sciences enterprises try to bring the same degree of rigor to their business processes and their supply chains as they do to drug discovery or consumer products testing. Although some pharmaceutical companies produce breakthrough drugs and deliver outstanding consumer products, they also must ensure that they are using business processes that won't become outdated. One of the key processes is sales and operations planning (S&OP). To achieve enterprise objectives, ranging from increased earnings per share and return on assets to improvements in customer service and inventory levels, companies know that they must fully integrate their S&OP process and create a supply chain as scientific in nature as their core pharmaceutical competencies.

Does your current S&OP process truly reflect today's realities? Or are you limping along with a dated model of the business, old planning technology, and a business process that restricts your ability to replan quickly and more frequently than once a month or quarter? In today's world of competitive pressure and Wall Street's impatience with less-than-expected performance, companies need a planning environment that addresses those deficiencies and takes full advantage of the technology solutions being used by leading companies.

How does your S&OP measure up?

To determine whether your S&OP process is the best it can be, consider the following questions:

- Do your S&OP planning models encompass all capacity constraints, including constraints from the added capabilities from mergers and acquisitions?
- Do your models properly reflect constraints for third-party manufacturers and suppliers of critical and/or active ingredients?
- Does your technology infrastructure give you timely access to pertinent information, or do you have to wait for long batch runs or weekly or monthly update cycles?
- Are you using spreadsheets, which require cumbersome and extensive manual data entry or manipulation, to produce a consolidated single view of planning information?
- Are you able to quickly identify exception situations between formal planning cycles?
- Can you effectively respond to these exceptions quickly in the context of the entire business plan while still involving all other business functions?

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Can plan adjustments made between formal planning cycles be communicated quickly and accurately? Despite the technological advances of the past several years, a significant number of pharmaceutical companies that do not have integrated systems still perform S&OP the old-fashioned way — using spreadsheets, which must be manually updated with new inventory information and forecasts, causing planning cycles to consume two to three weeks.

What's at stake
Business processes and technology that lack optimization capabilities adversely affect the performance of the pharmaceutical enterprise and will not support the enterprise of the future. In the next few years, the pharmaceutical supply chain will morph dramatically and will resemble more closely the supply chain of the consumer packaged goods industry. Responsiveness, visibility, and velocity will become the key characteristics of a well-managed supply chain. The days of two to three inventory turns per year will disappear, and eight to twelve will become the norm. Customer service levels will improve while inventory levels decrease. New channels will reduce intermediate inventory stops in the distribution network. Products and services eventually will be customized for individual consumers, and products will be shipped directly to their homes or offices. Unless major changes are made soon, an S&OP process using technology that doesn’t execute at “e-speed” in terms of time and frequency could prove to be the Achilles’ heel for many enterprises.

The current environment
Most companies today have multiple manufacturing locations and are geographically dispersed. The S&OP process tends to be centralized, and a statement of manufacturing requirements based on a consolidated inventory plan is sent from the central group to plant sites for constraint analysis (see Figure 1). The manufacturing sites, in turn, create their own constrained supply plan using the spreadsheet method or their materials requirements planning (MRP) systems. These individual constrained supply plans are then forwarded to the central organization, which consolidates them and determines compliance with the inventory plan.

In general, the forecast is provided to the central organization in a spreadsheet. The forecast may or may not be provided to the SKU level, so a disaggregation may be required to break down the forecast from product family to SKU. In addition, the typical forecast has a national perspective and lacks detail by distribution center, market, customer, or channel. As a result, decisions made downstream about inventory deployment must be recorded manually, which can cause distribution centers to experience inventory imbalances and reshipments or an additional load on manufacturing resources to produce more product.

Often, the central organization also uses spreadsheets to create manually a netted, time-phased finished goods inventory plan. Typically, no effective distribution planning system exists that includes all inventory and in-transit visibility. At best, an automated feed from various finished-goods inventory systems provides input to the spreadsheet. But many times a consolidated view of inventory by distribution center, with in-transits and totals for the entire enterprise, must be arrived at manually. Safety stocks generally are calculated as the minimum number of days of sales that can be kept on hand. There is no statistical calculation of safety stock based on forecast error or the like. This results in either too much or not enough inventory for individual products in a distribution center. Usually, with companies erring on the side of caution, it results in too much safety stock inventory.

Once inventory requirements are calculated and netted against current inventory, customer orders, and safety stock, the central group then must determine the time-phased unconstrained production requirements. Lot sizing must be considered as well as in-transit lead times. Often, the production requirements are calculated manually and entered in the spreadsheet. These production requirements then are assigned to manufacturing sites. If a product can be made in multiple plants, the planner must make a decision about how to split the requirements between the source plants. This decision has cost implications not only because of different manufacturing cost structures between plants, but also because of deployment costs to distribution centers.

This front-end process by the central group to create the inventory and unconstrained supply plans is time consuming and labor intensive. It can take anywhere from two to five days to complete, depending on the complexity of the enterprise and the amount of automation supporting the process. The process also is subject to individual interpretation of information, which can result in inconsistent decisions. Worst of all, decisions are not optimized by weighing all cost variables against customer service implications.

Figure 1: Typical ERP-based planning structure.
At the plant level, the process can become circular. Generally, planning systems at the plant level are based on enterprise resource planning (ERP) and manufacturing resource planning (MRPII) systems and can support only a very iterative process to balance demand and constrained supply. Material and capacity constraints cannot be considered simultaneously and typically are analyzed separately in overnight batch runs. In some environments it is possible to constrain capacity first and then materials; however, most environments constrain materials first.

Once the first resource to be constrained (material or capacity) has been reconciled, the reconciliation process of the subsequent resources may unbalance the initial resource plan, requiring replanning. This loop between material and capacity balancing may need to be repeated several times to balance both simultaneously. To avoid this problem, some companies use spreadsheets to try to balance material and capacity constraints at the same time. Others reconcile only capacity and assume there is enough material, or they cover material constraints with lots of inventory and expedite supplies when shortages exist.

Typically, in today’s environment the supply chain contains multiple tiers. Active ingredients sometimes are supplied by company-owned facilities. Outside operations, including packaging, lab testing, and quality control, also increase the complexity of the planning process. Often, planners essentially ignore these potential external constraints and make assumptions of infinite capacity or supply. In some instances the constraints may be planned outside the formal system by means of spreadsheets. Clearly, such planning at the plant level does not easily and efficiently encompass the complexities of today’s supply chain. Meanwhile, mergers and acquisitions have increased the number of facilities that must be planned, and the outsourcing of activities that are not core competencies has increased the amount of time and people required to identify and resolve constraints and coordinate external activities.

After the central group consolidates the plants’ supply plans, it analyzes them to identify any discrepancies with the inventory plan. When discrepancies exist, potential solutions are identified. Some solutions can be implemented within the central group, while other solutions involve some effort at the plant level. Solutions may include intentionally allowing safety stock for the affected item to temporarily decrease below desired levels, thus risking stock-outs; or the solution could entail spreading the risk of stock-outs by adjusting the inventory plans on other items to make needed capacity available. Working overtime at a plant may be the solution. Any resolution that affects the constrained production plan could require the plant to re-plan. Many times replanning is not performed and manual adjustments are made without the benefit of analyzing the effects in the context of the plant’s entire plan.

Planning the manufacture of new products is only part of the challenge of introducing new products. In an ERP environment it is difficult to make sure that all of the required documentation (e.g., regulatory, production, and quality control) is included in the planning process. MRPII was intended to help plan and manage direct items that are produced or purchased and that move in and out of inventory. Indirect items such as documentation and tooling are not easily managed within the system, so using spreadsheets or other external tools or systems requires additional effort. The synchronization of all assets needed to produce a product in this environment is not assured. It is not uncommon for this entire process to consume three to four weeks until a balanced supply and demand plan is completed. Completed is an arguable description because in many environments key resources are not considered, synchronization between all critical resources in the supply chain is lacking, and the results are not optimized across the entire enterprise to balance cost with customer service.

The future is now
In some industries such as high technology and electronics the future already has arrived. Other industry segments, including automotive and consumer packaged goods, are moving rapidly to a new model. Competitive pressure, shorter product life cycles, customer and market expectations, margin erosion, and cost containment are driving the S&OP process in these segments to become more responsive to market conditions. The process must be capable of being executed in hours as opposed to weeks, and it must drive efficiencies both internally and with customers and suppliers. Industry analysts are increasingly vocal about their projections that supply chains for pharmaceutical, medical device, and biotechnology companies will evolve rapidly to resemble more closely the supply chains of the automotive and packaged goods industries. Organizations, business processes, performance metrics, technology, and supplier-customer relationships must begin changing immediately.

Stage one — an integrated planning solution
The evolution of the new planning model generally is accomplished in three stages. The first stage is an integrated planning solution that simultaneously optimizes and synchronizes all material and capacity constraints across the enterprise. The optimization engine at the heart of the solution is tightly integrated with the demand-forecasting application so that forecasts are fed automatically to the engine. If a change in forecast is needed, planners won’t have to wait until a new forecast update cycle before they understand the effect of the forecast change and can resolve any exceptions created as a result of the change. The optimization engine models all critical material and capacity resources in the extended supply chain. The model includes internal and external constraints such as potential bottlenecks in company-owned manufacturing plants, third-party manufacturers, quality control, and suppliers.

This engine replaces the separate centralized finished-goods inventory planning process and the plant-level, circular planning process. On the basis of enterprise cost and customer service objectives, the engine synchronizes the finished-goods inventory plan and optimized supply plan in a single process. When the engine cannot optimize on the basis of planning parameters, messages and alerts are created with suggested resolutions (e.g., increasing manufacturing capacity by working overtime). Simulation capabilities allow multiple business scenarios and resolutions of problems to be evaluated. The time required for the planning process is significantly reduced, thereby allowing more frequent planning cycles and faster problem resolution.
The engine uses existing data in other systems to eliminate the redundant maintenance of data. Enterprise application integration technology facilitates rapid development and integration with existing ERP and legacy systems. This technology also facilitates integration outside the enterprise firewall with the data of customers and suppliers. Integration with current data allows the planning process to be executed quickly in response to changing market and operational conditions. According to business requirements, integration can take place in batch or real time.

The stage one planning process can improve the existing process in several key areas. The total time to execute the plan and resolve constraint issues is reduced from weeks to potentially, hours. The process can be executed more frequently, which, among other things, reduces the need for finished goods, raw materials, and work-in-process inventory buffers. It also enables the inclusion of additional critical resources in the planning process, thereby reducing unforeseen problems. This can significantly reduce manufacturing costs, improve use, and help prevent customer service problems.

Stage two — collaboration with trading partners

In the second stage of evolution, companies establish and expand collaboration with external trading partners (see Figure 2). Collaborative relationships allow faster exchange of information that affects existing plans. Viewing customers’ inventory replenishment plans and comparing them with the statistical forecast helps identify potential discrepancies that should be reconciled. The more the forecast is synchronized with your customers’ plans, the more accurate the forecast will be. If customers are experiencing higher-than-expected demand for a company’s product, the company can receive electronic notification of the potential change to the customers’ replenishment plans and work with them to provide a mutually satisfactory solution. The solution then can be immediately reflected in the company’s internal plans and schedules. Simulation capability in the planning system supports a collaborative business process that allows testing of multiple scenarios so that the most cost-efficient solution that provides the highest level of service can be quickly identified and communicated throughout the organization and to the customer. The planning and collaborative business processes are tightly integrated so that information flows quickly between them and timely alerts and messages can be generated. The same process applies to a collaborative relationship with a supplier.

Stage three — the network hub

Stage three of the evolution is the creation of a network hub — a virtual network that electronically connects all participants through all levels of the extended supply chain (see Figure 3). In this environment, planning is continuous. All relevant participants are notified simultaneously of conditions that might push the current plan beyond mutually developed tolerances. Participants are in constant communication with the hub, and electronic alerting and messaging is used to manage and communicate events. In this environment, for instance, all participants on the supply side of the equation would receive the same demand signal simultaneously when sales are higher than expected and continuous supply is in jeopardy. This means that manufacturing plants will be able to see an imminent change to the schedule. At the same time, the supplier of the active ingredient would receive the same demand signal when sales are higher than expected and continuous supply is in jeopardy. An alert also may go to a transportation provider warning of the pending shipment. Replanning at all levels assures continuous supply and minimum disruption in the supply chain. It also takes cost out of the system by eliminating buffer inventories, for example, and spreads more of the risk among multiple partners.

Implementation of the network hub concept is just beginning. Few companies in any industry have reached stage three, but several high-technology companies and automotive companies have started down the path of implementing complete network hubs. The experience that these trailblazers gain will provide companies across industries, including pharmaceutical manufacturing, with valuable lessons. At the same time, these pioneers will gain a first-mover advantage as well as the competitive advantages that will be sustainable for a long time. In
the meantime, other companies can let the pioneers work out any potential problems. Pharmaceutical companies, especially those with complex, multilevel supply chains, should have the network hub vision in mind as they create their strategies for continuous improvement.

Business and financial benefits
A responsive S&OP process can help generate numerous business and financial benefits. Short-term benefits can include:
- operational efficiency. Measurable operational efficiencies can include reduced finished goods, raw materials, and work-in-process inventories. Experience shows that significant reductions in all three of these categories can be achieved through an S&OP process that can be executed quickly and frequently. With the additional visibility and analytic capability that comes from more frequent planning cycles, manufacturing productivity also can increase significantly.
- improved customer service. Customer service levels measured by order fill and line fill also can rise, even while inventories are being reduced. The increase in service levels translates to improved availability at the pharmacy or store level, which in turn can lead to increased sales.
- enhanced shareholder value. All of these factors can enhance shareholder value and increase stock prices (see Figure 4). Asset utilization is improved, unit costs are lowered, working-capital requirements are reduced, and sales are increased. These improvements can be used to fund additional research and development projects and marketing programs.

Personal productivity also increases as people spend less time performing data entry and maintenance and more time analyzing and solving problems. Increased visibility of potential problems provides lead time to solve them more cost effectively. If planners take the time to understand and evaluate alternatives, they can attain the proper balance between cost and customer service.

One large pharmaceutical company implemented an improved S&OP process and was able to see a potential capacity issue associated with a new product launch. It was able to resolve the issue in time to assure availability of the new product without adversely affecting the production schedules of existing products. The same company also reduced inventories significantly.

Another global pharmaceutical manufacturer implemented a centralized S&OP planning function and improved customer service levels while almost doubling inventory turns. A third company increased revenue while decreasing inventory significantly.

An adaptive planning structure will provide a company with longer-term and more strategic results such as changing the ways that pharmaceuticals are brought to the marketplace. In the future, business success will be predicated on responsiveness to end customers and the fast provision of service and value. These changes will not necessarily happen overnight, but the first companies to differentiate themselves will enjoy a sustainable competitive advantage.

Critical success factors
The critical success factors for implementing ERP, customer relationship management, and other systems are applicable to the initial and ongoing implementation of S&OP systems as well. Because the implementation of this S&OP vision is evolutionary, and the market and industry also are evolving at an accelerated pace, the ability to manage change is probably the most critical success factor. Enterprises that are experienced and adept at managing organizational and business process change are more likely to succeed. In this environment change is not an event, it is an ongoing process — and a critical process at that.

Measureable improvements for specific key performance indicators must be defined early in the evolution and monitored for progress. Performance indicators such as customer service and inventory levels, performance to plan (e.g., actual production versus planned production or percent of on-time supplier deliveries), and planning cycle time must be measured continually and communicated throughout the organization. Individual and organizational compensation or promotion plans must be in place to achieve the improvement targets.

Beyond S&OP
The S&OP process is the center of effective enterprise planning (see Figure 5). S&OP implements the strategies developed...
in the network design and optimization planning processes. These strategies are designed to provide the optimal balance between costs and customer service to help the enterprise maximize profitability. Sales planning can provide accurate forecasts for existing products and new product launches. Driven by network strategies and in the context of critical constraints, the S&OP process determines the tactical balance between demand and supply. The synchronized plan is then collaboratively implemented with suppliers and in manufacturing. Transportation is optimized and executed to support the plan, and the customer service department has access to the plan to communicate product availability to customers. This entire structure is built on a base of event management and analysis, integration technology, collaborative services, and a private- or public-trading network platform.

For the S&OP process to drive the desired business benefits, all components in this total architecture must be best-in-class. The chain of business processes and technology is only as strong as the weakest component. For example, a sales planning and demand-forecasting process that yields a forecast of poor quality results in inefficiencies and additional costs in downstream processes. The S&OP process must be able to be repeated frequently and rapidly to react to alarms and messages that identify exceptions to the plan. Data from internal and external sources must flow through the entire network in near-real time so that all processes are driven by current information. Event and information analysis must be continuous so that exception conditions can be identified and quickly messaged to the appropriate people and functions. Any weak link will put the vision at risk.

Supply-chain solutions to match the science
The technology solutions for a company's supply chain are not one-size-fits-all. On one hand, the company needs best-in-class technology and solutions tailored to its particular needs. On the other hand, the solutions also must provide open integration and a level of flexibility that keeps the solutions in step with an evolving business model. For example, Manugistics offers the NetWorks system, a comprehensive set of solutions designed to be operating and delivering results to life sciences companies in an extremely short timeframe. NetWorks for S&OP can deliver a fully open solution that is designed to be compatible and easy to integrate with a company's current applications, including ERP systems, transaction systems, execution systems, legacy systems, and warehouse management systems.

A company also must leverage its industry expertise and experience with that of its solution provider. Manugistics, for example, has provided the technology and domain expertise to help numerous pharmaceutical companies reach their business and financial objectives.

With continuing industry consolidation, globalization, new product introductions, and the proliferation of disparate systems, S&OP and the pharmaceutical supply chain have become more complex than ever. Pharmaceutical companies must manage their businesses with a new level of detail and synchronization. With profit-margin pressure mounting, a fully integrated and evolving S&OP process is even more crucial for a company's profitable growth — and for a twenty-first-century supply chain to match twenty-first-century science. PT.