SALES AND OPERATIONS PLANNING PART II: ENABLING TECHNOLOGY

By Larry Lapide

(This is an ongoing column in The Journal, which is intended to give a brief view on a potential topic of interest to practitioners of business forecasting. Suggestions on topics that you would like to see covered should be sent via email to llapide@mit.edu)

This column represents the second of a three-part series covering the Sales and Operations Planning (S&OP) process. As discussed in Part I, S&OP has been receiving a lot of attention for the past couple of years. There are a number of industry-wide studies in the area.

Companies are recognizing its value in improving the tactical and operational planning to prepare the supply chain for meeting anticipated customer demand. S&OP appears to be driving supply chain benefits such as better meeting customer demand while at the same time resulting in reduced inventories and minimized supply chain operating costs.

In addition, an indicator of a longer term interest in the S&OP process is the fact that, according to AMR Research, companies have spent over $12 billion in supply chain planning application software over the last 6 years. Yet, while spending significant sums of money on S&OP-related software, they are not seeing the benefits they expected because many did not change the process to fully leverage the enabling technology.

Hence, the rationale for this column is to see what kind of enabling technology is needed to support the S&OP process.

THE NEED FOR TECHNOLOGY

First and foremost, one needs to recognize that software technology itself is not very useful. It becomes useful when one starts to improve a business process. However, often, without technology, a business process like S&OP is cumbersome and can't support the scale needed to achieve all its benefits. In that case, technology becomes necessary, but not sufficient. Often, the process is dealing with a large complex set of needs that require a level of automation and computational sophistication that goes beyond what can be achieved with manual processes merely supported by computer spreadsheets.

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Take, for example, the planning needs of a typical Fortune 500 multinational manufacturing company. Its S&OP process may need to develop weekly plans 6 to 18 months out for the following supply-demand elements:

- *Customer demand* in terms ofStock-Keeping-Units (SKUs) at a variety of shipping locations (i.e., SKULs). Given that products might be shipped from 25 or more plants and distribution centers from around the world, it is not inconceivable to have to develop weekly demand plans for over 100 thousand SKULs over a 50-week time frame — or 5 million planning elements.
- *Finished goods inventory replenishment requirements* for 25 or more shipping locations would also result in millions of numbers of planning elements.
- *Production plans/schedules with the corresponding component and material needs* of 15 or more plants would also require millions of numbers of planning elements.

Given that there might be a total of

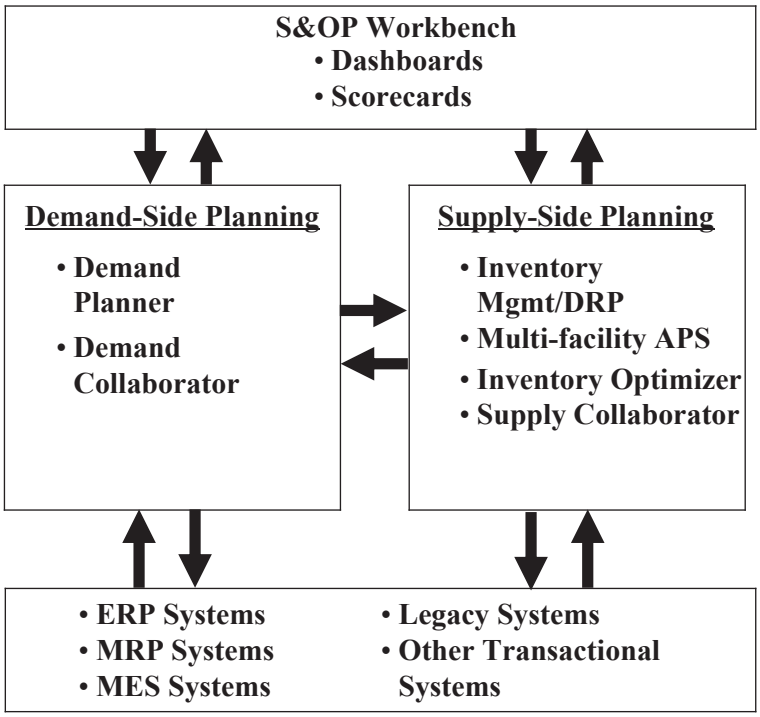
over 10 million planning elements that need to be generated, coupled with the fact that constraint-based planning might need to be done using computationally intensive algorithms, it is often virtually impossible for a Fortune 500 manufacturer to support the S&OP process manually with spreadsheet technology alone. This holds true even when the S&OP process is done at a scaled-down aggregated-product level, which is often done to make it more manageable.

ENABLING TECHNOLOGY ARCHITECTURE

The S&OP process needs to be supported by three types of software applications: 1) demand-side planning, 2) supply-side planning, and 3) an S&OP workbench. The components and the integrated supply-demand planning technology architecture for these are displayed in Figure 1. It depicts how the components need to be integrated among themselves, as well as with other transactional-oriented business systems such as Enterprise Resource Planning (ERP), Manufacturing Execution (MES) and Material Requirements Planning (MRP) systems. The components for each of the 3 types of software applications are described below:

1. Demand-Side Planning Systems: These system components support the development of a demand plan and an "unconstrained" baseline forecast that are used as demand-side inputs to the S&OP process. As such, they need to allow users of the systems to generate statistical forecasts based on various endogenous and exogenous variables such as Marketing & Sales plans that reflect promotional campaigns, new product introductions, pricing actions, and a changing competitive environment, which have an impact on future demand. Then they incorporate the market intelligence into the base line forecasts. The "Demand Collaborator" system, on the other hand, captures, assembles, and processes the market intelligence gleaned from a variety of sources such as from field sales and marketing personnel, as well as from downstream customers that share their demand forecasting data or are involved in co-management inventory programs such as Vendor Managed Inventory (VMI) and Collaborative Planning, Forecasting, and Replenishment (CPFR). To facilitate information collection from remote locations and external sources such as customers, a "Demand Collaborator" is usually web-based so that the Internet can be leveraged to transfer information around.

FIGURE 1
INTEGRATED SUPPLY-DEMAND PLANNING TECHNOLOGY ARCHITECTURE



2. Supply-Side Planning Systems: These system components support the development of supply plans that are used as the supply-side inputs to the S&OP process. As such, they help to generate the inventory, production, and procurement plans that will be followed to best meet the "unconstrained" baseline demand forecasts. These plans might result in supporting a "constrained" demand forecast when supply capacity is insufficient to meet all expected customer demand. The role of "Inventory Management and Distributed Requirements Planning (DRP)" systems is to support users in coming up with the expected inventory replenishment needs of finished goods warehouses, such as customer-facing warehouses and the centralized warehouses that might replenish them. In constrained supply environments, "Multi-facility Advanced Planning and Scheduling (APS)" systems are used to produce more accurate plans that account for limitations in plant and distribution capacity, as well as for any short-supply of components, materials, and other production resources. "Inventory Optimizer" systems support these types of systems by helping users set inventory targets during the S&OP process that optimally tradeoff customer service targets against component, material, sub-assembly, and finished goods inventories. Lastly, "Supply Collaborator" systems are

used to capture, assemble and process supply capabilities from a variety of sources such as from purchasing personnel and upstream suppliers, including contract manufacturers. To facilitate information collection from remote locations and external sources, a "Supply Collaborator" is usually web-based so that the Internet can be leveraged to transfer information around.

3. S&OP Workbench: This system component supports two types of information needed to be shared during cross-functional S&OP meetings. First, using the workbench, generate dashboards to display a multitude of metrics that portray the planned supply versus "unconstrained" demand situation. These include supply-side metrics like expected plant utilizations, production capacity shortages, and critical component shortages/surpluses; as well as demand-side metrics such as expected unfulfilled customer demand and expected customer order backlogs. The dashboard functionality also allows S&OP participants to quickly conduct what-if analyses of potential changes to the supply and/or the demand plans. (Since a complete regeneration of all supply-demand plans usually takes too long, the what-if analyses cannot include a full run of all the supply and demand systems, and an incremental approach is usually necessary. For example, one Semi-conductor company I talked to said it took 12-hours to run their supply planning systems — certainly too long to support these types of what-if analyses during an S&OP meeting.) A second type information that is needed during the S&OP process is how well the process itself is working. Thus, using the workbench, scorecards of Key Performance Indicators (KPIs) that reflect how well the S&OP process has been working foster learning and improvement to the process over time. Some of these KPIs include metrics such as demand forecast accuracy, variance to the baseline forecast, and adherence to both the supply and demand plans previously put in place.

As shown in Figure 1, the demand-side and supply-side planning systems need to be integrated and synchronized so that a change in either the demand or the supply plan can be quickly reflected in the overall supply-demand picture. The S&OP workbench also needs to be integrated and synchronized with these and other planning components so that any changes made in plans during or between S&OP meetings can be reflected in the workbench's supply-demand picture, as well.

OFF-THE-SHELF TECHNOLOGY

A large part of the technology architecture described above is available as off-the-shelf supply chain planning applications in the market today. Much of it — primarily the Demand-Side and Supply-Side planning components — are marketed by the major ERP software vendors that have bolstered their Supply Chain Management (SCM) applications over the past 5 years, as well as from the specialty SCM software vendors that are responsible for the early innovations in developing and marketing supply chain planning software.

Off-the-shelf S&OP workbench functionality, however, is less available. A few ERP and SCM software vendors are beginning to offer some of the off-the-shelf functionality needed. Business Intelligence (BI) software vendors specialize in software that can create much of the dashboard and scorecard capabilities that are needed as part of an S&OP workbench, but do not generally offer (off-the-shelf) Demand-Side and Supply-Side planning components.

Do you need all the components of the S&OP technology architecture discussed above? Probably not. In my third and last column of this S&OP series, I will offer a diagnostic tool that can be used to help you improve your S&OP process by assessing what stage of an "S&OP Maturity Model" your company's process is currently at, as well as the process changes that may need to be made to improve it. And it is these process changes that will dictate the types of enabling technology you would need to put in place. Remember, business processes dictate the enabling technologies that one needs for supply chain improvement! ■