Enhancing Sales and Operations Planning with Forecasting Analytics and Business Intelligence
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Introduction

Sales and operations planning (S&OP) can be described as a consensus-based communication process that provides insight and control over an organization’s supply chain decisions. Executing an S&OP process is dependent on many factors. An organization can have an S&OP process in place and still have difficulty aligning demand and supply effectively.

Developing advanced forecasting technology and processes within an enterprise can enhance sales and operations planning and significantly improve demand and supply alignment. This paper will explore technology that can be leveraged, along with better communications and collaboration, to benefit an organization’s S&OP process.

Analytics

A demand forecast is a fundamental component of an organization’s S&OP process. Its value is demonstrated by its ability to predict future requirements with a reasonable degree of accuracy. Seasonality, promotions and unexpected spikes in demand are difficult to forecast accurately using judgmental input or a jury of executive opinion exclusively. Even when historical patterns are consistent, forecasts created by opinion can be inaccurate. The creation of the unconstrained demand forecast should be based on a statistical analysis of time series historical data. Predictive analytics establishes a forecast baseline that provides the necessary means to initiate fact-based discussions that can drive better supply chain decisions.

Taking into consideration the multitude of forecasting software on the market, selection of a package should be made by paying careful attention to components that enhance the effectiveness and maximize the impact of sales and operations planning. The S&OP process can benefit from a software solution that incorporates the following characteristics:

- Advanced analytics with optimized model selection.
- Scalability.
- Reduced forecast cycle times.
- Exception forecasting.
- The ability to support collaborative planning.

Although the art of business forecasting continues to evolve and develop, the importance of predictive analytics is often understated. There is clear evidence in the form of case studies and customer success stories that support the concept of improved forecasts through analytics. As referenced in the *Harvard Business Review* article “Competing on Analytics” by Thomas H. Davenport, organizations have successfully leveraged analytics to drive business processes. He recognizes analytics as a competitive advantage and states, “Organizations are competing on analytics not just because they can, but also because they should.”

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Not all forecasting software tools are alike and many provide less than acceptable results. SAS® Forecast Server is a strong analytical forecasting tool that can automatically generate millions of statistically based forecasts without the need for human intervention unless desired. SAS Forecast Server is capable of selecting forecasting parameters that are optimized based on an organization’s unique historical data. Optimized model parameters are selected automatically so users do not have to manually derive them to achieve improved forecasts. As a result, more appropriate models and better-fitting forecasts are generated, which are more accurate and responsive to demand volatility. The benefit to an organization’s S&OP process can be seen in its ability to react to changes in demand more effectively. Changes can be detected and acted on quickly, so inventory exposure can be minimized, and material and capacity alignment can be improved.

Advanced analytics within SAS Forecast Server also accommodates flexibility – an important factor since business models change over time and the amount of data that is available today could be very different from what is available in the future. A typical S&OP process may evolve over time to include additional product lines or geographical areas. Existing hierarchy levels may need to be realigned to reflect changes in organizational structure (such as the realignment of sales territories).

Being able to create hierarchies easily using SAS Forecast Server is a valuable functionality. Forecasts with their associated hierarchies can be developed and compared to provide a more accurate depiction of demand patterns. The “standard” corporate hierarchy may not always fit the data being forecasted. Because customers don’t always buy products or services in a way that is easy to detect, the ability to make sense of demand by slicing and dicing data into unique hierarchies provides forecasters with a better understanding of demand segregation.

When selecting a forecasting solution, take note of how easy or difficult it is to build hierarchies as required. It’s a good idea to avoid forecasting tools that don’t have a flexible hierarchical design. Many ERP systems are not flexible when it comes to an organization’s hierarchy and can require extensive redesign to support a hierarchy change. SAS Forecast Server combines advanced analytics and an intuitive graphical user interface (GUI) to support an organization’s S&OP process by giving better control of the forecast to users who are directly responsible for supply chain management. This is accomplished by addressing the needs of both novice forecasters as well as more experienced analysts.

A forecasting software solution should not hinder an S&OP process with interfaces that are difficult to use or by providing less than desirable forecasts. It should incorporate features such as econometric modeling into each forecast to provide a greater understanding of the effects of holidays, marketing events, sales promotions and many other factors. The ability to model external events more effectively can have a direct impact on S&OP by better predicting volatility in demand patterns.
Forecast Cycle Efficiencies

An automatic forecasting software solution with predictive analytics can improve S&OP cycle times. When an organization is constrained by a short forecasting cycle, the ability to create demand forecasts, identify exceptions and make recommendations for change becomes a necessity. The creation of the forecast can be one of the most time-consuming functions, and it needs to be as accurate as possible because it is the primary driver of the S&OP process. Reviewing the forecast also can be challenging because many organizations have thousands of SKUs to review and adjust during a typical monthly cycle.

Automation and forecasting analytics designed into SAS Forecast Server software can provide the best level of prediction with a lower degree of risk. The ability to review forecasts by exception using filters and customized list views can help the demand planner manage his or her demand plan more effectively within the allotted time. Problem forecasts and high-value forecasts can be identified and adjustments can be made quickly to adhere to the S&OP cadence. This results in a more dynamic planning process allowing for a comprehensive evaluation of supply chain drivers as they relate to demand, production and inventory management all within a more dynamic and efficient planning cycle.

Business Intelligence

The ability to drive S&OP activity throughout an organization can be greatly enhanced by using a business intelligence (BI) solution. A truly integrated BI solution can consolidate data from every corner of the enterprise. S&OP requires the dissemination and reporting of key information, which is the result of a company’s activity related to supply chain management. This information needs to be available to each group in a format that supports its specific S&OP reporting and analysis requirements.

SAS Business Intelligence delivers the insight, reporting capability and drill-down analysis required for intelligent decision making throughout the company in direct support of the sales and operations planning process. When evaluating a business intelligence solution, make sure that the appropriate interfaces and tools are available to users who directly or indirectly participate in the process.

The business intelligence framework that supports the S&OP process should have the following capabilities:

- Portals and dashboards.
- Report viewing.
- Report creation (both standard recurring reports and ad hoc reports).
- Advanced data exploration.
- Microsoft Office integration.
- Web report creation/viewing.

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A dashboard should provide participants in the S&OP process with easy access to specific data and reports that need to be reviewed and evaluated. Advanced functionality such as the ability to drill down on important data elements enables users to perform a more detailed analysis of key business drivers. BI reporting should support the evaluation of specific S&OP metrics, such as forecast volatility, demand consumption, forecast accuracy, supply chain liabilities, inventory management and financial evaluations. Because SAS can access various databases throughout an organization, it has the unique ability to provide timely reports and analysis that can directly enhance S&OP by giving participants additional power to explore and understand data.

New Product Forecasting

New product forecasting can also benefit from SAS Business Intelligence by providing better information to forecasters responsible for developing demand curves for new products. New product introductions based on the evaluation of historical sales data as it relates to “like products” can be developed. This can have a significant influence on the success of a new product’s launch. Having the ability to perform a more detailed analysis of key factors such as target markets, product functionality, demographics, attach rates, effects of promotions and discounts, as well as many others elements, can help provide additional insight into establishing demand profiles. Since the relationships between existing and new products can be established, demand profiles can be created and applied to a new product forecast with confidence knowing that the forecast is supported by the data.

New product forecasting is an important part of the S&OP process and is usually based on methods that are supported by collaboration. The process of creating demand curves for new products can be established first by utilizing data mining capabilities found within an analytical solution set. (See the SAS white paper New Product Forecasting Using Structured Analogies for an example of this approach.) A forecasting method for new products supported only by the input of a particular individual or group within an organization should not be relied on exclusively. New product forecasting performance should be monitored over time so that the capability of the new product forecasting process is understood and accuracy expectations for new product forecasts are reasonable.

The benefit of a collaborative S&OP process should be the validation of demand curves for new products, which are mined from product data. This process will yield the most effective results because it relies not on any one method but a combination of methods.

Microsoft Office Integration

During a typical S&OP monthly cycle, many organizations use Microsoft PowerPoint or Excel to consolidate, review and present data. To support this initiative, SAS Enterprise BI Server has the capability to export and update reports and analysis to any Microsoft Office product on the fly. That means the analyst responsible for consolidating information for a specific S&OP meeting does not have to redo analysis, create output and copy results to Excel or PowerPoint over and over again.
Being able to update S&OP data directly into a presentation is a huge timesaver, cutting down on cycle time and can be especially useful to organizations that have S&OP data available to many associates with various skill levels throughout the company.

The ability to export and update data in real time to Microsoft Office products puts the power to analyze data and make business recommendations in the hands of individuals who are stakeholders in the S&OP process. A sales and operations planning process supported by a business intelligence solution with advanced forecasting analytics is a powerful tool and provides an organization a competitive advantage within its industry.

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Figure 1: An S&OP process supported by a BI solution provides direct access to dashboards with embedded reports. Analyses can be performed with drill-down capabilities and the entire process can be linked back to a business warehouse and an advanced planning system.
• Advanced analytics is a powerful driver of the S&OP process: Model optimization, event planning, scalability, flexible hierarchy design, intuitive user interface.

• Automation results in process improvement and reduced forecast cycle time: More time to analyze inaccurate forecasts, react to trends and make recommendations for change.

• A business analytics framework provides the necessary means to collect and deliver information: Portals, dashboards, data exploration, consensus planning and consolidation of data from across the organization.

• BI analysis and reporting capabilities can be leveraged through access to Microsoft Office products: Reduce meeting preparation time; no need to redo analyses, create output and copy results to PowerPoint or Excel over and over again.

The foundation of a comprehensive S&OP process effectively merges predictive analytics and business intelligence with an organization’s consensus-based planning process. Communication and collaboration of supply chain information are also an essential part of this process and should be evaluated carefully to measure their ability to complement an organization’s supply chain initiatives.

Communication

S&OP communication is a key contributor in understanding, interpreting and making intelligent business decisions. Communication within the context of an S&OP process does not only happen at the executive level during an S&OP meeting. It must exist and be utilized by all associates who are directly and indirectly involved in the S&OP process. Communication starts at a much lower level and is essential during discussions that lead up to specific high-level S&OP meetings.

An example of this is the reconciliation of demand inputs prior to a consensus S&OP meeting. This is often referred to as a collaborative forecasting process because of the consolidation of various inputs into the final demand plan. Take note of the inputs identified in Figure 2. An effective forecasting process evaluates each input and tests the associated assumptions. In this model, the forecast analyst needs to work very closely with marketing and sales. Effective communication skills are used to facilitate meaningful discussions, which result in an effective demand plan.

By utilizing a forecast software tool such as SAS Forecast Server, the statistical forecast can be created with a level of confidence and trust that enhances discussions and provides insight into various business decisions.
Unconstrained communication between participants is another very important consideration for making S&OP meetings productive. All participants need to have the ability to discuss openly, in a constructive way, the business issues that have been identified using the predictive analytics and business intelligence tools mentioned previously. Unfortunately within some organizations, the S&OP process is categorized as a “shoot-out” between departments and/or individual contributors, which leads to unproductive meetings.

Developing the right environment within an S&OP process is crucial in order to achieve a free flow of information that can then be used to manage an organization’s supply chain process. This environment is enhanced by trustworthy forecasts and timely, flexible information flow.

The measure of how communication between S&OP team members benefits the organization falls on the shoulders of the S&OP champion. In this role the S&OP champion will have the ability to directly influence participant behavior and set the proper expectations.
Collaboration

Interaction of departments and associates directly and indirectly involved in the S&OP process is essential. Because the essence of sales and operations planning is defined by reconciliation of demand and supply, it should be expected that a necessary part of an organization’s ability to execute effectively has much to do with the successful collaboration of all departments involved in the process. This is particularly true when dealing with the various areas of focus such as forecasting, material/capacity planning and revenue plan alignment.

As shown in the previous model, the process of developing the consensus demand plan is based on a collaborative effort that evaluates and considers various inputs carefully. SAS Business Intelligence can effectively manage many of the inputs required to support S&OP. A BI portal can be a repository of various inputs linked back to a consensus demand plan.

For example, product marketing and sales departments can provide new product introductions, discontinuation dates and transition forecasts, as well as identify like items. They can also identify planned promotions and sales events to be used as part of the statistical forecast models. SAS Forecast Server easily incorporates these types of external events into the analytical forecasting process.

Effectively managing inputs within a BI framework can enhance S&OP by providing the necessary means to coordinate and validate data. Once the consensus demand plan has been established, manufacturing’s ability to satisfy the demand can be evaluated. This is characterized by the detailed analysis of material, labor and capacity constraints. The results of this constraints analysis should not be taken lightly. An organization can effectively maximize its potential revenue by considering limitations and excesses within the factory. This analysis should be considered by the marketing and sales departments as they adjust their plans to reflect the reality of manufacturing’s capability.

The finance team also plays an important role in the S&OP process by evaluating the consensus demand plan. This process is structured around the conversion of units into dollars for comparison to business plan projections and other financial evaluations. The resulting analysis can include major deviations that would need to be reviewed and adjusted as necessary. This evaluation of the demand and supply plan can be an important step in the S&OP process since over time it can directly contribute to more accurate financial projections.

The evaluation that each group performs on specific supply chain data should be a collaborative effort supported by effective tools and techniques. A business intelligence solution that incorporates predictive analytics can provide each user group the ability to review and adjust data in order to enhance an organization’s S&OP process.

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Figure 3: The interlock and collaboration between departments are essential in establishing consensus demand planning.

Although business intelligence and predictive analytics are key components of the S&OP process, the interlock and collaboration between departments are essential in establishing accountability. With short S&OP cycle times in place within many organizations, timely access to information becomes critical. If one group fails to participate in the process then the S&OP interlock is broken. This can lead to an ineffective plan categorized by unsubstantiated business assumptions as well as potential inventory or revenue liabilities.
Conclusion

Since the unconstrained demand forecast is such an important part of an organization’s S&OP process, it should be based to a large extent on statistical techniques as opposed to judgmental techniques. Many organizations develop demand forecasts utilizing a group’s product knowledge as the primary driver.

Although product knowledge is a crucial and valuable asset in the evolution of the forecast within the context of the S&OP process, it needs to be applied appropriately and at the right time. (See the SAS white paper Forecast Value Added Analysis: Step-by-Step for details on this approach). Timing is critical within an S&OP process, and if not executed correctly the demand forecast can become a tactical tool that does little to achieve an organization’s strategic supply chain initiatives. The best combination of techniques will provide a forecast that has been statistically derived, evaluated for inaccuracies and modified accordingly. Also remember that when dealing with large volumes of data, it is advantageous to develop a forecast automatically using predictive analytics with econometrics and optimized models.

With increasingly complex business models driven by a global economy, sales and operations planning has become a competitive advantage in the marketplace. The effectiveness of the S&OP process within an organization has much to do with the people who execute the process and the tools that support it.

SAS Forecast Server provides an automated forecasting solution that is scalable and flexible to match an organization’s business model. Its advanced predictive analytics engine improves forecasts by automatically optimizing model parameters to fit historical demand patterns and by incorporating external demand factors to further enhance and improve the forecast. Automation provides the demand analyst with the time to evaluate problem forecasts more effectively.

When used as part of SAS® Enterprise BI Server, information can be accessed in real time, S&OP cycle times can be reduced and the presentation of information can be created and updated more rapidly, providing better control over business processes.
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