White Paper

Four Pillars of Demand Planning Excellence

Achieving higher supply chain performance with more powerful, accurate demand planning

Executive Summary

Estimating future demand is one of the most valuable, but difficult challenges in supply chain optimization. Any discussion of this subject will invariably note that forecasts are always wrong, but absolutely essential to planning business effectively. Demand forecasting provides the crucial forward-looking picture that shapes how a company will deploy its supply chain to take maximum advantage of customer opportunity. "Demand planning" is the effort to increase forecast accuracy and customer service levels through better perceiving, predicting, and shaping the full range of factors that determine how well your product portfolio satisfies market needs.

No other aspect of supply chain optimization has greater impact on business profitability. Providing the best "one number" forecast requires capturing demand close to its source and accurately predicting actual demand with enough lead time and confidence to ensure maximum sales and operations performance at minimum cost.

This paper outlines four key elements that support effective demand planning and establish fundamental parameters for higher service levels and lower inventory cost. These are the "pillars" on which competitive advantage and profitability:

- Forecast modeling
- Demand aggregation [and disaggregation]
- Management by exception
- Collaboration between internal and external supply chain stakeholders

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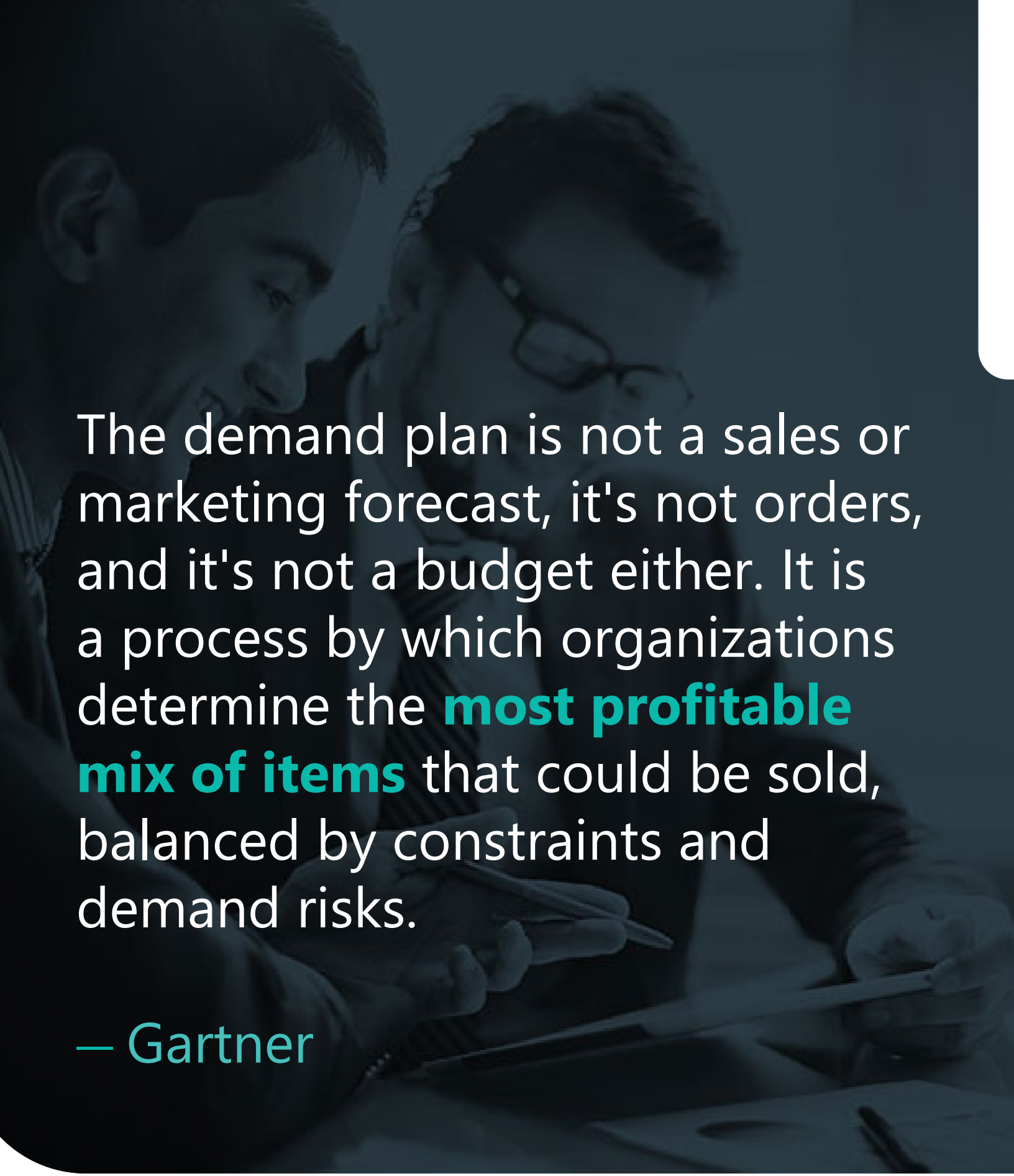

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— Gartner

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Pillar #1: Go Beyond Simple Forecasting

Demand planning software applies science to deliver a better forecast [a prediction that turns out to be closer to actual demand]. While forecasts have long been executed using not much more than a "spreadsheet and a hunch," leading planning organizations strive for a multi-layered approach that employs a variety of statistical models in an unbiased way to comprehend the many factors that influence demand for products in the marketplace over time.

According to a recent Gartner survey on improving demand planning, respondents indicated that "lack of accountability for the accuracy of the forecast" was the biggest challenge. Companies can benefit from clearly defining the balance between statistical modeling and collaborative forecasting methods.

The first pillar of better demand planning is to bring the power of a hybrid statistical forecasting approach to NPIs, brand extensions, and product retirement initiatives.

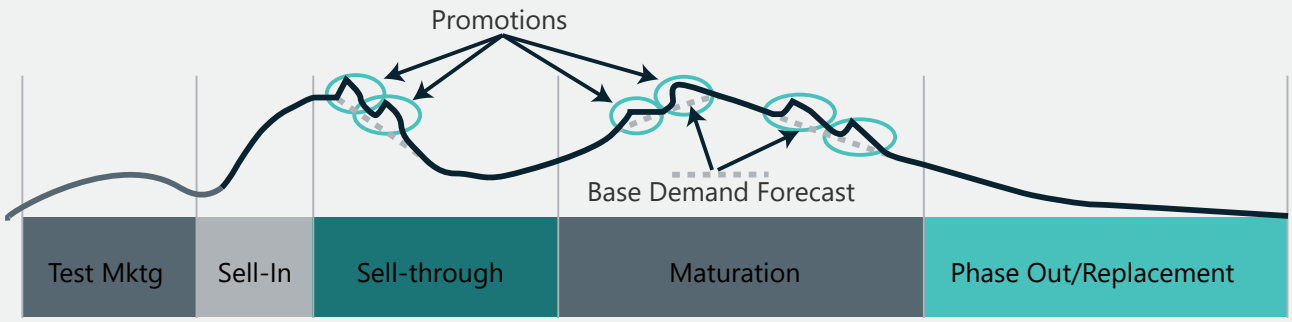
New Product Introduction

The process of developing and bringing a new product or service to market can be a grueling journey that spans idea generation through concept development, business analysis, market test, implementation, and finally commercialization. Quantitative forecasting algorithms, based on existing hard data, can only be used for products with an existing demand history in place. For new products, more qualitative models that include subjective inputs like product attributes, market knowledge and experience may provide the best available guidance.

The first pillar of better demand planning is to bring the power of a hybrid statistical forecasting approach to NPIs, brand extensions, and product retirement initiatives. Advanced demand planning technology surpasses spreadsheet-based efforts by calculating the best possible demand prediction based on several inputs, including past performance of related products or unrelated products that share key attributes in addition to any data generated by pre-launch market testing.

According to Gartner, "New product launch forecasting is overly reliant on sales and marketing for demand inputs. Opportunities exist to remove forecast bias by utilizing attribute modeling techniques and solutions that use similar product introductions to understand consumer/customer trial and repeat, as well as volume build assumptions, to improve the forecast."

Example of a life cycle demand curve



Sell In, Sell Through and Maturation

The demand profile ramps up as introductory promotions, advertising support and word-of-mouth combine to create an initial strong demand, then dips as the sell-through period gives way to the maturation phase, with its own promotions and marketing programs attempting to shape demand over time.

As the product life cycle unfolds, the demand planning solution compares actual demand versus the forecast. Statistical matching algorithms can be used to determine just how significantly actual demand has deviated from the prediction. The predictive accuracy of other demand profiles can be compared, and when a different profile provides a better match to the actual demand signal, it is swapped into play.

Products that experience low level, "spotty" demand—or periods of zero demand—require specific statistical treatment in order to generate a pertinent forecast. Planning systems' statistical models must be able to accommodate low or zero demand intervals in the time-phased forecast.

According to Gartner, Mean Absolute Percentage Error [MAPE] is the primary forecast error measurement used by 92% of survey respondents. Planning systems should support accuracy measures including MAPE, Mean Absolute Deviation [MAD] and Smoothed MAD [SMAD]. These can be used together to provide standardizing dashboard displays and key performance indicators.

Studies by Aberdeen Group have shown that demand planning programs improve forecast accuracy by an average of 13%, with a 5% improvement in gross margin.

Seasonality and Promotional Events

Product demand signals are disrupted by the effects of promotions [discounts, buy-one-get-one offers, coupons, rebates, etc.] and price manipulations that alter market demand temporarily. In addition, the demand curve for many products alternately waxes and wanes with the cycle of the seasons. According to Gartner," the ability to understand baseline volumes from promotional volumes, as well as mix and shift within portfolios, is a ...daunting task."

At every step of the way, planners must incorporate and layer the effects of these factors onto the base + seasonal forecast, because these factors drive the replenishment signal. A recent Gartner survey indicates that 65% of companies employ demand shaping techniques to "influence customer demand toward more profitable categories or specific products."

Causal modeling helps reconcile potential conflicts or overlaps in promotional planning proposals. If promotions are expected to increase demand for an item/location by 5% over three months, while price changes are predicted to suppress demand by 2% over a six month period, demand modeling must net out the total time-phased demand.

Demand Sensing

Demand sensing capabilities provide a control over how reactive the system is to changes in the demand signal. A recent Gartner survey indicates that 60% of companies sense demand. To best sense real-world demand, planners strive to collect demand data as close to the customer as possible [e.g. point-of-sale data] and determine what is being sold and where. While some leading planning organizations perform daily analyses to adjust demand predictions, an Aberdeen study on Demand Management in Consumer Industries finds that 50% of organizations took one month or longer to sense changes in demand.

During new product introductions, planners generally want a high degree of sensitivity to actual demand data so that forecasts can be refitted as quickly as possible and not lag behind. On the other extreme, for commodity products at the mature stage of the life cycle, overreaction to transient spikes or dips in demand can throw inventory levels off unnecessarily. State-of-the-art planning platforms offer the ability to vary their sensitivity and become more or less reactive at any level from product family down to individual items.

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End of Life/Supersession

Detecting when a product enters its end-of-life phase is made easier by a demand planning system that monitors deviations from the current demand profile, taking emotion out of the evaluation and clarifying the situation in the marketplace. Decisions are based on data, rather than opinion, helping the team to reach consensus more easily.

One Plan, Multiple Forecast Models

For all products, even short life cycle items, it's clear that no one statistical forecasting method is enough; several models are required to cover the wide range of demand situations products encounter throughout a lifetime. ***The first ingredient in demand planning excellence is to adopt a forecasting solution that self-selects the best profile for a product's specific characteristics, life cycle stage, and current market conditions.*** The forecasting effort must evolve to a better-fitting model as actual demand feedback is acquired. For mature products, deviations of the demand signal from the forecast model can indicate the item has entered its end-of-life/supersession phase.

Takeaway: Advanced demand planning and forecasting systems automate many of the functions required to select, model and generate forecasts, lifting the burden of manually intensive approaches. Best practices include the ability to incorporate personal expertise and weight the various factors in generating forecasts. Multiple forecasting methods may be appropriate over time as a product goes through life changes, and also to match conditions at different geographical regions or levels of aggregation. Planners need a sophisticated yet easy-to-use technology solution to develop and identify best-fit demand profiles and then automatically evaluate and adjust the profiles and forecasting methods as actual demand data accrues over the life of the product.

Pillar #2: Beat the "Devil in the Details" Using a Demand Aggregation Hierarchy

Demand aggregation and disaggregation are key to creating the best possible forecast at all levels of granularity required to reconcile corporate [strategic] plans with operations [tactical] plans. As Gartner puts it, "the balance between bottom-up collaborative approaches versus top-down statistical modeling is challenging." The demand aggregation hierarchy is a concept familiar to most planners: a multi-layer view in which the lower, larger levels represent demand for a greater number of sub-components, while the higher levels summarize demand by product family, group, region, etc.

In practice, this pyramid should support input from multiple sources, including customer forecasts, sales forecasts, management direction and constraint-based forecasts, as well as external demand signals generated by syndicated data and point-of-sale information.

The hierarchy structure breaks down higher-level plans into detailed forecasts associated with product components such as style, color, size, sales channel, customer, region and other elements. It captures "how many of which kind" need to be created, stocked and distributed for multilevel product structures such as accessories, components, consumables and service parts that have time-phased dependent demand.

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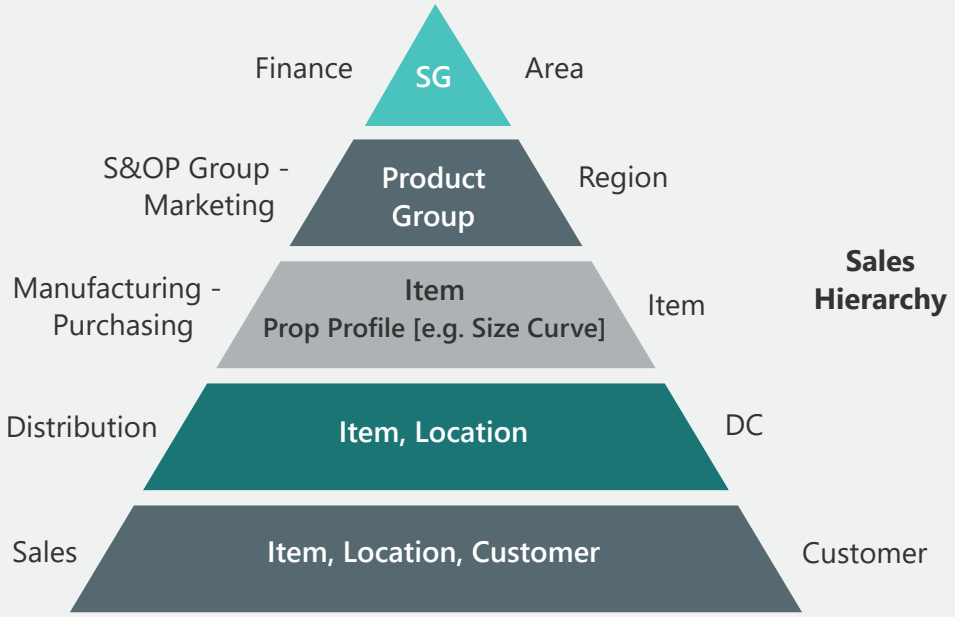
Demand hierarchy, showing multiple aggregation stacks



Source: Logility, Inc.

While the pyramid can be used "bottom-up" to aggregate the more detailed levels up to an overall demand forecast, this tends to magnify the estimating error of lower tiers into a larger coefficient of error at the master forecast level. Generally, the most accurate forecasts are achieved by disaggregating higher-level demand forecasts down to tactical levels, thereby dividing the forecast error inherent in the higher tier into smaller inaccuracies at the lower levels of demand planning.

A powerful demand planning system will calculate a forecast for every record at every level of the pyramid using appropriate statistical models.

It's extremely useful to go beyond a "one hierarchy" layered demand plan to create multiple hierarchies that aggregate different characteristics. While C-level executives may want to see an aggregate forecast by customer, and have less interest in detailed breakdowns, other stakeholders have other priorities. Distribution managers are interested in the demand plan by geographical region. Marketing teams may be focused on demand by product style. Manufacturing needs component details: quantities of each size, flavor, container, etc. When selecting a demand planning system, priority should be placed on the ability to switch models based on a range of factors.

Proportional Profiling

When disaggregating item forecasts to detailed quantities by characteristic [size, color, region, configuration, etc.], proportional profiling comes into play. Proportional profiling uses actual sales history to determine the relative percentages needed of each intrinsic version of a product. One common example is the "size curve," which defines what percentage of an apparel item should be manufactured in each size. The size curve for a running shoe, for instance, as determined by its sales history data, would outline the relative popularity of sizes 5 ½ D, 10 E and so on. Size curves are used to explode the forecast for an individual style into specific execution plans for replenishment.

Traditionally, size curves and other proportional profiles have been generated manually by planners using spreadsheets. This unsophisticated approach suffers from limited precision, and doesn't really meet the challenges posed by seasonality, regional differences, time sequencing and SKU proliferation. In addition, proportions change as an item passes through the stages of its life cycle. Also, situations where demand is sporadic require even more flexibility and accuracy.

Advanced forecasting systems now create more accurate and precise proportional profiles. A good demand planning solution will perform analyses on historical demand patterns to create optimal profiles [size, color, speed, configuration, etc.]. This shortens a time-consuming activity and gives planners vital confidence that they are generating the best-fitting component-level forecasts.

Takeaway: Demand aggregation hierarchies disaggregate demand by SKU location while automated proportional profiling create best-fit size curves based on historical sales data.

Pillar #3: Take Planner Productivity to the Next Level

One of the primary distinctions between leading companies and all others is their ability to focus valuable planner resources on high-value-add activities like problem avoidance, issue resolution and optimization.

Management by Exception

Adopting a management-by-exception approach to demand planning is a crucial way of maximizing planner productivity in the organization. Advanced demand planning systems encourage a "set-and-forget... until alerted" philosophy around forecasts. As actual sales data becomes available, the system monitors validity by comparing the existing demand curve to the actual demand signal. A centralized dashboard display and planner-specific real-time email alerts call attention to important conditions that have deviated from established targets or expectations. Sales and demand anomalies may occur at the level of SKU locations, product groups, geographies, etc. Sophisticated demand planning solutions let planners create custom alerts as needed to support the priorities and business goals of the organization.

Products are often viewed in a way that suits the needs of sales and marketing teams, using a customer-centric or product-family-centric hierarchy. At the same time, a product-oriented hierarchy can be employed for execution, to suit manufacturing.

ABC stratification is based on the universal finding that for most manufacturers ±20% of SKUs drive ±80% of sales, while the next 30% drives 15% to 19% and the balance [the "long tail"] generates 5% or less. Setting up business rules that focus alerts on the high-value products [the "A" items] brings more expertise to bear on products that contribute the most. Management-by-exception flags deviations from forecast using stricter thresholds for A items than for B items. System alerts spur the planner into action at the first indication of possible variance for the most business-critical products. Alerts for C items can be handled on an as-needed basis.

Key Performance Indicators [KPI]

Establishing and automatically monitoring a customized set of performance indicators gives planners and other stakeholders a comprehensive picture of how well the forecasting effort is working. Common KPIs include forecast accuracy, inventory levels, service level, fill rate, and stock-out percentage. The demand planning system provides individualized dashboards that display KPIs relevant to each stakeholder's needs.

By managing one integrated set of KPIs across the organization, from supply-side to demand-side, at every level of forecast aggregation; everyone stays on the same page regarding overall performance against unified customer service metrics.

Takeaway: Managing forecasts for thousands or hundreds of thousands of SKU/locations can overwhelm the very best demand planners. Adopt a strategy of identifying key products, customers, or other criteria and set alerts to warn planners when high-value items begin to deviate from the plan. Define KPIs and track performance at every level of demand aggregation.

Pillar #4: Make Collaboration a Core Demand Planning Competency

Getting visibility to what customers, partners and internal stakeholders know can make a more accurate demand plan and provide reliable input to the sales and operations planning [S&OP[team. There is no greater contribution to wise S&OP decision making than collecting information as close to the demand signal as possible, and receiving feedback as early as possible. A recent Gartner survey showed that gathering demand insights from customers presents the largest gap between importance [74% think it is important] and effectiveness [44% think they are effective at it]. Gathering demand insights from sales and marketing [importance 65%, effectiveness 48%] and gathering demand insights from product management [importance 55%, effectiveness 42%] showed smaller, but still significant, gaps between importance and effectiveness.

VMI and CPFR

Two traditional methods of improving forecast accuracy are Collaborative Planning, Forecasting and Replenishment [CPFR] and Vendor-Managed Inventory [VMI]. In recent years, there has been a movement to combine and improve the two concepts into "Collaborative VMI." In any form, the purpose is for trading partners to share information and cooperate to sense demand as early as possible and respond to changes in demand efficiently.

A Collaborative VMI process is based on shared calendars and proactive meetings that allow trading partners to integrate and view point-of-sale data, promotional calendars, buyer and seller inventories, replenishment forecasts, new product introductions, and more. When executed in an environment of trust, wholesalers do not blindly react to a retailer's inventory level and retailers are not caught off-guard due to, say, a slippage in lead times. The planning function moves beyond a focus on orders only and gets closer to actual consumer behavior.

A recent Gartner/RIS News survey of the retail sector found that demand-forecasting initiatives can increase on-shelf availability by 20% to 30%, improve inventory productivity by 3% to 5%, reduce obsolete inventory by 105 to 15%, and increase revenue and gross margin by 1% to 3%.

Success requires formalized processes to accurately anticipate time-phased inventory and customer replenishment needs. Business rules automatically trigger replenishment orders, and parameters are established for managing returns, setting inventory turn goals, and managing slow-moving goods. Each trading partner should view pertinent information in the context of its business.

Collaborative planning systems can reduce the complexity of partnering, and provide a secure vehicle for sharing information with partners. By providing automated business alerts, a good collaboration facility encourages planners and buyers to move from reactive to proactive, focusing their attention on exception conditions before they blow up into major issues. The system must scale to handle large networks and provide ongoing data integration across business units and trading partners.

Sales and Operations Planning [S&OP] Input

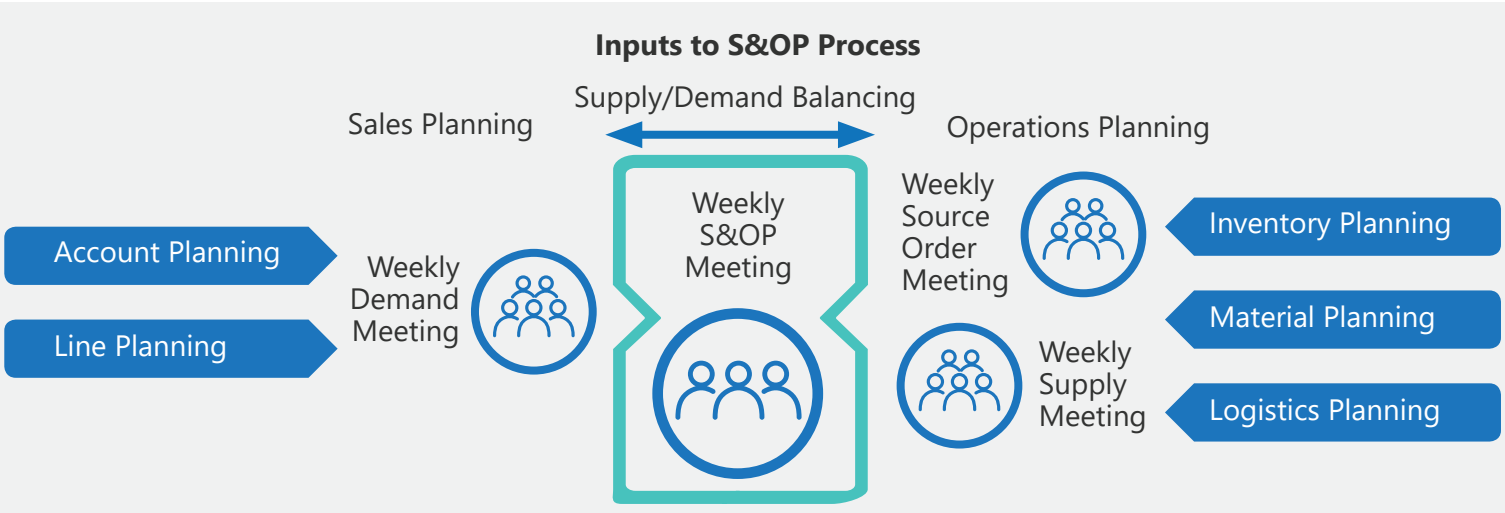
S&OP brings together marketing, sales, manufacturing, finance, sourcing and more on a regular basis to make fully informed decisions and create one collaborative plan that best drives the organization toward its business goals.

S&OP is probably the most vital collaborative activity in the organization. No other program has a bigger impact on the expectations, commitments, costs, and profits of the company. To synchronize the operational plan with corporate financial objectives, demand and supply scenarios must be in balance with cash flow objectives, profit contribution, margin criteria, etc. Companies should be able to aggregate demand planning data for the executive-level S&OP review and then drill down to a level of detail that may reveal challenges and opportunities related to smaller demand groupings by sub-family, item, geography, style, or other subsets. An excellent demand planning program ensures that the S&OP process is fed the most accurate possible forecasting insights, and supports a "one-number" plan giving all departments a unified view of what is to come. The internal negotiation between sales, marketing, and operations can proceed with clarity and mutual understanding when the demand plan is built on solid ground, supported by facts and proven estimating techniques rather than intuition, emotion, and even wishful thinking.

The level of demand uncertainty should be correctly contemplated, and alternate demand scenarios should be examined to see what options are available to shape actual demand. The ability to produce dynamic demand evaluations quickly is extremely valuable: frequent insights into how factors such as buying patterns and time-phased demand signals are changing enable a more nimble response to real-world market conditions.

With maximum visibility to inventory levels, point-of-sale data, promotional plans, regional variations and more, the demand plan can become the most powerful weapon supporting wise recommendations and better S&OP decisions every month.

Takeaway: Establish closer trust relationships with partners and customers wherever possible in order to gather and share vital demand information from anywhere across the globe through a common, secure information sharing platform. Use scalable, science-based demand planning techniques to invigorate your sales and operations planning teamwork at the departmental and executive levels.



A High Tech Company Before and After: Demand Planning Evolution

Before:
One consumer electronics product and accessory manufacturer operated at a typical level of demand planning effectiveness. It assigned demand planners by region and generated forecasts that were flat projections based on six months shipment history, with no provision for seasonality and little analysis of forecast accuracy. Each forecast was manually re-built every month. Ongoing accuracy depended on planners finding and addressing issues. Reports were generated by Access database tables, and forecasts were exported to MRP twice a week.

After:
An advanced demand planning system upgraded the company to a new way of working, with demand planners aligned by product code, generating demand forecasts for the next 12 months based on 36 months of history, and applying seasonality curves. Planners focused on new product introductions, promotions and only high-priority SKUs that deviated from predictions. Web-based reports are available to all stakeholders. Forecast changes are transmitted dynamically to the replenishment plan for immediate action.

The company has seen a 12.5% improvement in forecast error on established products.

Conclusion

As we have seen, providing the best "one number" forecast requires capturing the demand signal close to its source and accurately predicting demand with enough lead time and confidence to ensure maximum sales and operations performance at minimum cost.

The four pillars of demand planning are:

1. **Forecast Modeling**
   Increase forecast accuracy by better perceiving and predicting the full range of factors that influence demand signals. Draw from a range of statistical methods to create a forecasting model that best fits the complete situation, including a baseline forecast plus seasonal, promotional, and other components. Use attribute-based models for products with little or no reference history. Adopt a demand planning strategy that automates model selection, automatically monitors the fit against actual data, and recommends more accurate alternative models as needed throughout the product life cycle.

2. **Demand Hierarchy**
   Break down forecasts at a higher level of aggregation into detailed plans covering product components such as style, color, size, sales channel, customer, region, etc. Employ a pyramid of multiple faces, in order to aggregate different characteristics important to different stakeholders. While one face of the pyramid rolls up to an aggregate forecast by customer, other faces may by organized by geography, or product family, and so on.

3. **Management by Exception**
   Adopt a "set-and-forget... until alerted" philosophy around forecasting. A good demand planning system can automatically compare an existing demand curve to the actual demand signal as sales data becomes available. Set thresholds such that real-time email alerts focus planners' attention first on A-level SKUs that deviate from expectations.

4. **Collaboration**
   Use collaboration techniques such as CPFR and VMI to organize and share information with customers, partners, and internal stakeholders via a secure, Internet-based system. Capture the demand signal as close to the end-user as possible through fast feedback loops. Base S&OP planning sessions on statistically sound forecasts and fresh demand data to take the emotion out of negotiations.

Gartner references: Building an Effective Demand Planning Process, July 2012.
Aberdeen references: Demand Planning Segmentation: Getting the Max Out of Your Business, January 2013.

About Logility

Accelerating the sustainable digital supply chain, Logility helps companies seize new opportunities, sense and respond to changing market dynamics and more profitably manage their complex global businesses. The Logility® Digital Supply Chain Platform leverages an innovative blend of artificial intelligence [AI] and advanced analytics to automate planning, accelerate cycle times, increase precision, improve operating performance, break down business silos and deliver greater visibility. Logility is a wholly owned subsidiary of American Software, Inc. [NASDAQ: AMSWA].

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For more information, contact Logility:
Worldwide Headquarters **800.762.5207**
United Kingdom **+44 [0] 121 629 7866**
asklogility@logility.com