

Next-generation forecasting is closer than you might think

+ Surrounded by an explosion of data, most forecasting systems can't leverage it. Here's how you can.

Joseph Shamir

Next-generation forecasting is closer than you might think

Surrounded by an explosion of data, most forecasting systems have no way to leverage or take advantage of it.

Business complexity is growing, driven by multi-channel marketing, the growing influence of Demand Shaping (Media, Promotions, NPI), and the impact of the internet on buying behavior - to name a few. To manage and ultimately profit from this complexity, marketing and sales departments are investing in modern data infrastructures to unlock valuable clues to customer sentiment and behavior, even including technologies such as machine-embedded telemetry and social media channels.

Unfortunately most companies' supply chain systems and processes haven't begun to catch up. Most are still using forecasting approaches based on cumbersome algorithms and time series of aggregated sales history. This inability to integrate, analyze and take advantage of increasingly available data is causing forecast accuracy to get worse when it could be getting better. We see companies with Item-Location forecast accuracy of 70 percent or even less, negatively impacting business outcomes. For example, analysis from Lora Cecere of Supply Chain Insights shows that food manufacturing companies have "...lost 1% in operating margin and have increased average inventories by 22% over the last decade".

The good news is that most companies already have the data they need to achieve big improvements in forecast accuracy. Those wanting to move to the 'next generation' of forecasting to achieve greater demand and supply reliability have readily available data and powerful tools at their disposal.

The road to 'next-generation' forecasting

The goal for forward-thinking supply chain executives is to get to a market-driven forecast. Historical demand is a valuable proxy for future demand, but to forecast demand that is heavily influenced by marketing initiatives, you have to model the marketing-related data that "shapes" the demand. It allows us to capture and model the relevant market attributes that impact the demand signal, generating more signal and less noise. This additional information improves the forecast, inventory and service levels.

But rather than jump straight to the most advanced form of market-driven forecasting, this article will explore an evolutionary path, summarized into four stages as illustrated in Figure 1 below. In each stage, we employ additional capabilities to achieve a more reliable forecast, leading to our ultimate goal.

Stage 1 - Traditional Forecasting

Many companies still apply a traditional 'top-down' approach to forecasting. They attempt to drive the organization towards a single number; at best based on aggregated data; at worst from a process more like crystal ball reading. High level data is then typically split to an Item-Location level of detail for inventory and replenishment planning.

This approach aggregates demand to smooth out variability. The smoothing makes it easier to generate a high level forecast, but the Item-Location level forecast quality is poor because demand signal detail is dismissed along with the 'noise'. Crucial information about volatility and error is lost in the process. To illustrate, when one of our customers ran a benchmark study of its ERP system, forecast error grew by more than 40 percent when splitting monthly data into weeks. It also increased by 40 percent when National/SKU aggregates were split into SKU/Ship- From detail.

For simple and highly predictable businesses with a few fast-moving commodity items and single channel distribution, this approach may be acceptable. But for most companies, the operational forecast that drives inventories and replenishment is well off the mark.

Stage 2 - Statistical Forecasting

The first major improvement towards a demand-driven supply chain is including a statistical forecast using a bottom-up approach. This approach models the unique demand pattern for each individual Item-Location (or SKU/L).

Rather than aggregating the demand variations, the forecasting process preserves and leverages the Item-Location demand signal (e.g., customers trending up and down, regions growing or shrinking, SKUs exhibiting unusual behavior), creating a much more accurate forecast and confidence interval. This approach is valuable because the most significant information about variability and volatility lives in the granular level of detail, which can then be aggregated to any level as needed.

This approach is also important for supply chains that include 'long-tail' SKUs. Their intermittent demand is typically served from inventory that should be based on statistical models of Item-Location level demand. Even when forecast quantities are identical, variables like order size and frequencies have a major impact on the right safety stock and replenishment levels needed to reach the target service level. So the only way to accurately define inventory mixes with long-tail SKUs is by analyzing order-line detail.

Fortunately, all the data needed to add statistical forecasting at this level is available today using tools that automatically handle the data integration, demand analytics and other "heavy

lifting", freeing the planner to focus on adding market intelligence. They can augment existing ERP forecasting modules (such as SAP APO) or be built from scratch.

Stage 3 - "Outside-in" Forecasting

Outside-in forecasting builds on and leverages this granular demand data by adding downstream channel data. A "demand sensing" approach translates downstream demand into a demand signal for each upstream SKU/L, improving the reliability of the statistical forecast and reducing demand latency. Analyst Lora Cecere summed it up well in a recent blog post: "If you can cross these boundaries, companies find that the use of downstream data pays for itself in less than six weeks, every six weeks, and companies that were good at the use of downstream data and sensing channel demand aligned and transformed their supply chains 5X faster than competition."

By adding outside-in forecasting, a company begins to use market-driven demand sensing techniques to move closer to more optimal trade-offs and the effective frontier of improved business outcomes (profitability, revenue, etc.). For instance, when one of our customers compared Ship-To demand forecast to translated POS demand signal, forecast error and bullwhip were reduced by an average of almost fifty percent (48% across the benchmark). Within the replenishment horizon, forecast accuracy increased by 13 points, from 73 to 86 percent. Another customer, Costa Express, utilized machine telemetry feeds of real-time POS data from their self-serve coffee locations to drive demand, inventory and replenishment planning, significantly reducing field inventory stock and ingredient costs.

Stage 4 - Machine Learning Enables "Next-generation" Forecasting

The key to a true market-driven forecast is to begin taking advantage of the wealth of market data to understand the impact of more complex demand drivers such as media, promotions and new product introductions and to use that understanding to drive improved forecasts. It is a more challenging goal, but one that many early adopter companies have already begun working towards.

This goal poses multiple challenges. First, there is the issue of obtaining, storing and modeling the data. In the forecasting stages described earlier, most companies already have the data they need, even if they weren't making best use of it. In this stage, companies often must be able to access, assimilate and analyze large quantities of 'big data'. They may even require more extended use of a demand signal repository (DSR) that integrates and cleanses many disparate demand data sources.

A predictive demand analytics or machine learning engine is required to translate the data into actionable information. These more sophisticated tools can deal with the volume, variety and velocity of required data and can handle unstructured or incomplete data.

A growing number of our early adopter customers are taking first steps. One of the first was Danone, who deployed it for trade promotion and media event forecasting, achieving a 20 percent reduction in forecast error, 30 percent reduction in lost sales and a 30 percent reduction in obsolescence. Another, a large on-line electronics distributor, was able to leverage web data such as page views,

unique visitors, and bounce rate to identify the new products which will become 'the stars' with a much higher confidence level.

The ultimate goal for market-driven forecasting is to capture and model the relevant market attributes that impact on the demand signal, generating more demand signal and less noise, and anticipating demand as much as possible. But there are many steps in the journey, and many opportunities to begin. By starting now, companies can not only prepare for the future, but also drive immediate improvements in forecast accuracy, inventory, service levels and the bottom line.