A better crystal ball

Forecasting adapts to shorter product life cycles, build-to-order trends

Is forecasting relevant in an e-world? Editors, pundits, and analysts are spending a lot of time asking that question. However, manufacturers that venture forth into the e-world without proper forecasts do so at their own risk! The e-world—characterized by rapid product life cycles, shortened manufacturing lead times, and mass customization of products—heightens the need for companies to both control their inventories and maintain high service levels. The expansion of e-commerce is ratcheting up the pressure to have the right product in the right place at the right time—and at the lowest price.

To this end, the desire for high service-level inventories has to be reconciled with the need to minimize inventory costs. There is no better way to satisfy these competing requirements than to render the most accurate demand forecasts on a timely basis. In today's environment, demand planners face greater pressure than ever to get their forecasts right. Customers buying on the Web and demanding more personalized service will make demand planning more challenging than in the past, but not necessarily more difficult.

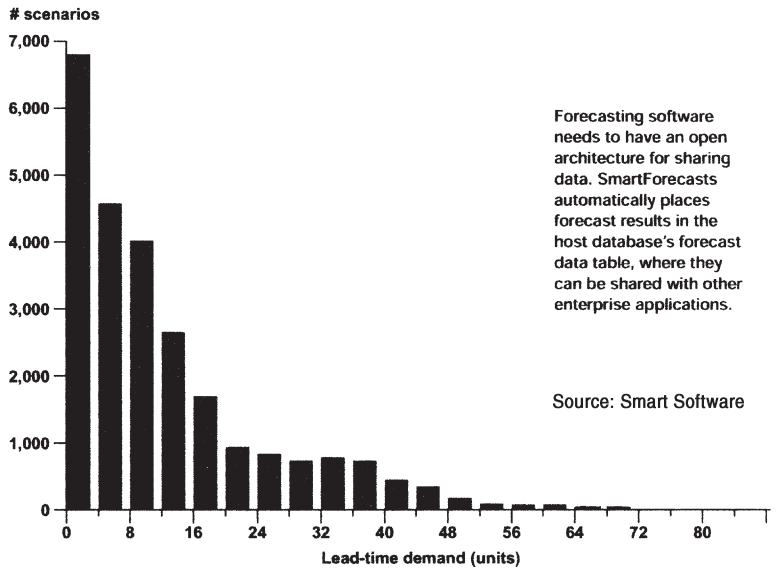
While the ability to forecast finished-goods demand may be limited in a make-to-order environment, this in no way diminishes the forecasting function. Customized products still require parts and subassemblies, and companies need to stock optimal inventories to meet an increasing number of product variations. In this environment, the focus of forecasting activities becomes the core of intermediate assemblies that become the finished product. Forecasting is not forgone; it simply drops down a level in the bill of material.

Another question being asked is whether forecasting can maintain its relevance as product cycles and manufacturing lead times continue to shrink. The answer is a definite "yes." Forecasting over short lead times, rather than long, actually is beneficial to a company because it produces more accurate results with less uncertainty.

The e-world aside, planners still face real-world problems that require accurate demand forecasting solutions. They have to deal with thousands of items; incorporate the effects of special promotions and events into their sales plans; handle new products and obsolescence; and in some cases, deal with service-parts inventories that exhibit a high degree of intermittent demand.

While more is expected now, luckily "more" is possible with new and improved forecasting tools.

Intermittent-demand data patterns



Forecasting software needs to have an open architecture for sharing data. SmartForecasts automatically places forecast results in the host database's forecast data table, where they can be shared with other enterprise applications.

Source: Smart Software

From spreadsheets to magic!

Numerous companies still depend on spreadsheets to try to forecast. Slow and unwieldy, spreadsheets are time-wasters in a world that doesn't wait—and they commonly produce inaccurate results. The spreadsheet, as a demand-planning tool, is a technology dinosaur.

The visionary author Arthur C. Clarke once wrote, "Any sufficiently advanced technology is indistinguishable from

By Charles N. Smart
President, Smart Software

magic." The inner workings of modern forecasting technologies may indeed seem magical, especially when they make demand planners' problems disappear. But make no mistake: these systems yield real benefits.

Today's forecasting technology is light-years away from the early mainframe systems that were so limited in their power and performance; or spreadsheets, where platoons of planners can routinely spend weeks forecasting a company's product line using simple moving averages.

Two developments in the last 15 years rocked the forecasting universe and helped large and small companies alike achieve giant economies in inventory and resources planning. First, the automation of advanced statistical methods gave non-statisticians the tools they needed to create robust forecasts. Second, the introduction of "batch" forecasting technology made it possible to forecast thousands, or tens of thousands, of product items in minutes on a single PC.

Today's automatic forecasting software allows planners to predict the demand for unlimited numbers of products and determine their inventory requirements with the push of a button. The speed that automatic forecasting affords—colorfully described by one manager as the time it takes him to "have a cup of coffee"—must be seen as one of the giant productivity gains of our time.

All commercially available forecasting systems contain the basic extrapolative methods (moving averages, exponential smoothing, etc.) necessary for handling seasonal and trending data. And many have a flexible user interface that allows on-screen adjustments to forecast results and graphs that incorporate one's business judgment and knowledge of market conditions. These capabilities include management overrides, what-if adjustments, and goal-seeking. They are the standard tools of the demand planner who seeks to maximize the accuracy of his forecasts.

However, in the past five years, new capabilities have been built into some of the more advanced demand forecasting software applications to handle some of the special problems confronting demand planners in a variety of industries. Also, the open architectures of some best-of-breed solutions ensure that forecasting results, when generated, can be easily shared by key applications throughout the organization—from sales to production, distribution, and finance.

What are the new?

A recently developed forecasting technology that builds on this concept is *trend hedging*, a useful tool in estimating future demand for new and aging products. Simultaneous new-product introductions and product obsolescence have brought with them the twin threats of overstocks at the time of product introduction, and stock-outs at the end of the product life cycle. Trend-hedging essentially allows planners to avoid both of these pitfalls by applying their business knowledge to *soften*—or dampen—a statistical forecast that might otherwise predict a steady, upward trajectory of sales (for a new product); or an unmitigated nosedive in sales (during a product phase-out).

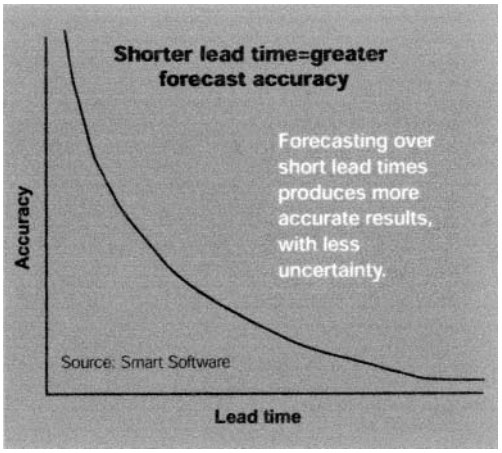
Trend hedging requires some demand history, but occasionally a new product appears to have no history—and forecasting its future demand is considered impossible. This often is the case in the high-tech industry, where product life cycles are short. In many instances, however, "new product" is a misnomer. Often an item shares enough similarities to existing or previous products so that a planner can use several methods to construct a demand history.

If there are no similarities, there still may be a solution. Instead of forecasting from the "bottom up," it may be preferable to forecast at the group or product-line level, where life cycles and trends are longer. Proration of these "top-down" group forecasts, together with the application of judgmental adjustments, can produce forecasts for individual product items.

Manage intermittent demand

Judgmental techniques aren't always the cure, however, especially when products exhibit intermittent—also known as irregular or slow-moving—demand patterns. This major demand-planning problem is well known to the capital goods, specialty chemicals, aviation, automotive, industrial tools, high-tech, and utilities industries. It is especially troublesome for the managers of large service-parts inventories. And it costs industries billions annually in unnecessary inventory-carrying costs and lost business opportunities.

Intermittent demand data—identified by its large proportion of zero values with non-zero values mixed in randomly—is not "normal" or "smooth." It defies the best efforts of traditional statistical methods like exponential smoothing and moving averages to forecast it. These conventional forecasting methods work by identifying recognizable patterns in demand history data, such as trends and seasonality. However, there are *no* easily



recognizable patterns in intermittent demand data. With products or parts that exhibit intermittent demand, companies also have found that it's not feasible to rely simply on previous business experience to predict future demand values, for a number of reasons—not the least of which is the typically large number (thousands or tens of thousands) of product items involved.

Once again, a new forecasting solution has filled the void. A more accurate method of forecasting intermittent demand, derived from a statistical technique called "bootstrapping," recently was introduced. It accurately forecasts both average product demand per period, and customer-service level inventory requirements over an entire lead time. Its early evaluation in retail warehousing and aviation maintenance environments has produced increases in customer-service level accuracy and impressive, multimillion-dollar annual savings in inventory carrying costs.

For example, the warehousing operation of a nationwide retailer forecasted inventory requirements for 12,000 intermittently demanded stock-keeping units (SKUs) at the 95- and 99-percent service levels. The forecast results were almost 100-percent accurate. At the 95-percent service level, 95.23 percent of the items did not stock-out (95 percent would have been perfect). At the 99-percent service level, 98.66 percent of the items did not stock-out (99 percent would have been perfect). The aircraft maintenance operation of a multinational company achieved similar service-level forecasting results with 6,000 SKUs in one part of its business. It also estimated potential annual savings in inventory-carrying costs of $3 million.

Other improvements

Improvements in demand forecasting technology continue to deliver dramatic cost benefits in the areas of inventory and materials management, as well as customer service. For instance, when you stock-out of a finished goods item, you may lose an order to a competitor. If you stock-out at the component level, it may interrupt the production line. Unfortunately, to avoid such situations, the tendency on the part of many companies has been to overstock.

There are no easily recognizable patterns in intermittent-demand data.

To deal with this problem, it is now possible to estimate, automatically, the volatility of future demand and apply that estimate (forecast error) to set optimal buffer-stock requirements. The end result is to lower inventory levels and, at the same time, still maintain (or decrease) the risk of stocking out of key items.

New *event modeling* techniques allow planners in consumer products, retail, and other industries to measure the impact of past events—e.g., spike orders, strikes, competitor plant closings—or sales promotions, and estimate the impact of similar events on future product demand. Not only can event models be run serially at the SKU level, but planners can now assign a potentially unlimited number of unique event scenarios to an equally unlimited number of individual SKUs and run these *simultaneously*. We've come a long way from those spreadsheets.

All together now

Until recently, if you wanted to integrate your forecasts with your enterprise planning applications, your choices were limited. As with spreadsheets, most best-of-breed forecasting solutions stood alone as islands of data and analysis. To move their forecast results into other applications was a clunky procedure at best. In addition, there were ERP and other planning systems that sported their own demand forecasting features in proprietary data formats. Once more, however, the problem was sharing the data with other enterprise applications.

Today, best-of-breed demand forecasting solutions exist with open systems architectures that don't restrict how or where forecast results can be used. These solutions connect directly to a company's client/server relational database or ERP/supply chain management system, and will facilitate collaborative planning. That is the future of forecasting! Internet-enabled systems already take collaboration to a new level, allowing easy transmission of forecast graphs and results via the Web to support a global planning network.

As to the future, the sure trend lies in the direction of continued technology innovations and their creative application to demand forecasting and planning problems; increased collaboration; and correspondingly greater productivity gains. Not magic, exactly, but no longer the stuff of science fiction. ■