

**Leveraging enterprise data and advanced
analytics in core operational processes:
Demand forecasting at Cisco**

This case was prepared by Blake Johnson of the Management Science & Engineering Department at Stanford University. The author gratefully acknowledges the contributions of Anne Robinson and Andrew Fisher.

Introduction

Accurate forecasts at the product level are critical to many core business processes across a company, from financial planning to sales and marketing, supply chain management, and customer service and support. However, generating good forecasts is challenging for a number of reasons.

First, relevant data includes both large enterprise data sets about the present (current customer orders) and the past (historical demand), as well as forward-looking insight from sales and marketing, both which can be difficult to access and effectively utilize. Second, most companies have a diverse range of business units, products, and customers, ruling out “one size fits all” forecasting approaches. For example, Cisco has over 18,000 product IDs, ranging from high-end enterprise systems to consumer products, which it sells to a diverse set of customers around the world.

“The top two challenges are speeding up our new product introduction to world-class levels and forecasting accuracy & demand management.”

Angel Mendez, Senior Vice President of Customer Value Chain Management

At the operational level of forecast process implementation and execution, the challenges are even greater. Different functional groups use different data definitions and different IT systems, and have different goals and objectives. For example, finance and sales and marketing focus on revenue and track the time orders are booked, while supply chain focuses on units and tracks the time orders are to be delivered.

To create the best possible forecast all available data and organizational expertise must be utilized, and relevant stakeholders engaged in the process of forecast generation, review, and sign-off. To realize the value of the forecasts generated, an even wider range of stakeholders across the company must be convinced of their quality, and must be able to easily access them.

Cisco solution

Cisco has developed a forecast generation process that combines advanced analytics applied to enterprise data on bookings and historical demand, with a consensus process that incorporates current insights from sales and marketing and finance. To ensure broad organizational adoption, forecast performance is carefully monitored and documented, and the forecast generation process is kept transparent and accessible. Finally, performance metrics and incentives drive on-going improvement in both forecast quality and utilization.

Cisco’s Demand Forecasting Process

The development of Cisco’s demand forecasting process was sponsored by Karl Braitberg, Vice President of Demand Management and Planning. The process was

designed to address three key challenges: 1) data acquisition and management, 2) forecast analytics, and 3) organizational process development and stakeholder engagement. Each is described below.

Data Acquisition and Management

“Data Mining and Analytical Forecasting provide a math-based, unbiased window into both future demand and the fundamental drivers behind the projection”

Karl Braitberg, VP, Demand Management & Planning

The main categories of forecast-relevant data are current orders and historical demand. A range of different data sets are available for each of these categories, and must be evaluated to determine the data with the greatest predictive value. For example, Cisco tracks customer order data by vertical market segment, customer segment, and sales coverage area, and also tracks customer shipment data. In addition, because differences exist in the markets served by, the organizational processes of, and the underlying economics of Cisco’s diverse product lines, the forecast process has to be flexible enough to handle different data and analytic approaches.

The first step in identifying the best data set for each product line is establishing access to the complete set of available data. At many companies the cost and time required to extract each of these data sets from their respective source systems creates a significant barrier to forecast quality. At Cisco, however, an enterprise data warehouse exists that contains each of the data sets.

Forecast Analytics

To generate the best possible forecast for each product line, Cisco’s analytic forecasting process compares the performance of a range of analytic methodologies over the available data. Because the characteristics of demand vary widely across product lines, the ability to tailor both the data set chosen and the analytic methodology employed has enabled Cisco to realize significant improvements in forecast performance relative to a more standardized, or “one size fits all” approach.

For example, the demand for some of Cisco’s product lines is driven by a small number of negotiated deals with a few large customers, while the demand for other products occurs primarily through many ongoing sales to smaller customers. In addition, most of Cisco’s products have significantly higher demand variability shortly after they are introduced to the market (when very limited product-specific data is available) than during the subsequent higher volume stage of their lifecycle.

To test and refine the performance of alternative forecasting models across the available data sets quickly and at low cost, Cisco’s forecasting team maintains a close working relationship with IT. In addition, to enable efficient and flexible model construction and selection, the team chose to develop its own analytic tools using a common forecasting platform. Doing so enables the team to leverage best practices, while also allowing it to

make the modeling adjustments necessary for particular demand patterns and data sets. This flexibility has proven important, since the technology-driven nature of Cisco's business leads to levels of demand variability and product lifecycle-driven demand patterns for many of its products that are difficult to capture with standard forecasting techniques.

“We’re trying to strike a balance between forecast automation and objectivity, with the practical realities of working with the disparate and complex demand patterns across our different product families.”

Andy Fisher, Manager, Analytical Forecasting

Consensus Process

Once the best combinations of data and analytic methods have been used to generate analytic forecasts for each of Cisco's products, the forecasts are fed into Cisco's monthly forecast consensus process. In the consensus process stakeholders from sales and marketing, finance, and demand planning review, if necessary revise, and ultimately sign-off on forecasts for each of Cisco's products.

Each stakeholder in the forecast consensus process brings a different focus, different data, and different expertise. For example, finance brings a top-down focus on revenue, while sales and marketing brings current information about future sales of key products (with sales focused primarily on the shorter term and marketing on the longer term), and analytic forecasting brings data-driven projections for unit sales across Cisco's entire product portfolio. Because Cisco has over 18,000 product IDs and generates forecasts monthly, the consensus process focuses on products for which the analytic forecast deviates significantly from the expectations of sales and marketing.

A key role of the analytic forecast in the consensus process is to serve as a second point of reference. Because the analytic forecast is generated using a different data set and methodology, it generates active discussion about the key drivers of forecast performance, and about the relative performance of competing forecasts. This discussion has led to broader organizational involvement in forecast review and performance benchmarking, and driven improvements in both forecast performance and organizational adoption.

“Analytical forecasting provides an unbiased view of the future, shielded from traditional marketing enthusiasm. This baseline provides an invaluable perspective for understanding the true direction and magnitude of demand.”

Anne Robinson, Sr. Manager, Information and Data Strategy

Once the consensus process is complete, the finalized forecasts are entered into Cisco's enterprise data warehouse for use across the company, and are also input into Cisco's demand planning system for immediate use in supply chain planning. The number of times the forecasts are accessed from these systems, and by who, is monitored to measure their utilization.

Results

The output of Cisco's demand forecasting process is weekly forecasts, for all 18,000+ of its product IDs over a 24 month time horizon, which have been reviewed and approved by Cisco's cross-functional forecast consensus team.

By combining enterprise data, advanced analytics, and forward-looking insights from sales and marketing, Cisco has been able to realize improvements in forecast accuracy averaging 12%. In addition, establishment of the analytic forecasting and consensus process has created a foundation for ongoing improvement in forecast performance and utilization, and for active collaboration across key stakeholders from finance, sales and marketing, demand planning, and IT.

Cisco is realizing business benefits from greater forecast accuracy across a wide range of activities, ranging from supply chain to sales and marketing and finance.

Key Take-aways

The success of Cisco's demand forecasting initiative demonstrates the value of combining effective enterprise data management, advanced analytics, and cross-functional collaboration and consensus. While each company is different, to create a core operational process to accomplish these steps Cisco has combined five elements likely to be essential in any environment:

- Executive leadership that provides resources and drives awareness of the business value of high quality forecasts
- Easy access to data through enterprise data management and partnership with IT
- Analytic expertise to determine the data and models that generate the best forecasts by product line and business unit
- An open and transparent process built around clear, consistent measurement of forecast performance
- Broad organizational involvement that ensures all forecast-relevant data is utilized and the forecasts generated are widely used