# Four Steps to NextGen Forecasting

## Chart a path to use rich demand data for better business outcomes

Business complexity is growing and it's not only due to the unpredictable nature of today's global economy. New retailing trends like subscription e-commerce, along with ever-more sophisticated demand shaping tactics like flash sales and 'fast fashion' all conspire to make reliable forecasting harder than ever. To manage and ultimately profit from all this complexity, marketing and sales departments are investing in new systems that harvest data from smart machines to social media feeds in hopes of revealing valuable clues about customer sentiment and behavior.

Despite all this, many businesses still use planning systems and forecasting approaches that were designed for simpler times. These aren't engineered to integrate, analyze and take advantage of increasingly available data. Just when forecast accuracy could be getting much better, for many businesses it's getting progressively worse. We often talk to demand planners whose Item-Location forecast accuracy is only at 70 percent—or worse.

> **The good news is that most companies already have all the data they need to achieve much better forecasting outcomes.**
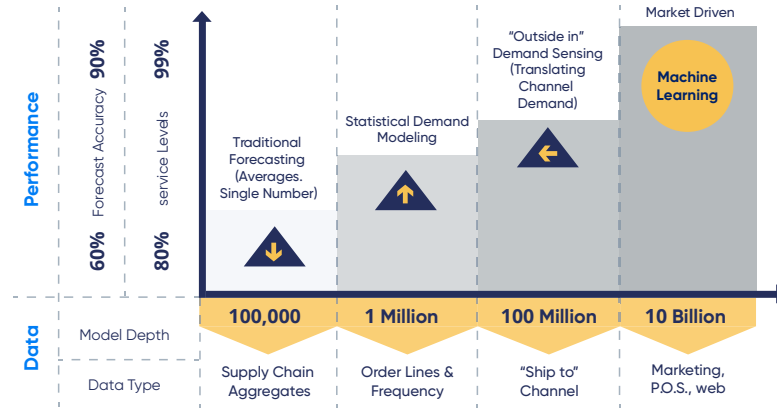
Crucially, tools and processes have also evolved to the point that companies, regardless of their size or business model, can harvest this data to reap the substantial benefits of 'NextGen' forecasting.

## The Road to NextGen Forecasting

Most of the ambitious supply chain leaders we talk to aim to generate 'NextGen' market-driven forecasts. This involves looking beyond historical demand to that which is influenced by marketing initiatives. By modeling the marketing-related data that 'shapes' demand, we 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, in this article we will explore an evolutionary path, summarized in the four stages in Figure 1 below. In each stage, we employ additional capabilities to achieve a more reliable forecast, leading to our ultimate goal.

**The Four Stages
of Forecasting**



The Four Stages of Forecasting diagram showing Performance (Forecast Accuracy 60%–90%, service levels 80%–99%) against Data (Model Depth, Data Type). Four stages: Traditional Forecasting (Averages. Single Number) – 100,000 – Supply Chain Aggregates; Statistical Demand Modeling – 1 Million – Order Lines & Frequency; "Outside in" Demand Sensing (Translating Channel Demand) – 100 Million – "Ship to" Channel; Market Driven / Machine Learning – 10 Billion – Marketing, P.O.S., web.

## / 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, which is at best based on aggregated data and at worst, based on guesswork. 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, making it easier to generate a high-level forecast. However, what you gain in simplicity, you more than lose in forecast quality. The smoothing erodes SKU-L level forecast quality because it cuts out important demand signal details about order sizes, volatility and error. 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 the few simple and highly predictable businesses that sell just a few fast-moving commodity items through one channel, traditional forecasting should work. All others, read on!

## / Stage 2 - Statistical Forecasting

In this stage, there are two interrelated approaches to cover: bottom-up forecasting and probability forecasting.

/ **Bottom-up Forecasting:** The first major improvement is the bottom-up statistical forecast, which models the unique demand pattern for each SKU-L. Rather than aggregating demand, this process maintains and leverages the SKU-L demand signal (e.g., customers trending up and down, regions growing or shrinking, SKUs exhibiting unusual behavior). The result is 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.

/ **Probability Forecasting:** The next, related approach is probability forecasting. It's the only reliable approach to plan for unpredictable, slow-moving, long-tail SKUs, and those with limited or no order history.

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With probability forecasting, advanced algorithms crunch multiple demand variables to identify the probabilities of a range of possible outcomes. This probability distribution is derived by modeling both order lines frequency and order lines size; this richer information is ignored by most traditional forecasting packages, and allows you to generate accurate demand behavior much more quickly than considering demand history alone.

The beauty of the probability forecast is that it helps you manage the risk that comes from demand volatility. It's not just about improving average demand predictions but assessing the entire range of possible outcomes, which have the biggest impact on service levels.

## / 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.

Through outside-in forecasting, a company begins to use market-driven demand sensing techniques to move closer to optimal trade-offs and better business profitability and revenue outcomes. For instance, when one of our customers compared its Ship-To demand forecast to translated point-of-sale demand signal, it reduced forecast error and bullwhip by an average of nearly fifty percent. Within the replenishment horizon, forecast accuracy increased by 13 points, from 73 to 86 percent. Likewise, when hearing retailer Amplifon started sensing and integrating short-term demand data into its sales forecast, it slashed inventory by 18 percent and obsolescence by 40 percent and significantly improved service quality.

## / Stage 4 – "Next-Generation" Forecasting Augmented with Machine Learning

The key to being able to generate a truly market-driven forecast is being able to tap into the wealth of market data and also factor in the impact of demand shapers like media, promotions and new product introductions. It's a more challenging goal, but, thanks to machine learning, one that supply chain leaders have already begun working towards.

Machine learning is one of the most powerful technologies being applied to achieve market-driven forecasting. Some of the most popular use cases we've seen include:

- Promotion forecasting
- Extreme and multiple seasonality forecasting

- New product introduction (NPI) forecasting – including launch profiles and ongoing baseline demand
- Incorporating climate and weather data into demand forecasting

Note that managing the processes of ingesting, storing and modeling data, especially when many and various types are involved - can be difficult and laborious. Companies with high data volumes and variety may require a demand signal repository (DSR) to integrate and cleanse disparate demand data sources.

/ **The optimal balance of man and machine**: Planning systems that apply machine learning do indeed "learn," which makes them grow better at predicting demand over time. Not only do these systems learn from a wide range of demand and historical data, but they also assimilate the knowledge and experience of demand planners and others involved in the planning process. This enables these smart systems to serve as 'expert assistants', helping people make the best decisions in the context of current business conditions.

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Time and time again, we've seen how planning systems that apply advanced algorithms and machine learning serve to elevate planners, allowing them to focus on the most productive and the highest value-added activities.

## Wrap-Up

The ultimate goal for market-driven forecasting is to capture and model everything that influences the demand signal, filtering out the 'noise' and achieving high accuracy. But there are several steps in the journey, each building on knowledge gained in the previous. The beauty of this journey is that you have nothing to lose by getting started. The sooner you begin applying new tools and planning approaches, the sooner you'll learn what works for your business and improve your demand forecasting outcomes.

## Additional Resources:
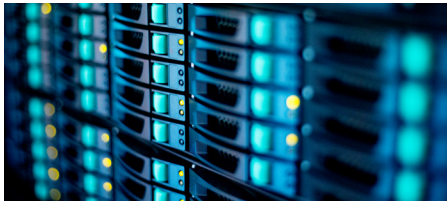


**ebook**
Six Tips for Success Using Machine Learning for Demand Planning



**Case study**
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