One Network Enterprises™

Demand Sensing

Much More Than a Demand Management Evolution

"Demand sensing" has become increasingly important over the past few years. Why? Because companies believe that improving demand forecast accuracy can drive higher levels of customer service through better shelf inventory availability while simultaneously decreasing overall inventory costs and increasing profits. Furthermore, evolving consumer behavior and rising market volatility have underscored the opportunity to sense and react in near real-time to changes in the demand and supply network. Yet these shifts have also fully exposed the limitations of our traditional forecasting techniques.

So what is demand sensing? Simply put, it is a next generation forecasting methodology that greatly improves current levels of forecasting by employing an updated set of mathematical techniques which are designed to analyze daily demand information, thereby creating a much more accurate forecast of near-term demand based on the current realities of consumer sell through.

This jump in forecast accuracy helps companies manage the effects of market volatility and gain the related benefits of a demand-driven value network, including more efficient operations, increased service levels, and a range of financial benefits including higher revenues, improved profit margins, decreased inventory levels, better order performance and a shorter cash-to-cash cycle time.

The principles of demand sensing discussed in this paper apply across industries and more directly to any company participating in a supply network, including retailers, manufacturers, suppliers, or carriers.

From an infrastructure perspective, demand sensing platforms must scale to process the high volumes of data associated with hundreds of thousands of item and location combinations every day. The sheer volume, frequency and compressed processing windows require increased process automation along with the application of advanced mathematics to ensure that the resulting demand signal used to drive the execution environment is accurate and consistent.

Of course significantly increasing demand accuracy is only half of the equation. To gain the potential network benefits, the platform must support both a seamless environment between planning and execution as well as the ability to replenish the high frequency demand signals with optimized execution.

A NEW FRONTIER IN FORECAST ACCURACY

At some point most forecasting methods will hit the law of diminishing returns where the forecast accuracy will tend to flatten out, regardless of the formulae or analytics that are applied.

Mathematicians have traditionally approached forecasting based on various time series and curve fitting techniques which create a forecast based on data such as prior sales history, drawing on several years of data to provide insights into predictable seasonal patterns.

Yet with today's rapid pace of new product introduction and shortened product life cycles, having more than an 18 month sales history might be considered a luxury. Supply chain professionals have also come to the realization that past sales can be a poor predictor of future sales, especially when considering the variations associated with capabilities like distributed order management.

Couple those challenges with all the promotional activities in today's markets, as well as the availability of increasingly precise and frequent data, and you can begin to understand why yesterday's math is having difficulty solving today's problems.

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HIGHER EXPECTATIONS REQUIRE HIGHER ACCURACY

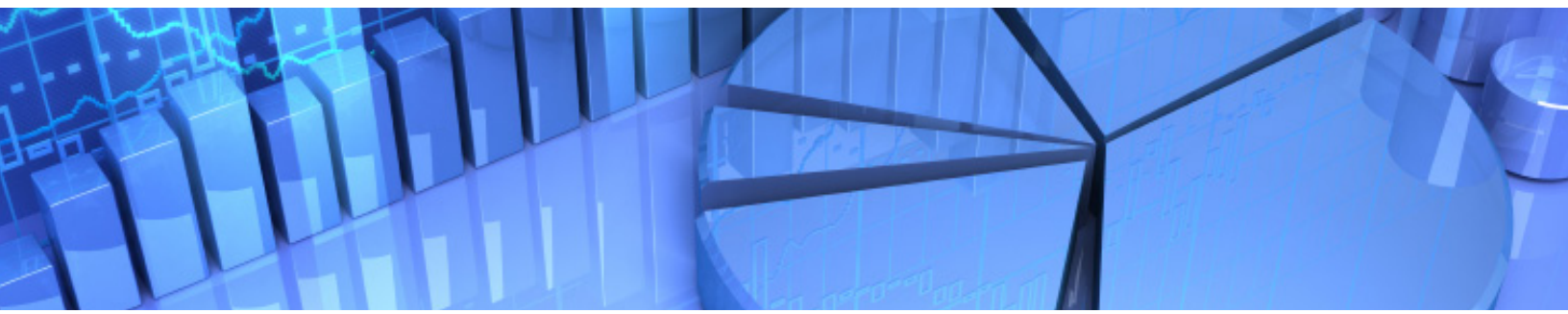
Recently, forward thinking companies have begun employing improved mathematical approaches that can leverage the movement toward real time and network-based business processes along with their increased data volumes to create a completely new ceiling for forecast accuracy.

Much of newly available data requires that we use a massively scalable, network-based, real time platform in order to provide both a single version of the truth from a data integrity perspective as well as a seamless functional environment between planning and execution from a modularity perspective.

As an example, consider One Network's cloud-based platform, which provides this type of service across some of the largest corporations in the world today. With this type of platform we can continue to use the longer horizon and more aggregate level mathematical techniques to create the traditional forecasting baseline, and then layer on the newer techniques working in tighter time buckets to drive forecast accuracy from the traditional 60% to over 80% at the SKU/shelf/location level. Greater than 80% accuracy levels have been the norm at One Network customer sites for many years now.

The key is that with the newer network- based platform, the business processes from forecasting to order management through replenishment and ship can react in ways that maximize customer service levels while also reducing inventory requirements and transportation costs.

Traditionally when choosing a platform, companies have used an ERP environment with Bolt-Ons, or a Best of Breed solution integrated through an Enterprise Service Bus sharing a common Master Data Management system. Yet while the ERP might be able to provide a single version of the truth if rigorously controlled, it is not modular and therefore too difficult to extend and support. Furthermore, Best of Breed, while solving for modularity, is not able to provide a single version of the truth—causing significant duplication issues and associated data integrity problems.



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Without an advanced platform, a ceiling of about 60% accuracy is the reality for time series-based forecasting. From a platform perspective this ceiling isn't governed so much by computing power and storage (which has always been available in the old ERP architectures), but rather by the fundamental limitations imposed by information theory and the fact that the data being used to drive the forecasting algorithms in our traditional systems does not reflect current events or market conditions.

Information theory shows us that increasing mathematical precision to model a "perfect fit" will reach a point where further sophistication of time-series analysis no longer is able to improve upon forecast accuracy. As a proof point, industry surveys show that despite highly tuned models, forecast error remains a significant challenge for most corporations. And the high forecast error rate isn't limited to slow movers which can experience error rates of over 60%.

Even high-volume products with well-understood seasonality patterns continue to experience high near-term forecast error rates of over 40% while using sophisticated time-series methods for demand planning. These forecast techniques are best at predicting much longer horizons and aggregate levels of insights than what is required in today's consumer driven world.

Just looking at typical real time events helps us understand why many techniques can't possibly work in the near term. Extreme examples might include a financial downturn or recovery, fluctuations in energy prices, a medical outbreak of some type, regional factors, or some type of a natural disaster. However there are many everyday occurrences that will affect demand like changing weather patterns, such as cold snaps or heat waves, which alter consumer demand from historical patterns. It therefore comes as no surprise that time series models are ill-suited to predicting demand in today's consumer-driven markets.

Demand Sensing can import demand data on an hourly rather than a batch or daily basis, immediately sensing demand signal changes as compared to a detailed statistical demand pattern, and then evaluate the statistical significance of the change.

DEMAND SENSING VERSUS DEMAND MANAGEMENT

Demand sensing is fundamentally different in that it uses a much broader range of demand signals (including current data from the supply chain) and different mathematics to create a more accurate forecast that responds to real-world events such as market shifts, weather changes, natural disasters, consumer buying behavior, etc.

Demand Sensing allows companies to incorporate detailed short-term demand data into their forecasts to reduce their forecast error by up to another 50%, increase inventory accuracy by up to 20%, and optimally deploy available inventory whether it's in transit, shipped from the DC, cross docked, flowed through or shipped direct from manufacturing. Given that retail level forecasts tend to run at an error rate of 40%, this then reduces the error rate to 20% or in other terms gives us an 80% accuracy rate at retail.

By using more frequent and near real-time customer or channel data, daily demand trends are quickly identified, providing advanced warning of problems which will affect customer service levels. Given that the network-based platform has removed the latency between the plan and execution (or in other words what is really happening in the supply chain), issues are elevated quickly, intelligent responses developed, and actions taken, driving an overall immediate response using a single version of "demand" truth.

Demand Sensing can import demand data on an hourly rather than a batch or daily basis, immediately sensing demand signal changes as compared to a detailed statistical demand pattern, and then evaluate the statistical significance of the change. The automated routines analyse partial period actual demand and execute short-term forecast adjustments using a combination of heuristics, probabilistic pattern recognition, and predictive analytics. Advanced statistical analytics identify and rapidly react to replenishment issues or sudden changes in customer demand.

While being driven directly by high frequency POS/consumer data at the SKU/shelf/location level will generate the highest forecast error reductions, the mathematics around pattern recognition and predictive analytics will also drive significant

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levels of improvement if applied by other supply network nodes including retail DC's, manufacturing DC's, or any integrated suppliers.

Demand Sensing is really a call to action for every company because now the capability exists to manage the entire process from demand signal capture to both short-term and long-term forecasting, resulting in increased sales revenues and decreased inventory costs.

WHAT ABOUT THE DATA?

Breaking the accuracy ceiling requires the inclusion of current demand signals throughout the supply chain as well as the application of new mathematics designed to sort through the masses of data and determine what is truly predictive. There is no shortage of near real-time data collected from the downstream retailers in the supply network all the way upstream through to the manufacturers and their suppliers.

However take care not to misinterpret the data. For example, many of today's forecasting systems will skip data from days where there were inventory shortages on the shelf! From a demand sensing perspective, this could be the most important data set since we need to predict what consumer demand would have been on the days the inventory was not available on the shelf. Without this more accurate prediction of the actual daily demand we will certainly make poor replenishment decisions, creating inefficiencies upstream which reflect themselves in any planned inventory allocations.

The improved data usage also drives value upstream into manufacturing. According to a McKinsey & Company report, manufacturers can improve their demand forecasting and supply planning by the improved use of their own data[1]. But as we've seen in other domains, far more value can be

1. McKinsey Quarterly, "Are you ready for the era of 'big data'?

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unlocked when companies are able to integrate data from other sources including data from retailers, such as promotion data, launch data, and inventory data.

By taking into account data from across the value chain (potentially through collaborative supply network planning and execution), manufacturers can smooth fluctuating order patterns. The benefits of doing so will ripple through the value chain, helping manufacturers to use cash more effectively and to deliver a higher level of service.

VALUE BASED PERFORMANCE MANAGEMENT

Pursuing improved forecasts is certainly not an academic exercise. Better forecasting translates directly into making better business decisions. Some research indicates a 6% forecast improvement could improve the perfect order by 10% and deliver a 10-15% reduction in unnecessary inventory.

Layering a demand sensing capability onto the overall demand management process will generate significant improvements to a company's core KPI's. Revenue will improve given the ability to sense and react to changes in demand and capturing additional sales. Profit margins will improve by avoiding costly supply chain inefficiencies stemming from demand variability. Cash flows along with higher return on invested capital will improve through the reduction of risk-based inventory positions.

From a supply chain perspective, companies can expect to see improvements in order fulfillment rates, the smoothing of production schedules, as well as reductions in transportation and warehousing costs. Considering that up to 80% of a company's Cost of Goods Sold is actually incurred within a 6 week window of retail replenishment, doesn't it make sense to drive a more accurate near-term window?

For more information contact One Network at:

Tel: +1-866-302-1936 (toll free)
Email: inquiries@onenetwork.com

One Network Enterprises™

Corporate Headquarters US
One Network Enterprises
4055 Valley View Ln, Suite 1000
Dallas, TX 75244
Tel: +1-866-302-1936 (toll free)
+1 972-385-8630
Email: inquiries@onenetwork.com
Web: www.onenetwork.com

International Headquarters
One Network Enterprises (Europe)
PO Box 59383
London NW8 1HH, UK
Tel: +44 (0) 203-28-66-901
Email: europe@onenetwork.com
Web: www.onenetwork.com