Innovations in Business Forecasting: Predictive Analytics

By Charles W. Chase, Jr.

**EXECUTIVE SUMMARY** | There has been a lot of focus on demand signal repositories (DSR) over the past several years with little emphasis on leveraging that information using predictive analytics. The majority of the output has been focused on descriptive analytics, or reporting. If you want to be more proactive than simply basing replenishment on shipment data, you need access to downstream data, analysis, and insights to make decisions that put you ahead of the demand curve. It is about more than just forecasting trends and seasonality, using DSR information for demand sensing to identify and measure market signals, and then using those signals to shape future demand. DSR is a basic foundation but Demand Signal Analytics (DSA) is where real differentiation and value can be gained.

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**CHARLES W. CHASE, JR.** | Mr. Chase is the Chief Industry Consultant and CPG Subject Matter Expert for the Manufacturing and Supply Chain Global Practices at SAS Institute, Inc. He is also the principal solutions architect and thought leader for delivering demand planning and forecasting solutions to improve SAS customers’ supply chain efficiencies. Prior to that, he worked for various companies including the Mennen Company, Johnson & Johnson, Consumer Products Inc., Reckitt Benckiser PLC, Polaroid Corporation, Coca Cola, Wyeth-Ayerst Pharmaceuticals, and Heineken USA. He has more than 20 years of experience in the consumer packaged goods industry, and is an expert in sales forecasting, market response modeling, econometrics, and supply chain management. He is the author of the book, *Demand-Driven Forecasting: A Structured Approach to Forecasting*, and co-author of *Bricks Matter: The Role of Supply Chains in Building Market-Driven Differentiation*. He is also an adjunct professor in North Carolina State University’s Masters of Science in Analytics Program.

Companies, across a myriad of industries, understand the importance of transforming into a demand-driven company. The challenge is to gather, cleanse, and access the vast amount of downstream demand data. Downstream data can be difficult to master and govern without a cohesive approach across the organization. The demand signal repository solution for consumer products companies is an integrated information hub that provides the foundation for breakaway analytics and optimization across the enterprise. Companies aren't utilizing “big data” to its fullest potential. Information sources such as retailer point-of-sale (POS), syndicated scanner sources (Nielsen, Information Resources-IRI, and others), loyalty programs,
consumer panels, and social media as well as ERP software from SAP, finance, and internal systems are all available to drive powerful analytics. Downstream consumption data are now more widespread, with many retailers sharing POS data with consumer products companies on a daily basis and, as a result, expecting enhanced knowledge from their suppliers.

There are challenges to becoming a demand-driven organization. Many of the data sources are new for most companies to manage, so ownership, expertise, and governance are important. Many executives say that their organizations are still in the basic stages of data integration and cleansing due to data quality and internal lack of skills about how to maximize analytic benefits. In today’s business environment, there are significant financial implications to ineffectively managing all this “big” data. These challenges can take the form of higher costs and lower revenue due to conditions such as non-optimized inventory, ineffective demand planning, strained product launches, and higher out-of-stocks.

The successful implementation of a demand signal repository, supercharged by demand-signal analytics, is dependent upon managing POS and syndicated scanner data effectively, and complementing it with specific internal data attributes, such as the company’s product hierarchy. This exercise makes the POS and syndicated scanner data a more robust source of information to analyze with more dimensions that can be “sliced and diced” to gain more actionable insights. This type of data attribute comes from internal corporate systems, local repositories, as well as spreadsheets. Furthermore, it is usually manually maintained, and thus not subject to good data governance disciplines.

WHAT ARE DEMAND SIGNAL REPOSITORIES?

A demand signal repository (DSR) is a data warehouse designed to integrate and cleanse demand data, and leverage that data by consumer goods manufacturers, automotive manufacturers, electronics manufacturers, Pharmaceuticals, and others to service retailers and end user customers efficiently. The focus has been on cleansing the data and synchronizing POS and syndicated scanner and internal (shipment/replenishment) data, which allows companies to provide business users with a more complete view of their retail performance. The repository itself is a database that stores the information in a format that allows for easy retrieval of information so that users can quickly query the database to identify what’s selling, where, when, and how. Identifying marketing opportunities, “demand performance,” and out-of-stock (OOS) along with control tower tracking and monitoring are the key requirements.

Leveraging that data to perform predictive analytics (DSA) is where the real benefits (innovation) of such applications actually leverage POS within their data model to help identify both current and potential impact from the perspective of sales, marketing, and demand planning. With the right architecture, DSR will continue to grow with the business needs. It will be leveraged across multiple business groups including category management, supply chain management, inventory management, promotion and event management, sales, marketing, and more.

Gartner defines demand signal repositories (DSRs) as centralized databases that store, harmonize attributes, and organize large volumes of demand data such as point-of-sale (POS) data, wholesaler data (electronic data interchange—EDI), inventory movement, promotional data, and customer loyalty data for use by decision support technologies (category management, account team joint value creation, shopper insight analysis, demand planning forecast improvement, replenishment, and so on.)

According to Steve Steutermann, Vice President Research, Consumer Products at Gartner, Demand Signal Visualization (DSV) provides companies with faster decisions and scenario modeling for outcomes and accurate decisions. Furthermore, Demand Signal Analytics (DSA) combines DSV with predictive analytics, allowing companies a real-time, root-cause visualization and exploration system. DSR/DSV/DSA is at the heart of being demand-driven. The fact is this: to reap the maximum benefit from a true Demand-Driven Value Network (DDVN) takes commitment and a well-conceived plan, which requires a best-in-class Demand Signal Repository (DSR) at the core. Although, at its early stages of maturity, the Demand Signal Analytics market is hot, and there is no end in sight for how far it will grow.

BENEFITS OF DSR COMPLIMENTED WITH DSA

The augmentation of DSR data into the process improves visibility and control. POS and syndicated scanner
Data can be a tremendous asset when used properly. By integrating POS data with company-specific attributes, manufacturers can leverage that data by collaborating more effectively across the organization and with their retailer (customer) networks. POS data can then drive commercial and operational improvements, such as:

- Improving demand forecast accuracy, and enhancing demand sensing and shaping activities,
- Reducing out-of-stocks,
- Sensing product category changes more effectively,
- Improving evaluation of new product information via integration of sentiment analysis,
- Increasing trade promotion effectiveness, and
- Lowering inventory and safety stock levels.

**WHAT ARE USERS LOOKING TO GAIN?**

Users are looking for easy-to-use visualization tools with predictive analytics capabilities to uncover market opportunities with the ability to more efficiently synchronize demand and supply to take advantage of the information stored in their DSRs. If they can't, then they have a point solution that is proprietary, and not a true DSR. An open architecture should have an intuitive point-and-click user interface with strong visualization capabilities that lets users easily get reports to help them understand their sales, manage category and brand information, and more. Users should be able to easily drag, drop, and drill into information. They should be able to pull data from multiple data sources, share reports securely, and create alerts. In addition, users that have specific job requirements, such as price elasticity or analyzing promotional ROI that aren't handled in their DSR, require an exploratory capability that uses predicative analytics that leverages POS/syndicated scanner and shipment/replenishment data. Alerts combined with predictive exploratory capabilities, using visualization, will allow users to pinpoint areas of the business that require immediate attention. The goal of a DSR is to provide faster access to more information, improve retailer relationships, maximize ROI, streamline internal efficiencies, improve performance at all stages of the supply chain, and support multiple departments and teams. However, most DSRs fall short of their promise by providing control towers (dashboards) and descriptive reporting to monitor and track their business year after year with virtually no predictive analytics to uncover insights into the data that are actionable.

**WHY IS IT IMPORTANT?**

If you want to be more proactive than simply basing replenishment on shipment data, you need access to downstream data, analysis, and insights to make decisions that put you ahead of the demand curve. There is more to it than just forecasting trends and seasonality. Demand sensing is about identifying and measuring market signals, and then using those signals to shape future demand. According to Steve Steutermann, Research Vice President at Gartner (March 2014):

> Consumer products companies continue to face an uncertain global economy, with an expectation that demand volatility will continue to increase and revenue growth will continue to be challenging. In this scenario, increasing revenue growth means finding new markets, increasing market share, and improving on-shelf availability (OSA) of products sold. Supply chain leaders that can measure OSA and collaborate with retailers to improve shelf availability and manage inventories have an advantage versus those CP (Consumer Products) manufacturers that cannot use customer data to improve OSA.

Effectively using customer data requires making an investment in a demand signal repository (DSR) to harmonize and cleanse POS data so that it is usable for data analytics. Demand signal analytics using consumption data (POS/Syndicated Scanner), and inventory and shipment/replenishment data are today examples of using “structured” data. While the term “downstream data” is most often connected to consumption and inventory data, unstructured data, like loyalty data, social sentiment, consumer perception attitudinal data, are starting to be used for targeting consumers, shaping demand, and improving new product launch effectiveness.

**WHAT IS THE CORE OF DEMAND SENSING?**

Demand sensing and shaping are common terms that have been used loosely over the past several years with different definitions depending on the industry and purpose. The most common definitions are associated with the consumer product goods (CPG) industry. Demand sensing,
especially in recent years, has come to denote the use of granular downstream sales data (sales orders, preferably POS data) to refine short-term demand forecasts and inventory positioning in support of a one- to six-week supply plan. It is slowly being expanded to cover medium-term operational and inventory replenishment plans that require a one- to eight-month demand forecast. Now, it also includes long-term strategic forecasting and planning (two years into the future and beyond). The term demand shaping often describes the measuring of the relationships of customer (or consumer) demand with sales promotions and marketing events or price discounts, and then using those influence factors to shape future demand. These new, much broader definitions and needs for demand sensing and demand shaping, have been at the forefront of many conversations with senior executives across all industries globally.

Demand sensing is the translation of downstream data with minimal latency to understand what is being sold, who is buying the product (attributes), and how the product is impacting demand. Overall, there are three key elements that define demand sensing:

1. **Use of downstream data (for demand pattern recognition).** This requires the ability to collect and analyze POS data across market channels, geography, and so on to understand who is buying what product and in what quantities. Those demand signals measured are not just traditional demand signals, such as trend and seasonality. Demand signals also include price, advertising, sales promotions, in-store merchandizing (e.g., features, displays, feature/displays, temporary price reductions—TPRs, weighted distribution), economic factors, and others.

2. **Measuring the impact of demand-shaping programs.** This refers to the ability to analytically measure and determine the impact of demand-shaping activities, such as price promotions, sales tactics, and marketing events, as well as changes in product mix, new product introductions, and other related factors on demand lift. It also includes measuring and assessing the financial impact of demand-shaping activities related to profit margins and overall revenue growth.

3. **Reduced latency/minimal latency.** This refers to the ability of modeling and forecasting demand changes on a more frequent basis (e.g., weekly versus monthly). Traditionally, demand forecasting is done on a monthly or longer basis. Demand sensing requires that the demand be modeled on a shorter-term basis—weekly or even daily, depending on the frequency of new information—and that the changes in demand be reflected on a daily basis (or whatever is the frequency of new information). Demand sensing utilizes downstream data to communicate what products and services have been sold, who is buying the products and services, and the impact of sales and marketing activities on influencing consumer demand. These three demand elements are used to shape future demand, which is translated into demand requirements to create a profitable demand response through internal processes or tools designated to translate this information into demand. Although many companies have developed demand processes to capture volume information and replenishment (shipments) within their supply chain networks, it is the responsibility of Sales and Marketing to capture demand insights in regard to what sales promotions and marketing activities have influenced consumers to purchase their products. The information translated into a demand response by Sales and Marketing is used to adjust prior predictions by shaping future unconstrained demand using “What If” analysis. Traditional sources have yielded structured data, but unstructured sources, such as weather patterns and chatter on social media, are increasingly important sources of insight. (For more detail, see the book, *Demand-Driven Forecasting: A Structured Approach to Forecasting*, by Charles W. Chase Jr., 2nd edition, John Wiley and Son, 2013.)

**WHAT IS DEMAND SIGNAL ANALYTICS?**

Demand Signal Analytics—the next big innovation in business forecasting—uses the combination of visual analytics and predictive analytics to access the data in DSRs to uncover actionable insights with minimal latency. You can think of DSA as being comprised of three layers. The foundational layer is a demand signal repository (DSR), an integrated database of essential (big) data you need to provide insight into sales, marketing, inventory, price, demand performance, and operations. It cleanses, normalizes, and integrates this raw demand data from any source (point-of-sale, wholesalers, social media, weather, EDI, inventory, syndicated scanner data, promotional/marketing, customer loyalty, and more). It works with any data type or source format—from multiple retailers, distributors and their respective disparate systems—to make that data available for retrieval, query, reporting, alerts, and analysis.

The second layer uses visual
analytics to transform the DSR data into demand signal visualization (DSV) to allow for exploration, analysis, and insight that suggest areas of focus, improvement, and action. While typical marketing research only provides answers to predefined questions, DSV provides insight into questions you didn’t initially know to ask.

The third layer brings the DSR and DSV to culmination by combining DSR and DSV creating “Demand Signal Analytics (DSA).” The addition of predictive analytics (forecasting and optimization) complements the descriptive analytics of DSV, and quantifies the direction, size, scope, and variability of supply chain replenishment.

Using Demand Signal Analytics, companies can produce forecasts automatically, with the ability to modify models interactively without programming. This makes large forecasting projects manageable, requiring less manual input, so analysts focus on the most important forecasts. Your forecasts will better reflect the intricacies of the business, and the drivers of the behavior being forecast. DSAs automatically build the most appropriate model for your data, delivering forecasts that are as accurate as possible for the behavior being forecast. Figure 1 illustrates a typical interactive visualization combined with predictive analytics allowing the demand planner to review both demand and replenishment by combining POS and replenishment data.

**KEY BENEFITS**

1. Optimize data management no matter the source: Always have access to the data you need, from legacy systems to ERP applications to data stored in Hadoop, from virtually any hardware platform or operating system. New sources can be easily added and security is centrally managed at the user, department, or enterprise level. You’ll get improved productivity using a standard interface for building and documenting work. The result is consistent, timely data that lead to improved accuracy and confidence.

2. Unlock insights with visual data exploration: Give yourself a competitive advantage and make better, more impactful decisions using all of your strategic data investments. The visual analytics component empowers business users to conduct thorough exploration on all available data quickly without requiring them to know sub-setting or sampling techniques. By using all of the data available, users are able to clearly view all options to make more accurate decisions faster.

**SUMMARY**

The race is on among companies to deploy the capabilities required to convert increasing large, complex, disparate sets of downstream data into retail customer, shopper, and consumer insights that can enable improved decision making and execution across the organization. The transformation...
from DSR to DSV and ultimately DSA will require leadership, a strategic vision, a road map of priorities, and the ability to execute against the organization’s strategy. Achieving best-in-class status across every measure could merely mean adding unnecessary cost and complexity. What’s important is to invest in people, process, analytics, and technology improvements that are valued by customers. Leaders make conscious trade-offs, with an understanding that it may be appropriate to have benchmarks that are at par with industry averages while, at the same time, having other measures that reflect best-in-class outcomes. Now that many companies have created DSRs, to move to the next level will require the migration to DSV, and then, ultimately, to DSA. Until those companies implement DSV/DSA, they will not have the capabilities to take full advantage of all the “big” data collected, cleansed, and loaded into their DSRs. In order to take full advantage of their DSRs, companies will need to add a second layer of DSV combined with a third layer of DSA. With DSA, companies can get a near real time picture of retail store level sales and inventory replenishment trends while identifying potential challenges as well as market opportunities. The entire organization can take advantage of the predictive intelligence of DSA by easily visualizing (using DSV) big data libraries of facts and measures at the lowest granularity across account hierarchies, category/item hierarchies, and geographical hierarchies. In addition, DSA can deliver targeted alerts to enable exception-based processes and workflow.

Finally, most DSAs should come with a set of pre-packaged reports, dashboards, and easy-to-use exploration capabilities designed to support demand management, brand management, category management, and product performance along with score carding capabilities that accelerate time to value.

(info@ibf.org)
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—Keyamma Garnes
Director of Demand Planning, ESTEE LAUDER

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