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Using Big Data to Enhance Demand-Driven Forecasting and Planning

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EXECUTIVE SUMMARY | Big data is a popular term used to describe the exponential growth, availability, and use of information, both structured and unstructured. Much has been written on the big data trend and how it can serve as the basis for innovation, differentiation, and growth. Companies using real information to sense demand signals and respond quickly to changes in demand can confidently cut inventory, reduce working capital requirements, and free up cash.

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. 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. 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 is the author of the book, Demand-Driven Forecasting: A Structured Approach to Forecasting, and co-author of Brick Matter: The Role of Supply Chains in Building Market Driven Differentiation. He is also an adjunct professor in the North Carolina State University, Masters of Science in Analytics Program.

Big data, what is referred to as the vast quantity of both structured and unstructured information that is now available as a result of the Internet, can be manipulated in ways never before possible, and is becoming the backbone of corporate performance and economic growth. Big data is the oil of the information economy that needs to be treated as an economic asset. If not, companies are condemned to confirm the old witticism that a skeptic knows the price of everything and the value of nothing. Yet the value of big data is not well understood.

Globally, companies are starting to realize that no matter what industry they are in, one of their most precious assets is their data. If harnessed correctly, the data can unleash new forms of economic value. However, putting a price tag on data is essential. Otherwise, the information will be undervalued, and the potential for further developing and monetizing big data may not be fully realized.
Companies are also finding that big data doesn’t necessarily translate into easy success. Furthermore, there is no real means for companies to calculate the true value of their data. To further complicate this situation, according to The Wall Street Journal’s technology reporter Shira Ovide, roughly 44% of information technology professionals surveyed recently said that they had worked on big data initiatives that were eventually scrapped or put on hold. As a result, the value of information captured today is increasingly put to use for reporting purposes (descriptive analytics), rather than the primary purposes for which it was collected (predictive analytics). With big data, information is more potent, and it can be applied to areas unconnected with what it initially represents.

Furthermore, supply chain executives identified data and analytics as two of their top four most important supply chain challenges, according to interviews conducted by Lora Cecere, the editor of the online website Supply Chain Insights LLC. Two out of the top four challenges that supply chain executives identified are access to data and actionable analytics. (See Figure 1) Gaining insights and creating actionable analytics from huge quantities of data will require technology and high performance analytics (to take advantage of the parallel and grid processing power, and in-store memory). The challenge for companies will be staying ahead of the technology in a cost-effective manner, and developing organizational processes to effectively utilize the huge amounts of data and consume the information into their organizational decision making processes.

During interviews (75 in total) with supply chain executives, it was found that their top focus area is improving their demand forecasting and planning process. (See Figure 2) Lora Cecere and Charles Chase conducted interviews in 2012. Other recent surveys found senior executives and managers believe big data to be a forecasting priority for the future. Those same executives plan to make an investment in a new demand forecasting and planning solution in the near future. However, many supply chain executives have substantial concerns regarding the costs of the technology, and the requirements essential to make an informed adoption decision for their individual needs while considering costs versus capabilities. They also have concerns regarding change management requirements for adoption of new technology within their organizational processes. To be more specific, supply chain executives will have to overcome the challenges associated with big data. Those challenges are:

Data versus Actionable Information. Big data enables mining of huge quantities of data. The challenge is converting this massive amount of data into actionable (or usable) information that the organization can absorb, understand, and use effectively to make better informed decisions. There are two critical elements for success:

a. Having a good demand forecasting and planning process in place before technology adoption. This also includes having the combination of statistical skills and domain knowledge. The biggest gap still today in the demand forecasting discipline is the lack of statistical skills, not to mention having the correct consumer and market acumen. This is accentuated by having demand planners reporting into upstream operations planning, rather than downstream in marketing closer to the customer. Technology layered on top of a poor process only solidifies poor performance. Leading companies understand that they cannot just invest in these technologies without adequate organizational processes in place.

b. Having an organizational structure that can understand and integrate the information into its decision-making processes will be critical. This requires creating a learning organization where the learning system is part of the company’s future continuous improvement practices. Rules-based ontologies, sentiment analysis, learning algorithms based on industry benchmarking in the cloud, and real-time learning demand-driven systems for demand planners are all possibilities. Within 10 years, companies will systemically test and learn based on real-time data, while today’s response is a fixed and often lack luster response based on historic demand data alone. The demand forecasting and planning process of the future will listen, test, and learn in real time using big data and high performance analytics.

Consumer/Customer Orientation. The primary reason for investing in data, analytics skills, and technology is to improve supply chain efficiencies, not just operational performance. We need to redefine the term supply chain to include the commercial (sales/marketing) side of the business. Become more outside-in focused and think market-to-market, rather than supplier forward (inside-out focus). This includes improving demand forecast accuracy, reducing demand variability, and improving supply chain visibility from the customer back to the supplier. Understanding
Figure 1 | Top 4 Elements of Supply Chain Management Pain for Respondent

<table>
<thead>
<tr>
<th>Element</th>
<th>Top Areas of Pain for Respondent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to get data</td>
<td>41%</td>
</tr>
<tr>
<td>Knowledge &amp; understanding of supply chain among executive team</td>
<td>34%</td>
</tr>
<tr>
<td>Quantity and frequency of new business requirements</td>
<td>32%</td>
</tr>
<tr>
<td>Actionable analytics</td>
<td>32%</td>
</tr>
<tr>
<td>Shortening lead-times</td>
<td>30%</td>
</tr>
<tr>
<td>Dirty data</td>
<td>25%</td>
</tr>
<tr>
<td>On-time delivery</td>
<td>25%</td>
</tr>
<tr>
<td>Talent: knowledge and availability</td>
<td>23%</td>
</tr>
<tr>
<td>Software usability</td>
<td>18%</td>
</tr>
<tr>
<td>Supply chain finance (ability to get at and use financial data in the supply chain decisions process)</td>
<td>14%</td>
</tr>
<tr>
<td>Secure online communications with customers and vendors</td>
<td>2%</td>
</tr>
<tr>
<td>Other</td>
<td>2%</td>
</tr>
</tbody>
</table>

Source: Supply Chain Insights LLC, Logility (Aug-Sept 2012)
Base: Distributors, Manufacturers, Retailers (n=44)
Question: When it comes to supply chain management, which of the following are the top 3 elements of business pain for you personally? Select no more than 3.
Note: Elements #3 and #4 above are both considered within the “top 3 elements” because they share the same percentage.

Figure 2 | Supply Chain Focal Points for Next 2 Years

<table>
<thead>
<tr>
<th>Focal Point</th>
<th>Total</th>
<th>Primary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improving demand planning</td>
<td>74%</td>
<td>23%</td>
</tr>
<tr>
<td>Saving costs</td>
<td>70%</td>
<td>21%</td>
</tr>
<tr>
<td>Shortening cycles</td>
<td>66%</td>
<td>21%</td>
</tr>
<tr>
<td>Network design</td>
<td>62%</td>
<td>8%</td>
</tr>
<tr>
<td>New product launch effectiveness</td>
<td>48%</td>
<td>10%</td>
</tr>
<tr>
<td>Channel sensing</td>
<td>30%</td>
<td>3%</td>
</tr>
<tr>
<td>Revenue management</td>
<td>26%</td>
<td>7%</td>
</tr>
<tr>
<td>Other</td>
<td>18%</td>
<td>7%</td>
</tr>
</tbody>
</table>

Source: Supply Chain Insights LLC, Voice (April 2012)
Base: Supply Chain Executives—Total Sample (n=61)
Questions:
1. What do you expect to be your primary focus on your supply chain over the next 2 years? Please select one.
2. What other supply chain element, if any, will you be focusing on over the next 2 years? Please select all that apply.
and uncovering market opportunities are the first steps in the new market-driven process. That requires data, analytics, and technology to perform on a large scale across thousands of SKUs (Stock Keeping Units), across markets, channels, and key customers. By default, this new focus will improve forecast accuracy, thus improving customer service levels, while lowering inventory costs, waste, and working capital. In fact, a large percentage of companies today are placing greater importance on data and analytics to drive growth, rather than merely cutting costs. It’s all about making tradeoffs based on profit, sustainability, and customer service, rather than just costs. The use of analytics helps identify key elements of the product-service bundle customers that appear to be most important.

Eliminating Information Silos. Past investments in enterprise technologies, such as CRM, supply chain management, and/or operational supply chain software, have created information silos at many organizations. By learning how to turn big data into information and actionable insights, companies can better integrate information residing in disparate data marts supporting organizational areas, such as sales, marketing, purchasing, operations, and distribution. Effective performance will come from combining these informational silos into one single enterprise data warehouse.

Sales & Operations Planning. Best-in-class companies are breaking down the silos with big data by sharing information across the organization, improving collaboration, and sharing common performance metrics. Combining and integrating data marts from CRM, supply chain management, and operational supply chain solutions will enable a better understanding of the market-to-market and supplier-to-supplier’s supplier processes. Further, incorporating pricing, sales promotions, in-store merchandising, customer inventory, and risk as decision factors within the S&OP and IBP (Integrated Business Planning) processes provides greater understanding and insights.

Technology Can Do It Better and Faster. Automation is the key enabler of any local big data application for one reason only, which is scalability. If you combine retailer and manufacturer data across multiple markets, channels, and categories, there is simply too much information for people to review daily, let alone make sense of it to gain actionable insights. The ability to absorb and comprehend all the information quickly becomes overwhelming. On the other hand, technology helps if it is specifically designed to handle the routine repetitive tasks associated with calculating volumes of data, seeking complex correlations, finding meaningful patterns, and publishing daily reports and outputs for upstream applications and execution systems.

This has a natural extension related to reduced latency and human productivity. Anything technology can do to free people from mundane repetitive work and tasks will increase efficiency. Furthermore, unloading repetitive work to technology frees demand planners and supply chain professionals to focus on strategic and tactical initiatives, such as planning sales promotions or changing process design to improve cost efficiency. It is not just theoretical or about descriptive analytics (reporting past results), it’s about predictive analytics (predicting what will happen in the future). Those companies that have successfully implemented big data applications to improve forecast accuracy have done so by proactively sensing demand signals and routinely shaping future demand (using “What If” Scenario analysis), thus recognizing improvements in demand planning performance.

A Structured Process Supported by Technology. Big data applications can only be transformational when used in a systematic and structured way to drive core operational activities across the enterprise. Though many companies store large quantities of retailer data in demand signal repositories, few solutions use this data for more than account-level business intelligence inquiries, such as trade promotion management or retail compliance. While useful for reporting, these systems are far from transformational. On the other hand, big data applications used by skilled analysts in the supply chain can be truly enterprise-wide, encompassing most if not all items and locations performing a structured daily analysis of demand signals to power core activities such as the preparation of short-, medium-, and long-term forecasts; replenishment; inventory management; transportation planning; and supplier visibility. Since daily reporting and review of key performance indicators results are essentially impossible using legacy technology, more robust applications are required. For example, sudden input swings in demand for even a small number of items risk causing disruptive shocks (“Bull Whip” effect). Another reason why big data applications are designed with layers of safeguards is to ensure that results are always consistent and meaningful. Software developers carefully guard these safeguards as core intellectual property because it is instrumental to make use of big data,
and it works. Some of the world’s largest consumer packaged goods (CPG) companies with the most respected supply chains already rely on big data applications to create and publish daily forecasts directly to upstream supply planning systems for the majority of their business.

Technology is required to access big data and facilitate actionable information. Using big data to create an agile supply chain that thrives in the face of demand volatility has a significant impact on a company’s balance sheet by reducing inventory costs, waste, and working capital while increasing revenue and profitability. Despite market volatility, companies using real-time information with minimal latency to sense demand signals and shape future demand can respond quickly to changes in demand and meet that demand with a more cost-effective supply response, reducing working capital, and freeing cash. CPG companies often see a 15% to 30% reduction in inventory costs, which for large manufacturers can represent hundreds of millions of dollars. Furthermore, better visibility to future demand lowers operating costs. Getting products in the right place the first time means fewer instances of transshipments across warehouses, reducing freight expedites, and overall costs. Improved customer service levels translate into fewer lost sales and higher revenues, which can be especially important in more mature, lower-growth markets such as North America and Europe. In my experience, large CPG companies have been able to capture lost sales through the reduction in backorders and save money by cutting inventories by millions of dollars on a monthly basis. Closing the gap between backorders and actual demand is even more important as the economy begins to recover from the great recession.

BIG DATA FOR SENSING, SHAPING, AND TRANSLATING FUTURE DEMAND

Sensing market signals, translating them into demand signals, and using those demand signals to shape future demand are allowing companies to create a more accurate demand response. This new market-driven process is becoming an integral part of the demand management process. The new demand-driven management planning process is not only becoming the accepted best-in-class approach across all industries, but it has also proven to benefit from big data by supporting the identification of new market drivers and key performance indicators that influence consumer demand (consumption) patterns, thereby improving the overall efficiencies of the supply response. Big data has the potential to improve our ability to expand demand-shaping activities by influencing future consumer behavior while creating alignment between demand and supply (fitting supply to demand, not demand to supply).

Having access to big data alone will not benefit an organization unless it has the internal analytical expertise, business processes, and technology to collect, sense, shape, and respond to demand signals. Delivering products or services to customers is not a one-way relationship. It requires constant monitoring, feedback, and analysis to manage costs while improving alignment and profitability (trade-offs) between what is ordered by customers and what can be delivered. Large volumes of data make this analysis challenging and require decision support applications to obtain and prepare data to sense demand signals, shape future demand (trade-offs), develop the appropriate demand response, and synchronize that response with the most cost-effective supply response.

Large amounts of data make demand sensing and shaping challenging, thus requiring advanced decision support tools to access, stage, and standardize the data. Sensing demand signals, interpreting the results, and developing the appropriate demand response can only be obtained using large-scale enabling technology. Through the use of advanced analytical techniques, such as high-performance analytics, and big data enabled by advances in hardware and software provide companies with the ability to create strategic plans while executing tactical campaigns and synchronizing demand and supply. Organizations that have the capabilities to sense demand signals, shape future demand, and translate demand can expect to have improved alignment of resources, infrastructure, and a more real-time flow of information to support customer demand and profitability.

CONCLUSION

As supply chain executives stand at the edge of this new era of big data and look forward, what they see is a new world of opportunities. Big data applications will shape our lives in ways that are hard to comprehend; but one thing is certain, the processes, analytics, and technology requirements of big data will undoubtedly transform business and society. So the real challenge is not that companies are acquiring large
amounts of data (because they are clearly already in the era of big data). It’s what they do with their big data that matters. The hopeful vision for big data is that organizations will be able to harness relevant data and use it to make the best decisions.

Technologies today not only support the collection and storage of large amounts of data, they also provide the ability to understand and take advantage of its full value, which helps organizations run more efficiently and profitably. For instance, with big data and big data analytics, it is possible to:

- Sense demand signals and shape future demand for millions of SKUs as well as determine optimal prices that maximize profit and reduce inventories, while maintaining higher customer service levels.
- Mine consumer loyalty data for insights that drive new sales and marketing strategies for customer retention, campaign optimization, and next best offers.
- Generate retail coupons at the point of sale (POS), based on the customer’s current and past purchases, to ensure a higher redemption rate.
- Send tailored recommendations to mobile devices at just the right time, while customers are in the right location to take advantage of offers.
- Analyze data from social media to detect new market trends and changes in demand.
- Determine root causes of failures, issues, and defects by investigating user sessions, network logs, and machine sensors.

A number of recent technology advancements are enabling companies to make the most of big data and big data analytics, such as cheap, abundant storage and server processing capacity, faster processors, and affordable large-memory capabilities, such as Hadoop. New storage and processing technologies are designed specifically for large data volumes, including unstructured data. Parallel processing, clustering, MPP (Massive Parallel Processing), virtualization, large grid environments, high connectivity, and high throughputs are making it possible to process big data faster. Cloud computing and other flexible resource allocation arrangements are becoming more desirable and cost effective. Big data technologies not only support the ability to collect large amounts of data, they also provide the ability to understand it and take advantage of its value. The goal of all companies with access to large data collections should be to harness the most relevant data and use it for optimized decision making.

It is very important to understand that not all data will be relevant or useful. But how can companies find the data points that matter most? It is a challenge that is widely acknowledged. Most businesses have made slow progress in extracting value from big data, and others attempt to use traditional data management practices to big data, only to learn that the old rules no longer apply.

REFERENCES

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— Elizabeth Tambongco, Business Planning Manager, THE PUREFOODS - HORMEL CO

“I loved it! The structure was outstanding. The instructor was confident. He knew the topic extremely well.”
— Sameera Al-Masool, Corporate Planning, SAUDI ARAMCO

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