Demand Planning Maturity Model

Strategies for Demand-Driven Forecasting and Planning

A joint paper by Purdue University and SAS.
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Executive summary

In today’s unstable economy, many organizations are finding out that they have inadequate processes to handle demand planning, and traditional methods of predicting demand aren’t efficient in a fluctuating market. What are the characteristics of a successful demand forecasting system? What steps do organizations need to take in order improve their demand management? A recent study conducted by SAS and Purdue University reveals some answers.

The study uses three key criteria to evaluate companies’ demand forecasting abilities and distinguish best-in-class/leading companies from laggards:

■ Average forecast accuracy at the product family level.

■ Customer service level in terms of on-time and completion per customers’ requests.

■ Organizations’ satisfaction levels with forecasting processes and systems.

Analyses of companies’ capabilities clearly demonstrated huge maturity gaps between leaders and laggards in terms of maturity of organizational processes, functional capabilities and technology enablers. Best-in-class organizations consistently shared many characteristics, including:

■ Ability to create a single demand forecast with input from multiple roles (e.g., sales, marketing, finance and others) within the organization.

■ Ability to include causal factors (e.g., weather, natural disasters, competitor actions) into demand forecasts.

■ Ability to model events (e.g., sales promotions, marketing events, economic activities).

■ Ability to allocate forecasts down to the stock keeping unit (SKU) level.

■ Ability to shape demand using what-if analysis and scenario planning.

Best-in-class companies also consistently reported significant improvements in key performance metrics over a period of two years, such as: improvements in inventory turns, order fulfillment rates, forecast accuracy at both the product family and SKU levels, as well as improvements in gross profit margins – indicating a need for a proactive, process view of demand forecasting.

The paper makes specific recommendations for organizations striving to move up the demand forecasting maturity curve by providing them with an assessment framework to evaluate their current stage, and highlighting the characteristics common to best-in-class companies.
Introduction

Organizations across all disciplines are on a journey of self discovery. Troubled economic times are forcing them to discover what they are made of, what their strengths are and where their weaknesses lie. As Warren Buffet once said, “You only find out who is swimming naked when the tide goes out.”

As these organizations ask themselves tough questions, many are discovering that their demand planning processes are inadequate to deal with today’s market volatility because past trends are no longer an indicator of the future. Intuitively sensing future demand is no longer adequate; trends and seasonality are now being distorted by changes in the economic landscape. Understanding the effects of sales promotions, marketing events and economic factors is becoming critical as organizations strive to shape demand to get the most value out of every marketing dollar spent.

Additionally, traditional demand planning and forecasting systems are ineffective in supporting the level of organizational alignment, collaboration and responsiveness required to deal with demand fluctuations of an unstable market. Companies proficient at demand forecasting recognize this and know that demand forecasting must be a companywide endeavor, traversing company politics and functional domains.

So what are the specific characteristics of a successful, companywide demand forecasting endeavor?

To explore this question, SAS, in association with Purdue University, conducted a study to assess the current state of demand forecasting and planning systems. More than 180 forecasting managers, planners and supply chain executives from 173 unique companies participated in the study. This paper presents the survey findings regarding the challenges faced, strategies deployed and successes achieved. Additionally, it explores the differences in processes, technologies and strategies between leading, best-in-class companies and those that are less successful.
Top pressures driving the focus on demand forecasting and planning

Study participants revealed that the drive toward cost efficiencies, need to improve customer service levels and demand volatility were the top three pressures driving investment and interest in demand forecasting and planning.

Figure 1 illustrates the key pressures driving companies across all industries to improve their demand planning and forecasting practices.

While it was no surprise to see all survey respondents mention the need for cost efficiency and customer service as the primary drivers forcing companies to re-examine their demand management practices, it was interesting to note that manufacturing companies considered cost efficiency to be their top driver while nonmanufacturing companies focused more on customer service.
Manufacturing: Top Concerns for Demand Management Performance

- Shrinking profit margins requiring cost efficiencies: 57%
- Need to improve customer service levels: 41%
- Volatile market resulting in high uncertainty in demand: 33%
- Utilizing expensive assets with maximum efficiency: 30%
- Pressure from stockholders to reduce inventory: 27%
- Inability of supply to meet demand: 25%
- Global supply chains resulting in increased lead times: 22%
- Competition from global brands: 17%
- Number of trading partners increasing: 4%

Figure 2

Nonmanufacturing: Top Concerns for Demand Management Performance

- Need to improve customer service levels: 52%
- Shrinking profit margins requiring cost efficiencies: 43%
- Volatile market resulting in high uncertainty in demand: 34%
- Utilizing expensive assets with maximum efficiency: 26%
- Inability of supply to meet demand: 15%
- Competition from global brands: 12%
- Global supply chains resulting in increased lead times: 7%
- Number of trading partners increasing: 7%
- Pressure from stockholders to reduce inventory: 5%

Figure 3
In light of increasing product commoditization and shrinking product life cycles, one would expect manufacturers to be more focused on the customer. However, research showed that while manufacturers are increasingly realizing the need for improved customer service, the need to be more cost efficient is still their primary driver. In contrast, nonmanufacturing companies are more concerned about customer service.

Many factors explain this difference. One of the primary reasons is a much higher level of investment in fixed assets by manufacturing companies compared to nonmanufacturing companies. However, the most significant factor is that many manufacturing companies still consider their downstream channel partners (i.e., retailers and wholesalers) to be their customers, not end-consumers.

Further breakdown of data confirmed that respondents from more customer-facing industry segments, such as retail, ranked the need to meet customer service goals as a larger concern when assessing performance of their demand management systems.
Key challenges to demand management and strategic actions

Industry studies have shown that, on average, companies with more accurate demand forecasting and planning capabilities have less inventory, better perfect-order ratings and shorter cash-to-cash cycle times than others. Surveys have also shown that demand forecast accuracy leads directly to higher earnings per share (EPS), higher return on assets and improved profit margins.

So what prevents companies from accruing these gains?

Respondents in the SAS survey named a number of challenges hampering their ability to manage demand (see Figure 4).

<table>
<thead>
<tr>
<th>Biggest Challenges Managing Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Getting timely customer demand data</td>
</tr>
<tr>
<td>New product forecasting</td>
</tr>
<tr>
<td>Non-normal demand distributions making traditional forecast modeling difficult</td>
</tr>
<tr>
<td>Functional silos preventing efficient demand shaping</td>
</tr>
<tr>
<td>Lack of an internal forecasting process</td>
</tr>
<tr>
<td>Getting sales force input</td>
</tr>
<tr>
<td>Inflexible supply and inventory processes making it difficult to recover from poor demand plans</td>
</tr>
<tr>
<td>Previous demand management initiatives failed to deliver sufficient improvement</td>
</tr>
<tr>
<td>Customers/trading partners are not collaborating with us</td>
</tr>
</tbody>
</table>

n=184  Source: Purdue University & SAS Demand Management Survey 2008

Figure 4 illustrates the top challenges and the associated level of importance respondents assigned to each challenge

Interestingly, there was a resounding consensus across all industries that access to timely consumer data and new product forecasting were their biggest challenges to effective demand management.
As demand volatility has increased with the number of choices available to customers, so has the importance of access to real-time consumption data. It has become even more relevant now that companies are facing difficult economic conditions the likes of which they have never before experienced. Increasing velocity of promotions as companies try to lower their inventory levels, lower consumer confidence and increased competitive activity have all led to much higher demand volatility. Forecasters can’t rely exclusively on historical patterns as a good predictor for the future, hence the increased focus on effective, real-time access to consumption data for more accurate demand forecasting and planning.

For years, companies have struggled with new product forecasting because of a lack of historical demand patterns. As companies focus more on innovation in both products and services in order to stay relevant to customers in these economic times, it is no surprise to see companies assigning equal importance to new product forecasting (41 percent) and access to consumption data (41 percent).

We asked survey respondents to share some of the key strategies they have deployed to improve their demand management ability (see Figure 5).

**Actions to Improve Demand Management**

<table>
<thead>
<tr>
<th>Action</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improving internal collaboration for creating forecasts, pricing and</td>
<td>52%</td>
</tr>
<tr>
<td>promotion plans, and making mid-course corrections</td>
<td></td>
</tr>
<tr>
<td>Implementing a sales and operations planning process</td>
<td>33%</td>
</tr>
<tr>
<td>Forecasting at the customer level to ensure that customer service</td>
<td>30%</td>
</tr>
<tr>
<td>levels are being met (Either B2B or B2C)</td>
<td></td>
</tr>
<tr>
<td>Creating a tighter feedback loop from actual consumption data</td>
<td>29%</td>
</tr>
<tr>
<td>(e.g., point-of-sale data) to demand assumptions and plans</td>
<td></td>
</tr>
<tr>
<td>Focusing on forecasting new product launches</td>
<td>26%</td>
</tr>
<tr>
<td>Synchronizing demand shaping decisions with product life cycle</td>
<td>22%</td>
</tr>
<tr>
<td>Improving external collaboration to ensure that trading partner inventories and capacities are considered during demand planning</td>
<td>19%</td>
</tr>
<tr>
<td>Focusing on order lead time reduction initiatives</td>
<td>17%</td>
</tr>
<tr>
<td>No actions being taken at this time</td>
<td>9%</td>
</tr>
</tbody>
</table>

*Source: Purdue University & SAS Demand Management Survey 2008*

*Figure 5 shows the key strategic actions taken by respondent companies.*

None of the surveyed companies reported any single action as the answer to their demand management challenges. Though improving internal collaboration was most frequently listed as the top strategy, none of the respondents considered it to be a silver bullet. In fact, they all pointed to taking a multipronged approach with a number of interrelated strategic actions.
A closer look shows a clear alignment between companies’ listed challenges and the top five actions they are taking to improve demand management.

- **Improving internal collaboration** for creating forecasts, pricing and promotion plans to facilitate midcourse corrections addresses the challenge emerging from functional silos and lack of an internal consensus on forecasting processes.

- **Implementing a sales and operations planning (S&OP) process** further supports improving internal collaboration, thus helping alleviate siloed functions and consensus forecasting challenges.

- **Forecasting at customer levels**, whether in a B2B or B2C environment, and creating a tighter feedback loop from point-of-sale (POS) data to demand plans addresses challenges related to non-normal demand distribution, access to customer-demand data and new product forecasting.

### Competitive Benchmarking

#### Requirements for success

The survey attempted to identify characteristics of best-in-class organizations. Three criteria used for evaluating the success of a demand forecasting process were forecast accuracy, customer service metrics and a company’s overall satisfaction with the process. These three criteria were more specifically defined in the survey data as: forecast accuracy at the product family level, customer service levels in terms of timeliness and completeness, and satisfaction with the forecasting process. Examining the survey results across the three criteria distinguished best-in-class companies (demand forecasting leaders) from those needing improvement.

Leaders represented the top 20 percent of total respondents for each of the three criteria. Overall, leaders displayed the following characteristics:

- An average forecast accuracy of 85 percent and above at the product family level.

- An average customer service level of 90 percent and above.

- A satisfaction level of six or above with forecasting processes and systems.

By contrast, laggards, or those companies lower on the demand maturity curve (bottom 20 percent of total respondents), displayed the following characteristics:

- An average forecast accuracy of 65 percent or below at the product family level.

- An average customer service level of 80 percent or below.

- A satisfaction level of five or below with forecasting processes and systems.

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1 Sixteen percent of the total respondents could not be analyzed due to missing values or invalid data.

2 Satisfaction level was measured based on a scale that ran from zero to 10, with zero being “extremely dissatisfied” and 10 being “extremely satisfied.”
Comparison of leaders versus laggards yielded significant differences. Leading companies reported significant improvements in a number of key metrics over a two-year period:

- Five times improvement in inventory turns.
- A 2.3 times improvement in order fulfillment rate.
- A 2.8 times improvement in forecast accuracy at the product level.
- Three times improvement in forecast accuracy at the SKU level.
- Two times improvement in overall performance compared to competitors.
- A 1.7 times improvement in gross profit margin.

Leading companies also consistently reported higher satisfaction levels with their demand management systems compared to laggards. In fact, leading companies were **three times more likely to report satisfaction with their demand management systems than laggards**.

Analysis also revealed a strong correlation between companies’ satisfaction levels and maturity of organizational processes, functional alignment, and sophistication of forecasting and planning tools and technology.
Competitive scorecard

The tables below illustrate how leading organizations differed from the rest of the companies in terms of organizational alignment, process maturity, functional capabilities and technological capabilities. A company aspiring to move up the demand forecasting and planning maturity curve can leverage this research to model itself to be in line with the other leading companies.

Table 1: Maturity of organizational alignment and processes

<table>
<thead>
<tr>
<th>Capability</th>
<th>Leaders (Top 20%)</th>
<th>Laggards (Bottom 20%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create single demand forecasts</td>
<td>63%</td>
<td>26%</td>
</tr>
<tr>
<td>Create multiple demand forecasts</td>
<td>49%</td>
<td>11%</td>
</tr>
<tr>
<td>Formal consensus forecasting</td>
<td>46%</td>
<td>11%</td>
</tr>
<tr>
<td>Integrate order management</td>
<td>46%</td>
<td>17%</td>
</tr>
</tbody>
</table>

Table 2: Functional capabilities

<table>
<thead>
<tr>
<th>Capability</th>
<th>Leaders (Top 20%)</th>
<th>Laggards (Bottom 20%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Include causal factors</td>
<td>20%</td>
<td>9%</td>
</tr>
<tr>
<td>Include promotions</td>
<td>46%</td>
<td>9%</td>
</tr>
<tr>
<td>Model events</td>
<td>51%</td>
<td>14%</td>
</tr>
<tr>
<td>Allocate forecasts to SKU level</td>
<td>46%</td>
<td>11%</td>
</tr>
<tr>
<td>Measure return on forecasting value</td>
<td>37%</td>
<td>6%</td>
</tr>
<tr>
<td>Shape demand using what-if analysis</td>
<td>31%</td>
<td>6%</td>
</tr>
<tr>
<td>Segment demand forecasts</td>
<td>46%</td>
<td>14%</td>
</tr>
</tbody>
</table>

Table 3: Technological capabilities (technologies, tools and techniques used)

<table>
<thead>
<tr>
<th>Capability</th>
<th>Leaders (Top 20%)</th>
<th>Laggards (Bottom 20%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statistical demand forecasting</td>
<td>80%</td>
<td>49%</td>
</tr>
<tr>
<td>Demand analytics and reporting</td>
<td>63%</td>
<td>23%</td>
</tr>
<tr>
<td>Sales and operations planning</td>
<td>66%</td>
<td>26%</td>
</tr>
<tr>
<td>Collaborative planning, forecasting and replenishment</td>
<td>34%</td>
<td>11%</td>
</tr>
<tr>
<td>Tool</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Integrated ERP modules</td>
<td>29%</td>
<td>9%</td>
</tr>
<tr>
<td>Best-of-breed demand forecasting software</td>
<td>37%</td>
<td>11%</td>
</tr>
<tr>
<td>Supply chain management software</td>
<td>23%</td>
<td>3%</td>
</tr>
<tr>
<td>Microsoft Excel spreadsheets**</td>
<td>83%</td>
<td>91%</td>
</tr>
<tr>
<td>Technique</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jury of executive opinion</td>
<td>3%</td>
<td>38%</td>
</tr>
</tbody>
</table>

Percents equal the proportion of survey participants who currently use the specified tools. Statistical tests were conducted to compare leaders to laggards. Green indicates statistically significant differences. ** While these capabilities didn’t show a statistically significant difference, it was worthwhile noting the difference – see below for explanation.
Competitive analysis

Analyses of companies’ capabilities clearly demonstrated huge maturity gaps between leaders and laggards in terms of the maturity of organizational processes, functional capabilities and technology enablers.

Maturity of organizational processes

Leading companies tended to be more than twice as likely to create a single demand forecast based on input from multiple areas within the organization, indicating that these organizations have the maturity to understand the importance of input from marketing, sales and other related groups for accurate forecasting. Leaders consistently reported the inclusion of sales, marketing and financial data (including promotions, marketing events and competitive activity), and factors such as economic conditions into their forecasts.

Figure 6
Functional capabilities

The survey showed leading companies to be four times more likely to measure forecast accuracy at the SKU level than laggards, indicating that these companies have embraced processes and technology that enable them to forecast at any level of the hierarchy, including the SKU level, for accurate demand planning.

Leaders also reported as much as five times the likelihood of performing what-if analysis and scenario modeling to shape demand as laggards, even more when it came to measuring returns. This shows a clear focus on modeling the impact of changes in marketing events, economic conditions, competitive activities and other factors on demand, and therefore, on profitability. Survey respondents corroborated this by reporting that leading organizations were almost six times as likely as laggards to measure return on forecast value.

Figure 7
Technology enablers

Leaders consistently showed use of more sophisticated demand forecasting and planning technology solutions, tools and techniques.

While leading companies reported using statistical forecasting solutions for demand planning, they also understood that traditional demand forecasting and planning solutions are no longer sufficient for sustainable differentiation. Leaders were consistent in the use of applications with more innovative capabilities, such as attribute-based forecasting; advanced analytics for what-if and scenario planning; and best-of-breed forecasting solutions that support cross-functional processes. Thus, these organizations were able to **sense, shape and execute on demand across multiple, functional silos and enterprises**.

The survey revealed that leaders were:

- 3.5 times more likely to use best-of-breed demand forecasting software.
- 2.7 times more likely to use demand analytics and reporting (e.g., simulation, what-if analysis and scenario planning tools).
- Three times more likely to use technology for collaborative/consensus forecasting and planning.
- 2.5 times more likely to use technology supporting sales and operational planning.

![Figure 8](image)

Despite some clear advances in technology use by leading companies, it was interesting to see that **almost as many leaders as laggards are still using Excel/spreadsheets extensively** for demand forecasting and planning (83 percent of leaders and 91 percent of laggards). This could be an indicator that their current technology, no matter how advanced, still lacks the flexibility to create real-time, ad hoc reports and share them across the enterprise in a timely manner.
Leaders also showed continued reliance on their enterprise resource planning (ERP) systems (and ERP-integrated modules) for demand planning, indicating that while most best-in-class organizations have realized the limitations of ERP/supply chain management systems for demand forecasting and planning, some leading companies are still using these technologies, at least in part, to manage demand.

One of the most notable differences between leaders and laggards was reliance on executive opinion in demand forecasting. **Laggards were 12 times more likely to rely on executive opinion** for demand forecasting and planning than leaders who relied more on data and analytics.

## Achieving demand forecasting maturity

As illustrated from the above results, a proactive, process view of demand forecasting is needed. In many cases, the first step toward establishing a more effective demand forecasting endeavor is acknowledging that the process needs attention. Companies that do so are better able to understand their business, readily identify business drivers, better align business capabilities, improve resource distribution, reduce inventory levels, raise customer service levels and diminish product returns. Those companies that overlook the importance of forecasting often reflect a reactive business model because they are only responding to the marketplace, not anticipating it. Those companies preoccupied with hitting a single financial target are not demand forecasting either. Saying that sales volume must increase by 10 percent next year is NOT demand forecasting, nor is making statements such as, “The forecast is not good enough; cook the numbers some more and come back.” Bumping numbers without consideration for how such a bump will be driven is wishful thinking, not forecasting.

The survey findings illustrate the mix of organizational alignment, functional capabilities and technology that companies need to move up the demand forecasting maturity model. Analysis of leading companies also shows that companies that have invested in best-in-class demand planning and forecasting systems, tools, technologies and processes are seeing significant returns.

Envisioning forecasting as an integrative, companywide process is an important step toward improving demand forecasting and demand planning. Similar works by Mentzer, Bienstock and Kahn (1999); Kahn (2001, 2002) and Moon, Mentzer and Smith (2003) provide a foundation on which to build a forecasting process maturity map. Based on more than 620 individual company surveys and 50 in-depth company benchmarking studies across industries, the works of Mentzer et al. (1999); Kahn (2002) and Moon et al. (2003) suggest a valued framework on which to evaluate the forecasting process. Their framework comprises four dimensions: functional integration, approach, systems and performance measurement. Each of the dimensions is further detailed on four levels of sophistication, ranging from worst in class (Stage One) to world class (Stage Four), where each level of sophistication is associated with a specific set of forecasting characteristics.
Common stages of the forecasting process maturity map

Adopting the framework of Mentzer et al., SAS presents a forecasting process maturity map. The proposed forecasting maturity model provides a guideline defining the most common stages in the demand forecasting and planning life cycle of a company, along with recommendations for how a company can move up the maturity curve. Four criteria helping to evaluate the success of a company’s demand forecasting process are:

- **Process integration**: Overall satisfaction with their demand forecasting and planning process.
- **Systems integration**: Implementing the right enabling solution.
- **Performance integration**: A focus on forecast accuracy at product family and SKU levels.
- **Customer integration**: A focus on the customer in terms of using upstream customer data, and concentrating on timely delivery and completeness of orders.

Each of these four integration areas is assessed to determine the appropriate development stage within the context of the following progression:

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning</td>
<td>Evolving</td>
<td>Improving</td>
<td>Best Practices</td>
</tr>
</tbody>
</table>

*Figure 9*

The current demand management survey findings confirmed that the four integration areas collectively contribute to leadership in demand forecasting. However, designing the right combination of the appropriate elements from each integration area is an important factor in creating a successful demand forecasting process. Companies that have low forecast errors and have effectively satisfied their business objectives balance the right elements with a range of practices that span across information systems, business processes, human resources and organizational dynamics, and data resources. Companies with a balanced structured approach, incorporating more sophisticated statistical methods, best demand forecasting practices and enabling technologies are more likely to be satisfied with the overall effectiveness of their demand forecast process than those incorporating either one or none of the recommended integration areas (process, performance, systems and customer). Not surprisingly, those companies deploying sound demand forecasting practices also achieve the narrower business goal of higher forecast accuracy. Those companies – that have invested significant resources in designing a demand forecasting process, purchased the right enabling solution and established links through collaboration with other functional areas within the company – have been the most successful.
**Process integration**

Using this assessment, we can classify laggards as Stage 1-2 (Beginning/Evolving) and leaders as Stage 3-4 (Improving/Best Practices). From our survey findings, we see a strong correlation with the previous works conducted by Mentzer, Bienstock, Kahn, Moon and Smith. For example, Figure 10 outlines the four stages of growth for process integration.

### Process Integration Stages of Development

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beginning</strong></td>
<td><strong>Evolving</strong></td>
<td><strong>Improving</strong></td>
<td><strong>Best Practices</strong></td>
</tr>
<tr>
<td>• Major disconnects between departments (i.e., sales, marketing, finance, operations planning).</td>
<td>• Formal meetings held between sales, marketing, finance and operations planning.</td>
<td>• Integrated communications between sales, marketing, finance and operations planning.</td>
<td>• Complete department collaboration and integration.</td>
</tr>
<tr>
<td>• Multiple forecasting efforts.</td>
<td>• Forecasting isolated to one area, typically in the operations planning area.</td>
<td>• Recognition that the sales and marketing forecast is an unconstrained demand forecast.</td>
<td>• Integrated collaborative forecasts with customers.</td>
</tr>
<tr>
<td>• No accountability for forecast accuracy.</td>
<td>• “Dominated” consensus forecast meetings.</td>
<td>• True consensus forecast process with reconciliation between demand, sales/marketing programs and events.</td>
<td>• Separate forecasting department reporting to a C-level manager.</td>
</tr>
<tr>
<td></td>
<td>• Performance rewards based only on performance contribution of each individual department.</td>
<td>• Forecast champion driving continuous improvements.</td>
<td>• Demand forecasting process is completely integrated with the S&amp;OP process matching demand with supply.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Performance rewards for all people involved in the consensus forecast process.</td>
<td>• Multidimensional performance rewards based on individual performance, as well as corporate performance (KPIs and forecast performance metrics).</td>
</tr>
</tbody>
</table>

*Figure 10*
In our survey findings, improving internal collaboration was the most frequently listed strategy for improving the demand forecasting process. This can be directly related to the process integration for a Stage 3-4 development, or what we refer to as a leader (Improving/Best Practices). Our findings found that leading companies were more than twice as likely to create a single demand forecast based on input from multiple disciplines within the organization, such as marketing, sales and other related groups, which helped to improve forecast accuracy. This is consistent with the findings related to the figure above, where companies that were in the Improving or Best Practices stages of development tend to have a more formalized and open collaboration across all functional groups with the purpose of creating a consensus forecast. We also found that those organizations that did a better job of incorporating input from multiple departments in their baseline forecasts were more satisfied with their demand forecasting results. In fact, satisfied companies were 2.5 times more likely to have processes in place that enabled the creation of a single demand forecast based on inputs from multiple roles; 2.8 times more likely to have the ability to integrate multiple forecasts; and 2.3 times more likely to implement a formal consensus forecasting process. Those same companies were classified as leaders in our survey, further validating the maturity model and Stages 3-4 of development.

**Systems integration**

The study findings confirmed that leaders consistently showed use of more sophisticated demand forecasting and planning technology, solutions, tools and techniques.

### Systems Integration Stages of Development

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning</td>
<td>Evolving</td>
<td>Improving</td>
<td>Best Practices</td>
</tr>
<tr>
<td>• Islands of analysis.</td>
<td>• Interdepartmental system linkage.</td>
<td>• Flexible user interface.</td>
<td>• Open architecture.</td>
</tr>
<tr>
<td>• Poor systems integration.</td>
<td>• On-screen reports.</td>
<td>• Common database ownership.</td>
<td>• Enterprise data integration linkages with major customers and suppliers.</td>
</tr>
<tr>
<td>• Poor systems understanding.</td>
<td>• Periodic system-generated reports.</td>
<td>• On-demand reporting.</td>
<td>• Online collaboration with customers and suppliers.</td>
</tr>
<tr>
<td>• Printed reports only.</td>
<td></td>
<td>• Large-scale hierarchical forecasting capabilities.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Full spectrum of statistical forecasting methods available.</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 11**
While leading companies reported using statistical forecasting solutions for demand planning, they understood that traditional demand forecasting and planning solutions are no longer sufficient. More sophisticated statistical methods are required to capture the effects of sales promotions, marketing events and other causal factors that impact demand. Leaders were consistent in their use of applications with more innovative capabilities—such as attribute-based forecasting, advanced analytics for what-if analysis and scenario planning, and best-of-breed forecasting solutions that support cross-functional processes—allowing companies to **sense, shape and respond to demand across multiple, functional silos and enterprises.**

When it comes to systems integration, we found similar responses that fall into Stages 1-2 for laggards and Stages 3-4 for leaders. (See Figure 11 for more details.) We found that companies with more advanced systems functionality within their demand management systems, such as the ability to model events, include promotions, forecast at any level of hierarchy (including SKU level) and include causal factors (such as weather, CPI index, etc.), tend to be more satisfied than those companies that lack these abilities.

**Performance integration**

Usually the technology systems supporting these functional abilities are more advanced demand forecasting and planning systems, resulting in improved forecasting accuracy and customer service levels, thereby leading to higher satisfaction.

**Performance Integration Stages of Development**

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning</td>
<td>Evolving</td>
<td>Improving</td>
<td>Best Practices</td>
</tr>
</tbody>
</table>

- **Laggards**
  - Accuracy not measured.
  - Forecast performance not tied to measure of accuracy.

- **Leaders**
  - Accuracy measured (typically mean absolute percentage error).
  - Evaluation based on accuracy with no consideration for implications of accurate forecasting.
  - MAPE used with focus on supply chain impact of accuracy.
  - Performance graphed and analyzed.
  - Other statistics are calculated and monitored.
  - Forecast value management (FVA).
  - Forecast exception management.
  - Recognizes external factors affecting forecast accuracy.
  - Treats forecast errors as indications of possible problems.
  - Multidimensional metrics of forecasting performance using balanced scorecards tied to KPIs.

*Figure 12*
Our survey findings support increased focus of leading companies on performance metrics. Per survey results, leading companies were four times more likely to measure forecast accuracy at the SKU level than laggards, showing that these companies have embraced processes, as well as technology, enabling them to forecast at any level of the hierarchy (including SKU level) for accurate demand planning. Leaders clearly demonstrated the understanding that in order to fix their forecasting problems, they need to first measure them.

Customer integration

The study confirmed consistent focus of leaders in integrating upstream customer data to drive efficiencies in the forecasting process. In fact, all survey respondents mentioned the need for cost efficiency and customer service improvement as the primary drivers for re-evaluating their current demand forecasting and planning practices.

Customer Integration Stages of Development

<table>
<thead>
<tr>
<th>Stage 1</th>
<th>Stage 2</th>
<th>Stage 3</th>
<th>Stage 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning</td>
<td>Evolving</td>
<td>Improving</td>
<td>Best Practices</td>
</tr>
<tr>
<td>• Business plan driving forecast.</td>
<td>• Demand forecast influencing the business plan.</td>
<td>• Demand forecast driving business plan.</td>
<td>• Collaborative planning with customers.</td>
</tr>
<tr>
<td>• Using only shipment history.</td>
<td>• Forecasting invoices/orders.</td>
<td>• Forecast POS/customer demand.</td>
<td>• Implementation of a formal S&amp;OP process.</td>
</tr>
<tr>
<td>• No customer collaboration.</td>
<td>• Examine promotional events and seasonality.</td>
<td>• Integration of sales promotions, marketing activities and economic factors.</td>
<td>• Demand forecast and business plan reconciliation with supply plan.</td>
</tr>
</tbody>
</table>

Laggards | Leaders

Figure 13

While there were industry-specific differences between manufacturing and nonmanufacturing, such as manufacturing companies being more likely to consider cost efficiency to be their top driver and nonmanufacturing companies considering customer service to be the primary driver, both agreed that customer integration is key to improving their overall demand forecasting process. The study showed leaders to be more focused on improving customer-facing performance criteria. Those companies categorized as leaders reported 2.3 times more improvement in order fulfillment rates, five times more improvement in inventory turns and 1.7 times more improvement in gross-profit margin.
Key ingredients to a successful demand forecasting and planning process

Based on the survey findings, demand forecasting leaders are more likely to have the following good or very strong capabilities:

• Have the ability to create a single demand forecast with input from multiple roles (e.g., sales, marketing, finance and others) within the organization.
• Have a formal consensus forecasting process.
• Have the ability to include causal factors (e.g., weather, natural disasters, competitor actions) into demand forecasts.
• Have the ability to model events (e.g., sales promotions, marketing events, economic activities).
• Have the ability to make rapid product introduction decisions.
• Have the ability to allocate forecasts down to the SKU level.
• Integrate the order management process with the demand planning process.
• Use the demand forecast as an input into the sales and operations planning process.
• Implement performance metrics to measure the return on forecasting value.
• Shape demand using what-if analysis and scenario planning.
• Segment demand forecasts based on key product or customer characteristics.
• Are more likely to use statistical forecasting methods.
• Report demand metrics automatically across the corporate enterprise.
• Measure order fill rates and customer service levels.
• Link demand forecasting and supply planning using a sales and operations planning process.
Conclusion

Survey results demonstrate that organizations with best in class demand forecasting and planning processes reap multiple benefits. The best-in-class leaders reported higher satisfaction with their current demand forecasting and planning systems (76 percent vs. 27 percent), as well as improved inventory turns, order fulfillment and forecast accuracy at both the product and SKU level. Leaders also reported better demand forecasting performance than their competitors (70 percent vs. 36 percent).

Analysis of the survey results also confirms that organizations that are further along the demand forecasting maturity curve share common characteristics, such as the use of more innovative technologies and the employment of collaborative internal processes.

Those that wish to improve their demand management in order to survive and thrive in today's uncertain economy must begin by evaluating their position on the demand maturity curve. They can then make changes to their processes to improve organizational alignment, build functional capabilities by leveraging data in their existing systems and deploying technologies and tools already available in the marketplace.
Appendix: Research methodology

The findings in this paper are based on a quantitative research study conducted by Purdue University and SAS from October through December 2008. The survey examined the current demand management practices of over 170 enterprises, primarily focusing on concerns related to demand management performance, challenges to effectively manage demand, current demand management capabilities, and actions taken to improve the demand management process.

The online survey was limited to respondents who were directly involved in managing, implementing or making decisions about their companies’ demand management processes. The survey respondents are profiled below:

**Job title and functional area:** Of the more than 180 respondents, 9 percent were C-level executives, 16 percent were at the director level, 29 percent at the manager level, 32 percent at the nonmanagement/analyst level and 13 percent were consultants. These respondents represented several different functions: 20 percent supply chain, 19 percent finance, 18 percent operations planning, and the remaining 26 percent split evenly among IT, marketing and market research.

**Industry:** While the research sample included respondents from all industries, the majority (44 percent) came from manufacturing. Of the rest, 15 percent came from financial services, 10 percent from retail, 7 percent from healthcare, and the remaining 24 percent from travel and transportation, oil and gas, utilities, and leisure and entertainment (hotels, gaming, recreation, etc.). In manufacturing, the industries most represented were consumer packaged goods (24 percent), networking and telecommunications equipment (10 percent), computer equipment and peripherals (10 percent), chemical (8 percent), pharmaceutical (7 percent) and automotive (7 percent).

**Geography:** As expected, the majority of survey respondents (about 69 percent) were from North America, another 15 percent came from Europe, 8 percent from Asia, and the remaining 8 percent were from other parts of the world.

**Company size:** Large enterprises, those whose total annual revenue totaled at least $1 billion, made up half of the respondents (50 percent). Nearly 20 percent of survey participants were from midsized enterprises ($100 million to $1 billion in annual revenue), and 15 percent were small enterprises with less than $100 million in annual revenue. The remaining 15 percent of respondents either didn’t know or chose not to answer.
Suggested reading:


Chase, Charles W., Jr. 2007. *Integrating Consumer Demand to Improve Shipment Forecasts*. SAS Institute Inc.


