

Supply-Chain Analytics: Beyond ERP & SCM



Improving performance through predictive, data-driven insights

Table of Contents

- 3 About This Report
- 4 Executive Summary
- 5 Confidence in Data Yields Better Performance
- 6 What is Supply-Chain Analytics?
- 7 Sidebar: 8 Levels of Analytics
- 9 Benefits of Advanced Analytical Capabilities of Supply-Chain Data
- 10 AmBev Cuts Costs, Increases Profits with Demand Intelligence
- 11 Steel Manufacturer Boosts Improvement Efforts
- 12 Appliance Maker Saves \$5 Million Through Service Fraud Audit
- 14 Barriers to Implementation
- 15 Sponsor Perspective

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About This Report

This is a report on the findings of the IW/SAS Supply-Chain Analytics Survey. Survey objectives were to determine challenges faced by companies related to supply-chain operations, examine tools used to guide supply-chain operations, and investigate future plans and investments to improve supply-chain operations.



► **Email survey:** Between June 8 and June 15, 2010, Penton Research e-mailed invitations to participate in an online survey to 37,629 IndustryWeek print subscribers. By June 30, 2010, Penton Research received 398 responses, a 1.1 percent response rate. Of those, 210 respondents that were involved in their companies' supply-chain operations were considered qualified to answer the questions.

► **Job functions:** Most respondents identified themselves as working in operations (33 percent); 22 percent said they worked in supply-chain management; 19 percent said they worked in production; and the remaining respondents identified logistics, IT, finance, or "other" as their professional fields.

► **Industries:** Most respondents come from traditional manufacturing sectors, which include: industrial machinery, automotive, consumer-packaged goods, aerospace and defense, medical devices, plastic and rubber products, metals and mining, and computer equipment and peripherals.

► **Company Size:** Company sizes varied from \$4.9 billion or more in annual sales (23 percent) to less than \$999 million (77 percent).

Executive Summary

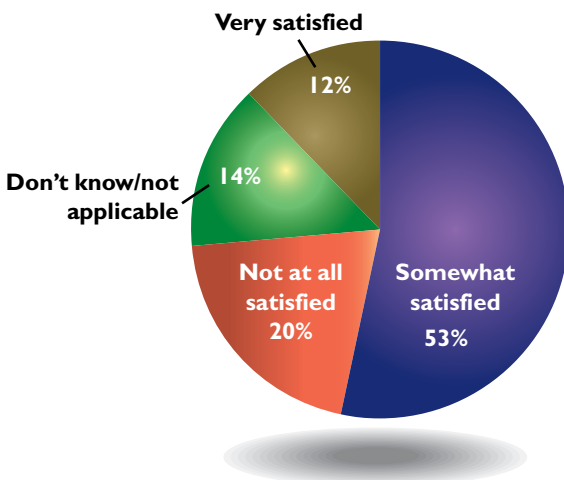
Today's business world is awash in data. In manufacturing, information has replaced hard assets as the fulcrum for decision-making and the impetus for action. In such an environment, it is easy to assume that as long as strategy planning draws on ample data that accurately documents activity, good decisions will be made. Unfortunately, this is not true.

Leading manufacturing companies have come to realize that to remain competitive, they must do more than just plan and act within the four walls of a plant. To offer the flexibility and increased responsiveness that customers so desire — and to meet their goals of cost containment and improved efficiency — manufacturers must connect across their supply-chains and derive analytical insights from data within.

However, many a times companies confuse deep analytical capability with the ability to pull and report on data from their SCM and ERP systems. Traditional supply-chain management systems, while valuable for automating operations, are not designed to feed the crucial decision-making loops that become more numerous and frequent as a manufacturing company evolves into a more sophisticated — hence more profitable and competitive — enterprise. This is because SCM/ERP systems reflect only what has already happened instead of what is happening or will happen. Adding analytical capability can provide the forward-looking guidance that yields better, more-informed decisions.

Figure 1

How satisfied are you with your current SCM/ERP system's ability to access and analyze relevant data for timely decision-making and reporting?



The need for adding analytical capability is apparent in manufacturers' level of satisfaction with their SCM and ERP systems' capability to analyze relevant data for timely decision-making and reporting. Only about 12 percent of the manufacturers responding to the IW/SAS survey said they were "very satisfied" with this approach.

In this report, we will discuss what it means to have analytical insight into supply-chain data, and the benefits this ability provides to manufacturers as related to cost containment, customer fulfillment, efficiency, sales, and other functions.

In addition to reporting on the research results, we provide case studies that illustrate real-world examples of how manufacturers reduced costs and improved quality using supply-chain analytics.

Please note: In some figures, "no reply" and "not applicable" answers are not included, so total percentages do not add up to 100 percent.

>> Confidence in Data Yields Better Performance

The IW/SAS Supply-Chain Analytics Survey shows that manufacturing companies that have clearer visibility into operations and market activity through supply-chain analytics can better foresee challenges and thus respond to them proactively, increasing both efficiency and profitability.

Considering the global economic climate of the past two years, it is not surprising that 44 percent of surveyed companies experienced a decline in gross margins during that period, while less than one-third (31 percent) reported an increase. (The remainder reported flat sales or didn't respond.)

Comparatively, 43 percent of respondents who were very confident in the accuracy of data used to make strategic decisions saw an increase in revenues, while only 28 percent with less confidence in data reported an increase. Lacking confidence in data used for decision-making also more frequently indicated a loss of revenues during the past two years.

Figure 2

How has your company's gross margin changed in the past two years?

Very confident in data:		Less than very confident in data:	
Increased	43%	Increased	28%
Decreased	36%	Decreased	46%
Stayed the same	16%	Stayed the same	19%

In addition to having higher revenues, companies with confidence in their ability to analyze data for decision-making tend to be more efficient. They are improving key metrics, deriving more value from their assets, and keeping inventories at more efficient levels (based on higher inventory turns and more accurate forecasts). Unfortunately, the reverse also is true. Those companies with less confidence in data are more likely to be getting worse on all metrics that were queried. (Figure 3)

In addition to having higher revenues, companies with confidence in their ability to analyze data for decision-making tend to be more efficient.

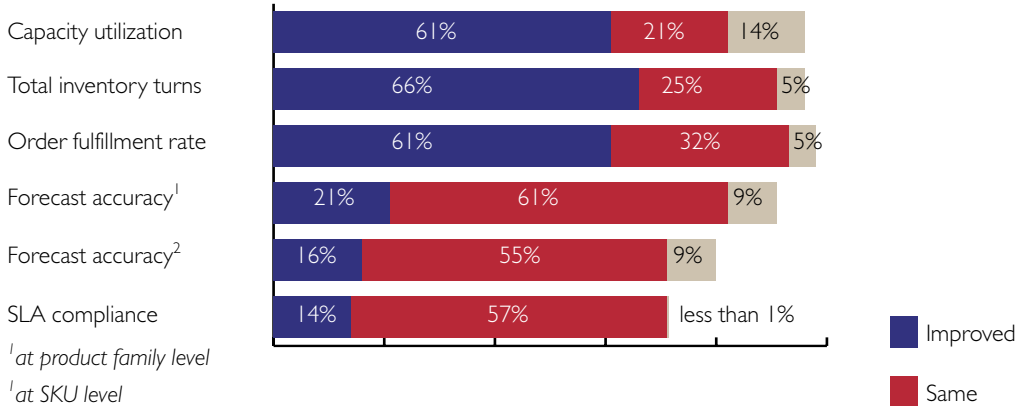
Despite the better competitive position of companies with more confidence in their data, there is still room for improvement — even among this group of leaders. According to the research, 41 percent of these respondents are only “somewhat confident” in the data used to make decisions specifically within supply-chain management. Only 59 percent expressed a high degree of confidence.

Clearly, manufacturers have an opportunity to improve competitiveness by adding or advancing their ability to analyze supply-chain data.

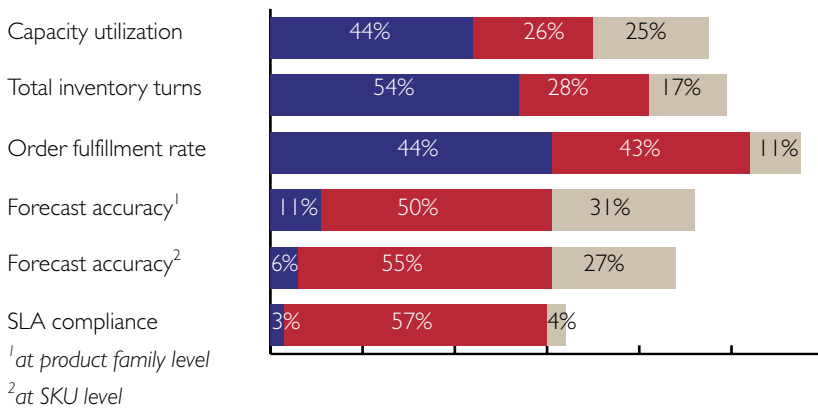
Figure 3

Metrics: Improved, Stayed the Same, or Gotten Worse in the past 2 years?

Very confident in data:



Less than very confident in data:



>> What is Supply-Chain Analytics?

Using data for standard reporting via spreadsheets is common (73 percent of all respondents), but this is not enough to drive decision-making that results in a competitive advantage. Even companies that report using supply-chain data for forecasting and inventory planning across the distribution network can benefit from advanced analytics.

Why? Because traditional planning systems tend to rely only on historical sales data to forecast demand; and their limited modeling capability makes it difficult to clearly understand the impact of changes in price, weather and other causal factors on future demand — leading to poor forecast accuracy. In modern markets, economic and demand volatility are commonplace. Predicting demand accurately in such conditions requires sophisticated math-based forecasting that can include downstream consumption data such as point-of-sales data, and model the impact of sales promotions, price, and other factors on demand.



“Traditionally, supply chains have been managed by transactional systems,” explains Ritu Jain, Global Marketing Manager/Supply-chain at SAS. “These ERP/SCM systems are meant to run operations in automated fashion, not to analyze data for predictive insights. Customarily, supply chains have focused on day-to-day operations: The demand is forecasted, materials are sourced to meet that demand, production plans are created based on available manufacturing assets, and then produced material is shipped per requirement. The focus is on execution, not on improving decision-making, and execution is what the traditional SCM and ERP systems are meant to do.”

8 LEVELS OF ANALYTICS

Not all analytics are created equally. Like most software solutions, you'll find a range of capabilities with analytics, from the simplest to the most advanced. In the spectrum shown here, your competitive advantage increases with the degree of intelligence.

Level 1: Standard reports

Answer the questions: *What happened? When did it happen?* An example would be monthly or quarterly financial reports.

We all know about these. They're generated on a regular basis and describe just “what happened” in a particular area. They're useful to some extent, but not for making long-term decisions.

Level 2: Ad hoc reports

Answer the questions: *How many? How often? Where?* An example would be custom reports that describe the number and types of parts required each day to deliver the targeted number of finished products. At their best, ad hoc reports let you ask the questions and request a couple of custom reports to find the answers.

Level 3: Query drilldown (or OLAP)

Answers the questions: *Where exactly is the problem? How do I find the answers?* An example would be sorting and exploring data about customer calls to contact centers and their reported issues or complaints.

Query drilldown allows for a little bit of discovery. OLAP lets you manipulate the data yourself to find out how many, what part and where.

Level 4: Alerts

Answer the questions: *When should I react? What actions are needed now?* An example would be a demand-planning executive receiving alerts when production is behind schedule.

With alerts, you can learn when you have a problem and be notified when something similar happens again in the future. Alerts can appear via e-mail, RSS feeds or as red dials on a scorecard or dashboard.

Level 5: Statistical analysis

Answers the questions: *Why is this happening? What opportunities am I missing?* An example would be the ability for a manufacturer to discover why there is a decline in production yield.

Here we can begin to run some complex analytics, such as frequency models and regression analysis. We can begin to look at why things are happening using the stored data and then begin to answer questions based on the data.

Level 6: Forecasting

Answers the questions: *What if these trends continue? How much is needed? When will it be needed?* An example is when retailers can predict how demand for individual products will vary from store to store.

Forecasting is one of the hottest markets — and hottest analytical applications — right now. It applies everywhere. In particular, forecasting demand helps supply just enough inventory, so you don't run out or have too much.

Level 7: Predictive modeling

Answers the questions: *What will happen next? How will it affect my business?* An example is when manufacturers can predict the impact of rising fuel prices on customer demand.

If your competitor runs a promotion, what will be the impact on your sales? What can you do to avoid cannibalization of your sales? Which products should you be spending your promotion dollars on? Predictive modeling provides the answers.

Level 8: Optimization

Answers the question: *How do we do things better? What is the best decision for a complex problem?* An example is to be able to determine the best way to optimize your production plan to meet targeted service levels considering financial goals, supply constraints and available inventory.

Optimization supports innovation. It takes your resources and needs into consideration and helps you find the best possible way to accomplish your goals.

Source: SAS

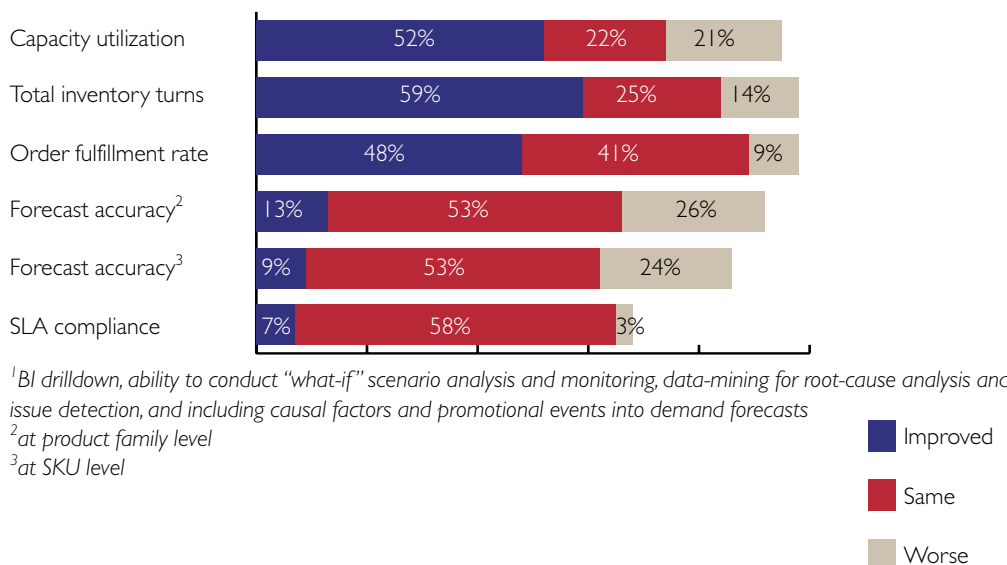
With predictive analytics, Jain says, manufacturers can leverage the data within their legacy systems to derive real-time insights and use that information to optimize future decisions: *What will be the impact of increasing prices on demand? Which promotion will have a higher impact on sales? We have limited production capacity — should we produce more of Product A or more of Product B to meet our revenue and margin goals?*

According to Jain, many users, and even industry analysts and consultants, have not fully grasped the difference between business intelligence and analytics.

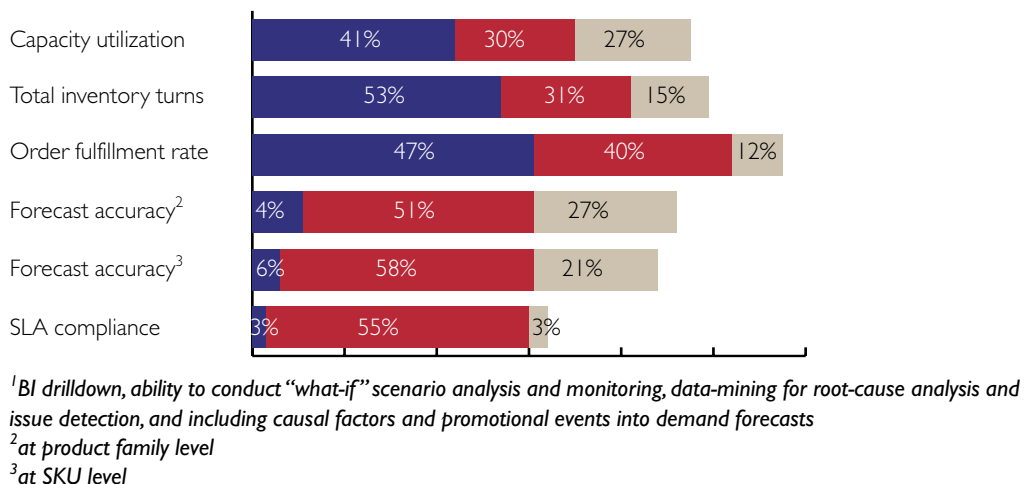
Figure 4

Metrics: Improved, Stayed the Same, or Gotten Worse in the past 2 years?

Companies with advanced analytical capabilities¹ of supply-chain data:



Companies without advanced analytical capabilities¹ of supply-chain data:



“They continue to consider simple query, reporting, and OLAP drilldown capabilities to be analytics, thereby limiting themselves by just relying on systems that provide simple alert, monitoring and dashboard capabilities rather than taking advantage of advanced science for predictive modeling, scenario analysis and optimization. The fact is that there are many levels of analytics [see “8 Levels of Analytics,” page 7] covering a whole spectrum of capabilities from standard reporting and alerts all the way to statistical analysis, forecasting, predictive modeling, and optimization.”

When a company’s supply-chain management is fueled with data-driven insights, it is more effective at controlling costs, thereby protecting profits. Looking at the same metrics referenced in Figure 3, we see that clearly in Figure 4 on page 8, companies with advanced analytical capabilities in their supply chain are performing at a higher level. This is true irrespective of industries and company sizes.

>> Benefits of Advanced Analytical Capabilities of Supply-Chain Data

Respondents identified the following as the top challenges to their organization’s strategic goals:

1. Shrinking profit margins due to per-unit cost increases (28 percent identified as No. 1 challenge; 23 percent as No. 2; 14 percent as No. 3)
2. Demand uncertainty and volatility due to globalization (22 percent identified as No. 1 challenge; 21 percent as No. 2; 16 percent as No. 3)
3. Inability to efficiently link supply-chain planning, fulfillment activities, and customer demand (16 percent identified as No. 1 challenge; 11 percent as No. 2; 14 percent as No. 3)

Supply-chain analytics can directly address these challenges. When asked specifically, respondents ranked improved customer satisfaction (28 percent), cost reduction (23 percent), and improved productivity (19 percent) as the top three benefits of advanced analytics.

These findings are in line with benefits reported by industry leaders. Following are three case studies that illustrate how companies are leveraging predictive analytics in real-world situations to improve profitability and overall efficacy of their supply chains.

CASE STUDY:

AMBEV CUTS COSTS, INCREASES PROFITS WITH DEMAND INTELLIGENCE

AmBev, Latin America's largest beverage company, is a high-mix, high-velocity manufacturer with complex, integrated operations. The company operates 41 beverage production plants, four malting plants, one soft-drink concentration plant, one guarana farm, and three units for barley fermentation — for a total of 49 plants in Brazil and abroad. Its distribution network of 11,000 resellers includes a fleet of 16,000 trucks that distribute the company's products (including Pepsi-Cola and Skol) to more than 1 million points of sale throughout the country.

With so much raw material and finished goods in the pipeline — and the capricious nature of the consumer-packaged goods market — AmBev realized that relying on historical data for production and distribution planning would not be fruitful. It needed deeper analysis to predict demand and guide decision-making.

The company began using SAS for demand forecasting and planning to maximize profit margins and the distribution of products.

"In short, I don't want to produce too much or too little, so that I don't have too much capital invested in my inventory or a shortage of products in stores," says Tiago Rino, a Demand Planning Specialist at AmBev.

SAS combines data from all demand and replenishment planning processes and generates weekly forecasts for setting sales goals, production levels, and distribution plans. According to Rino, SAS has helped improve processes throughout the company.

"We've been able to replan production and distribution. We've committed our sales force to meeting targets based on the forecast. We're maximizing the use of our logistics chain."

With SAS, the company's product turnover rate has improved by 50 percent.

"For example, we have products in many factories that used to sit in inventory for 14 to 15 days. Now, these turnover rates have been reduced to seven or eight days."

CASE STUDY:

STEEL MANUFACTURER IMPROVES PERFORMANCE, PROFITABILITY

On a large scale, a performance management strategy — such as Six Sigma — can have a tremendous impact on profitability, provided it has executive buy-in and is supported with scalable software.

A large, Asian manufacturer of steel (19,000 employees working to produce 28.5 million tons of steel annually), proved this by basing two of its process innovation (PI) programs on SAS's software. The PI programs had a goal of updating 30-year-old business practices to improve efficiency and competitiveness. First, the company used SAS to extract, transfer, and transform its ERP and legacy data into a data warehouse, allowing data to be compared on a like-for-like basis and quality-checked. Secondly, the company combined SAS's analysis capabilities with its Six Sigma Project Tracking system. This combination allows managers to gather data on PI projects, identify most-critical quality issues, and analyze them for root causes. By enabling daily and monthly monitoring, the company can resolve issues early on and improve overall manufacturing processes

With the first PI phase, the company achieved a 50 percent reduction in lead times for standard hot coil production (from 30 days to 14 days), and a 60 percent reduction in inventory (from 1 million tons to 400,000 tons). Further, by analyzing and then making necessary improvements to the manufacturing process, the company was able to reduce the scrap ratio on hot coil from 15 percent to 1.5 percent, leading to additional savings and resulting in a total ROI of over \$15.5 million in less than two years.

CASE STUDY:

APPLIANCE MAKER SAVES \$5 MILLION THROUGH SERVICE FRAUD AUDITS

A major appliance manufacturer relies on thousands of service providers to handle its more than 1 million warranty claims. After a technician makes an appliance repair, he/she files a claim with the manufacturer's service division. Auditors in the manufacturer's service division look for suspect claims about the work, which could indicate fraud. But due to a high number of claims, many suspect events were not being detected.

Using SAS Suspect Claims Detection and SAS Solutions on Demand, the company was able to save \$5.1 million in the first year by detecting fraud that would have gone unnoticed without analytical capability. Here's how it works: Claims data is uploaded to the fraud-detection software, where 26 claim-level sets of analyses are automatically calculated for each claim. Claims are flagged for audit when multiple elements are out of the ordinary, compared with averages. Once flagged, auditors receive reports of the suspicious claims to investigate.

The company is also using the software to improve customer service. Using the data, the company identifies service providers who might not be as efficient as they could be at repairs, and then they are offered training.

Another significant benefit of supply-chain analytics is that it enables organizations to build horizontal processes that are in line with their strategic goals. Data does not lie, and therefore can be an effective tool when breaking down functional silos and removing subjectivity from crucial decision-making.

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Even companies with advanced continuous-improvement (CI) cultures that are already driven by demand signals and hold little inventory could become more competitive with supply-chain analytics. This is because analysis of supply-chain data can give clues about what's happening in the marketplace even when that something is exceptional and entirely unexpected. When companies with advanced CI programs move to this stage, horizontal alignment becomes exponentially

beneficial — not only do they benefit from cost-reduction through streamlining, but they are also empowered to make enterprise-wide trade-off decisions faster when market conditions change.

“The greatest value of demand planning comes from the evolution of value networks and the building of horizontal processes,” explains Lora Cecere, partner of Altimeter Group, a research-based advisory firm that specializes in guiding companies on using disruption to their advantage. “What happens is that demand becomes a forward-looking signal for the organization to look outside in and align the vertical segments such as sales, marketing, production etc., against market drivers. In a very recent case, companies that were able to move to this stage were able to sense the [2007-2009] recession five times faster and align their value chains much quicker, which had quite a large impact.”

Cecere calls this benefit “resiliency” and notes that these companies also had more credibility with capital markets during the recession because they could more accurately forecast their earnings.

Supporting such a model, however, does require a shift in thinking at the executive level, and then subsequent support. Predictive planning sometimes requires enterprises to face unexpected outcomes. In such situations, executives need to move beyond wanting to place blame and instead work across the value chain to affect functional decisions that align with strategic goals. For example, in some cases demand error becomes part of the trade-off equation in decision-making rather than a by-product of bad performance.

>> Barriers to Implementation

When asked what is preventing them from adopting supply-chain analytics, respondents chose these three factors as top challenges, and gave them equal weight:

- Integration concerns with existing SCM/ERP systems.
- Other IT priorities/commitments within the company or the supply-chain organization.
- Length of expected implementation timeline.

Closely behind these were “total cost of ownership is not convincing” and “user adoption.”

According to Jain, these concerns are outdated. Supply-chain analytics programs have evolved along with the rest of business software to become easier to implement and use.

“Solutions today are packaged in such a manner that even novice- and intermediate-level modelers can take advantage of advanced modeling techniques via point-and-click interfaces,” Jain says. “Earlier user-resistance roadblocks and existing technology integration costs should no longer be a concern. Advanced analytical capabilities are available through software as a service (SaaS) and on-demand channels, and can even be invoked from within existing ERP and SCM systems using service-oriented architectures (SOA). Users can improve forecast accuracy, perform what-if analyses and optimize resources all without ever leaving the comfort of their familiar planning modules.”

As for total-cost-of-ownership concerns, consider that the benefits of supply-chain analytics directly address the biggest challenges all manufacturers face in running an efficient supply chain, and thus, enterprise. (Figure 5)

Figure 5

Challenges: What could prevent achieving efficiency in supply-chain management?

Which of these factors will be a challenge to managing an efficient supply chain in the next 24 months?

(m=millions, b=billions, annual revenues)

	Less than \$100m	\$100m-\$999m	\$1b or more	All
Increased internal pressure to reduce costs	72%	69%	79%	72%
Increased customer pressure for flexibility and responsiveness	59%	59%	58%	59%
New product configurations and/or increased product complexity	38%	42%	44%	41%

“Before you resign yourself to the status quo,” Jain says. “Ask what makes better sense in the long run – continuing to sink more money into an existing system that is already behind the times? Or updating it with new, advanced technology that requires initial outlay but provides the robust functionality required to survive in the new age economy?”

As a sponsor of the IW/SAS Supply-Chain Analytics Survey, SAS® offers the following lessons learned from the research, including insights about how you can use business analytics to address a variety of challenges and opportunities.

1. Efficiency and performance gains require predictive, data-driven insights.

It's clear that the key concerns of supply-chain professionals – shrinking profit margins, demand uncertainty and the pressure to reduce lead times – are key performance and efficiency issues that companies cannot fully address with historical reports alone. SAS® Business Analytics can give you a new, forward-looking perspective that allows you to not only understand the past and monitor the present, but also predict future outcomes. With these data-driven insights, you gain the ability to improve forecasting accuracy, understand demand patterns, optimize supplier performance, and reduce finished goods inventory and stockouts.

2. Traditional SCM/ERP systems are not advanced enough for current economic conditions.

Many organizations are proficient at using ERP/SCM systems to collect large amounts of data, create reports and automate day-to-day transactions involving customers, supplier performance and product orders. However, in our increasingly global and competitive economy, most successful companies realize that they cannot simply rely on surface-level data from scattered transactional systems. SAS Business Analytics lets you enhance the value of your previous SCM/ERP investments by integrating data from these transactional systems with downstream consumption data as well as upstream supply data, removing inaccuracies, and providing forward-looking analytical insights. You can then discover trends, anticipate events and understand the underlying drivers of costs and revenue, allowing you to be innovative and agile in a rapidly changing business environment.

3. Analytics are the wave of the future for next-generation supply-chains.

Supply-chain leaders expect their future systems to help them make more strategic decisions, including how to control costs, improve demand forecasts and upgrade customer service. Traditional supply-chain systems have not successfully addressed these issues due to their limited ability to answer only very basic questions like “What happened?”, “How many?” and “How often?” Next-generation supply-chains will include advanced analytical capabilities that allow constraint-based optimization, advanced forecasting, what-if analyses, scenario planning, business simulation and modeling. As a result, you will be able to answer high-impact questions like “What will happen next?” and “What is the best that can happen?”

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