

The Smarter Supply Chain of the Future

*Insights from the
Global Chief Supply
Chain Officer Study*

IBM

This study is based on face-to-face conversations with nearly 400 supply chain executives worldwide.



Tim Carroll
Integrated Supply Chain Vice President
IBM Corporation

A note to fellow Supply Chain Executives

Welcome to our inaugural edition of the IBM Global Chief Supply Chain Officer Study. As part of this worldwide effort, we had the great privilege of sitting across the desk from 400 of you, discussing your supply chain challenges and aspirations.

You told us of your continuing struggle to gain more supply chain visibility, meet escalating customer demands and control costs—and about how emerging economies are developing into real markets, not just places to procure low-cost parts and outsource manufacturing. Cheaper, faster, better is—and has been—the mantra among supply chain executives. However, I was encouraged to hear about innovative approaches you're taking to meet these challenges. And we can continue to learn from each other through collaborative research like this study.

As important as cheaper, faster, better is, this year, we're beginning to hear a new verse—a clear message about the overwhelming need to manage risk. A crisis in some far-flung country can now spread very quickly across the world economy, creating tremendous turbulence. As our supply chains have become more intertwined, none of us is immune. To deal effectively with risk and meet your business objectives, we believe supply chains must become a lot smarter.

This is an extremely energizing prospect for supply chain leaders. You have a remarkable opportunity to use the instrumentation, interconnection and intelligence now within your grasp to create the robust, secure and sustainable supply chain businesses today demand.

I hope our Chief Supply Chain Officer Study is helpful to you. My IBM colleagues and I look forward to further conversation about what this smarter supply chain will look like—and how we can work together to make it a reality.

A handwritten signature in black ink, appearing to read 'Tim Carroll', with a stylized flourish at the end.

Tim Carroll
Integrated Supply Chain Vice President
IBM Corporation

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Executive summary

Volatile. That's perhaps the best word to describe today's global marketplace. Like economies and financial markets, as supply chains have grown more global and interconnected, they've also increased their exposure to shocks and disruptions. Supply chain speed only exacerbates the problem. Even minor missteps and miscalculations can have major consequences as their impacts spread like viruses throughout complex supply chain networks.

How are supply chain executives coping? As part of our recent Global Chief Supply Chain Officer Study, we spoke with 400 senior executives from North America, Western Europe and the Asia Pacific region who are responsible for their organizations' supply chain strategies and operations. Our discussions revealed five key findings related to:

Cost containment—Rapid, constant change is rocking this traditional area of strength and outstripping supply chain executives' ability to adapt.

Visibility—Flooded with more information than ever, supply chain executives still struggle to “see” and act on the right information.

Risk—CFOs are not the only senior executives urgently concerned about risk; risk management ranks remarkably high on the supply chain agenda as well.

Customer intimacy—Despite demand-driven mantras, companies are better connected to their suppliers than their customers.

Globalization—Contrary to initial rationale, globalization has proven to be more about revenue growth than cost savings.

These findings suggest that supply chains—and the executives charged with managing them—are under severe pressure. As compliance mandates, suppliers and information flows multiply, supply chains are becoming more complex, costly and vulnerable. And executives are finding it increasingly difficult to respond to these challenges, especially with conventional supply chain strategies and designs.

This is not to say companies have ignored these issues; in our findings, we see no shortage of supply chain improvement projects. But our research suggests it's no longer enough to build supply chains that are efficient, demand-driven or even transparent....

They must also be smart

We envision a supply chain of the future
that is far more:

Instrumented

Information that was previously created by people will increasingly be machine-generated—flowing out of sensors, RFID tags, meters, actuators, GPS and more. Inventory will count itself. Containers will detect their contents. Pallets will report in if they end up in the wrong place.

Interconnected

The entire supply chain will be connected—not just customers, suppliers and IT systems in general, but also parts, products and other smart objects used to monitor the supply chain. Extensive connectivity will enable worldwide networks of supply chains to plan and make decisions together.

Intelligent

These supply chain decisions will also be much smarter. Advanced analytics and modeling will help decision makers evaluate alternatives against an incredibly complex and dynamic set of risks and constraints. And smarter systems will even make some decisions automatically—increasing responsiveness and limiting the need for human intervention.

Building this kind of supply chain is a strategic undertaking; it implies a different role and set of responsibilities for supply chain executives. These executives must become strategic thinkers, collaborators and orchestrators who optimize complex networks of global capabilities. In their increasingly significant positions, Chief Supply Chain Officers have the mandate—and now the enablers—to create a Smarter Supply Chain of the Future.





The top five supply chain challenges

Top five supply chain challenges

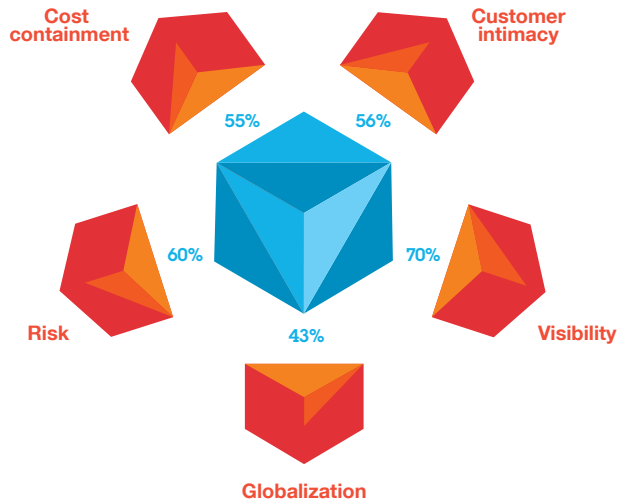
Businesses and supply chains have become substantially more global over the last decade. Between 1995 and 2007, the number of transnational companies more than doubled, from 38,000 to 79,000, and foreign subsidiaries nearly tripled, from 265,000 to 790,000.¹

In addition to spreading geographically, supply chains now involve more companies. Nearly 80 percent of executives say they expect the number of collaborative relationships with third parties to increase.² And an ever-broader range of activities is being outsourced: between 2007 and 2010, R&D outsourcing is forecast to increase by 65 percent, and engineering services and product-design projects by more than 80 percent.³

Supply chains must also contend with rapidly expanding and contracting product portfolios. In the consumer products industry, for example, product introductions increased by 17 percent in 2006—more than double the 2005 rate.⁴ Portfolio rationalization is eliminating SKUs almost as fast. Together, these shifts are creating constant turmoil.

Confronted with such daunting complexity, supply chain executives told us they face five major challenges, as shown in Figure 1. All are critically important, and must be addressed simultaneously. Together, they comprise what we call the Chief Supply Chain Officer agenda.

Figure 1 Supply chain leaders wrestle with five major challenges
Percentage who report this challenge impacts their supply chains to a significant or very significant extent.



“The supply chain will ultimately be measured based on its ability to produce bottom-line results, such as EBIT and cost-to-serve. However, with significantly increased input costs, relying only on these measures can mask true supply chain performance.”

Mark Sutton, Senior Vice President,
Global Supply Chain,
International Paper

Cost containment

Supply chains can't keep pace with cost volatility

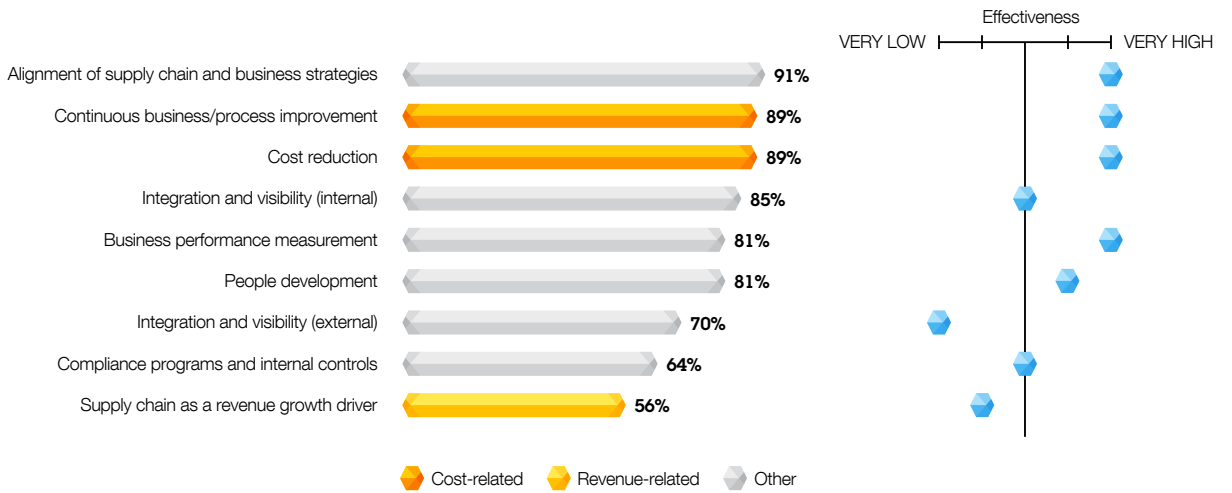
Supply chain executives rank cost containment as their number one responsibility to the business—far ahead of enterprise growth and product/service innovation. This intense focus on controlling costs is also quite evident in their activities and programs; two out of the top three types of initiatives are aimed at improving efficiency (see Figure 2). These are also the areas where executives have realized the most past success.

However, what used to be a methodical, continuous improvement process has turned frenetic. Shocks to integral costs—rapid wage inflation in previously low-cost labor markets, spikes in commodity prices, or even sudden credit freezes—are becoming more common.

Supply chain executives find themselves reacting to whatever the cost issue of the day happens to be. Escalating fuel prices, for example, send executives scrambling to reevaluate distribution strategies, engage third-party logistics providers more extensively or even share loads with competitors. When fuel prices fall, distribution and transportation methods become more lax as companies emphasize service over cost—reverting back to smaller, more frequent shipments and faster modes.

Shifts in costs and other operational fundamentals are happening so quickly that conventional supply chain strategies and design techniques can't keep up. New designs are outdated before executives can implement them.

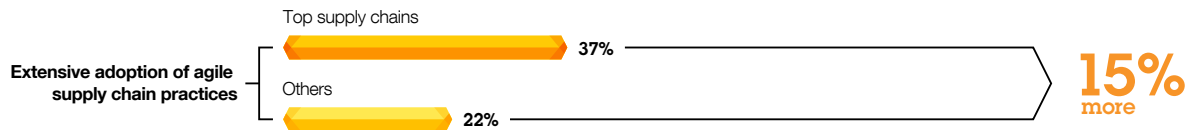
Figure 2 Cost control and efficiency programs significantly outnumber growth initiatives
 Percentage who report these activities and programs as very important or critically important.



Leading supply chains focus on flexibility

When it comes to managing costs, companies with top supply chains — those recognized in AMR Research's Top Supply Chains for 2008 — take a longer-term view.⁵ They are moving more quickly toward agile supply chains that allow rapid response to changing market conditions (see Figure 3) and variable cost structures that ramp up and down with revenues. Flexibility is their antidote for cost volatility.

Figure 3 To avoid manic cost-cutting, top supply chains build in more flexibility
Percentage who report extensive adoption of agile supply chain practices.



Visibility

Top challenge, but not top priority

At a time when, generally speaking, information is abundant and connectivity is more feasible than ever, supply chain executives still rank visibility as their greatest management challenge. Although more information is available, proportionally less is being effectively captured, managed, analyzed and made available to people who need it.

Despite its top billing on the issue list, visibility—and the collaboration required to get information and make decisions with it—is not attracting much attention in terms of activities and programs. Supply chain executives are focused more on strategy alignment, continuous process improvement and cost reduction. Driving integration and visibility of information inside their organizations ranks fourth on their priority list, and external visibility falls even lower—in seventh place (as shown in Figure 2). Making matters worse, the majority of those who have tried to improve external visibility describe their efforts as largely ineffective, making external visibility projects the least effective of all initiatives executives are undertaking.

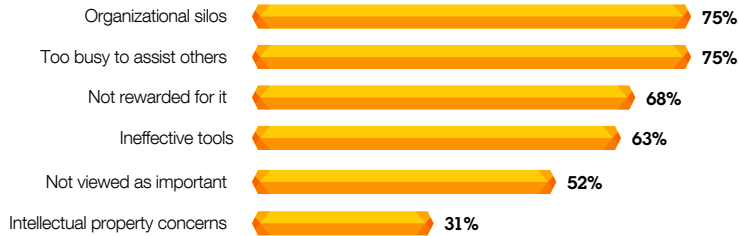
Though it may seem logical to blame poor visibility and collaboration on inadequate IT, supply chain executives point elsewhere (see Figure 4). Not surprisingly, organizational silos are the biggest barrier. But we were shocked so many executives reported that their organizations are too busy to share information or simply do not believe collaborative decision making is that important.

“When we talk about supply chain visibility, it does not simply mean visibility into your own supply chain and your own shipments. It means visibility among partners, which enables collaborative decision making closer to the customer. This is both a science (managing the technology) and an art (using the information and metrics for competitive advantage).”

Bob Stoffel, Senior Vice President,
Engineering, Strategy and Supply Chain,
United Parcel Service of America

Figure 4 Supply chain executives cite significant cultural barriers to achieving the level of interaction and visibility they need

Percentage who say this barrier has a moderate, significant or very significant effect.

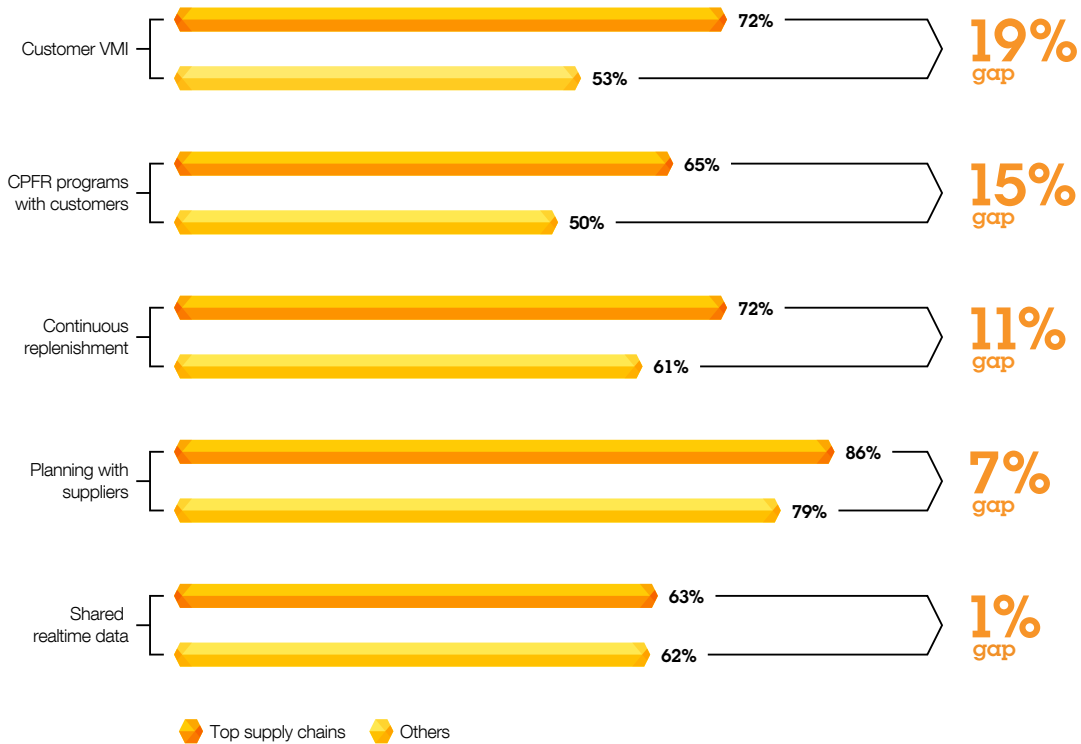


Top supply chains are collaborating more to improve visibility

More than half of all supply chain executives have implemented practices aimed at improving visibility, such as continuous replenishment and inventory management with customers. But less than 20 percent are pursuing these practices extensively.

In contrast, leaders of top supply chains are much more focused on improving visibility (see Figure 5). Twice as many report extensive implementations of collaborative planning with suppliers and vendor-managed inventory (VMI). And more than 60 percent of the top supply chains have implemented all the practices discussed in our interviews.

Figure 5 Top supply chains' largest leads are in the areas of customer collaboration
Percentage who have implemented these practices.



“Risk management is a fundamental building block of any supply chain strategy.”

Greg McKenna, Supply Chain Manager, Venture Production plc

Risk

Executives agree on importance of risk management, but are divided on approach

Risk management emerged as supply chain executives’ second largest challenge—a surprisingly high ranking that at first glance seems more likely to be found on the CFO agenda. But mounting supply chain risk—even more than increasing customer demands and higher costs—has leaders on edge.

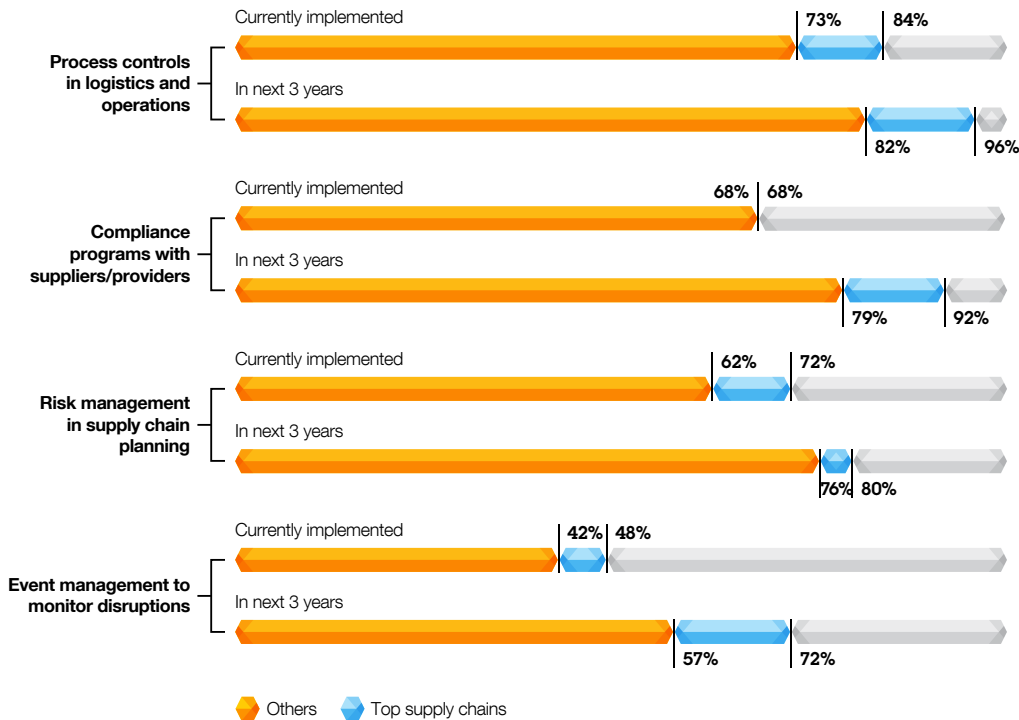
Although it may be exacerbating concerns, the current economic environment was not the impetus for this response.⁶ Instead, this sentiment was built from thousands of recall headlines and a deepening realization that globalization and greater supply chain interdependence have not only elevated risk, but also made it more difficult to manage.

Among our respondents, 69 percent formally monitor risk, but only 31 percent manage performance and risk together. Executives cite the lack of standardized processes, insufficient data and inadequate technologies as the chief stumbling blocks preventing effective risk management.

Top supply chains lead in risk management

More than two-thirds of supply chain executives have programs in place to monitor compliance. But top supply chains are taking risk management a step further—incorporating it into their plans and using IT to monitor and act on disruptive events.

Figure 6 In all areas of risk management, leading supply chains are pulling away from the pack
Gap between top supply chains and the rest of our sample in terms of current and planned implementations.



Sustainability in the supply chain

“Integration of sustainability principles will increase complexity. But our desire is to have the supply chain emerge as a major business tool that can help control costs, manage risks and make profit in a fully responsible manner.”

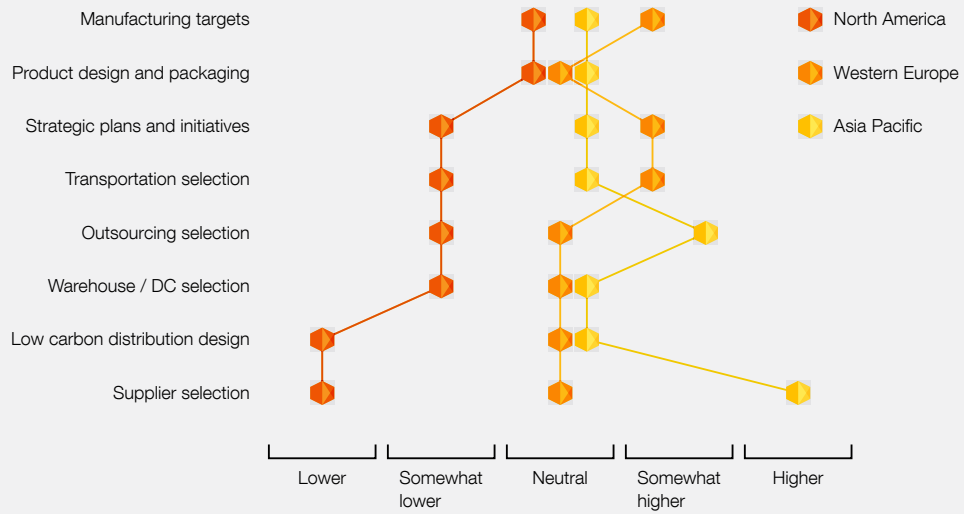
Maurice Sinclair, Supply Chain Director,
George Weston Foods

Sustainability challenges—including energy, water and waste management—are increasing concerns that affect almost every aspect of supply chain management, from the types of products offered to how they are manufactured, distributed and disposed of at end of life. More than half of the executives we interviewed have modified product design or packaging to address environmental considerations, incorporated sustainability initiatives in supply chain strategies and set carbon management goals as part of their manufacturing targets. Far fewer, however, extend sustainability objectives to their tier-two and tier-three suppliers. And only about 25 percent choose transportation, warehouse and distribution providers based on emissions or energy consumption evaluations.

Across regions, progress varies considerably (see Figure 7). Government regulations in Europe over the last half decade—including REACH, RoHS and the Emission Trading Scheme—are driving strategic attention to sustainability.⁷ The reason supplier selection based on sustainability goals is decidedly more prevalent in the Asia Pacific region is likely because of the environmental impact of growing supplier operations in that region, which is literally visible in the air, soil and water.

Meanwhile, the heavier focus outside the United States and Canada may be a sign that North American companies are merely waiting for a stronger signal of federal government intervention and incentives. However, with relatively new environmental legislation in Japan and Australia, and growing state and regional action in the United States and Canada, geographical differences may quickly melt away. Supply chain organizations avoiding sustainability issues risk being left behind by customers demanding more environmental accountability and governments mandating compliance.

Figure 7 Sustainability practices differ by region, with North America generally lagging other geographies
 Relative implementation of these sustainability, or “green supply chain,” practices.



“We must combine SCM with CRM... get supply chain staff thinking in terms of a commercial customer mindset. Bringing the customer perspective into all facets of SCM will push us to further supply chain excellence.”

Vice President, Supply Chain,
consumer products company

Customer intimacy

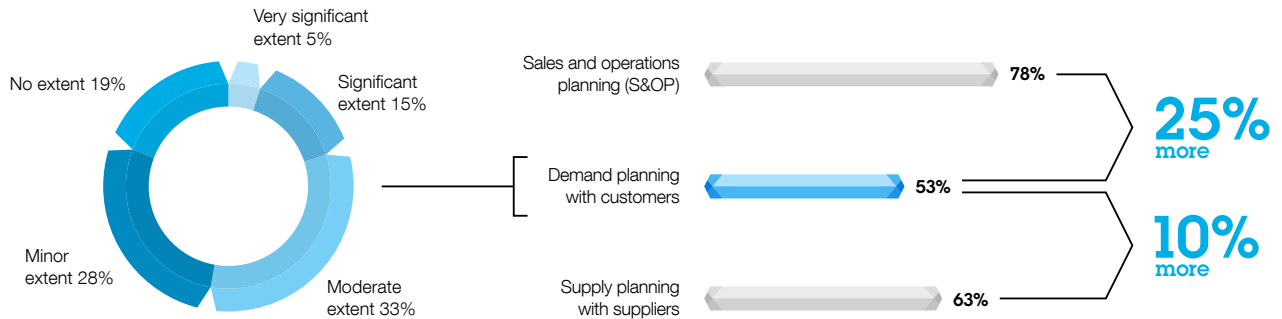
Companies interact with suppliers more than customers

Rising customer demands ranks as the third highest supply chain challenge, and two out of every three companies struggle to accurately identify customer needs. However, despite the obvious need for customer interaction, companies tend to focus more on their suppliers than their customers. Eighty percent design products jointly with their suppliers, but only 68 percent do so with customers. Even in supply-chain planning, with all the demand-driven hype, only 53 percent of companies include customer input, while 63 percent invite supplier participation (see Figure 8).

Although technology has made it more feasible than ever to incorporate customer input, working directly with customers remains the least common supply chain planning practice. In fact, demand planning at one out of every five companies ignores customers entirely.

Because customer interaction seems costly and time-consuming, some companies just don't bother. But as the pressure to be more profitable grows, supply chains won't be able to afford the excess inventory, lost sales and missed innovation opportunities caused by inadequate customer collaboration.

Figure 8 Supply chain planning largely remains an internally driven effort
 Percentage who plan with customers—as compared to suppliers and their own organizations—to a moderate, significant or very significant extent.



Leading supply chains have more advanced synchronization planning

Top supply chains take greater advantage of opportunities to synchronize plans both internally (15 percent lead over rest of sample) and with supply chain partners (10 percent lead). But perhaps most importantly, they are more likely than their less-effective peers to plan with customers (see Figure 9).

Figure 9 Top supply chains plan with their customers more extensively
 Percentage who plan collaboratively with customers to a moderate, significant or very significant extent.



“The one-size-fits-all supply chain model of the past seems to no longer work well to support the business portfolio with multiple lines of business.”

Rohit Anand, Director Supply Chain Excellence, Asia Pacific, Philips Electronics Hong Kong Ltd.

Globalization

Executives report growth, not cost reduction

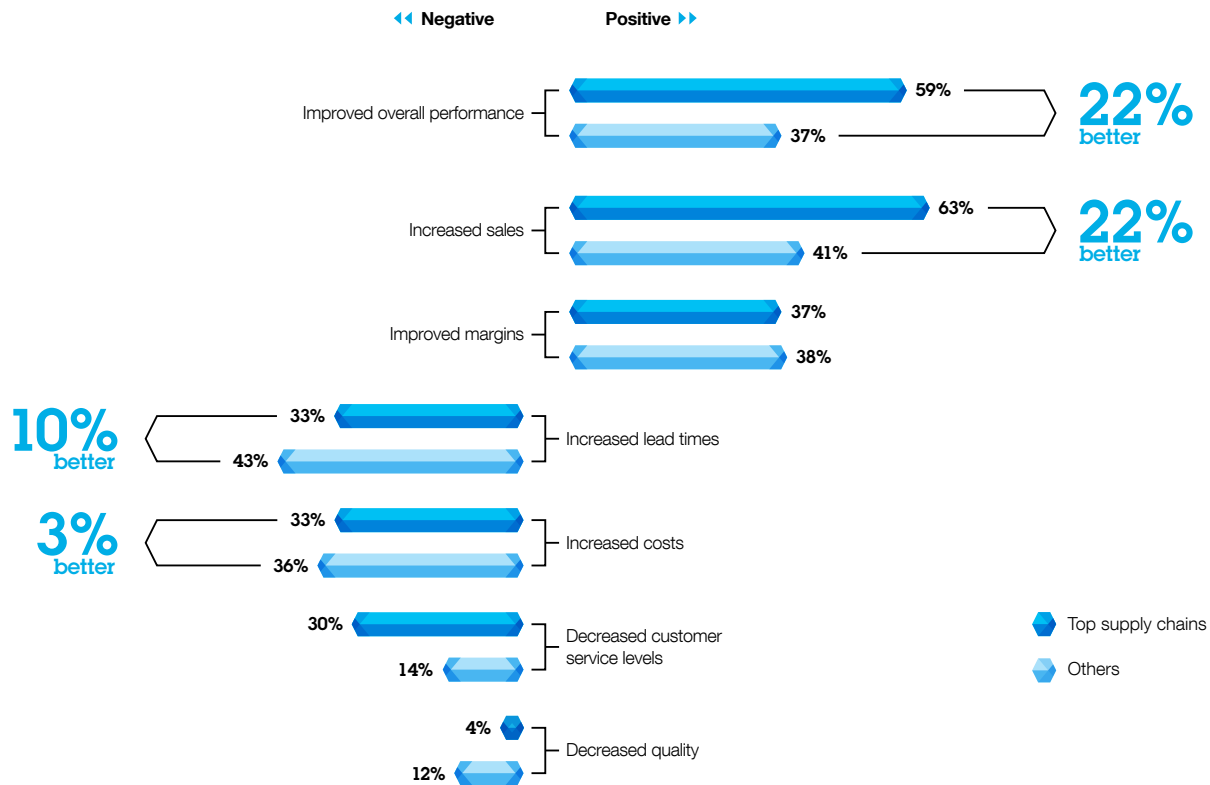
Given the growing interdependence among economies worldwide, it's no surprise that globalization ranks as a top supply chain challenge. Many companies are encountering issues with global sourcing, including unreliable delivery (65 percent), longer lead times (61 percent) and poor quality (61 percent), with an additional 14 percent of respondents anticipating such problems within the next three years.

So far, however, the financial advantages of globalization of their markets and operations outweigh these negatives. Nearly 40 percent of supply chain executives report improved margins. Yet this bump in profits is not necessarily tied to lower costs. In fact, more than one-third of executives are experiencing **increased** costs, likely because of the global sourcing challenges previously mentioned. Instead, these higher profits seem linked to sales increases, as reported by 43 percent of executives. These findings suggest globalization has contributed more to revenue growth than efficiency.

Top supply chains report greater gains from globalization

Although higher costs are affecting both high-performing and less-effective supply chains, they are less prevalent among top supply chains (see Figure 10). And on the positive side, far more leaders report increased sales and improved performance.

Figure 10 Leading supply chains report less pain and more extreme gains from globalization over the past three years
Percentage who have experienced these outcomes.



Global success hinges on leadership talent

“We need to drive the cultural change... and promote new leaders who share the vision.”

Lieutenant General Robert Dail, United States Army (retired), Former Director, U.S. Defense Logistics Agency

As supply chains become more global, the organizations that manage them require new skills and capabilities. Supply chain executives' most urgent need is leadership talent (see Figure 11). This talent vacuum is most acutely felt in the Asia Pacific region, with nearly nine out of ten executives citing it as a top challenge.

This shortage of leaders is not confined to the supply chain function. In the IBM Global Human Capital Study 2008, 75 percent of the more than 400 senior HR executives surveyed across 34 countries indicated that building leadership talent was a significant challenge.⁸

To strengthen their management pipelines, many of these HR executives said their companies are using action learning programs, mentoring and job rotation.

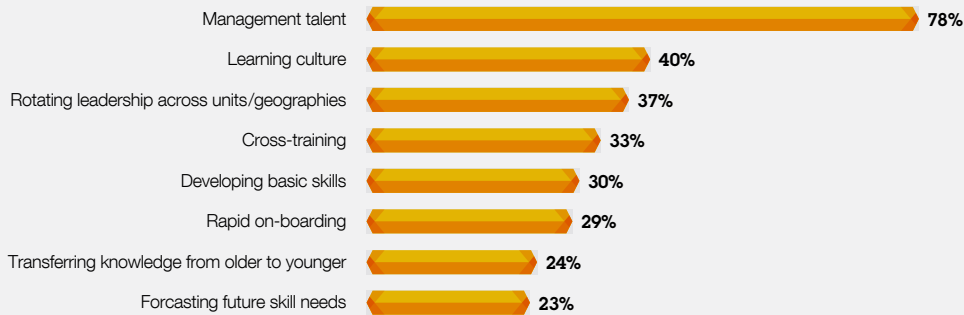
In fact, nearly 50 percent cited job rotation among business units as a key development technique. However, putting this into practice is difficult. More than one-third of both HR and supply chain executives indicate that rotating leaders is a significant challenge. Often, operating divisions are reluctant to surrender their top performers.

Although companies invest in leadership development and succession planning, they typically pursue these activities on a regional basis, which makes it difficult to maintain a global view of the leadership pipeline and resolve conflicting priorities among business units. Our research suggests that companies should consider factors such as the number, location, transferability and proficiency of leaders from around the globe as part of their strategic planning processes. Talent management at a global level helps companies make better decisions about the types of leadership development programs required, the speed with which those programs need to be implemented and the business risks associated with insufficient leadership talent.


While growing leaders within their own ranks, supply chains must also compete for new recruits, particularly in markets where talent pools are shrinking due to demographic shifts. Most supply chain executives are using traditional motivators — namely challenging

responsibilities, career growth and better compensation — to attract and retain staff. But leaders of top supply chains are using a different approach. They are leveraging their corporate reputations and strong values to connect with likeminded employee populations.

Figure 11 No other HR issue comes close to the overwhelming need for global leaders
Percentage who report these issues as one of their top three capability-building challenges.







The smarter supply chain of the future

“Together, we have to consciously infuse intelligence into our decision-making and management systems, not just infuse our processes with more speed and capacity.”

Sam Palmisano, Chairman, President and Chief Executive Officer, IBM Corporation⁹

The smarter supply chain of the future

The digital and physical infrastructures of our world are converging. Thanks to the falling price and rising reliability of sensor technologies, practically any activity or process can now be measured. Objects can communicate and collaborate directly, without human intervention. Entire systems can be connected — not just supply chains with other supply chains, but also with transportation systems, financial markets, electric power grids and even natural systems like rivers and weather patterns.

Every insight derived from a world of smart objects can lead to action — and more value. With so much embedded intelligence, supply chain management can progress from decision support to decision delegation and, ultimately, to a predictive capability. As the world begins to work differently, we see a different kind of supply chain emerging — a smarter supply chain with three core characteristics:

Instrumented

Supply chain information that was previously created by people will increasingly be generated by sensors, RFID tags, meters, actuators, GPS and other devices and systems. In terms of visibility, supply chains not only will be able to “see” more events, but also witness them as they occur. They will rely less on labor-based tracking and monitoring, as objects like shipping containers, trucks, products and parts report on themselves. Dashboards on devices perhaps not yet invented will display the realtime status of plans, commitments, sources of supply, pipeline inventories and consumer requirements.

Interconnected

Smarter supply chains will take advantage of unprecedented levels of interaction — not only with customers, suppliers and IT systems in general, but also among objects that are monitoring or even flowing through the supply chain. Besides creating a more holistic view of the supply chain, this extensive interconnectivity will also facilitate collaboration on a massive scale. Worldwide networks of supply chains will be able to plan and make decisions collectively.

Intelligent

To assist executives in evaluating trade-offs, intelligent systems will assess myriad constraints and alternatives, allowing decision makers to simulate various courses of action. A smarter supply chain will also be capable of learning and making some decisions by itself, without human involvement. For example, it might reconfigure supply chain networks when disruptions occur. It could acquire rights to use physical assets like production capacity, distribution facilities and transportation fleets on demand through virtual exchanges. This intelligence will be used not only to make realtime decisions, but also to predict the future. Equipped with sophisticated modeling and simulation capabilities, the smarter supply chain will move past sense-and-respond to predict-and-act.

Clearly, supply chains have the potential to become much smarter. But this will not happen simply because they can. Smarter supply chains will emerge because they must. The challenges that sit at the top of the Chief Supply Chain Officer agenda demand it.

Flexibility will counteract cost volatility

Smarter supply chains will be inherently flexible. They will be composed of an interconnected network of suppliers, contract manufacturers and service providers that can be tapped on demand as conditions change. To leverage resources optimally, the supply chain of the future employs intelligent modeling capabilities. Simulations allow supply chain managers to see the cost, service level, time and quality impacts of the alternatives being considered.

For example, during an advertised promotion, a retailer's system would analyze inventory, capacity and shipment information sent by suppliers against business rules and thresholds to determine if an out-of-tolerance situation is anticipated during the campaign. If predicted, the system sends a proactive notification to the merchandise planner, and generates an automatic transaction to the appropriate supply chain constituent. An anticipated late shipment could initiate a shipping request to a different logistics service provider, or a quantity discrepancy may automatically generate a reorder of merchandise from another supplier, thus avoiding costly out-of-stocks or missed sales.

Are you ready?

Can you adequately address rising cost volatility with your current contingency planning capabilities?

Is your supply chain design flexible enough to keep costs aligned with revenue?

Are your partners interconnected and aligned to provide efficiencies throughout the network?

Do you have sustainability strategies and procedures in place to manage fluctuating energy costs?

Smarter cost containment

Instrumented

Sensor-based solutions to reduce inventory costs with increased visibility

Production and distribution process detectors to monitor and control energy usage and waste

Physical transportation, distribution and facility asset management, controlled and monitored with smart devices for efficiency and utilization

Interconnected

Agile, on demand network of suppliers, contract manufacturers, service providers and other (financial and regulatory) constituents

Outsourcing non-differentiating functions to share risks across the global network

Variable cost structures that fluctuate with market demand

Shared decision making with partners at source (local, regional, global strategies)

Integrated, networked asset utilization and management

Intelligent

Network and distribution strategy analysis and modeling with event simulations

Scenario-based operational analysis

Simulation models and analyzers to evaluate flexibility factors— service levels, costs, time, quality— with inventory synchronization

Sustainability models to analyze and monitor usage impact (carbon, energy, water, waste)

Integrated demand and supply management with advanced decision support

Case study

AAFES collaborates to cut costs for its customers

The Army and Air Force Exchange Service (AAFES) is a U.S. military organization that sells merchandise and services to active-duty, guard and reserve members, retirees and their families at competitive prices. AAFES invests roughly two-thirds of its earnings to support morale, welfare and recreation programs.

Since every dollar saved contributes to an enhanced quality of life for military members and their families, AAFES is always looking for innovative approaches to reduce operating expenses. In 2007, it realized that tremendous synergies could be achieved through a shared services model with a peer organization: the Family and Morale, Welfare and Recreation Command (FMWRC). Both organizations served the same customer, and their product assortments were similar.

Starting in the European Theater, the organizations formed a joint team to examine overall landed costs and identify partnering opportunities across procurement, distribution and transportation. The team found, for example, that AAFES was providing merchandise to FMWRC warehouses, where it was unloaded, stored and subsequently delivered to individual FMWRC activities. Now, these goods are shipped directly to FMWRC locations, eliminating the need for the FMWRC warehouses. Through collaborations like these, the two organizations have lowered unit delivery costs through increased volume, eliminated the need to carry an average inventory of about US\$2.3 million and reduced labor expense by more than US\$800,000.



Visibility is vital

Executives want to know everything about their supply chains — each shipment leaving a supplier's dock, each unit sitting on a contract manufacturer's assembly line, each pallet being unloaded at a distribution center or customer's storeroom. But this pervasive visibility cannot require any extra effort from supply chain partners. Simply put, it must be easier to share than not to do so.

This means that in a smarter supply chain, objects — not people — must do more of the reporting and sharing of information. Critical data will come from trucks, docks, store shelves, and parts and products moving through the supply chain. This visibility won't just be used for better planning — it will be fundamental to realtime execution.

Visibility will also extend to the world in which the supply chain operates. Smarter supply chains will track soil conditions and rainfall to optimize irrigation, monitor traffic status to alter delivery routes or shipping methods, and follow financial markets and economic indicators to predict shifts in labor, energy and consumer buying.

Increasingly, visibility issues will not be about having too **little** information, but rather too **much**. Smarter supply chains, however, will use intelligent modeling, analytic and simulation capabilities to make sense of it all.

Are you ready?

If you had more visibility, could you act on it?

Is most of your visibility information generated by people, or by “smart” devices and objects?

Are you prepared for the impending increase in information volume, variety and velocity?

Smarter visibility

Instrumented

Shelf-level replenishment

Event-driven monitors and alert detection based upon thresholds and tolerances

Smart devices and sensors (RFID) to capture realtime visibility: forecasts/orders, schedules/commitments, pipeline inventory, shipment lifecycle status

Sense-and-respond demand and supply signal notification

Interconnected

ERP to ERP to ERP integration

Multipartner collaborative platform for suppliers, customers and service providers, with data synthesis and decision support

Integrated forecasting, orders and point-of-sale

Dynamic supply-demand balancing with just-in-time and demand-driven replenishment

Integrated performance management

Intelligent

Pipeline inventory forecasting and analytics

Service-level analysis with inventory optimization

Optimized buy recommendations

Price-protection analysis

Advanced decision-support analytics and optimization to automate and self-actuate supply chain transactions

Predictive buy-sell decision support

Case study

At Airbus, it's clear skies and high visibility¹⁰

Airbus is one of the world's largest commercial aircraft manufacturers, producing over half of all new airliners with more than 100 seats. With its suppliers becoming more geographically dispersed, Airbus found it increasingly difficult to track parts, components and other assets as they moved from suppliers' warehouses to one of its 18 manufacturing sites.

To improve overall visibility, the company created a smart sensing solution capable of detecting when inbound shipments deviate from their intended path. As parts move from suppliers' warehoused inventory to the assembly line, they travel in smart containers fitted with RFID tags holding vital information. At each important juncture, readers interrogate these tags. If shipments arrive at the wrong place or do not contain the right parts, the system alerts employees to fix the problem early before it disrupts production.

The Airbus solution, the largest of its kind in manufacturing, has significantly reduced the incidence and severity of parts delivery errors — and the costs associated with correcting them. Knowing precisely where parts are in the supply chain has allowed Airbus to reduce the number of containers by 8 percent and avoid significant carrying costs, and has also increased the overall efficiency of its parts flow. With its highly instrumented supply chain, Airbus is well-positioned to meet known — and unanticipated — cost and competitive challenges.



Risk must be managed systemically

Risk comes in many forms. The last decade has been peppered with wake-up calls: tainted food and toys, random acts of terrorism and, most recently, the worldwide economic crisis. As supply chains become more complex and interdependent, risk management must become more comprehensive — extending far beyond what any one enterprise can control.

The smarter supply chain recognizes risk as a systemic issue. Its mitigation strategies take advantage of millions of smart objects that can report threats like temperature fluctuations, theft or tampering. It also collaborates with supply chain partners on joint mitigation strategies and tactics. And if (or when) problems do occur, it capitalizes on realtime connectivity across the extended supply chain to respond in a rapid, coordinated fashion. Arguably, the smarter supply chain's greatest advantage is its ability to model and simulate risk across the entire network.

This intelligence also helps develop a sustainable supply chain that uses natural resources wisely and positively impacts the communities in which it operates. For example, smart systems enable the supply chain to conserve energy and resources by operating more efficiently and reliably. The same connectedness that allows social and environmental activists to find out about and pounce on the slightest company failing is used to detect potential problems, collaborate on risk mitigation activities and demonstrate the high degree of transparency that customers and supply chain partners have come to demand. Sophisticated analytics help executives evaluate a full spectrum of social and environmental considerations.

Are you ready?

How is risk factored into your operational decision making and contingency planning?

How are smart objects like RFID tags and sensors helping you detect potential supply chain disruptions before they occur?

How can you keep progressing against long-term goals — like sustainability — even in times of economic uncertainty?

Smarter risk management

Instrumented

Monitors and sensors for product traceability from ingredients to final customer consumption

Sensor solutions for monitoring product condition through the supply chain to help ensure product quality

Weather intelligence and sensors for predictive analysis for supply planning, shipment routing and allocations

Interconnected

Resilient supply chain network design at strategic level

Network integration with variable contingency plans and policies

Integration of financial and operational analysis

Compliance strategies and policies with suppliers, service providers, contract manufacturers

Networked sustainability policies for entire product lifecycle from design through consumption to afterlife

Intelligent

Probability-based risk assessment and predictive analysis: likelihood, severity, ease of detection for key risk factors with mitigation policies and procedures

Risk-based financial impact analysis: decision tree, sensitivity analysis

Risk-adjusted inventory optimization

Disaster response simulation models

Bayesian supply chain risk analysis and mitigation models

Case study

At Cisco an ounce of prevention is worth a pound of dollars

Cisco hardware, software and service offerings are used to create the Internet solutions that make networks possible. To improve overall resiliency and insulate itself from potentially catastrophic events, Cisco created a supply chain risk framework that included a resiliency index and a set of metrics related to recovery from events and crises. Each “node” (suppliers, manufacturing partners, logistics centers) in the Cisco supply chain is responsible for tracking and reporting its “time to recover” and ensuring recovery plans and capabilities are in place prior to any actual disaster.

Cisco’s solution, the first of its kind, has evolved from a forum of supply chain risk management practitioners invited from many industries to create best practices. The vision is an “open source” library of processes and practices that participating companies can leverage in order to quantify potential exposures and develop resiliency programs, e.g., alternate sources, alternate location qualification, risk buffers. It starts with Business Continuity Planning, in order to understand the vulnerabilities and resiliencies across the supply chain. When an earthquake hit China in 2008, Cisco’s forward-looking business continuity process allowed it to identify the potential exposure and initiate a mitigation plan before the disruption resulted in any customer or revenue impact. Cisco was able to identify which nodes were affected and assess the potential impact within hours of the event. Using that impact assessment, Cisco was able to work with its suppliers and manufacturing partners to avoid any component disruptions.



Customer input should permeate the supply chain

Most supply chains excel at meeting customer needs once they're known. It's the "knowing" part that is difficult.

While other supply chains connect with customers primarily to provide timely, accurate delivery, smarter supply chains interact with customers throughout the product lifecycle—from research and development, to everyday usage, to product end-of-life. Pervasive instrumentation allows smarter supply chains to intercept demand signals at their source—items lifted from shelves, products leaving stores or critical parts showing signs of wear. In effect, every interaction becomes an opportunity for effortless customer collaboration.

Smarter supply chains also use their intelligence to see beyond the masses. Through advanced analytics, they can identify ever-finer customer segments and tailor their offerings accordingly.

Are you ready?

Are your customer relationships as strong
as your supplier relationships?

Which parts of your supply chain lack
customer participation?

Is your performance measurement system
centered on customer goal achievement?

Smarter customer interaction

Instrumented

Sensor solutions to signal retail shelf requirements

On-site services such as automated sensor-based checkout

Product authentication and consumer loyalty program access with customer cell phones

Embedded software and analytics for automated product defect and service alerts

Interconnected

Global versus regional versus local strategies and tactics

Networked S&OP with optimized forecast, buy/sell decision support

Sustainable, “green” considerations and co-branding:

- Product design and packaging
- Co-branding with customer initiatives
- Compliance programs

Customer collaboration throughout all supply chain processes

Intelligent

Customer segmentation of product/service portfolio: profitability; geography/market; product/service mix

Simulation models of customer behavior, buying patterns and market penetration applied to planning and operations volumes

Optimized inventory pipeline planning and execution by customer segment

Cost-to-serve models and analysis

Case study

Nuance optimizes inventory to serve customers on the move

The Nuance Group is one of the world's top airport retailers with operations spread across five continents.¹¹ In its line of business, Nuance may only get one chance to make a sale. Maintaining the right inventory is critical.

Unfortunately, the company's Australian duty-free stores were regularly confronted with stock outages and, conversely, excess inventory. To serve its customers better — and realize more growth — Nuance decided to replace its manual inventory tracking and ordering approach with a smarter forecasting and inventory optimization system. The solution analyzes actual sales data, along with sales trends, customer buying preferences, planned promotions and projected airline passenger traffic, to calculate and submit replenishment orders.

Starting with its largest duty-free store at Sydney Airport in October 2007, Nuance has now equipped other Australian stores with this new system. In addition to drastically reducing the time required to replenish stock, the solution has also enabled more accurate demand forecasts, inventory reductions of 10 to 15 percent and increased sales.



Global supply chains require integration and optimization

To date, globalization has resulted in higher profits mainly because of rapid revenue growth. But as supply chains get smarter, companies will be able to address efficiency issues as well. For example, increased visibility from highly instrumented and interconnected supply chains will help companies identify and eradicate global delivery bottlenecks and quality problems.

In addition, decisions about manufacturing locations and suppliers will no longer be dominated by a single cost element like labor. Smarter supply chains will have the analytic capability to evaluate myriad alternatives in terms of supply, manufacturing and distribution — and the flexibility to reconfigure as conditions change. This will allow executives to plan for contingencies and execute amid economic and political volatility without reverting to protectionism or reverse globalization.

Are you ready?

How are you addressing the negative consequences of increased global sourcing?

With volatility rising, do you have the analytical capabilities to determine the optimal global configuration for your supply chain?

Do you have the agility to seamlessly switch to other manufacturing, supply or logistics partners when needed?

Smarter global integration

Instrumented

Sense-and-respond event management for end-to-end supply chain activities

Sensors and actuators: manufacturing, logistics, and process control

Realtime interconnection with sensors to detect product and shipment locations worldwide

Sensor solutions connecting the expanding global trading partner infrastructure for increased supply chain visibility

Interconnected

Global “centers of excellence” to optimize capability and delivery

Right-sourced global logistics network

SOA-based integration of heterogeneous systems

Collaboration tools embedded into performance management system

End-to-end supply chain collaboration tools and methods

Intelligent

Integrated dashboards for KPIs and event alerts, driven by business rules

Demand, supply and distribution network planning and execution:

- Simulation models and scenario-based strategies for planning
- Optimization of inventory throughout all phases of pipeline activity
- Integration of risk management and mitigation approaches
- Integrated production planning and execution

Case study

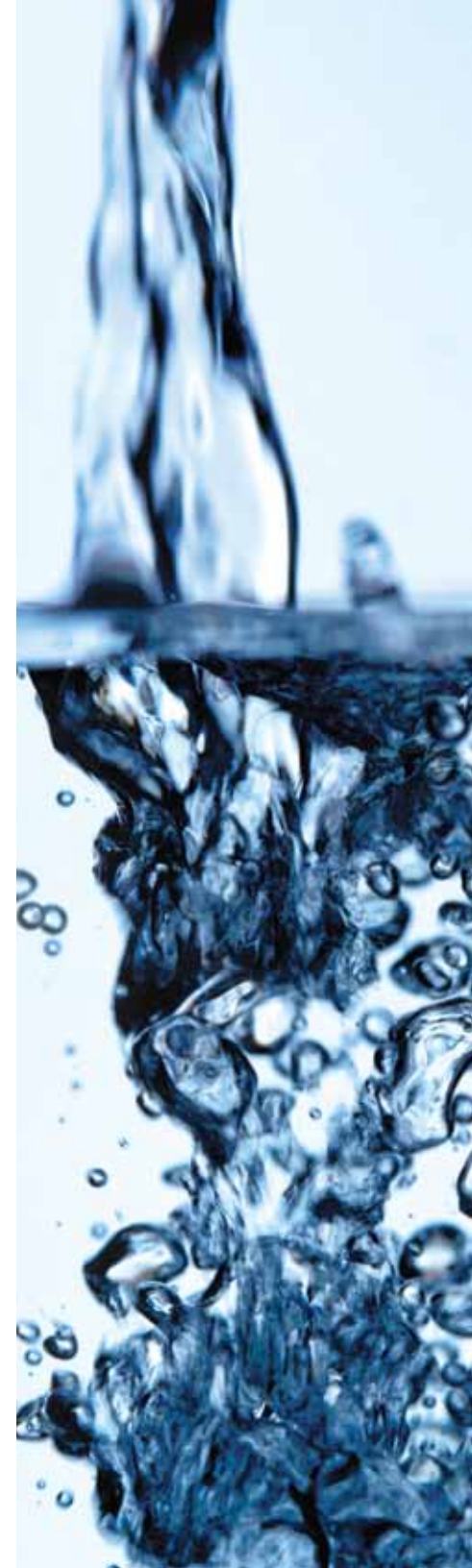
Grohe's global supply chain becomes globally integrated

Grohe AG is a leading manufacturer and supplier of sanitary fittings—holding roughly 10 percent of the global market. With 5,200 employees, 6 production plants, 20 sales subsidiaries and a presence in more than 130 countries around the world, Grohe is clearly a global company.

In 2005, Grohe faced limited growth in developed markets, increasing competition worldwide and rising product complexity. Responding to these challenges was difficult because the company's supply chain processes were not well integrated and were plagued by a high ratio of fixed costs.

To escape this gridlock and gain efficiencies from better global integration, Grohe initiated a company-wide transformation program called "World Class Grohe." This program of initiatives included alignment of supply chain strategy with business strategy, supply chain integration and harmonization, reduction of parts proliferation, make or buy strategies, logistics network optimization, globalization of the manufacturing footprint and increased global sourcing.

Grohe's transformation has produced tremendous value, including improved cash position, efficiency, speed, process excellence and quality. Through this comprehensive program, the company expects to achieve its strategic objective of becoming one of the leanest and most demand-driven companies in its industry worldwide.







Building the smarter supply chain

Building the smarter supply chain

As executives chart the future course of their supply chains, they will have several simultaneous objectives: They must align their supply chain strategies with rapidly changing business strategies. Then, to execute those strategies, they'll need to innovate and make the supply chain more sustainable, flexible and responsive through increased instrumentation, interconnection and intelligence. This transition to the Smarter Supply Chain of the Future must be seamless, without operational interruptions or performance slips. It's a strategic balancing act — one that requires a C-level leader.

The emerging role of the Chief Supply Chain Officer

The role of Chief Supply Chain Officer is emerging as a cross-line-of-business position reporting directly to the CEO (see Figure 12). This testifies to the pivotal role supply chain executives play in the success of their companies. But as supply chains evolve and become much smarter, what does that imply for the executives who manage them? What kind of capabilities will be required?

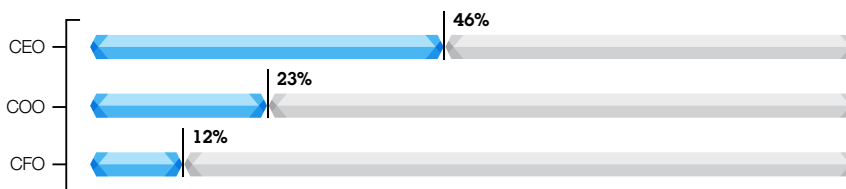
Right now, most senior supply chain leaders are overseeing traditional functions like distribution and logistics (77 percent), demand/supply planning (72 percent), and sourcing and procurement (63 percent). But some are beginning to play a role in strategy development (38 percent) and risk management (26 percent). We believe this involvement at a strategic level will grow. The Smarter Supply Chain of the Future will be a rich source of insights that inform other business functions and strategic decision making. The Chief Supply Chain Officer will be responsible for positioning the supply chain to make these critical contributions.

Since supply chain networks are rarely the responsibility of a single entity or decision maker, the Chief Supply Chain Officer will also need to be chief collaborator. He or she will need to be an expert at bringing together stakeholders (even those outside the extended supply chain, like regulators, activist organizations and governments) and facilitating joint planning and risk mitigation. Negotiation and stakeholder management skills will be important complements to market knowledge and supply chain expertise.

“This role will continue to gain importance to the overall organization. It is a critical success factor and will require more sophisticated talent and expertise in the future.”

Gary MacDonald,
Senior Vice President,
Supply Chain and Logistics, Hbc

Figure 12 Who does the top supply chain executive report to?



Chief Supply Chain Officers must also be diligent optimizers. Smarter supply chains will present decision makers with more choices and alternatives, and higher-precision controls and levers to achieve desired outcomes. Supply chain leaders must be capable of optimizing global networks of assets and talent — their own as well as those of partners and customers. These responsibilities also extend to environmental stewardship — maintaining the balance necessary to protect the earth’s natural resources. Perhaps more than any other C-suite role, the top supply chain executive must have an end-to-end understanding of the business, a broad view of external risks and the ability to manage holistically to produce optimal outcomes.

Why build a smarter supply chain now?

Why are we so convinced that supply chains are about to become much smarter? After all, the underlying technologies that enable this sort of intelligence have been around for some time. Why such a dramatic change now — especially with so much uncertainty ahead?

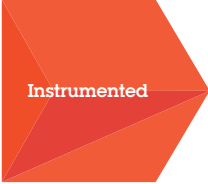
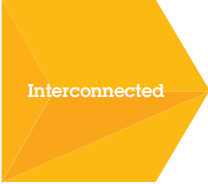
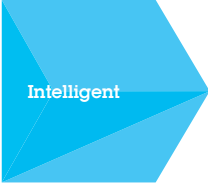
Actually, that’s precisely the point. Globalization and growing supply chain interdependence have introduced a heightened level of volatility and vulnerability that is unlikely to subside. Uncertainty has become the norm. This new environment demands a different kind of supply chain — a much smarter one.

With such a clear mandate for change, supply chain executives owe it to their organizations to reevaluate current strategies and initiatives (see Figure 13). Which investments are simply making processes faster or more efficient? And which go a step further — making the supply chain decidedly more intelligent and resilient in times of unprecedented instability and risk?

Often, when massive shifts are predicted, “change or perish” pronouncements pile up. But we do not see things in such a harsh light; the future we see is much brighter. Here’s why: Executives have at their disposal the necessary ingredients to make their supply chains substantially smarter. But perhaps more important — from our interviews with 400 of them worldwide — we also know executives are determined to make their supply chains strategic enablers. They understand how critical their function is to their companies’ success, and they relish the opportunity to create change that matters.

Thoughts and opinions on the smart supply chain concept and the business possibilities enabled by this kind of imbedded intelligence are evolving quickly. We look forward to discussing the Smarter Supply Chain of the Future with you in more detail — and working with you as you build it.

Figure 13 The “Smartmap” to the Supply Chain of the Future
Which capabilities are most critical to your organization?

	Strategy	Planning	Lifecycle Management	Sourcing and Procurement
	<p>Visibility and performance management</p> <p>SC optimization and transparency</p> <p>Sensors and simulators of customer demand</p>	<p>Realtime demand management and inventory optimization</p> <p>Realtime inventory pipeline visibility</p> <p>Early warning detection: supply and demand synchronization</p>	<p>Predictive analysis and simulation design techniques</p> <p>Embedded systems</p> <p>Sensors for preventative maintenance</p>	<p>Risk and compliance sensors and modeling</p> <p>Proactive and realtime supply network event monitoring</p> <p>Global sourcing and import logistics KPIs and detection</p>
	<p>Alignment of business and SC strategies with partners</p> <p>Integrated sustainability strategies</p> <p>Variable cost structures that fluctuate with market demand</p>	<p>Collaborative planning and execution</p> <p>Integration of financial and operational analysis</p> <p>Integrated S&OP with external metrics</p>	<p>Collaborative development and engineering with customers and partners</p> <p>Customer insight driving brand brilliance</p> <p>Knowledge sharing for continuous improvement</p>	<p>Realtime visibility of multi-tiered supply</p> <p>Contract management and strategic sourcing</p> <p>Outsourcing to share risks across the global network and create variable structures</p>
	<p>Segmented cost-to-serve analytics</p> <p>Sustained SC cost reduction via advanced analytics</p> <p>Risk-based impact analysis</p>	<p>S&OE (where “e” is execution)</p> <p>Risk-adjusted inventory optimization</p> <p>Networked S&OP with optimized decision support</p>	<p>New product development innovation and analytics</p> <p>Sustainable, “green” considerations throughout lifecycle</p> <p>Model-driven systems engineering</p>	<p>Predictive buy-sell analytics</p> <p>Sustainable procurement practices</p> <p>Intelligent spend analysis</p>

	Operations	Asset Management	Logistics	Enterprise Applications
	<p>Optimized inventory controls and event detection</p> <p>Sensors and actuators in production for carbon, water, waste monitoring</p> <p>Visibility for operational risk management and control</p>	<p>Total cost management dashboards</p> <p>Environmentally sustainable asset monitoring</p> <p>Integrated probability-based risk assessment</p>	<p>Event-driven logistics alerts</p> <p>Realtime sensors for optimized network</p> <p>Ease of network on-boarding and automated data feeds from logistics partners</p>	<p>Monitoring and realtime detection and alerts</p> <p>Inventory optimization</p> <p>ERP to MES integration</p>
	<p>Networked design for manufacture, supply, use and reuse</p> <p>Trade terms management linked to partner KPIs</p> <p>Demand-driven production and postponement</p>	<p>Integrated asset and resource management</p> <p>Geographic information systems</p> <p>Dynamic and variable asset cost structures</p>	<p>Realtime visibility to logistics providers</p> <p>Network integration with variable contingency plans and policies</p> <p>Agile, on demand logistics network</p>	<p>Collaboration platforms: customer, provider, supplier</p> <p>ERP to ERP integration</p> <p>Enterprise and network performance management</p>
	<p>SC models to manage capital expenditure</p> <p>Disaster response models</p> <p>Simulation model to evaluate flexibility factors: service levels, costs, time, quality</p>	<p>Cost-of-ownership analysis</p> <p>Tax and compliance modeling</p> <p>Proactive redeployment/reconfiguration/ divesting of assets</p>	<p>Carbon footprint management</p> <p>Data-driven reverse logistics</p> <p>Network and distribution strategy analysis and modeling</p>	<p>Business intelligence and integrated analytics</p> <p>Predictive analysis and advanced analytics applied to events</p> <p>KPI trends linked to training and change management program</p>

18%

with annual revenues
below US\$500 million

24%

with annual revenues
above US\$20 billion

23%

with more than 1,000 supply
chain employees

25%

with less than 100 supply
chain employees

Study methodology

Over the past decade, we have conducted periodic surveys to understand the most pressing challenges and objectives of supply chain managers and staff. However, in recognition of the increasingly strategic role of the supply chain, we decided in 2008 to embark on our inaugural Chief Supply Chain Officer Study, based on in-depth, face-to-face interviews with companies' highest-ranking supply chain executives.

We spoke at length with 393 executives located in 25 countries across North America, Western Europe and Asia Pacific. These leaders head supply chains that serve 29 different industries, including Retail, Industrial Products, Food and Beverage, Pharmaceuticals, Telecom, Electronics and Government.

As part of our research, we examined how responses from the world's leading supply chains differed from the remainder of our study population. We defined **leading** or **top** supply chains as the subset of our respondents — 17 of them — whose companies are listed in “The AMR Research Supply Chain Top 25 for 2008.”



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We would like to thank the senior supply chain executives from around the world who shared their time, experiences and knowledge with us. Their commitment to supply chain excellence was obvious and inspiring. We are especially grateful to the executives who allowed us to share their own words and stories through the quotes and case studies used in this report.

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The IBM Institute for Business Value

The IBM Institute for Business Value, part of IBM Global Business Services, develops fact-based strategic insights for senior business executives around critical industry-specific and cross-industry issues.

Notes and sources

- 1 "World Investment Report 1996: Investment, Trade and International Policy Agreements." United Nations. August 1996; "World Investment Report 2008: Transnational Corporations, and the Infrastructure Challenge." United Nations. July 2008.
- 2 "Companies without borders: Collaborating to compete." Economist Intelligence Unit. 2006.
- 3 Lewin, Arie Y. and Vinay Couto. "Next Generation Offshoring: The Globalization of Innovation." Offshoring Research Network. March 2007. https://offshoring.fuqua.duke.edu/ORNreport_exec_summary.pdf
- 4 "Record 182,000 New Products Flood Global CPG Shelves." Metrics 2.0. February 19, 2007. http://www.metrics2.com/blog/2007/02/19/record_182000_new_products_flood_global_cpg_shelve.html
- 5 Throughout this report, when we mention "top" or "leading" supply chains, we are referencing the subset of our survey population that was featured in: Friscia, Tony, Kevin O'Marah, Debra Hofman and Joe Souza. "The AMR Research Supply Chain Top 25 for 2008." AMR Research. 2008.
- 6 We believe this to be the case because most of the supply chain executive interviews were conducted before September 2008.
- 7 REACH is a European regulation that deals with the Registration, Evaluation, Authorization and Restriction of Chemical substances; it became effective on June 1, 2007. The European Union's Restriction on Hazardous Substances Directive, or RoHS, took effect on July 1, 2006, while the European Union Greenhouse Gas Emission Trading Scheme (EU ETS) began operations in January 2005.
- 8 "Unlocking the DNA of the Adaptable Workforce: The Global Human Capital Study 2008." IBM Global Business Services. September 2007.
- 9 Palmisano, Samuel J. "A Smarter Planet: The Next Leadership Agenda." Speech given at The Council on Foreign Relations. November 6, 2008.
- 10 "Airbus's cost effectiveness gets a lift with greater supply chain visibility and automation." IBM Corporation. October 2008.
- 11 "About us: The world's top airport retailer." The Nuance Group. 2007. <http://www.thenuancegroup.com/aboutus/>

Glossary

ERP	Enterprise resource planning software
GPS	Global positioning system
KPI	Key performance indicator
MES	Manufacturing execution system
RFID	Radio-frequency identification
S&OP	Sales and operations planning

For further information

To find out more about this study, please send an e-mail to the IBM Institute for Business Value at iibv@us.ibm.com, or contact one of the IBM Supply Chain Management Services leaders below:

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