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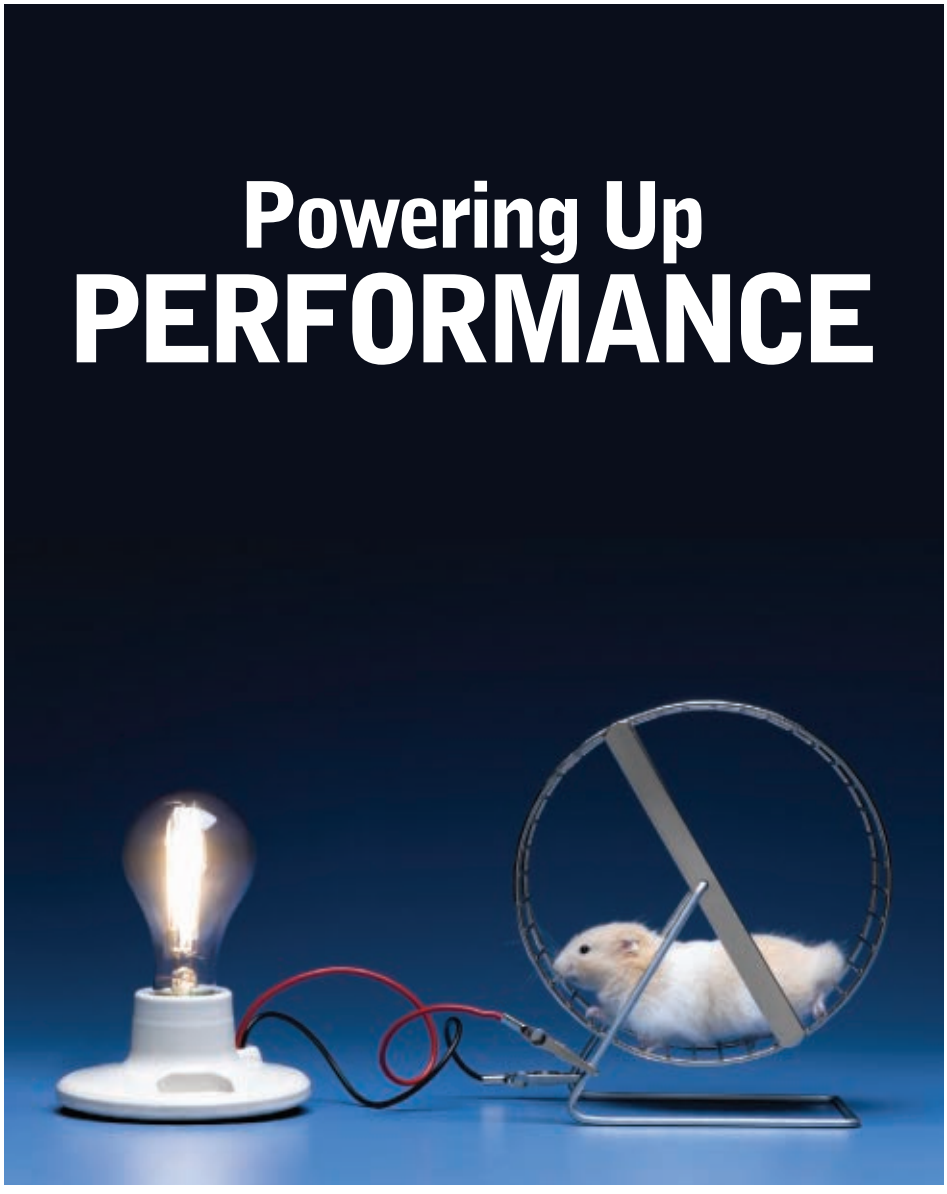

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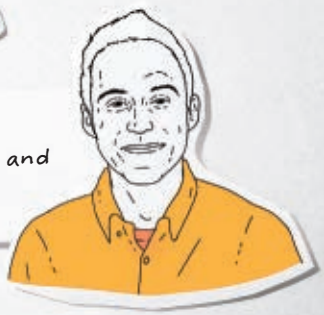

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March/April 2010 Volume 14, Number 2

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The Pressure to Perform

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Business today is unrelenting. Just as you've finished up a dynamite promotion campaign or launched a superefficient distribution center, the market has a tendency of saying, "Not bad, but what have you done for me lately?" That's cold!

It's exactly because of that competitive reality that companies today need to constantly fine tune and update every aspect of their performance. Naturally, we're particularly concerned about that part of the business called supply chain management.

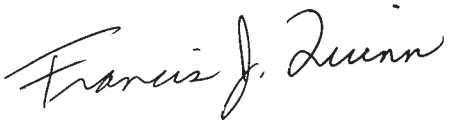
One thing we know for certain about SCM performance—there is a definite payback in consistently excelling. Most of us likely could have figured that out intuitively. But now the researchers at Michigan State University have the data to back up the intuition. In studying the financials of the top supply chain companies vs. comparable competitors, the MSU research team discovered some eye-opening differences between the two groups. Specifically, the top SCM companies overall had 50 percent higher net margins, 20 percent lower operating costs, and 12 percent lower average inventories. And that was just the beginning.

Looking for specific ways to excel in supply chain management while at the same time boosting your business? Supply management executive Justin Reaume of Magna Electronics offers six procurement actions companies can take to achieve those dual objectives. The great thing about these suggested initiatives is that they are proven and practical, based on the author's real-world experience as a supply chain practitioner.

It is not enough, by the way, that your own supply chain organization run at peak performance. You need your key suppliers operating at the top of their game as well. But how do you know if your suppliers are operating on all eight cylinders? And if they're not, how do you bring them up to speed? The answers, writes Robert Trent, lie in a comprehensive supplier scorecard. The Lehigh University educator details the essential characteristics of a supplier scorecard that can lead directly to enhanced performance.

Importantly, you have to accomplish all of the performance-enhancing activities in a safe and secure supply chain environment. That's where our interview with Gary Lynch of Marsh Inc., should help. The risk management expert and author of *Single Point of Failure* tells how to make risk management a priority with your executive management—and then how to go about building a risk management program that helps assure supply chain continuity.

So while the pressure to perform doesn't promise to let up anytime soon, continued supply chain improvement is not an impossible task. We hope that the collective insights from our March/April issue will help you pull it off.



SUPPLYCHAIN MANAGEMENT REVIEW

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BY LARRY LAPIDE

Cheap Oil is Dead—Again

Once again, oil prices are starting to rise. Don't scramble to accommodate later. Plan ahead now. Here's how.

Dr. Lapide is a lecturer at the University of Massachusetts' Boston Campus and is an MIT Research Affiliate. He welcomes comments on his columns at llapide@mit.edu.

Companies have been focused on surviving the dismal economy with a diminished focus on energy efficiency. Prior to the crash, I devoted two *SCMR* columns to rising oil prices because I believe energy efficiency is one of the most important issues to continually address.

A year ago in my "Oil Won't Stay Cheap" column, I re-argued that the economics still portend rising oil prices over the long haul. At that time, crude oil was trading as low as $40 per barrel after having skyrocketed to $147 per barrel. The precipitous economic decline caused oil prices to drop drastically and mask the long-term trend. Many, however, were breathing a sigh of relief because lower oil prices could help them reduce supply chain costs at the expense of being energy-efficient.

With economies showing improvement and oil prices rising to $70 to $80 per barrel–almost twice the price at the time of last year's column and three to four times more than during the Era of Cheap Oil–I feel compelled to write about energy efficiency again.

Supply Chains Are Energy-Inefficient

Exhibit 1 depicts the history of "real" and "nominal" crude oil prices since 1980, an update to what I've shown in prior columns. It shows the Era of Cheap Oil going from January 1986 to the fall of 2003, in which "real" prices largely bounced around from about $20 to $30 per barrel. The era overlapped with the Golden Age of Supply Chain Management, during which companies integrated supply chains, and significantly reduced costs and inventories leveraging cheap oil. Supply inventories were pushed up chains, with suppliers holding or manufacturing inventory as far away as Asia, and chains sped up to get finished goods to consumers in a "Just-in-Time" (JIT) mode. The end of Cheap Oil left us with cost- and inventory-efficient but energy-inefficient supply chains. For the most part goods traveled too far, vehicles and containers were shipped partially full, and energy-inefficient freight modes were deployed to speed up deliveries. The ensuing higher oil prices led many to reconfigure chains to squeeze oil out of them and make them more energy efficient.

Until (as can be noted in Exhibit 1) oil dropped to the $40/barrel range and they could leverage lower prices to reduce costs during the economic crisis. That drop was brief and oil prices started back on their uphill climb because easy-to-tap oil reserves are depleting and, to quench the thirst of rising economies, oil will be needed from places more expensive to extract it from.

Focus on Transportation

Logisticians should especially focus on energy efficiency in their transportation operations. An EPA report, the *2009 U.S. Greenhouse Gas Inventory Report: Inventory Of U.S. Greenhouse Gas Emissions And Sinks: 1990-2007*, April 2009, reported that the transportation sector is the second major source of greenhouse emissions (after electricity generation). The following quote from it attributes a significant portion of emissions as caused by freight operations:

"Transportation activities…accounted for 33 percent of CO_2 emissions from fossil fuel

combustion in 2007. Virtually all of the energy consumed in this end-use sector came from petroleum products. Nearly 60 percent of the emissions resulted from gasoline consumption for personal vehicle use. The remaining emissions came from other transportation activities, including the combustion of diesel fuel in heavy-duty vehicles and jet fuel in aircraft."

Given the current political winds, pollution control will become another reason to start with transportation. Below are some rules-of-thumb for doing so:

• *Customer Service Programs:* Bundling delivery costs into the price of a product hides the true cost of transportation and implications for energy efficiency. Unbundling is a good way to begin to understand and track efficiency. Customer service programs should offer a discount for full container and truckload orders. In addition, customers should pay an additional fee for expedited and emergency deliveries that require the use of less-efficient transport modes, and for JIT shipments that require shipping significantly less than a full container/truckload.

• *Strategic Network Design:* Generally shortening and slowing down supply chains make them more energy-efficient. However, doing so increases finished goods inventories needed to be held close to customers and might increase in-transit inventories. Energy efficiency will require becoming less fixated on reducing inventories via inefficient freight modes, and instead using slower, more efficient modes, such as ocean rather than air, barge rather than rail, and rail rather than truck for inbound and inter-facility shipments. Additionally, more finished goods will need to be stocked closer to customers and supply lines shortened via sourcing and manufacturing closer to customers.

• *Tactical Planning:* More accurate planning can lead to greater energy efficiency. When a plan is wrong, it often results in having to use energy-inefficient premium freight to expedite customer deliveries or to quickly re-deploy materials, components, and goods among suppliers, plants, and warehouses. Improved supply-demand planning (i.e., via a well-executed Sales and Operations Planning process) leads to more accurate plans requiring less intervention in responding to disruptions and unplanned events.

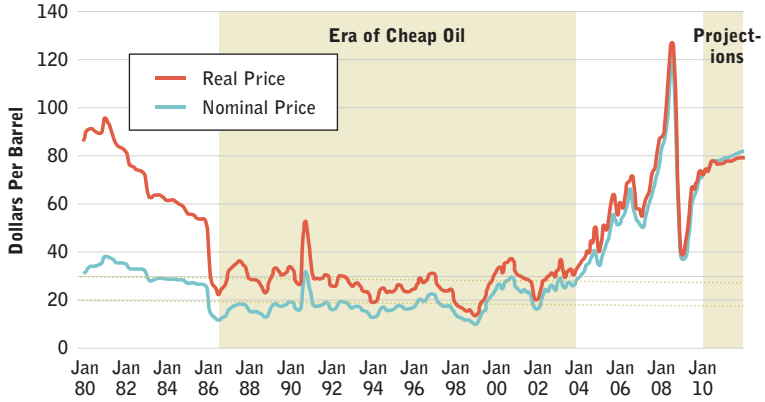
The end of the era of Cheap Oil left us with cost- and inventory-efficient but energy-inefficient supply chains.

• *Order Promising and Fulfillment:* Many companies provide a customer order promise date based only on available supply. Extending this to a promise based also on future planned supply can improve planning accuracy (hence energy efficiency) because it helps to make the plan a reality. In addition, service window management, whereby an extended promise date is given (such as adding a certain amount of buffer time to the date), allows a company to have extra time to fulfill orders, reducing expediting as well as allowing it to consolidate orders to improve transport efficiencies.

Following these rules-of-thumb can make your transportation operations more energy-efficient. And now that Cheap Oil is history, it will also help reduce overall supply chain costs. Since the EPA has indentified transport operations as a major cause of air pollution it will also make them more environmentally-friendly. However, beware the next big drop in oil prices. Don't get fooled into thinking that Cheap Oil is back. The drops are likely to be short-lived.

EXHIBIT 1

Imported Crude Oil Prices: Nominal and Real



Source: http://www.eia.doe.gov/emeu/steo/pub/fsheets/

Global Sourcing: The Regional Dynamic

Research into the sourcing potential and practices in Africa, Eastern/Central Europe, and Asia/China reveal big differences—and big opportunities—for supply management professionals.

By Arnold Maltz, Adegoke Oke, Poul Erik Christiansen and Fred O. Walumbwa

The need to compete effectively on cost is driving many firms in developed countries to source materials, products, components, and services from developing countries with low cost structures. Since developing countries view this as a driver of economic growth, they often compete vigorously to become suppliers to affluent economies. In the past decade, the sourcing success stories have been in Eastern Europe and Asia, but major buyers are now seeking alternative sources to reduce their vulnerability to supply disruptions and cost increases. (Exhibit 1 shows the significant growth among key emerging sourcing markets.) For example, Chinese toy manufacturers have experienced strikes and quality problems while local protests forced Tata to relocate a factory in India. The likely evolution of regional capabilities is now part of the global strategy equation.

We interviewed lead buyers, suppliers, and intermediary firms operating globally to understand their expectations of sourcing geography over the medium and long term. Specifically, we collected data from buying firms based in the United States, Scandinavia, and United Kingdom; an intermediary company based in Scandinavia; and suppliers based in Estonia and Kenya. All manufacturer and intermediary personnel had direct responsibility for choosing and working with partners in transitional, newly industrialized, and developing countries. These countries included Poland, Estonia, Romania, Mexico, China, and Kenya. Our research participants also offered their thoughts on other developing economies based on their past experiences in those economies.

We found that both buyers and suppliers perceived differences in both customer orientation and sourcing potential among firms in Africa, Eastern/Central Europe, and Asia/China.

Three Different Sourcing Roles

It appears that the three regional areas will play fundamentally different roles in the global economy and sourcing over the long term. Eastern and Central Europe will be integrated into Europe and may become the postponement platform for the rest of Europe, especially for manufacturers who want continuing control of their intellectual property. Southeast Asia, China, and India will become economically more independent; buyers within the region will be a primary long-term factor in Asian development and will work to support both export-driven and regional supply networks. Sourcing from Africa will gradually increase, focused on the consumer goods industry and low-value and commodity product networks such as primary commodities (petroleum, minerals, etc). We are already seeing sourcing shift as China and India aspire to higher value manufacturing and wages increase in these key markets.

As for Eastern Europe, it appears that its initial success in leveraging low cost, skilled labor to attract European manufacturers is not sustainable. In fact, some Eastern European countries are already considered higher cost than alternative Asian locations. Instead, Eastern Europe loca-

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tions may be assigned the duty of quick response to short lead-time customer orders. Warehousing of subassemblies and configure-to-order capabilities may be left in Eastern Europe, but high volume sourcing and manufacturing will likely be transferred to Asia. Conversely, it is unlikely that African suppliers (except South Africa) can aspire to produce high value or highly engineered items in the near future.

The drivers of continuing reconfiguration and shifting patterns in sourcing across different regions include the following:

• *Unit costs are lower in Asia and will remain lower because of demographics.* The limited labor pool in Eastern European countries is relatively well-educated and will be looking for opportunities in knowledge-intensive activities, rather than production jobs. On the other hand, the large rural populations in China, India, and other Asian countries remain very interested in manufacturing jobs.

• *Asian countries represent a large potential market.* The Scandinavian and American brand-owning companies were expanding in Asia to supply their sister plants in the region as well as to support demand outside of Asia. Some of these manufacturers are setting up separate Chinese operations, one for domestic Chinese markets and the other for export items. As East Asian economies grow, demand for sophisticated products will also grow. India's markets are also reaching critical mass and will require local manufacturing capacity.

• *Final assembly of components for manufactured products, or at least final configuration, is likely to remain in Eastern Europe for European markets.* Some manufacturers continue to make their most advanced products in the original European factories to preserve expertise and intellectual property. These companies will need a just-in-time source of outsourced subassemblies, and Eastern Europe is a logical location for these staging operations. Also, the European market is complex. Power sources, languages, and label requirements still vary from country to country. The most efficient way to cope with this complexity is to reserve some percentage of total inventory for final customization for European customers.

• *Low value product supply chains provide the entry points for companies in Africa (except South Africa).* With an under-developed infrastructure, a perceived lack of skilled labor, and political instability in some countries, African locations have to prove themselves in low risk areas such as consumer goods. However, the low labor cost and abundant natural resources of Africa are already attracting interest from both advanced economy firms and others (notably Chinese and Indian companies) who are used to operating in less stable environments. For example, Mauritius has become a key location for making garments in the apparel industry that are sold worldwide.

EXHIBIT 1

Shifting Patterns in Global Sourcing
($000,000)

	2004	2008	% Increase
To: United States	$1,469,704	$2,103,641	43%
From: China	$196,682	$337,772	72%
Mexico	$155,901	$215,942	39%
Nigeria	$16,248	$36,068	134%
Vietnam	$5,275	$12,901	145%
South Africa	$5,944	$9,948	67%
Guina	$1,770	$3,367	90%
Poland	$1,821	$2,587	42%
Cambodia	$1,497	$2,411	61%
Ukraine	$797	$2,339	193%
Ivory Coast	$715	$1,092	53%

China has been the big winner over the last five years, but imports from other countries have grown even faster.

Intraregional Differences Abound

Business environments and markets also vary within regions and countries. Thus, there is growing movement to open new operations in western China vs. the coastal cities, especially where labor cost is a major concern. In Eastern Europe the movement is from north to south (e.g., Poland to Romania) and may eventually be from west to east (Poland to the Ukraine, Russia, and Turkey). In Africa, sourcing geography will depend on such factors as political stability and economic development. For example, Kenya is presently seen as a preferred sourcing location for agricultural products. However, there may be migration to Zimbabwe, Nigeria and Ivory Coast as the situations in those countries improve.

The significant variations from country to country and within countries can be the result of labor differences, material costs and availability, market potential, cultural and religious differences, and levels of corruption. All of these factors were mentioned as criteria for choosing among sourcing locations in developing countries.

As various potential sourcing locations develop, supply chain professionals will need to continuously evaluate when and how to reconfigure supply networks. Global purchasing managers will be expected to act as they gain more intelligence on currently little-known areas such as Africa. Locating and training suppliers in these regions will become part of the supply chain charter. Further, it will be up to supply chain professionals to use research such as ours and others to make optimal use of the resources, human and otherwise, that will become available as the economies of the world continue their progress toward interdependence and development.

IT Opens Door to Collaboration Era

Are we finally ready to more from the adversarial to the truly collaborative in our supply chain relationships?

By Kevin O'Marah

With economic uncertainty weighing on countries around the world, I find myself reflecting on a prediction that I made ten years ago—that global supply chains would experience three phases of change as information technology found its way into each and every crevice of business processes.

The first phase, which was underway at the time I wrote the original article, involved improving productivity across business-to-business flows through the use of IT (and especially the Internet) to streamline transactions. The second phase, which seems duly to have been realized, was a flattening of these productivity gains as businesses tapped out the obvious benefits of things like online auctions and automated ordering. Only then, in the third phases, would businesses discover that the big advances available depended more on a collaborative approach to business than on technology deployments alone.

Today, a mere 60 days into 2010, I look at the original conceptual graphic portraying this prediction and hope that my estimated dates were right. (See (Exhibit 1.)

2010 was supposed to be the turning point where, in phase three, the flat part of our productivity curve would bend sharply upward. This promised to be a time of accelerated growth based on wider adoption of truly collaborative practices between trading partners tapping deeply into the efficiency gains wrought with IT in the global supply chain. Are we there yet?

The answer at the moment may unfortunately be no. Let's start with the bigger picture: Politics. At the moment we have a crisis in the European Union as the sensible, solvent big economies, especially Germany and France, sweat the continued financial weakness of the little guys, especially Greece, whose participation in the EU's single currency limits their ability to inflate their way out of trouble. Debt markets shudder.

Meanwhile, China's economic miracle faces strains itself as inefficient state enterprises drain resources while falling exports limit what's left for the working masses who are suddenly seeing some cracks in their economic prospects. Debt markets shudder.

And of course, in the United States, government-funded bailouts and expansionary spending, while staving off near-term disaster promise to deeply undercut the value of the dollar in the long run. Again, debt markets shudder.

Sadly, the lesson at this higher level is that collaboration is not working. No one seems willing to share the burden or the benefit associated with overhauling our world economic system.

IT as Supply Chain Accelerant

As for business, the place where IT and global supply chain should have the easiest time combining the physical world of production and distribution with the logical world of ideas, designs, and code, a start is being made.

Take for instance the work of Colgate-Palmolive, the well known global consumer products company. As a lifelong (well, 15-year long) user of SAP's Enterprise Resource Planning (ERP) software, Colgate has established principles for logically breaking down the physical

Kevin O'Marah is Chief Strategy Officer at AMR Research.

supply chain that allow it to add margin every single year for the last two decades. By mastering (collaboratively with SAP, I might add) such esoteric but vital technical foundations as Master Data Management (MDM), Colgate has put itself in position to do exactly what I predicted ten years ago—systematically building joint value with grocery customers downstream in a way that makes more money for everyone. This example shows not only that it can be done, but that IT, in fact, is the essential ingredient needed to lock good intentions down with repeatable and scalable efficiency gains. This is no mere pilot but the first steps up the steep part of the curve.

Colgate-Palmolive is by no means the only example. Harris accomplishes similar efficiency gains with its component suppliers using Oracle's PLM software (formerly Agile) to accelerate joint problem solving around highly engineered systems that control satellites. Del Monte uses a combination of Oracle for front office reporting, i2 Technologies (now JDA) for demand planning, Vision Chain for downstream data harmonization and One Network for demand sensing to streamline inventories while improving fill rates. Mercedes-Benz used DELMIA from Dassault Systèmes to reduce the number of welding tools in its plants from 350 to 10. Asian Paints uses Infor's Optiva application to streamline the transfer of chemical formulae for paints from 14 different development labs to an optimized balance across 29 global manufacturing sites.

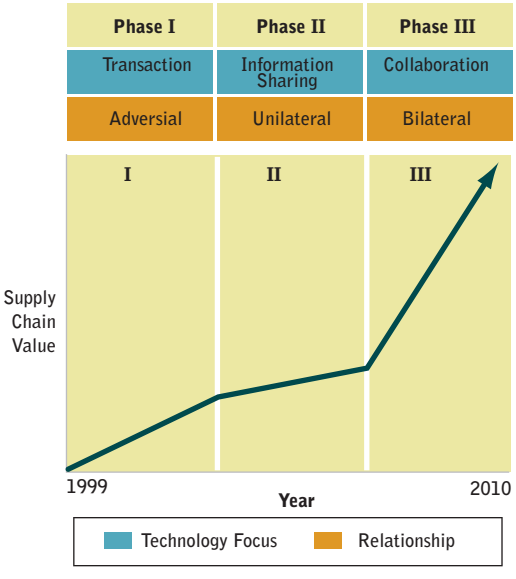
The common thread among these examples is that IT, when deployed against the efficiency imperative constantly driving global supply chains to improve, delivers big results.

For a sense of perspective on how important these advances are, consider the recent book by economics professor Gregory Clark, called *A Farewell to Alms*. This book's main message is that productive cultural characteristics, when manifested deeply enough, eventually persuade people to leave behind their hunter-gatherer instincts to compete violently in favor of patient, rational work for long-term gain. He calls the role of technology "crucial," stating: "The rate of technological advance in Malthusian economies can be inferred from population growth. The typical rate of technological advance before 1800 was well below 0.05 percent per year, about a thirtieth of the modern rate." The modern rate—about 1.5 percent per year—aligns well with historical data for productivity growth rates seen throughout the industrial age.

What I wonder, noting that most of Clark's data runs through 2000 at best, is whether the IT in global supply chain is ready to act as an accelerant to what he notes is a technologically-driven leap in living standards for certain parts of the developed world. Is the role of IT in supply chain to vault us not only forward, but also exponentially so with productivity growth rates two or three times as fast as we have seen since 1800?

EXHIBIT 1

Phases of Supply Chain Progress



Source: AMR Research

This brings us back to the core cultural challenge of the age, which is to embrace collaboration and eschew competition. The biggest weakness of Internet-enabled purchasing, for instance, was that suppliers felt that their value was reduced to a price-only bid for the business. Buyers were beating up suppliers with online auctions and ignoring their engineering or service value-add. The relationship was, as we note in Exhibit 1, adversarial.

Businesses Ready to Make the Move

Looking more recently at the wave of supplier scorecarding that has taken advantage of IT to broadcast ever more detailed information about buyers' needs back to suppliers, we see a flattening of value created, mostly because buyers still ignore their responsibility to adjust processes to add efficiency for all. Conceptually, it's not hard to imagine how supply-demand balancing could be radically improved if both suppliers and buyers worked together. This is what we mean by collaboration: it is a two-way street.

Our political leaders may be unable to get this collaboration groove going, but businesses are just about ready. One indicator is, of course, the steady drumbeat of real world examples like those described above. Another is signified by the very fact that AMR Research was acquired by Gartner just two months ago. AMR (Advanced Manufacturing Research) was built around the idea that physical production and distribution could be improved with IT. Gartner was founded to research the fast-changing world of IT itself, from microelectronics to business applications.

The Inclusive Leader: Ronald D. Casbon

By John Kerr

John Kerr is a special projects editor for *Supply Chain Management Review*

Most other senior managers would have thought they had the team they needed. After all, sourcing personal protective equipment for the factory was a relatively straightforward job. But Ron Casbon didn't think that way.

Casbon insisted that his cross-functional team at Bethlehem Steel—well-staffed with managers with great credentials in safety protocols and deep knowledge of safety gear—needed to get the opinions of the people who were going to have to wear the equipment on the shop floor. The insights from the factory workers proved invaluable—and surprised many on the sourcing team. "There's nothing like practical knowledge," says Casbon.

During the early 1990s, Casbon brought his inclusive perspective to bear as an officer of the Lehigh Valley chapter of what was then the National Association of Purchasing Management (NAPM). Attendance at chapter meetings generally did not top 25—a lackluster turnout since the chapter had more than 10 times that many members. Casbon led a drive to survey what members wanted to hear and learn—and then helped organize meetings around their declared interests. Three years later, meeting attendance had tripled, hitting numbers that were twice the NAPM's mean levels nationwide.

Involvement and empowerment are core tenets of Ron Casbon's leadership philosophy.

Ronald D. Casbon was, in fact, an inclusive leader long before it became fashionable to be so. In his earliest purchasing job in the 1980s, as a district purchasing agent for Bethlehem Steel's Shape and Rail Products division, he encountered the management culture that was typical of the times, where employees were expected to follow management's rules without deviation. "In those days I often paid a price for challenging processes and procedures," he recalls.

Asked to define leadership, he is quick to respond: "It's the ability and commitment to enable others to perform at higher levels by sharing knowledge and experience." He believes that the path to stronger leadership skills among supply chain management professionals must include more team-based cross-functional opportunities as well as plenty of strong mentoring and experience-sharing programs.

Over several decades in increasingly senior procurement roles, Ron Casbon has seen the prevailing management culture shift to recognize the value of employee involvement and to promote empowerment at all levels. "Without question, people are being encouraged to bring forth their ideas," he says. "It is happening more often than not."

But he still sees worrying gaps between what many supply chain executives say and what they practice. The issue he is most concerned about is the tendency for managers to play it too safe. High on the list of the leadership qualities he has always sought in his managers is "willingness to challenge the process"—meaning that he has always pushed himself and those who report to him to take prudent risks in the quest for results.

Five Rules to Lead By

Some time after he had first taken flak for challenging "the system" as a young manager at Bethlehem Steel, Casbon came across *The Leadership Challenge*, a book by James Kouzes and Barry Posner. "The five basic principles of this book really summarize the leadership style that I embrace and try to follow," he says. He lists them:

1. Model the way: Take prudent risks, eliminate barriers and provide full support.

2. Inspire a shared vision: Identify what is possible in spite of barriers.

3. Challenge the process: Ask what can we do better.

4. Enable others to act: Enlist and empower people—and give them freedom to fail.

5. Encourage the heart: Celebrate and reward accomplishments with personal memos, recognition events such as lunches, dinners, gift cards—both individual and team awards.

Casbon sees plenty of managers stepping up to those principles. But his issue is with those who don't step up to them often enough, uniformly enough, or consistently enough. "There is still some work to do to enable employees to challenge processes and accept failure when things don't go right," he says.

A big advocate of the book's first principle, Casbon also thinks many supply chain managers would do well to lead by example in terms of taking prudent risks."What I see are people doing it once or twice," he says. The higher that managers rise in the ranks, the less inclined they are to push the envelope as much as they could.

Casbon comes by his frank opinions honestly. Since 2008 he has been a senior consultant with Greybeard Advisors LLC, an advisory firm in procurement transformation, strategic sourcing, and supply chain management. In his consultancy role, Casbon has had ample opportunity to observe the behavior of supply chain managers up close. His years at Bethlehem Steel and later at chemicals producer Bayer also exposed him to many different styles of leadership.

The management practices he remembers most vividly were those of Jim Kegg, the manager who hired him for his first real "career job" as a purchasing agent at Bethlehem Steel. Kegg, who would go on to become a corporate vice-president of purchasing there, was fair, honest, and very demanding. "He was very much a taskmaster; he had a work ethic second to none!" recalls Casbon. "He wanted everyone to try their best, and exhibited that behavior in his personal approach to his job."

Ron Casbon warns against managers playing it too safe. He has always encouraged his people to take prudent risks in the quest for better results.

Kegg's standards meshed with Casbon's ideas. By the late 1980s, Ron Casbon was division purchasing agent for the company's Structural Products division; by the mid-1990s, he was the manager of capital and MRO purchasing. And by 1997, Casbon had become the general manager of capital, MRO, services and reclamation, responsible for an annual spend of $850 million. There, he led the transformation of the department from a traditional tactical approach to a strategic focus in all procurement activities.

On his career journey, Casbon's leadership stance in turn made a difference to those who worked for him—so much so that in 1998 and 1999, his department was recognized by Purchasing magazine as among the "Best Places to Work." Recalls Francis Farris, a strategic sourcing manager who worked for Casbon for five years: "Without a doubt, they were the most successful and positive years for me at Bethlehem Steel. Ron constantly showed a genuine interest in his buyers and encouraged us to express our ideas. He respected differences of opinion."

In 2000, Ron Casbon took on leadership of Bethlehem's transportation and logistics operations, where he led the reorganization of dispersed activities into one centralized department. When the steel company folded, he joined Bayer Corp. as the chemicals company's director of procurement for indirect materials and services, a strategic sourcing activity across multiple business units that accounted for an annual spend of $950 million.

Challenge: The Greatest Driver

But it is outside the workplace where Casbon has found some of his most satisfying professional moments. He was heavily involved in the Lehigh Valley chapter of NAPM (now the Institute for Supply Management) as past president, vice-president and at one stage as director of national affairs. He strongly encouraged his lieutenants to become involved, too. Professional association activities are "a great way to develop leadership skills in a completely non-threatening way," he says. His roles were recognized in 1998 when he received the Distinguished Service Award for outstanding contributions to the chapter, and then the following year as "Leadership Person of the Year" for the NAPM district.

If there's a final insight about leadership that Ron Casbon has to share, it's this: It is not the material rewards that drive people—it's the challenge. He is living proof of that—and so are the many supply chain professionals he has influenced to date.

The short answer is a resounding yes! New research findings show that the top supply chain management companies significantly outperform their competitors across most financial measures. This article offers insights into those financial gains that differentiate the leaders from their rivals—and offers tips on how to get your top management interested in investing for supply chain excellence.

Does Supply Chain Excellence Really

By Morgan L. Swink, Rajdeep Golecha and Tim Richardson

Do top supply chain companies consistently outperform their peers financially?

What performance metrics are most powerful in distinguishing top performing supply chain companies from their competitors?

How do you justify supply chain investments and get your CFO interested in supply chain initiatives?

Questions like these frequently form roadblocks to supply chain change initiatives. Getting executives, especially CFOs, to lend their support to supply chain improvements often means first convincing them of the financial potential of the investments.

To gain insight and provide some guidance on this task, we analyzed the financials of top supply chain management companies (Top SCM) and their nearest competitors (Comparable companies) using data from 2004-2007. The analysis reveals some interesting correlations between dimensions of supply chain excellence and financial performance. It also provides insights into the operating policies of companies with top performing supply chains. We draw upon these results to develop expectations for returns on supply chain improvements, and to identify the financial metrics that seem to be the most important distinguishers of supply chain excellence.

The results conclusively show that leading supply chain companies do, in fact, outperform their peers in most financial measures—even when accounting for other factors such as size and financial leverage. The market also appears to reward supply chain excellence, as the leading supply chain companies show greater stock returns and economic value added. Over the 2004–2007 timeframe,[1] the supply chain leaders outperformed their closest competitors across the following metrics:

- 50 percent higher net margins.
- 20 percent lower operating and SG&A (Sales, General & Administration) expenses.
- 12 percent lower average inventories (days of sales).
- 30 percent less working capital expenses/sales.

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PAY OFF?

- Twice the ROA (return on assets).
- Twice the ROE (return on equity).
- 44 percent higher economic value added.
- Twice the returns on stock prices.
- 2.4 times the risk-weighted stock returns.
- 46 percent greater market value-to-assets ratio.

These differences in performance are truly stunning. The following sections of this article discuss the approach we used to develop these findings and points out some surprising strategic implications for managers who seek to elevate their supply chain performance to the next level.

Identifying the Top SCM Companies

One of the initial challenges in this type of study is to identify "top" companies that are truly excellent in their supply chain management capabilities and practices. We combined multiple sources of data to identify these organizations, thereby minimizing the bias associated with any single source. The sources included the following:

- *AMR Research Top 25/50 Supply Chain Rankings (2004-2008).* For several years AMR Research has identified the top 25 companies selected from the Fortune 500 based on a composite score of financial and perceptual metrics. The financial metrics (ROA, inventory turnover, and sales growth) account for 60 percent of the total score. The perceptual components (AMR Research Opinion and Peer Opinion Panel) are weighted at 20 percent each.
- *Michigan State University MBA SCM Rankings (2007-2008).* Two MBA classes at the school's Eli Broad Graduate School of Management conducted research in 2007 and 2008 to identify top supply chain management companies in each of 20 different industry segments, including all manufacturing, distribution, and retail firms with sales greater than $100 million per year. The students first identified the six to eight companies that appeared in the top quartile of their respective segment most frequently over a two-year period on the

following supply chain oriented metrics: ROA, gross margin, inventory turns, cash-to-cash cycle time, and sales growth. Using information from company sources, direct interviews, and published articles, the students scrutinized the supply chain performance of these candidate companies. They then identified and reported on the top two or three companies in each industry segment.

• *CSC/SCMR/MSU Global Survey of Supply Chain Progress (2004-2008).* Each year *Supply Chain Management Review*, CSC, and Michigan State have jointly conducted a survey on supply chain management practices and performance. One of the survey questions asks respondents to indicate who in their opinion represent the best supply chain companies. We included all companies that received at least three mentions by respondents in a given year.

• *Supply Chain Digest (SCD)/Cannondale Associates Ranking (2008).* A recent study by *Supply Chain Digest* and Cannondale Associates ranks the top supply chains in the consumer packaged goods and retail industries.

While each of these sources has potential biases, the combination of all sources offers a more complete variety of perspectives. The AMR Research study, for instance, is limited to large firms (Fortune 500) while the MSU study addresses both small and large firms. The AMR study is broad based while the MSU study is industry focused. The AMR and MSU studies are both U.S. centered while the CSC/SCMR study gathers perceptions from international respondents as well. By combining the findings of these different studies we reduced the potential that a myopic perspective would unduly influence the selection of top supply chain companies.

In compiling our final list, we selected companies that were identified by at least two of the studies at any time within the 2004-2008 timeframe.

Identifying Comparable Companies

Once we identified the Top SCM companies we next had to identify a Comparable company for each. For this we used two sources: the Hoover's competitive report and Yahoo Finance Competitor Analysis. From the lists of direct competitors provided by Hoover's and Yahoo, we chose the company that was closest to each top supply chain company in terms of sales.[2] Table 1 at the end of the article lists each Top SCM company and the Comparable company selected.

As we mentioned earlier, part of the challenge with evaluating financial performance for the top companies is that most supply chain ranking systems either explicitly or implicitly use financial metrics as part of the rankings criteria. Importantly, our analysis determined that the financial criteria that influenced the selection of Top SCM companies do not actually have significant effects on overall performance differences between the top companies and comparable competitors. Our comparison indicated that only ROA and inventory turns are significantly higher on average for the Top SCM companies than for comparable companies. Cash-to-cash cycle and sales growth do not significantly differ between the two groups. And gross margin, in fact, is actually higher on average for the comparable companies.

Our conclusion: the use of these metrics in the original selection of the Top SCM companies does not appear to have systematically biased the results across the years.

EXHIBIT 1

Performance Comparison: Top SCM vs. Comparable Companies

	Performance Metric	Top SCM Company Average	Comparable Company Average	Is Top Company Performance Significantly Different?
Operational	Sales Growth	13%	16%	No
	Cash to Cash Cycle (days)	60 days	58 days	No
	Days of Receivables	55 days	55 days	No
	Days of Payables	55 days	78 days	Yes
	Days of Total Inventory	61 days	69 days	Yes
	% Inventory as Raw Material	35%	24%	Yes
	Goodwill/Sales	12%	27%	Yes
	Working Capital/Sales	13%	19%	Yes
	Operating Expense/Sales	23%	29%	Yes
	SG&A/Sales	23%	29%	Yes
	R&D Sales	7%	10%	Yes
	Advertising/Sales	4%	6%	Yes
	Gross Margin	40%	45%	No
	Net Margin	10%	7%	Yes
	Assets Allocated per Employee ($000)	$405	$564	Yes
	Revenue / Employee ($000)	$420	$386	Yes
Financial	ROS	14%	12%	Yes
	ROA	11%	5%	Yes
	ROE	29%	15%	Yes
	Economic Profit/Total Invested Capital	13%	9%	Yes
	Economic Profit/Capital Charge	2.66	1.69	Yes
Stock	Geometric Mean of Returns	1.13%	0.32%	Yes
	Average Mean of Returns	1.37%	0.67%	Yes
	Sharpe Ratio (Returns/Risk)	0.44	0.18	Yes
	Market Value/Assets	2.23	1.53	Yes

It's also important to note that our analysis explores differences on a wide range of operational, financial and stock market-based metrics that were not part of the initial ranking and selection procedures.

The Results: Clear Differences Emerge

Exhibit 1 gives the comparison statistics for operational, financial, and stock-based performance metrics. We used a paired t-test to compare the average scores for the Top SCM and Comparable companies in each year on each of the metrics. This analysis estimates the significance of a difference between the average scores for two groups, while taking into account the pairings of companies across the two groups. Except for sales growth, cash-to-cash cycle, and days receivables, the reported differences are statistically significant at a 95 percent confidence level or higher.

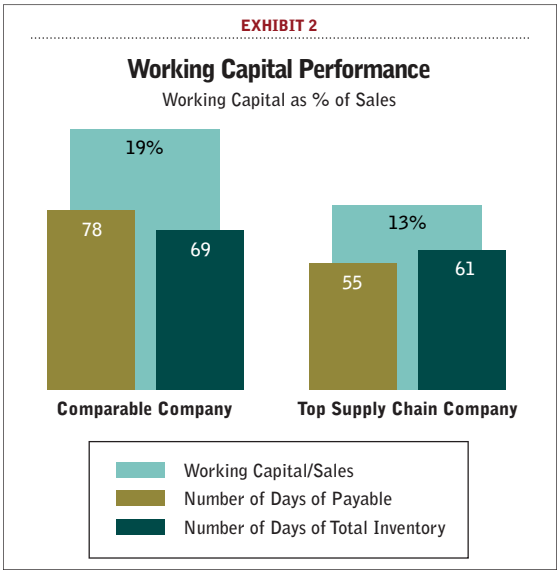
Let's take a closer look at the results for each of the categories of performance metrics—operational, financial and stock performance.

Operational Performance

While sales growth differences for top companies and their competitors are not statistically significant, the Top SCM companies appear to do a much better job of managing their working capital (see Exhibit 2). In particular, Comparable companies need almost one and a half times more working capital than the top performers to support a comparable level of sales.

As expected, the number of days of total inventory is lower for the top companies than for the others. These leaders have evidently created process and planning efficiencies that enable them to support the same levels of sales as their rivals with less overall inventory. Interestingly, there appears to be a difference in inventory and market strategies across the two groups. Top SCM companies hold a significantly larger proportion of their inventories in raw form (35 percent vs. 24 percent for Comparable companies). This inventory profile suggests that the top companies are likely more responsive by making greater use of postponement and make-to-order strategies. Also, raw materials inventories have a lower value, possibly accounting for the overall lower cost of inventories in Top SCM companies.

EXHIBIT 2



Differences in how the two categories of companies manage cash also point to some interesting strategic choices. The cash-to-cash cycle values are not statistically different between the two groups (recall that cash-to-cash cycle is calculated as days receivables + days inventories – days payables). Days receivables values are equal across the two groups. However, the average days payables for Top SCM companies is 55 days vs. 78 days for Comparable companies. This difference runs counter to what we would expect. Conventional wisdom would suggest that the better performing and larger leading companies would be able to negotiate more favorable payment terms with their suppliers. Why would the Top SCM companies pay their suppliers faster than Comparable companies do? Perhaps purchasing managers in the top companies are making a trade-off. They are more willing to give favorable payment terms to their suppliers in return for excellent performance and closer relationships. We will explore this possibility further as we analyze differences in the expenses of the two groups of companies.

Top SCM companies had lower operating expenses per sales dollar than their counterparts (see Exhibit 3). They also enjoyed lower SG&A expenses, lower R&D expenses, and lower advertising expenses per sales dollar. It is remarkable that the Top SCM companies achieved statistically similar levels of sales growth as the Comparable companies given their lower expenses in these areas. The results suggest that the top companies have developed superior efficiencies in all the related areas of the supply chain, enabling them to get the most out of their internal resources. This efficiency is also reflected in their deployment of human resources, as their revenue per employee is greater on average than for their competitors.

Surprisingly, the Top SCM companies had lower gross margins on average as compared to the Comparable companies, indicting either that their costs of good sold (COGS) are higher or their pricing power is lower. Given that the Top SCM companies are able to generate more sales per dollar spent on R&D, SG&A, and advertising, they appear to have substantial pricing power. Thus, the gross margin result suggests that Top SCM companies have high-

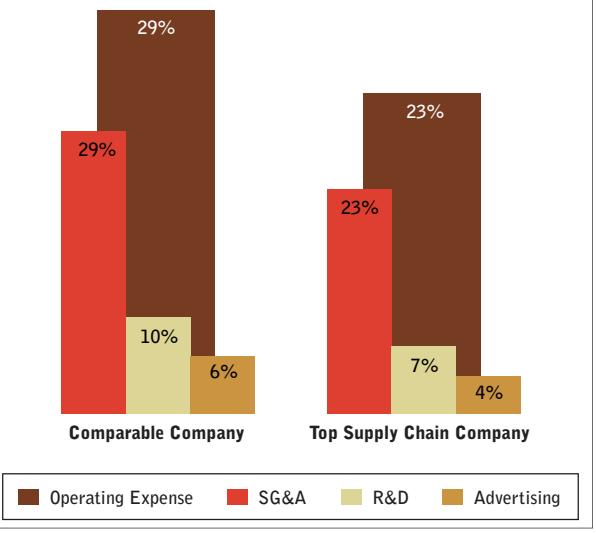
er COGS, yet they also have lower operating expenses. The implication is that they are paying higher prices to their suppliers.

A comparison of net margins sheds more light on the results. Though their gross margins are lower, Top SCM companies have significantly higher net margins than their competitors on average. Thus, while the top companies appear to be paying more for goods sold, their improved internal operating efficiencies and marketing power are great enough to more than offset the higher purchasing costs, making them more profitable at the bottom line.

EXHIBIT 3

Comparison of Operating Expenses

Expense as % of Sales



This brings us back to the trade-off we mentioned earlier. The Top SCM companies appear to be paying suppliers more (higher COGS) and faster (lower days payable) in order to reap benefits elsewhere. These other these potential benefits likely include:

- Lowered R&D Expenses through earlier and more intense supplier involvement.
- Lowered working capital through JIT delivery.
- Lowered transaction costs (operating and SG&A expenses) through greater integration with upstream and downstream partners.

The data are suggestive of each of these benefits, indicating that the top companies have opted to reward their suppliers in return for providing them with a lower total cost of ownership. The results also indicate that the Top SCM companies have a more variable cost structure. Their asset/employee ratios are almost 30 percent lower on average than the ratios for the Comparable companies. This result again suggests that the top companies are leveraging the capabilities of their suppliers, as they appear to have outsourced more of their asset-intensive processes.

A look at goodwill gives a final insight into the strategy of Top SCM companies. Goodwill is generated when one firm acquires another firm. It is defined as the difference between the purchase price and the fair value of the acquired company's net assets. The goodwill for Comparable companies is on average more than twice that for the top firms. A likely explanation is that Comparable companies have had a greater propensity to grow through acquisitions, whereas the Top SCM companies have grown more organically. Growth through acquisition could also account for the apparent inefficiencies reflected in the higher operating expenses of the Comparable companies. It takes time to rationalize and fully integrate the different operating systems and products of acquired business units.

Financial and Stock Performance

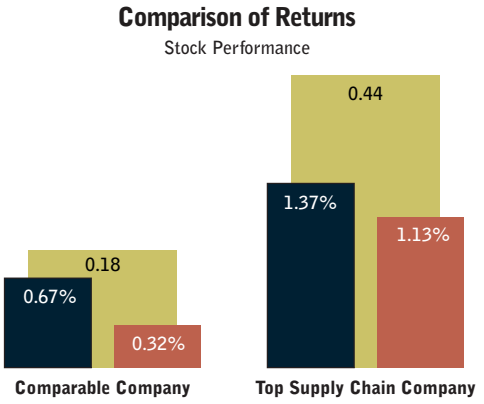
Between 2004 and 2007, the Top SCM companies outperformed their competitors on every financial and stock market based performance metric that we evaluated. The top companies delivered a statistically significant better ROS. However, the more dramatic performance differences are reflected in ROA and ROE, where they delivered double the returns of Comparable competitors.

The Top SCM companies also performed better on economic profit, one of the most comprehensive financial performance measures. Economic profit measures the true profits of a company by subtracting from the total revenue the total cost of doing business, including operating costs, taxes, depreciation and the total cost of capital invested. We evaluated two economic profit metrics: annual economic profit per dollar of invested capital, and annual economic profit per capital charge (where capital charge = WACC X Invested Capital). The economic profit generated by the Top SCM companies was about 50 percent greater than that generated by the Comparable companies in this timeframe.

One would surmise that these kinds of financial results would make the Top SCM companies very attractive investments. The stock market data agree; they confirm that investments in Top SCM companies generated significantly higher average monthly stock returns when compared with rival options (see Exhibit 4). Investments in stocks of the Top SCM companies grew at more than twice the rate of Comparable companies. The Sharpe Ratio, which measures the stock returns weighted by risk, is two and half times higher for top companies. A final measure, Market Value/Assets, indicates that the

market placed a 45 percent greater value on the assets of the Top SCM companies over the assets of the Comparable companies. These results indicate that these top companies provide both higher and less variable returns.

EXHIBIT 4



Key Questions Answered

The results of our study provide some useful guidance on the questions we asked earlier:

Do top supply chain companies consistently outperform their peers financially?

The results answer this question with a resounding yes! The magnitudes of the financial performance differences indicate that the payoffs are indeed substantial and highly desirable. Taken as a set, the average values for the Top SCM companies could be used to establish benchmarks for supply chain performance—though we hasten to add that there is high variability across industries. For example, 61 days of inventory might be quite lean for one industry and quite "fat" for another. In setting goals for improvement, managers would be advised to pick the top performers among their direct competitors as benchmarks.

What performance metrics are most powerful in distinguishing top-performing supply chain companies from the others?

To get an even more precise answer to this question we used a statistical technique call Logit Regression to identify the variables that have the greatest "predictive power." The performance metrics that were found to be the most significant in identifying companies as Top SCM companies were:

- ROA (higher)
- SG&A/Sales (lower)
- Days of Total Inventory (lower)
- Working Capital/Sales (lower)
- Days of Accounts Payable (lower)

The data suggest that better scores on these performance variables are most likely to be strong indicators that a company is becoming a top performer in supply chain management.[3] Interestingly, these metrics collectively cover most of the elements of supply facing and customer facing processes in the supply chain. ROA gives a broad measure of the productive use of the company's assets. SG&A/Sales gives an indication of sales and distribution efficiencies. Inventory and Working Capital/Sales metrics are suggestive of how well material and information flows are managed. Days of accounts payable gives an indication of supplier relationships. Remember that for the Top SCM companies, "better" in the case of days of payables means a lower number of days. As we pointed out earlier, the fact that this metric is such a strong differentiator hints at an important difference in the primary strategies that Top SCM companies and Comparable companies may be using.

The top companies appear to be focusing on net margins rather than gross margins. We think they are minimizing total costs and maximizing efficiencies by investing more in their suppliers. This conjures up the old adage, "you get what you pay for." Consider what the data have to say. The Top SCM companies do not have lower COGS, yet they appear to outsource more and they outperform their rivals on just about every other dimension. To us, this is strong evidence of the power of a supplier relationship model that prioritizes partnering with and rewarding the best and brightest suppliers.

The other surprising differentiating factor between the two groups of companies has to do with growth. While the Top SCM companies did not grow any faster than their rivals over the period we studied, disparities in goodwill suggest that they grew differently. Top SCM companies appear to have grown more organically, depending less on mergers and acquisitions to fuel sales improvement. This is surprising, especially given the larger size of the Top SCM companies. However, it does potentially explain why they have more efficient, faster moving supply chains. It may be better to invest in improving one's existing supply chain than to invest in acquiring someone else's.

How do you justify supply chain investments and get your CFO interested in SCM initiatives?

The results confirm that the potential value of becoming a Top SCM company is huge. They also establish the kinds of performance improvements that SCM managers might expect to see as they grow their operational

capabilities. These potential gains could be used to target improvements and to financially justify investments in technologies, collaborative partnerships, and employee training programs across the supply chain. An important first step is getting the CFO to be engaged and supportive. We offer two suggestions for making this happen.

First, highlight the potential gains associated with SCM excellence. Ask your CFO, what other investments could yield the kinds of returns implied by the findings of this study? The financial performance differences between Top SCM companies and their rivals are so substantial that it is hard to imagine other options yielding similar long-term returns.

When communicating the potential, it is important to speak the CFO's language. Look beyond the process improvements and operational metrics that are typically the focus of SCM initiatives. Find ways to translate operational improvements into financial returns that CFO and analysts care about. Tools such as the strategic profit model (also known as the DuPont model) and the balanced scorecard may be useful in making such translations. Using the performance differences highlighted in this and other studies of SCM leaders, develop your own supply chain performance scorecard that clearly links operational gains to top line, bottom line, and financial market-based results.

Also, find stories and examples that highlight the importance and potential of SCM initiatives. Researching the Top SCM companies in your industry can yield examples that bring a "real-world" note to proposals that will capture the imagination of your CFO. Perform retrospective case studies of the leaders to determine how they attained their leadership positions.

Second, clarify the importance of the CFO's role. The CFO needs to understand the role that his/her office plays in making SCM excellence a reality. The CFO's office typically controls both the data and the perspectives needed to prioritize actions according to their financial impact. CFO involvement is critical in directing SCM investments so that the right strategic capabilities are developed—and in the right time frame.

In addition, the CFO is needed to drive initiatives that span multiple functions or business units. A basic principle underlying supply chain management is that the benefits of boundary-spanning improvements greatly exceed the benefits of internal, functionally oriented initiatives. Because any given supply chain manager's scope of influence is typically limited, the CFO can play a critical role in driving changes—especially those that require give and take across functional lines. By pointing out the fact that the CFO has a unique overall perspective of the business, coupled with a keen insight into the firm's financial workings, a savvy supply chain manager can show the CFO the importance of his or her role in justifying and implementing change.

Moving Forward

The methods and results reported in this article can serve as a baseline for future studies of supply chain management performance. The results have provided some pretty convincing answers to lingering questions about the real benefits of being on the cutting edge of supply chain competence. SCM excellence clearly affects performance in ways that financial markets appreciate. It is up to you to get your CFO and other top executives motivated to put this information to use.

Compare your company's operational and financial performance profiles against those of the Top SCM companies. Where are the largest performance differences? What do these differences say about your current supply chain operating strategies? What kinds of initiatives are needed to close the gaps?

As we stated earlier, benchmarking the practices of the top performers could help to clarify the needed changes. Most important is to quantify the opportunity value of SCM excellence using terms and metrics that are important to your CFO and other financial analysts. These are the early steps needed to progress down the road that leads to greater profits from SCM superiority.

Notes:

1 Our analyses omitted 2008 data due to the extraordinary market conditions of that year. Do Top SCM Companies outperform their rivals in a down economy? It is difficult to answer this question using data from only a single year, as there is high variability in financial data from year to year. We plan to repeat these analyses once 2009 financials become available.

2 The Top SCM Companies are significantly larger on average than the Comparable Companies (average sales were $45B and $23B respectively), so one could argue that the differences in performance are due to scale and leverage. We used two methods to evaluate this possibility. First, we repeated the statistical tests on all the performance metrics, dividing each metric by sales in order to account for scale effects. Second, we used a technique called regression analysis to statistically control for size. In both procedures, the overall performance differences remained clearly evident.

3 We used these results to examine the values for each of the Comparable Companies to determine whether or not it should be classified in the Top SCM category. The model indicated that both Colgate-Palmolive and Lenovo should have been classified as Top SCM Companies. Interestingly, the recently published 2009 AMR top supply chain company list included Colgate-Palmolive for the first time. We take this as a partial validation of our results.

TABLE 1

Top Companies and Comparable Competitors

Hoover's Industry Classification	Top SCM Company	Comparable Company
Specialty Chemical Manufacturing	3M	DuPont
Music, Video, Book & Entertainment Retail	Amazon.com	eBay
Alcoholic Beverages	Anheuser-Busch	Molson Coors Brewing
Computer Hardware	Apple	Sun Microsystems
Consumer Electronics & Appliances Retail	Best Buy	Circuit City
Construction, Mining & Other Heavy Equipment	Caterpillar	Komatsu
Computer Networking Equipment	Cisco Systems	Juniper Networks
Carbonated Beverages	Coca-Cola	Dr. Pepper Snapple
Discount & Variety Retail	Costco Wholesale	Sears Holdings
Drug Stores & Pharmacies	CVS Caremark	Rite Aid
Computer Hardware	Dell	Lenovo
Pharmaceuticals	GlaxoSmithKline (GSK)	Sanofi-Aventi
Consumer Products Manufacturers-Technology	Hewlett-Packard	Xerox
Auto Manufacturing	Honda	General Motors
Microprocessors, Microcontrollers & DSPs	Intel	AMD
Computer Software	IBM	Microsoft
Pharmaceuticals	Johnson & Johnson	Merck
Auto Parts Manufacturing	Johnson Controls	Magna International
Pharmaceuticals	Kimberly-Clark	SCA-Svenska Cellulosa
Food	Kraft Foods	HJ Heinz
Grocery Retail	Kroger	Safeway
Telecommunications Equipment	Motorola	Ericsson
Food	Nestle	Danone (Groupe)
Apparel Manufacture	Nike	Adidas
Telecommunications Equipment	Nokia	Ericsson
Automotive & Transport	PACCAR	Navistar International
Carbonated Beverages	PepsiCo	Dr. Pepper Snapple
Consumer Products Manufacturers	Procter & Gamble	Colgate-Palmolive
Grocery Retail	Publix Super Markets	Delhaize Group
Aerospace & Defense	Rockwell Collins	Honeywell Aerospace
Grocery Retail	SUPERVALU	Safeway
Discount & Variety Retail	Target	Sears Holdings
Grocery Retail	Tesco	Cameron International
Electronics	Texas Instruments	QUALCOMM
Auto Manufacturing	Toyota	General Motors
Consumer Products Manufacturers	Unilever Group	Colgate-Palmolive
Discount & Variety Retail	Wal-Mart	Sears Holdings
Drug Stores & Pharmacies	Walgreens	Rite Aid

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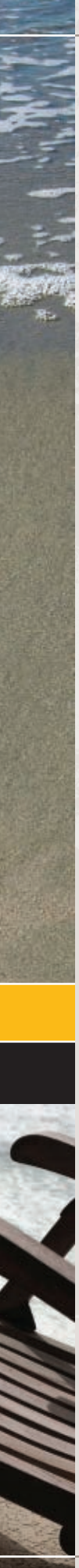

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CREATING THE IDEAL SUPPLIER SCORECARD

By Robert J. Trent

A revealing exercise, when working with groups of supply professionals, is to ask for a show of hands from those who say their organizations measure supplier performance. Those with hands up (usually a high percentage) are then asked to keep them raised if they are satisfied with their supplier measurement systems. The resulting rush of falling hands is quite an indictment of the state of supplier measurement today.

An unmistakable conclusion after researching academic and trade publications for information on supplier performance measurement is that not much is written on this topic. What is written about it reveals overwhelming agreement about its importance. Yet the development of effective measurement systems is still on the "to do" list for many organizations, particularly smaller ones. Even organizations that boast mature systems of supplier metrics should recognize that continuous improvement is an ongoing challenge—and that many such metrics systems have shortcomings.

This article identifies these shortcomings, and provides guidance about how to create an ideal supplier performance measurement and scorecard system.

A Primer on Supplier Scorecards

Let's make sure we are on the same page as it relates to supplier performance measurement. It can be defined as the business process that includes the methods and systems used to collect and provide information in order to measure, rate, or rank suppliers on a continuous basis. Many companies use the term "scorecard" to describe the report that conveys performance information to suppliers.

The types of scorecards in use typically fall into one of three categories—*categorical*, *weighted point*, or *cost-based*. Categorical measurement systems require simple check-offs to items that describe a supplier's performance across different categories. For relatively unimportant items, this may be an effective way to evaluate supplier performance. As it relates to supplier scorecards, most supply chain organizations use a weighted point system that includes a variety of performance categories, provides weights for each category, and defines the scales used for scoring within each category. The third type—cost-based systems—is used least. It attempts to quantify the total cost of doing business with a supplier over time.[1] Some companies use a hybrid system comprising several of these approaches. Exhibit 1 summarizes the advantages and disadvantages of each system.

No standard measurement approach exists across industries, although supply chain organizations should strive internally for some consistency, particularly with respect to the technical aspects of their systems. Some organizations have also joined consortiums that share best measurement practices or attempt to follow standards that appear in the Supply Chain Operations Reference (SCOR) model. It does not make sense for every business unit or internal location to re-invent how they measure performance. The challenge today is to develop a measurement process and scorecard system that offers some flexibility to a company's internal operations while maintaining company-wide consistency.

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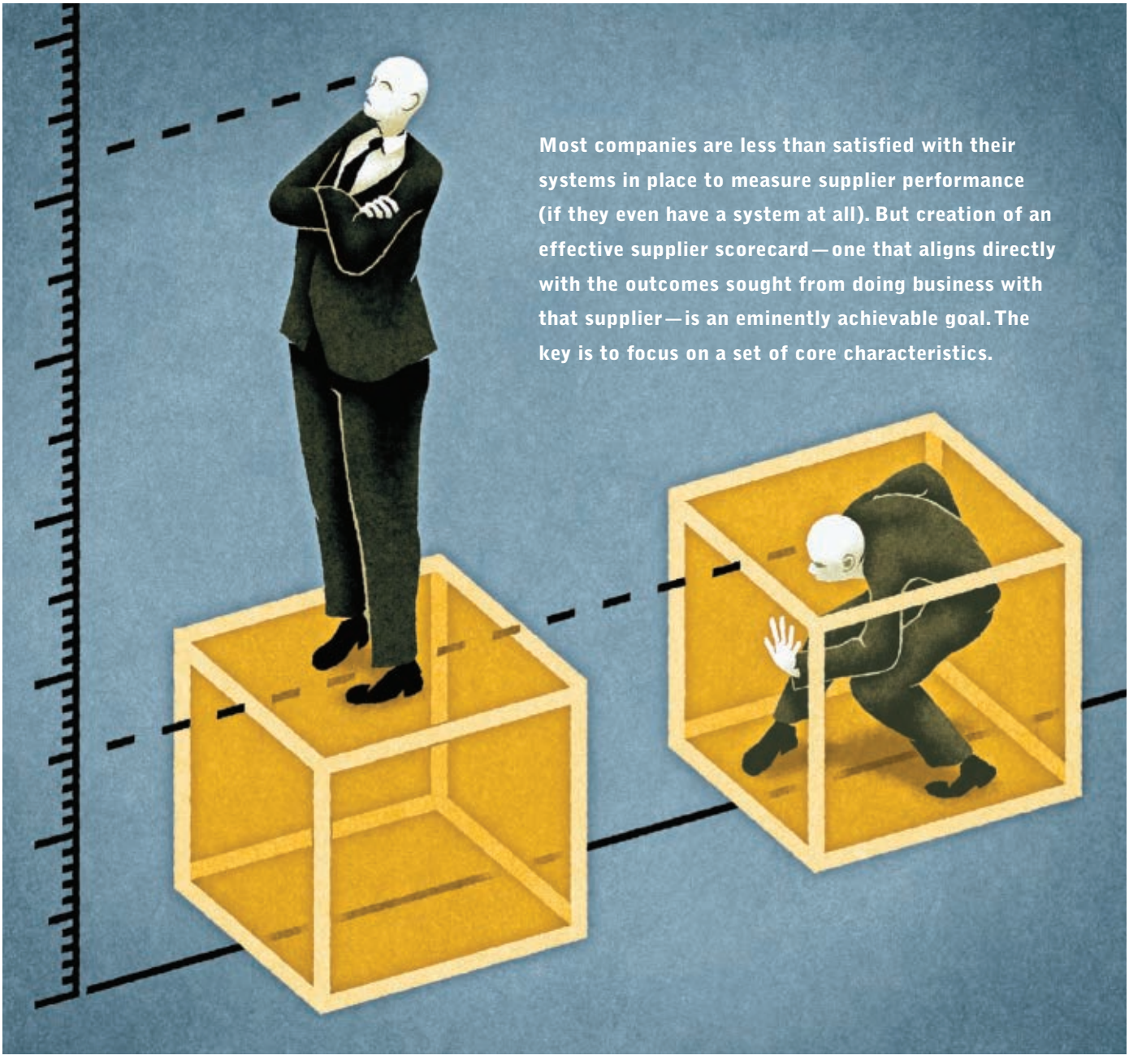

Most companies are less than satisfied with their systems in place to measure supplier performance (if they even have a system at all). But creation of an effective supplier scorecard—one that aligns directly with the outcomes sought from doing business with that supplier—is an eminently achievable goal. The key is to focus on a set of core characteristics.

Measurement Systems that Fail

Sherry Gordon, author of the book *Supplier Performance Management*, has stated that few purchasing and quality professionals are likely to answer "yes" when asked whether they are satisfied with their supplier assessment capabilities and results. Where supplier scorecards do exist, some are so ill-conceived that at times it might be better if they were not used at all. Far too often, measurement is an activity that fails to lead to improved results. Consider the following examples.

Several years ago, a consumer products company with $100 million in annual sales developed a scorecard to evaluate its suppliers, most of which were substantially larger than the company. It was bad enough that this scorecard was not pilot-tested and was less than professional in appearance. But the system failed when many larger suppliers challenged the accuracy of the company's scores, particularly when the scores were lower than those received from the suppliers' more sophisticated customers. Suffice it to say that this experience deterred the company from moving forward with its measurement objectives.

Procurement teams must take a hard look at their measurement processes long before suppliers can challenge the legitimacy of the metrics. The processes must not turn into the kind of exercise that one supplier's executive described as "they present and we rebut."

A second example highlights a variety of shortfalls that confront too many supplier measurement systems. Almost every supply chain organization has at least thought about developing a supplier scorecard system.

EXHIBIT 1

A Comparison of Supplier Measurement Systems

Categorical

Advantages	Disadvantages
• Easy to implement • Requires minimal data • Requires minimal systems resources to develop or operate • Low cost to maintain • Good for less critical requirements	• Less reliable • Mostly broad, subjective assignments • Usually manual, although some use spreadsheets

Weighted Point

Advantages	Disadvantages
• Offers flexibility in assigning weights across categories • Allows ranking of suppliers • Moderate cost to implement • Does not require extensive system to develop or maintain	• Often focuses on standard performance categories • Qualitative ratings may be inconsistent between raters • Usually requires manual data collection and input

Cost-Based

Advantages	Disadvantages
• Provides a total cost approach • Identifies specific areas of supplier non-performance • Allows objective rankings • Offers greatest potential for long-range improvement	• Usually requires a cost accounting system • High development costs • Cross-functional support required to capture data • Often relies on average rather than actual costs

Those that are serious about the process have most likely committed serious time, budget, and resources toward development and maintenance of systems of measurement. One such company is a major logistics player. On the surface, this company's system appears ideal. Do senior managers need a ranking of supplier performance sorted by commodity group? Do they want a listing of the company's best or worst performing suppliers? This, and much more, is available at the push of a button.

However, during a training session at this logistics company, an instructor asked a buyer to name one of his best performing suppliers—what the company called an elite supplier. The intent was to use examples of real suppliers to demonstrate the data features of the system. Without hesitation, the buyer provided a supplier's name. But from across the room, another participant responded by saying that the supplier just named was one of the worst suppliers that his operations group worked with every day.

How can one person cite a supplier as being worthy of preferred status while another, in the same supply chain organization, indicates that he would rather discontinue the relationship with that supplier? And what are the dangers of a system that awards high scores to poorly performing suppliers?

These differences of opinion led to some conclusions that almost everyone in attendance could agree upon. The consensus was that although the scorecard system was supported by an extensive database that allowed all kinds of rigorous analyses, the data to support the system was still collected and keyed in manually. Furthermore, many scorecard items required subjective judgments. On top of this, most buyers had responsibility for inputting data quarterly for about 25 suppliers, a heavy burden on top of their "normal" workload. Many in attendance also agreed that the data for the scorecards was keyed in just before, and sometimes after, the quarterly cutoff, meaning that the emphasis was hardly on the quality of the data. Attendees also acknowledged that supplier scores were used as an indicator of a buyer's job performance.

The group also agreed that their suppliers were held to the same criteria and weights, even though not all suppliers were equally important to the company's success. Participants further agreed that internal customers or stakeholders had no way to be part of the measurement process. There was also some confusion about what kind of organization qualified as a supplier since some suppliers provided material from multiple locations. Finally, no clear agreement emerged that the measurement process was contributing to higher performance.

What are some lessons here? Clearly, an effective scorecard system requires much more than a sophisticated database that can present data in many ways. While that capability is important, technical capabilities do not guarantee system success. And scorecards should not ignore the voices of internal customers. Managers at manufacturing plants, warehouses, distribution centers, and logistics hubs are often perfectly positioned to evaluate suppliers' day-to-day performance.

Another lesson is that scorecards often place a serious work burden on the individuals responsible for maintaining them, which often results in scorecards that are late or completed at the last minute—which raises concerns about data integrity. Is a reliance on subjective and last-minute evaluations affecting the integrity of the scores?

A further learning is that scorecard systems can result in too much averaging of data for suppliers that provide goods from more than one location. If a supplier provides goods from 15 locations around the world, does this call for one scorecard or 15? If this supplier pursued ISO 9000:2000 certification, the certification would apply to individual sites, not to the entire company. Furthermore, the number of suppliers and the number of shipping

points are often very different figures.

A final lesson is that scorecard systems can drive the wrong behavior. The results will be skewed—and not fit for their intended purpose—if a buyer's annual performance evaluation is based partly on the performance of her suppliers. Worse: Her performance is often being determined by scorecards that she is responsible for completing. The conflict of interest is obvious. While most everyone at her company may agree that supplier measurement can be a good thing, it is also evident that the system in place is far from ideal.

Characteristics of an Ideal System

Research and work with hundreds of supply chain organizations has provided a unique opportunity to identify what comprises an ideal supplier measurement system. With that in mind, the following characteristics (summarized in Exhibit 2) will go a long way toward defining that system.

The Measurement System Allows Scoring Flexibility

Perhaps the most obvious shortcoming of most scorecards is they treat each supplier the same way. If segmentation occurs at all, it might simply be between suppliers of material and suppliers of services. Why apply equivalent scorecard measures when few would argue that all suppliers are created equal? It is alarming to see how prevalent the "one size fits all" approach is at even some of the most well-recognized supply chain organizations.

Better systems will allow adjustments to the performance categories and their weights to reflect the realities of different supply requirements. The best scorecards align directly with the outcomes sought from doing business with a particular supplier.

In one good example, an automotive original equipment manufacturer (OEM) has changed the way it evaluates suppliers by involving more employees in the process and giving them the power to adjust the weights used to evaluate suppliers.[2] The OEM now relies on 240 internal "boards," one for each of its product segments, with at least four employees on each board to determine annually the weights of the various performance categories against which suppliers are evaluated. Each board consists of specialists in cost, technology, quality, and logistics who are responsible for posting supplier data monthly on a global supplier portal. Suppliers are even able to see the names and performance of their competitors, although the product boards have the authority to withhold names within their product groups if they so choose.

EXHIBIT 2

Characteristics of the Ideal Supplier Scorecard System

- The measurement system allows scoring flexibility.
- Internal customers evaluate supplier performance.
- Scorecards are reviewed and acknowledged by suppliers' top managers.
- Suppliers with more than one location receive multiple scorecards.
- Scorecards include cost-based measures whenever possible.
- Scorecards are updated in real time.
- The measurement system separates the critical few from the marginal many.
- Measurement database allows user flexibility in retrieving and displaying data.
- The measurement system provides early-warning performance alerts.
- Suppliers can view and compare their performance online.
- The measurement system is benchmarked against best-practice companies.

Internal Customers Evaluate Supplier Performance

In today's information age, internal customers should be able to submit comments and ratings about a supplier's performance directly into a scorecard system. These individuals are usually in the best position to evaluate a supplier's operational performance.

A good example of involving internal participants occurs at ADT Security Services, a business unit of Tyco. Fully 30 percent of a supplier's performance score relates to something called "account management." This reflects how well a supplier works with ADT and responds to requests and concerns. Buyers actively solicit input from engineering, product management, marketing, sales, and product support before assigning a score, reflecting an extensive level of cross-functional input across the company.[3]

Procurement teams should consider allowing suppliers to enter a Web-based portal or extranet to view any free-form comments or scores submitted by internal customers. This supports the efficient and open exchange of information, something that is widely practiced with other supply chain applications (think about sharing demand forecasts, for example). Most supply chain experts would agree that information-sharing across the supply chain is a good thing. So why should sharing of supplier performance data be any different?

Scorecards are Reviewed and Acknowledged by Suppliers' Top Managers

Key executives at each supplier should receive electronic copies of the scorecards. Perhaps most importantly, the party sending the scorecard should track acknowledgements that the scorecards were received and reviewed, along with any responses to specific queries.

Forwarding scorecards directly to executive managers supports at least two purposes. First, these executives will have access to information that their own personnel may not willingly share. More than one executive has been caught off guard because he or she was unaware of issues that affected

customers. Second: Information will likely reach the individuals who can effect meaningful change when it is required.

The distribution list should include more than one executive. For smaller suppliers, it is worthwhile to place the chief executive, president or managing director on the list. It makes a lot of sense to provide vital "feedback" information to those who are ultimately accountable for performance results.

Suppliers with More than One Location Receive Multiple Scorecards

As noted earlier, there can be a tendency to count a supplier as a single entity, yet many suppliers provide material from multiple locations. To aggregate different locations into a single scorecard can be misleading. It also makes it harder to assign scores to specific locations.

A possible solution is to evaluate each supplier's shipping locations across a basic set of operational metrics (such as cost, quality, and delivery) while the supplier as a corporate entity is evaluated by a set of higher-level metrics. Examples of such metrics include assessments of supplier innovation, responsiveness, and willingness to invest in the buyer-seller relationship.

One major OEM has addressed the issue of multiple supplier locations by assigning a five-digit code to each of its suppliers. Each location for that supplier receives a suffix to identify it as a unique location that will receive a scorecard. For example, a supplier with three shipping locations will have a corporate code (say, 45633). Its three shipping locations are then designated as 45633A, 45633B, and 45633C. This approach keeps the unique locations grouped within the supplier's code, which helps when conducting any analyses.

Scorecards include Cost-Based Measures Whenever Possible

Most scorecards include price as a performance category simply because price is easy to measure. Unfortunately, price never reflects the total cost of doing business. To compensate for any disconnect between price and total cost, progressive supply chain organizations calculate metrics that reflect more than unit price.

An example of a total cost metric is the supplier performance index (SPI). The SPI assumes that any quality or performance infraction committed by a supplier increases the total cost of doing business with that supplier. If a supply chain manager can track these infractions and assign a cost to them, the calculated index can then be used in a scorecard to supplement a price metric. The SPI or even the adjusted price can be included in the scorecard rather than simply the price paid (although price can still be included as a scorecard metric).[4]

Scorecards are Updated in Real Time

Too many scorecards still resemble a batch updating system that features periodic input of data submitted manually each month or each quarter. In a perfect world, anyone who is granted access to a scorecard system should be able to view supplier performance levels in real time. Whenever a transaction occurs, whether it involves the results of a quality audit at a receiving dock or an accounts payable transaction, data records should flow seamlessly into the scorecard database with real-time updating of supplier performance. Of all the attributes of an ideal measured system described in this article, this is the one that is rarely implemented.

For real-time updating to work, the scorecard system must be linked to other supply chain constituencies, including accounts payable, quality control, and transportation. Theoretically, any system that stresses objective rather than subjective assessment, particularly in a real-time environment, should receive serious consideration. It's safe to conclude that most supply chain systems are moving toward real-time data visibility. Some purchasing organizations are beginning to rely on suppliers to self-report and submit their performance to the scorecard system on a frequent basis. A few leading companies are even beginning to solicit performance data from or about second-tier suppliers.

The Measurement System Separates the Critical Few from the Marginal Many

Several leading consulting firms have recently criticized the fact that not all suppliers are being measured using scorecard systems. But should this really be a cause for concern? In an era when fewer suppliers are providing a greater share of total purchases, there has never been more need to separate the critical few from the marginal many. At Procter & Gamble, for example, 400 suppliers out of 90,000 worldwide receive 25 percent of the company's $50 billion in annual purchases.[5]

If a supply chain organization is adamant about measuring most of its suppliers, then the less critical suppliers should receive a basic scorecard—perhaps even one that is categorical. (See Exhibit 1). At some point, depending on the level of effort required to obtain scorecard data, the cost to measure a supplier could outweigh the value of measuring that supplier. When this is the case, a logical response is to not measure, measure less frequently, or simplify the type of scorecard used.

The Metrics Database Allows User Flexibility in Retrieving and Displaying Data

An effective system will not only generate the scorecard itself; it will enable data to be presented in a variety of reporting formats, along with easy generation of useful reports. Various on-demand reports can show side-by-side supplier rankings, demonstrate performance changes by category, and highlight the suppliers that improved or deteriorated in performance over a certain period. A database that allows the slicing and dicing of raw data is an essential element of an ideal scorecard system.

The Measurement System Provides Early-warning Performance Alerts

Most measurement systems are reactive in that they report what has happened, not what is likely to happen. As with a statistical process control system, an ideal measurement system would be able to "look ahead" to spot troublesome trends and non-random changes in a supplier's performance before it becomes out of control. An ideal system would notify supply chain managers of potential problems before the impact of those problems is even realized. The system would have predictive capabilities.

Consider the possibility of generating early warnings when using advance shipping notices (ASNs). Any time an ASN reveals a possible late delivery after comparing expected transit times against a due date, a material planner would receive a warning of the potential delay. Or consider real-time GPS tracking systems that could reveal that supply chain delays are occurring, with a notification sent to the appropriate personnel. It is almost always better to be proactive.

Suppliers Can View and Compare their Performance Online

For many years, almost every supply chain organization refused to identify the scores and names of competing suppliers within a category or commodity group. Later, most organizations became more willing to show relative comparisons against competing suppliers identified by letters (but not names). The time has come to accept that scorecards present a good way to create healthy competition among suppliers. That means permitting and enabling them to access their scores online, complete with comparisons to other suppliers in the same or similar commodity groups.

Scorecard transparency is an idea whose time has come. Note that transparency does not violate any buyer-seller ethics, laws, or standards of confidentiality. It is analogous to looking at the standings of any sports league. Doesn't every team know precisely where it stands in relation to competing teams? At the academic level, colleges and universities are routinely rated and ranked against one another. Somehow these institutions survive the ordeal. Suppliers will be no different.

The Measurement System is Benchmarked against Best-Practice Companies

Performance benchmarking involves comparing products, practices, processes, or strategies against key competitors or companies that are considered best-in-class. Benchmarking methodologies can involve working directly with other companies to compare scorecard practices, searching databases and the Internet to find information on performance measurement and working with professional contacts to obtain scorecard information. Some supply chain organizations belong to research consortiums that feature the sharing of best-practice information. While informal benchmarking can occur at any time, formal reviews of the scorecard system should occur at least annually. In an era when almost too much information is available, there is no excuse for not remaining current regarding the trends and technologies that relate to supplier performance measurement.

It's a challenge for supply chain organizations today to step back and take an unbiased view of their supplier performance measurement systems. The objective should be to take a poor measurement system and make it better—or to transform a good system into an excellent one. A worthwhile exercise is to assemble an internal team to compare the current state of supplier measurement against an ideal future state. Any gaps that exist between the current and future states—and there could be many—will require a clear plan to bring an existing system closer to a preferred system.

Footnotes:

1 For a detailed PowerPoint presentation of Total Cost of Ownership systems, please contact: rjt2@lehigh.edu.

2 This example is adapted from Armstrong, J., "Chrysler Changes Scorecard," *Automotive News*, Vol. 79, No. 1610 (November 8, 2004), 16.

3 Teague, Paul, "A Seat at Every Table," *Purchasing*, Vol. 138, No. 9 (September 17, 2009), 36-46.

4 For a more detailed of the SPI, including its shortcomings, see Robert J. Trent, "Strategic Supply Management—Creating the Next Source of Competitive Advantage, J. Ross Publishing, 2007.

5 Teague, Paul, "P&G is King of Collaboration," *Purchasing*, Vol. 137, No. 9 (September 11, 2009), 46.

MANAGING RISK
An Interview with Gary Lynch

Gary Lynch is managing director of the Supply Chain Risk Management Practice at Marsh, Inc. He also leads Marsh's Global Pandemic Response Center. Prior to Marsh, Lynch has held operational and IT risk positions at Booz Allen Hamilton, Chase, Prudential, and Ernst & Young. His latest book, *Single Point of Failure: The Ten Essential Laws of Supply Chain Risk Management*, discusses what supply chain managers need to know about risk in the current economy. Here, he talks with *Supply Chain Management Review* Associate Editor Sean Murphy about the book and risk management best practices.

Q: *Why is supply chain risk management so important today?*

A: Along the supply chain (the flow of goods, cash and information), threats are more pervasive and impacts more extreme and vulnerabilities are more relevant to organizations that operate global and are interdependent on others to create and deliver value to the markets they serve. Many of these vulnerabilities exist outside the scope of control of the organization, many layers removed (beyond wholesalers, distributors, 1st tier suppliers) up or downstream in the supply chain.

Supply chain risk and supply chains mirror what role supply chain has taken on in business—and in many cases, in the role of commerce in a country and the success of the country. You look at the way supply chain has morphed from that of an operational issue of things that we had to do in order to bring value to our customers, to now being a strategic issue, and a political issue in many cases. Now introduce this whole concept of global interdependency as well.

The reality is that threats are more pervasive, and they seem to be more impactful these days—whether it's larger hurricanes or typhoons or earthquakes as we've seen. And because the supply chains are spread around the globe, and they're constantly changing, the unknown is more common, so vulnerabilities are absolutely more relevant. So, I think that's the biggest challenge and what's really promoting risk to be a top issue right now.

Q: *How is risk management different for a company that runs a mostly domestic operation, as opposed to a company that has many partners around the globe?*

A: The first question I would have is, are you really domestic? You believe that you're contained, even if you're a local coffee shop, and then you start to dissect your so-called busi-

ness chain, your supply chain. And you realize, okay, well the coffee lids are coming from here, the cups are coming from there. Even the utilities I rely on. Look at energy as an example, which is necessary to keep my business going. It is something that no longer exists in my so-called "small, domestic environment." It's something I've contracted and is being sourced from elsewhere, and I need to understand what are my key external dependencies.

So, the first question we'd have to tackle is, are you truly domestic? And if you are domestic, the way that it's different goes back to that definition of how to look at risk, or measure risk, and that is, can you identify uncertainty? If you're domestic and truly very, very local, you probably better understand what drives uncertainty and you can probably better measure your exposure to uncertainty. You have more predictability, so to speak, on the uncertainty piece. And you certainly would have a much better handle on the exposure to uncertainty, which represents vulnerabilities in your supply chain. So, smaller number of elements, less complex, more familiar, less unknown… these obviously translate into an easier time at managing risk.

Q: *You talk in your book about people needing to embrace change. We had an article in* SCMR *recently which very bluntly said that companies that don't change, like Digital Equipment Corporation or Circuit City or Chrysler, become companies that are unfortunately famous for another reason. Is change a key part of risk management?*

A: Change is probably the number one or two most important issue in risk management. And that puts such a burden on the organization to ensure that they develop the systems and the standards from a risk management standpoint to deal with change. So embracing change, building the systems and standards, are even more important and more relevant today. And change happens at so many levels, all too often I hear that an organization has acquired other organizations and that years later the systems that support the flow of information and goods have not been integrated. Information is rekeyed, intermediary systems are put in place (adding yet another layer of complexity and cost) to handle the transition of information between two disparate ERP systems. And at a macro level, the change and risk associated with the strategic footprint of the placement of suppliers, manufacturing and distribution centers must be considered.

Q: *If, in fact, change management is the way to survive economic problems like the recession, and smart companies have accepted that idea, does that make the concept of risk management easier or harder for them?*

A: I think it makes it harder. When we look at the reality of today's situation, everyone is so tuned into their own function, their own incentives, their own boundaries. Quite frankly, that's not the way clients or customers look at the products they get. They don't care whether the transportation failed or the warehousing was a problem. They just want the products when they want them and where they want them. The big challenge now, from a risk management perspective, is how do you get people to look beyond their functions and at what's needed to create, deliver and service value? You're asking for a cultural change, a behavioral change. How do you get them to look beyond their functional roles at a time when, quite frankly, many of them are worried about either their jobs or their company surviving through the economic crisis.

Q: *In your book, you talk about the concept of supply chain management touching everything and everybody in the company. Yet siloing can be a problem in some companies. What's your key to getting through the silos so that people can understand that everybody is at risk?*

A: Well, depending on whether your audience is internal or external partners, obviously you want to put the pressure on in different ways. I think those who have succeeded have really done a good job of putting a system in place to measure the risk, both from an impact standpoint, and also from an investment standpoint. Where they had the greatest success is trying to measure the impact to a particular revenue stream, cash flow, product, set of SKUs. In building their impact and investment argument, they started to look at something that was a lot more tangible than the so-called organization. Just as I said in the book, everybody is part of the chain. You have to articulate that through getting the product managers on board first, and getting them to acknowledge that their revenue is potentially being threatened.

Q: *It seems that any major initiative like this should come from the top down, but what happens when you run into an obstinate CEO who just doesn't want to embrace risk management?*

A: I'm going to give you actually two thoughts on this. The reality is, I think in some cases, it's a hopeless cause, meaning that you will just have some individuals who will just be totally unconscious, or ignorant, to risk and ultimately lead organizations into destruction. And actually, when I was working at one organization my boss, a senior executive, decided to categorize our executive managers as it relates to risk into three categories: They were either considered risk-takers, which was the majority; the enlightened, which were the ones that considered risk early in their business decisions; or the ignorant or brain-dead. The reality is you can do a lot to try to change those that are brain-dead. But at the end of the day, if those are the people that are leading your organization, you might want to think about working for another organization.

Now, that's said in extreme. The other option is to really understand the motivations for why they are ignoring the risk. And if it truly is pressures around margins or survivability at the company, or because they haven't felt the pain, I think that's where and when you're managing supply chain risk. You need to prioritize risk management activities around those things of greatest value and the greatest pain points. This is really where you need to spend the time and allocate the dollars. If I were to use a large beverage manufacturer as an example, and I tried to tackle this at the functional level, that's probably not the right place to go to get some of the confidence you need in the executive management team. You really do need to go to that leading product, whatever it might be, to get them to acknowledge that yes, this is the real thing of value here and it can be measured. You also need to translate that into real dollars, from an impact standpoint. And it's not always revenue that's threatened. Sometimes it's liquidity that's threatened, and as we know, it's the strategic value of the organization, the brand, or ability to comply with certain standards. So, all those have to be articulated, and depending on where you are in the marketplace, it's the risk manager's job to put more emphasis on one versus the other.

Q: *You book describes ten different laws of risk management (see accompanying sidebar). Which are the most important?*

A: Two stand out. One we've already talked about, which is the change law: if you don't manage and lead change, you're going to have to surrender to it. The other one was the "laws of the law," which we talk about in the book's preface, when you look at the precepts about everyone being part of the supply chain. No risk strategy is a substitute for bad decisions. It's all in the details, and people operate from their self-interest. That really represents the behavioral and the management aspects of the problem. If we don't tackle those things, or we don't understand and acknowledge and address those

issues, then it doesn't really matter what we do from a mechanical standpoint in any of the other laws.

Q: *You've suggested that stakeholders, which you defined as including investors (shareholders), business partners, governmental organizations, and customers, should be setting the risk-management priorities and the paradigms. Doesn't it seem a little counterintuitive to have people who seem to be basically outside of the organization setting these priorities?*

A: It's more like a partnership with the stakeholders that are leading in the dance. However, they're often not even brought to the dance, and here's where it becomes important. Here's a particular example: Let's say you're working on trying to manage a number of risks across the supply chain, whether it's in transportation logistics, sourcing, third-party sourcing, whatever it might be.

So you're trying to manage or address some of these risks, and at the end of the day there has to be an investment made against that. Well, somebody has to pass judgment as to what's the threshold for pain and then, of course, how much investment needs to be made against that threshold of pain. What am I willing to accept in the supply chain as far as variability or volatility—and then if it's not met, it's going to cause me pain? Well, it gets back to that question of who's going to feel the pain? Certainly management is going to feel the pain, and the executives are going to feel the pain. But ultimately, the people who are going to really feel the pain are the investors, business partners, clients or customers, and what we've experienced most recently during the financial meltdown is governments who rely on these huge organizations for economic stability or tax revenues. So when we get to these really tough investment decisions, I always ask the management team what are the expectations of those that you're providing your product to, and have you ever had a conversation with them as to what are they willing to accept?

Q: *It sounds like the key takeaway here is not so much that you need to be putting the stakeholders in charge, but don't forget they're there either.*

A: Yes. Well, that's another way to say it. As long as we ask them the question and empower them. If the stakeholders don't do a good job at defining it, then the burden is on you to define, and have you met the expectation? And that's always the challenging question.

Q: *Now, once the stakeholder paradigm is in place, how do you take it to your partner organizations, and make it work?*

A: You need to clearly articulate what you want from your clients in a very, very consistent way, whether they're large or small and you need to understand what it might cost or what tradeoffs to service or quality need to be made to achieve it. I brought out examples in the book of some companies that do it in an automated way, and put the expectations on websites. The companies are constantly out with the clients, the providers, the suppliers. They're working with them, and I think that's extremely important.

But you may not have the resources, the time, the management attention or the capital to address all these risks. So if you're going to look at third-party risk, and some large multi-national organizations have 30,000 suppliers, you have to do it within the context of the thing of greatest value in your organization that you're creating. You've got to turn the argument away from the totality of the company and the totality of the supply chain network. You have to begin with what's the greatest value to the company in the marketplace. Is it a particular product, is it a future product, is it a combination of those things? You know, Nike and WalMart and others have a consolidated set of suppliers, a much greater influence.

The 10 Laws of Supply Chain Risk Management

1. If you don't manage and lead change, you have to surrender to it.
2. The paradigm should destroy the parasite; begin by defining the paradigm, not fighting the parasite.
3. Manage your business DNA in a Petri dish of evolving risk.
4. In supply chain risk management, demand trumps supply.
5. Never set up your suppliers for failure.
6. Managing protection risk is a dirty job; focus on managing the endless risk of manufactured weakest links.
7. The logistics risk management rule—Managing the parts does not equal managing the whole.
8. Mitigation—If supply chain risk management isn't part of the solution, it will become the problem.
9. Financing—The best policy is knowing what's in your policy.
10. Manage the risk as you manage your own; your supply chains are all interdependent but unique.

But of course, that's only good for the guys that have tremendous leverage in the market. If you don't have the leverage that a Toyota or a WalMart, then you're forced to really start to be creative.

In nine out of 10 cases that I've been exposed to, I'd have the conversation with the suppliers about expectations, or asking them how they define risk, what are the business risk objectives and their approach to managing risk such as continuity planning. Just that conversation alone seems to have more effect than almost anything else and gets them moving in the right direction, and putting them on notice—just by asking the questions, it forced the upstream suppliers to do a lot.

Q: *And if worst comes to worst, you find a new partner.*

A: Exactly. And I think the recent financial crisis with the drying up of trade credit and trade finance over the last year-and-a-half, two years, has really cleaned out some of the bad players. It's also put the big players on notice. You know, many of them have gone and consolidated their list of acceptable suppliers, and they've added a broader set of risk evaluation criteria such as continuity and crisis preparedness. So I think those are all good.

The last thing is being able to put some real-time monitoring in place where you're actually monitoring issues, particular risk issues or risk events, and you're able to understand the impacts of those events at different points in your supply chain. Even though you don't have ownership of them or you're relying on a third party, you make the assumption that they're going to fail, and when you're monitoring their environment and you perceive there's any potential failure, that's when your process really is triggered for trade disruption, and that's when you start to execute your response strategy. You're not waiting for your partners to respond. You're basically doing things independently of them, "trust but verify and monitor" and the real-time monitoring gives you that ability to do that.

Q: *Talk about the technology that is leading the way these days when it comes to risk management.*

A: One significant trend is an expansion of the tracking systems that are in place, whether they're specific technologies, whether it's GPS or RFID, which is used to obviously track the efficiency. It's also taking things that are used in the logistics industry, expanding that to incorporate some of those risk factors beyond what is perceived as the daily tolerance for problems. Predictive analysis tools are then used to better forecast risk, such as security and shrinkage. So those types of systems and the expanded use of those systems or other applications to track and to be part of a trade-recovery or a commerce-recovery process if you have failure.

Q: *So it is possible to take an existing system and maybe add modules to it rather than having to rip everything out and start from scratch?*

A: Absolutely. And some of the architecture really has to be challenged. So if you've got an ERP system that's looking at things in a modular fashion, then instead of designing the risk elements into each of the modules, you need the capability to look across multiple modules. You need to be able to look at the flow of the product, the information, and the cash to see again where you are going to have the greatest risk.

Q: *You also believe demand should trump supply when it comes to risk management. Your book talks about healthcare and vaccinations for H1N1. But demand is so volatile, especially with something like that. You can go for months without needing anything and then all of a sudden you need millions of doses right now. How do you handle that kind of volatility without building up massive inventory?*

A: I think it starts with the fundamentals; as we've seen before, we need systems. The tendency when looking at the demand side, especially through a risk lens, is to look at the threats to the demand. In other words, threats as they relate to the buyers, threats as they relate to the market itself. Now, that's OK, but there are just too many variables there. So from the demand side, that means understanding the impact of demand significantly changing or being volatile, and translating that into looking at failure of demand or looking at a huge uptick in demand, and then starting to understand what each inflection point translates into from a risk standpoint. What is your threshold or tolerance before the risk becomes a real concern? Doing all that requires you to understand all the variables in the supply chain that supports that product.

So for, say, a bottle of water. If the demand at a particular threshold is going to tax your ability to get a hold of certain resins, it really starts to change the decision about how you manage risk, how you manage the supply chain for that particular bottle of water. But when you do the analysis and you start to say, well, I've now been able to look at these thresholds, plot all these different impacts that you have at different levels. As you plot these things on a chart, you can see what parts of the product are going to cause you more pain or less pain. It could be products that are used in the production pro-

cess, such as certain gases, or it could be availability of materials that are actually part of the product.

The tendency is to just make the assumption that it's the whole, when in fact you have to dissect the part, measure all the individual pieces, and then really start to plot all these things on a common axis so you can see which ones of these parts with rapid demand is going to cause you the greatest pain. That's where you need to focus your strategies.

Q: *Is it possible to go overboard with risk management and, if so, where do you draw that line?*

A: It's absolutely possible to go over the top from a risk-management standpoint where you find out that the risk management has slowed your speed or slowed your service or impacted your ability to innovate. That's why I think it certainly needs to be layered in and integrated, and most importantly measured. The challenge is doing that, trying to get to the point of the balance.

But in answer to your question, yes, I think we can over-control the risk. That happens when the measures and the metrics aren't in place where you're not measuring impacts, where you're trying to chase different threads and you believe a particular thread is more important than another thread. When you take the shortcuts on the measurement side from an impact and investment standpoint, I think that's where you really start to get in trouble and you get out of whack with the ultimate decision process. And when you do that and you measure it, the person that's conducting the analysis is not the decision-maker, and they have to bring that data forward so that the real decision-makers can do what they do every day in business.

Q: *So talking about the leaders in supply chain and risk management, who's leading the pack? What industries?*

A: The ones that really jump out are some of the larger high-tech manufacturing companies, especially those that are in the hardware manufacturing business. Certainly, some of the global energy and mining companies who have been almost perfectionists at trying to measure and manage the financial risks are now spending a lot more time on managing the product risks, and certainly the cash risks as well. So I'd say the energy industry, oil and gas in particular. However, on the refinery side, it doesn't seem to be as strong as those companies, so I want to be careful there.

Public utilities, but they have a different set of criteria. They certainly have a supply chain and they tend to be very good at managing up-time, but there are other issues on the security side that that they're challenged with. A few of the larger mining companies that I've worked with certainly have a good system for managing the broad set of risks—labor, environmental, all part of their supply chain. There are some companies that are very good in managing the innovation risk, their innovation chain. Those are some of the more visible consumer-based electronics companies, high-tech companies. And then believe it or not, there's one or two automakers. They do a really good job in managing the third parties, not just from a quality standpoint, but a broader set of risk criteria, and there are so many companies that are trying to do a better job at managing third-party or supplier risk, depending on how you want to define it, they are just struggling. That, to me, is the number one issue that these companies are really trying to address: figuring out better ways to manage the supply area risk.

Q: *For companies seeking to get on the path to sound risk management, what are the initial steps they should take?*

A: Well, with supply chain risk management more than anything else, you need a hook and/or a success story. My suggestion would be to, as your target, use what is significantly going to change in the next few months—whether it's a major platform change on the technology side, whether it's a new product offering, a new product line, whether it's an acquisition, an integration of that company.

If you start with that as your target, something that's already changing, then you start to defuse that first bomb that's going to hit you, which is the corporate political bomb of "We're doing everything right, why are you challenging us?" Use change as your hook and then, as you look to manage the risk, you look to the fundamental elements of prevention and response. In order to do prevention, you need to identify it, you need to assess it, you need to assess the impacts to it, you need to measure it.

Then you could look at solutions, whether they're solutions to mitigate the risk, insure or finance the risk, or monitor the risk, realizing there's not much you can do. But you can respond quickly if something goes wrong. Or if it's a systemic failure at a particular port, shipping lane, cargo facility, make sure you have already thought through that scenario and can move quickly on it. I think those are the places to start to build that capability on the reaction and response side as well.

INVENTORY ACCURACY: Essential, but Often

Retailers today are struggling to manage demand across multiple channels while effectively controlling inventory levels. Vital to this process is the accuracy of their inventory systems. Cycle counting is the main technique used to curb inventory record inaccuracy (IRI), but it offers only a static perspective. This article provides clear evidence why retailers need to adopt a more dynamic perspective on their inventory picture.

Mark A. Barratt, Elliot Rabinovich and Annibal Camara Sodero

Inventory expenses for firms in the United Stated have become vast. An estimated $1.5 trillion is being invested in inventory on a yearly basis, with 82 percent of the total in the manufacturing, wholesale and retail sectors.[1] In the retail sector, mixed retailers—that is, retailers that have multiple channels to market—today are scrambling to manage these inventories in the face of still-stagnating sales across multiple channels, both traditional retail (that is, brick-and-mortar) and direct (internet-based). A typical approach has been to offer complex product assortments to meet localized consumer demand, while trying to keep a handle on their available inventory levels.

The advent of the Internet as a supporting tool for online sales has only intensified the challenge. To cite one example, buying behavior has changed greatly as a result of consumers utilizing the direct channel to verify product availability and assortment—for example, for subsequent in-store visits leading to purchases through the retail channel. This places extra emphasis on mixed retailers to maintain accurate records of their inventory and high-

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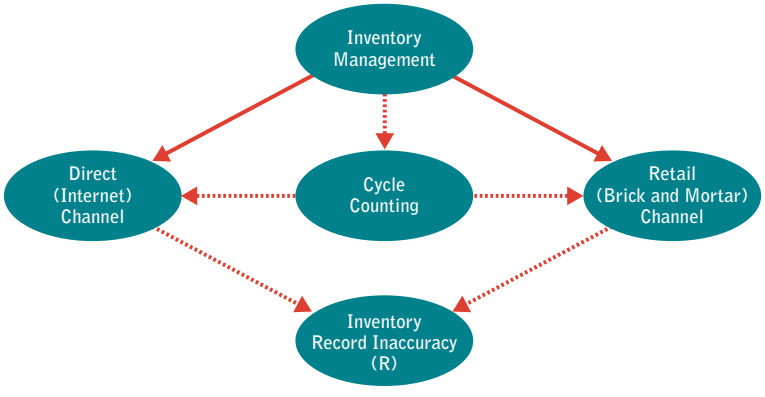
Overlooked

lights the dilemma of determining which product assortment to make available in particular channels. A related, though less well understood, challenge involves dealing with inventory record inaccuracy (IRI). Coping with—or trying to mitigate—IRI will become increasingly important as multi-channel retailers rush to increase the availability of their inventory across both their traditional retail channels and their newer, direct channels.

This raises the question as to whether mixed retailers should separately allocate inventory to serve individual channels or centralize inventory to satisfy overall demand irrespective of channel. A related question is what are the IRI implications of each course of action? Mixed retailers commonly separate their inventories across channels to maximize product availability for consumers. By allocating inventories exclusively at their brick-and-mortar channel, they ensure that Internet sales do not interfere with in-store product availability. This strategy, however, prevents retailers from realizing inventory efficiencies that can result from centralizing inventories across their channels. Such efficiencies have a huge potential for reducing carrying costs for safety stocks as well as on costs necessary to monitor and control inventory levels and their accuracy.

EXHIBIT 1

Managing IRI in a Mulitchannel Environment



Retailers also have utilized technology to automate various critical systems ranging from ordering to forecasting to planning and replenishment. All of these tools utilize "system" inventory records to determine sets of parameters that optimize inventory control, affecting both operational and financial decisions.[2] Further related to technology, radio frequency identification (RFID) technology has seen a rise in popularity in the retail space. Yet RFID still remains an expensive option and is not yet feasible for all firms.[3]

In short, the ability to accurately determine how much inventory is on hand has taken on an even more critical role than before. Without such accuracy, firms bounce between the opposing risks of holding more inventory than is necessary or alternatively running out of inventory and not being able to meet customer demand. This has made IRI a relevant—though often understated—issue for many firms across diverse industries, from retailing to defense.

Shortfalls of Cycle Counting

In their attempts to address and control the opposing risks of excess inventory vs. out of stocks, most retailers and manufacturers use some form of cycle counting, generally either by stock-keeping unit (SKU) or by location. In the case of multi-channel retailers the company's aim is to ensure acceptable levels of accuracy with their on-hand inventory (see Exhibit 1). Done correctly, cycle counting is accompanied by an ongoing root-cause analysis for source of errors leading to a continuous improvement approach that ultimately eliminates or significantly reduces the frequency of such cycle counting.[4] Cycle counting is, however, a static, predominantly financially-oriented, and periodically repeated measurement approach based on an ABC product classification.

Despite the fact that cycle counting has existed for over 30 years, there have been no significant improvements or breakthroughs in mitigating inventory record inaccuracy associated with this technique. Our main concern with cycle counting is that it overlooks the issue of physical product availability between counts; that is, what is happening on a dynamic basis in terms of product availability. Between cycle "counts"—the timing of which varies on average from one month to six months depending on the approach chosen—firms strive to maintain availability without holding excess inventory.

The cycle counting approach is based on accuracy measures that can be significantly out of date and may contain major errors. This could unnecessarily increase inventory or expose the firm to stock-outs. Such lack of visibility during counts creates potential shortfalls in product availability, not to mention the adverse impact on the organization's forecasting, planning and re-ordering processes.[5] The reality is that firms do not understand the true impact of errors on their inventory records; as a

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result, they respond simply by holding more inventory at a higher cost than is potentially necessary.

Inventory Record Inaccuracy Abounds

With firms still relying mainly on cycle counting to keep records accurate, both practitioners and academics have given special attention to IRI in retail settings—where out of stocks cause great concern. In particular, research has focused on the causes and consequences of IRI at a store level. To illustrate the scope of the problem, one study of a large retailer revealed that 65 percent of the 375,000 stock keeping unit (SKU) records were incorrect.[6]

Inventory record inaccuracy remains a pervasive and largely unexplored issue across industries spanning different supply chain echelons.

Further, recent anecdotal evidence indicates that IRI in the distribution center is still a major issue. In a large electronics retailer, for instance, researchers found that prior to the opening of a new retail store, 25 percent of the SKUs were already inaccurate, suggesting that the likely source of these errors emanated from the retailer's DC.[7]

Inventory record inaccuracy remains a pervasive and largely unexplored issue across industries spanning different supply chain echelons. Not surprisingly, the consequences of data inaccuracy are poorly understood not only at physical retail store settings, but also at distribution centers and beyond. IRI can generate different outcomes, as summarized in Exhibit 2. If the system inventory record (SIR) is higher than the actual physical inventory on hand (meaning a positive balance), then this gives rise to a situation referred to as "freezing."[8] If this situation is not detected and corrected, then subject to the magnitude of the error relative to the re-order point level maintained by a firm, the SKU will become "frozen" once its stock is depleted because the SIR will show a positive balance of items in inventory.

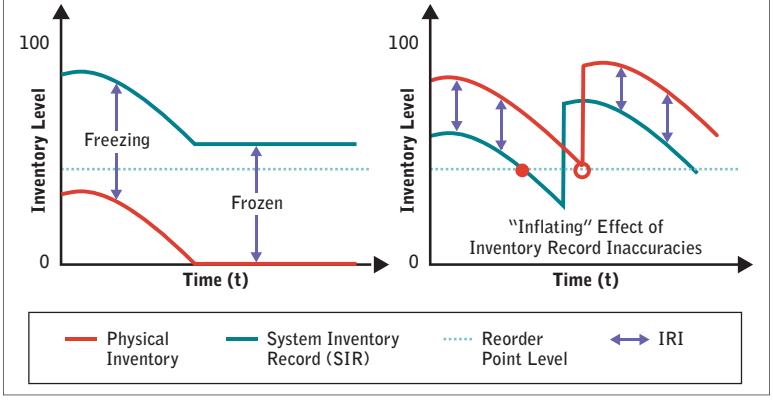
In a DC setting, this situation will persist only until an order for the depleted inventory arrives and the "zero" physical inventory state is detected. In a brick-and-mortar or an online retail setting, this situation becomes more damaging. As there is no physical inventory, customers cannot purchase the item. The fact that no customers are purchasing the item leads to a potentially dangerous scenario. With no sales for the product occurring, then over time the product's forecast is downwardly adjusted before being ultimately de-listed.

When the SIR is lower than the actual physical inventory on hand—signifying a negative balance—a situation referred to as "inflating." In such cases, the SIR will decline until the re-order point level to replenish the inventory is reached. At this point in time, an automatic replenishment order is prematurely generated. At face value, this is a more desirable outcome than freezing. The reason: most companies would prefer IRI manifesting itself as excess inventory as opposed to the risk of being out-of-stock. In a direct channel, however, this can be reflected in lower levels of inventory availability that do not correspond to the true amounts of inventory in storage.

EXHIBIT 2

Outcomes of IRI: Freezing vs. Inflating SKUs

System Inventory Record (SIR)	Physical Inventory On-hand	System Physical Balance	Condition of IRI
90 Units	50 Units	+40 Units	"Freezing"
90 Units	90 Units	0 Units	Accurate
40 Units	90 Units	-50 Units	"Inflating"



The Pilot Study

Understanding IRI as a supply chain phenomenon required us to first undertake an exploratory pilot study. Specifically, we investigated the inventory policy and practices in the DC of a national pet retailer (name withheld at company's request) to (1) better understand the issues associated with sustained periods of counting and (2) to gain insights into day-to-day variability of inventory records.

By counting inventory for only seven consecutive days, the pilot study revealed significant evidence of very dramatic variability between overages and shortages across a sample of 30 SKUs (see Exhibit 3). This sample comprised 10 SKUs that were selected from each of the three main types of storage locations—fast-moving, bulk and module picks.

On one hand, the fast-moving products, such as canned cat and dog foods, did not suffer from any IRI. Slower-moving, bulky and module items, on the other hand, exhibited significant variability (between overages and shortages) over the counting period. Across the 20 SKUs in the bulk and module categories, we also noted a clear tendency for there to be more inventory actually on hand than the system inventory record indicated. If this were to continue throughout the year, the company would be holding more inventory than needed and paying holding costs above and beyond what was necessary.

Potentially more worrisome than the excess inventory is the volatility of records accuracy for some of the individual SKUs. Some have records that "bounce" from accuracy to excess inventory and back again; other SKUs swing from excess inventory to shortage and back again. This variability was not explained by any transactions (such as receipts, put-a-ways or order picking), even though we corrected for any process delays in terms of how quickly, for example, product received from suppliers was credited to the system inventory record. This leaves us to consider the system as inherently unstable.

Main Research: Multichannel DC

To examine systemic conditions underlying IRI in a multichannel distribution center, we needed to find a retailer who serviced such channels from the same facility. So we next studied an apparel retailer with annual sales in 2008 of approximately $200 million. This retailer operates a national distribution center that serves both a traditional (brick-and-mortar) retail channel and a direct (internet-based) channel. From a total of approximately 12,000 SKUs, we isolated those that were common to both channels. We ranked these common SKUs by sales volume (in units) in 2008 within each product category to identify fast, medium, and slow-moving items. We then selected the two fastest-selling and the two slowest-selling products. This left us with 27 SKUs, including an item selection of the three most popular product colors and sizes.

To assess IRI, we tracked the physical inventory on hand for the 27 SKUs at the DC for both the retail and the direct channels. Simultaneously, we contrasted this information against the data in the retailer's SIR. In tracking the retailer's physical inventory, we counted the num-

EXHIBIT 3

Results of Pilot Study on IRI

Fast	Prod #1	Prod #2	Prod #3	Prod #4	Prod #5	Prod #6	Prod #7	Prod #8	Prod #9	Prod #10
Day 1										
Day 2										
Day 3										
Day 4										
Day 5										
Day 6										
Day 7										

Bulk	Prod #1	Prod #2	Prod #3	Prod #4	Prod #5	Prod #6	Prod #7	Prod #8	Prod #9	Prod #10
Day 1		-0.75%	3.85%			-1.15%	-0.54%		0.35%	0.09%
Day 2		-1.52%	-1.56%			-1.15%	-0.54%		0.35%	
Day 3		-1.54%		-0.28%		-1.20%	-0.45%		-0.77%	0.09%
Day 4	-0.41%	-3.17%	-0.95%	-0.89%		-1.28%	-3.33%		5.56%	3.57%
Day 5	4.15%	-1.72%		-2.44%		-1.28%	-0.50%		0.62%	
Day 6		-2.33%		-0.65%		-1.27%	-83.64%		0.26%	-1.03%
Day 7	-1.59%	-2.86%				-2.63%				

Module	Prod #1	Prod #2	Prod #3	Prod #4	Prod #5	Prod #6	Prod #7	Prod #8	Prod #9	Prod #10
Day 1	-3.57%			-2.22%	4.53%	-0.27%	0.33%	-30.00%	-0.30%	-0.39%
Day 2	-3.57%			-2.22%	5.09%	-0.45%	0.33%	-30.00%	-0.30%	-0.39%
Day 3	-3.57%			-2.29%	3.96%	-0.28%	0.32%	-30.00%	-0.32%	-0.24%
Day 4	-3.57%	-0.98%	-0.56%	-1.65%	3.08%	-0.83%	-0.46%	-30.00%	-1.57%	-0.92%
Day 5	-3.57%			-1.69%	4.49%	-0.17%	0.17%	-30.00%	-0.37%	-0.13%
Day 6	-3.57%		-0.28%	-27.54%	4.49%	-3.37%	-0.88%	-30.00%	-0.35%	-0.14%
Day 7	-3.57%		-0.71%	-1.88%	4.56%	-0.18%	-0.05%	-30.00%	5.77%	0.15%

Accurate | Excess | Shortage

NB: % = Percentage Difference Between SIR and Actual Physical Count

ber of items in storage for each channel every day over a period of ten consecutive business days. (We did not count the inventory during the weekend because the DC operated only from Monday to Friday.) The ten business days correspond to two calendar weeks in September of 2008. These two weeks were chosen because we wanted to examine IRI conditions without the interference of seasonality in demand for the retailer's products.

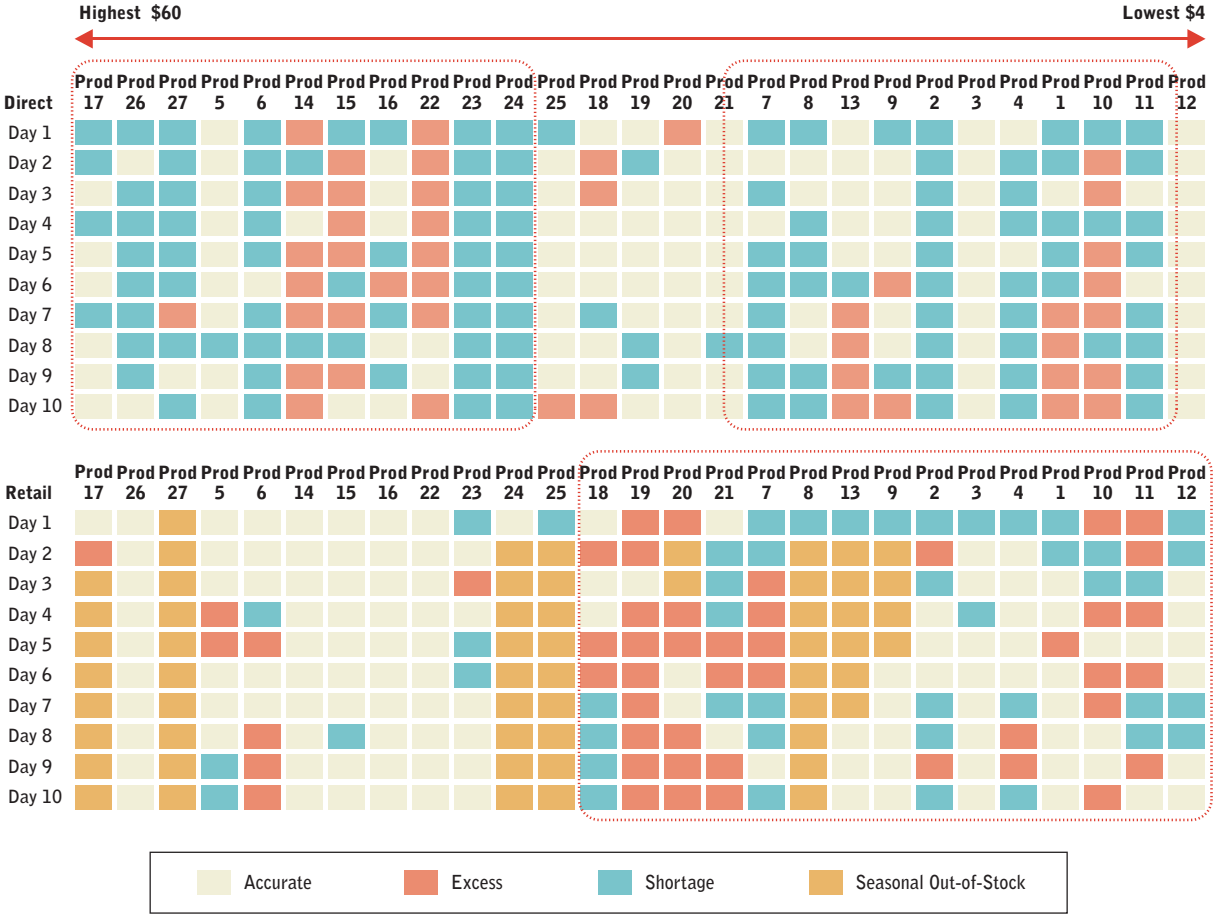
For each selected SKU, on every day of counting, the SIR balance and SKU locations for both channels were downloaded from the DC's warehouse management system (WMS). Additional data on product receipts, daily orders, returns and any (auditing) adjustments also was collected on a daily basis for both channels. The data on prices, product popularity in the market, and inventory review policies was collected from the retailer's records during the period when we collected data on the SKUs inventories. It is important to note that the retailer followed continuous review policies for all the SKUs in our study. These policies were based on a min-max approach for reordering and replenishing each SKU's inventory. When inventory reached a predetermined minimum level, the retailer reordered the inventory amount necessary to take the level back to a preset maximum.

Results Show Dynamic IRI Variability

The results of the research reveal significant dynamic IRI variability for both retail and direct channels. Specifically, SKU records move from being accurate, to having positive and negative divergence from the actual physical counts (that is, freezing and inflating)—all within the 10-day counting period. The research reveals some counterintuitive results, compared to previous studies. These findings support our assertion that IRI presents different challenges depending on channel structure and the company's position in the supply chain, corroborating the assertion that IRI should be investigated in settings other than retail stores.

EXHIBIT 4

Inventory Records Accuracy by Price and SKU



It's important to underscore that the errors found in both channels could not be explained by any transactions (receipts, put-aways or order picking). Again, this held true even with our correcting for any process delays such as how quickly product received from suppliers was credited to the system inventory record or how quickly returns were credited back to the system inventory record.

Impact of Item Price on IRI

We expected to see fewer inaccuracies at the higher end of the price range of the SKUs, figuring that order pickers should be more cognizant of being accurate with high priced items. Instead, as shown in Exhibit 4, we found most inaccuracies at both the high and low-ends of price range in the direct channel and more inaccuracies at the mid-low end of price range in the retail channel.

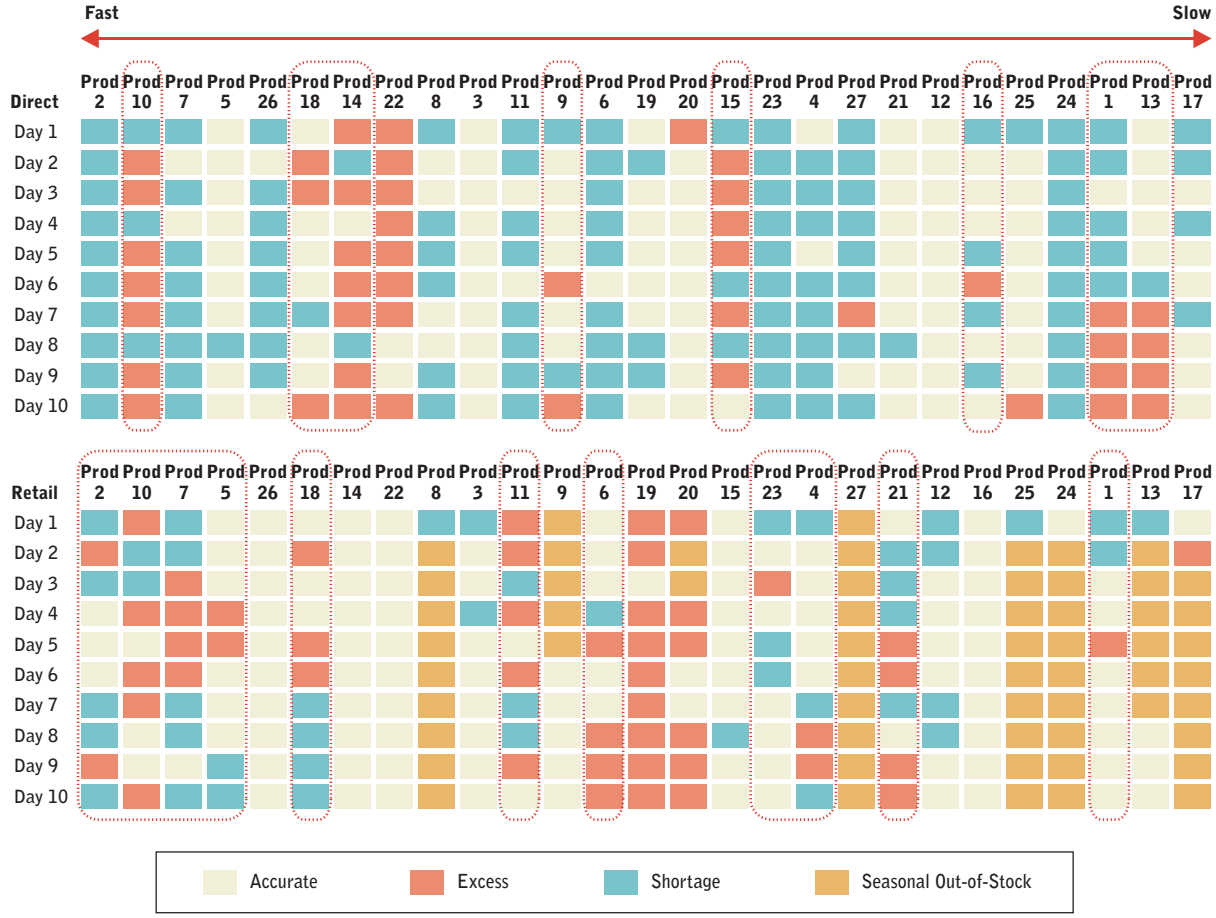
A program that effectively addresses IRI should aim to minimize inaccuracies for high value items because this is where the higher margins typically lie. One possible approach is to use incentives to focus the attention of managers and employees on operational activities related to these high value items. However, such incentives must be balanced with the multitude of competing objectives in terms of maintaining and increasing sales of these high-value items and inventory management.[9] Where high value (margin) items are concerned, it may be better to hold higher levels of inventory rather than to focus too much on reducing IRI across these particular SKUs.

Shrinkage—theft in particular—may also be a significant factor for higher priced items, which in turn leads to higher levels of IRI. Most retailers have focused on loss prevention in their retail stores; they need to pay the same level of attention to shrinkage in the direct channel.

The overarching concern here, however, is that the IRI errors are occurring at both the high and low price ends of the products in the direct channel. This suggests

EXHIBIT 5

Inventory Records Accuracy by Sales Velocity and SKU



that some other possibly counter-intuitive issues are in play. This is something that will be explored in the next stages of this ongoing research.

Impact of Sales Velocity on SKU IRI

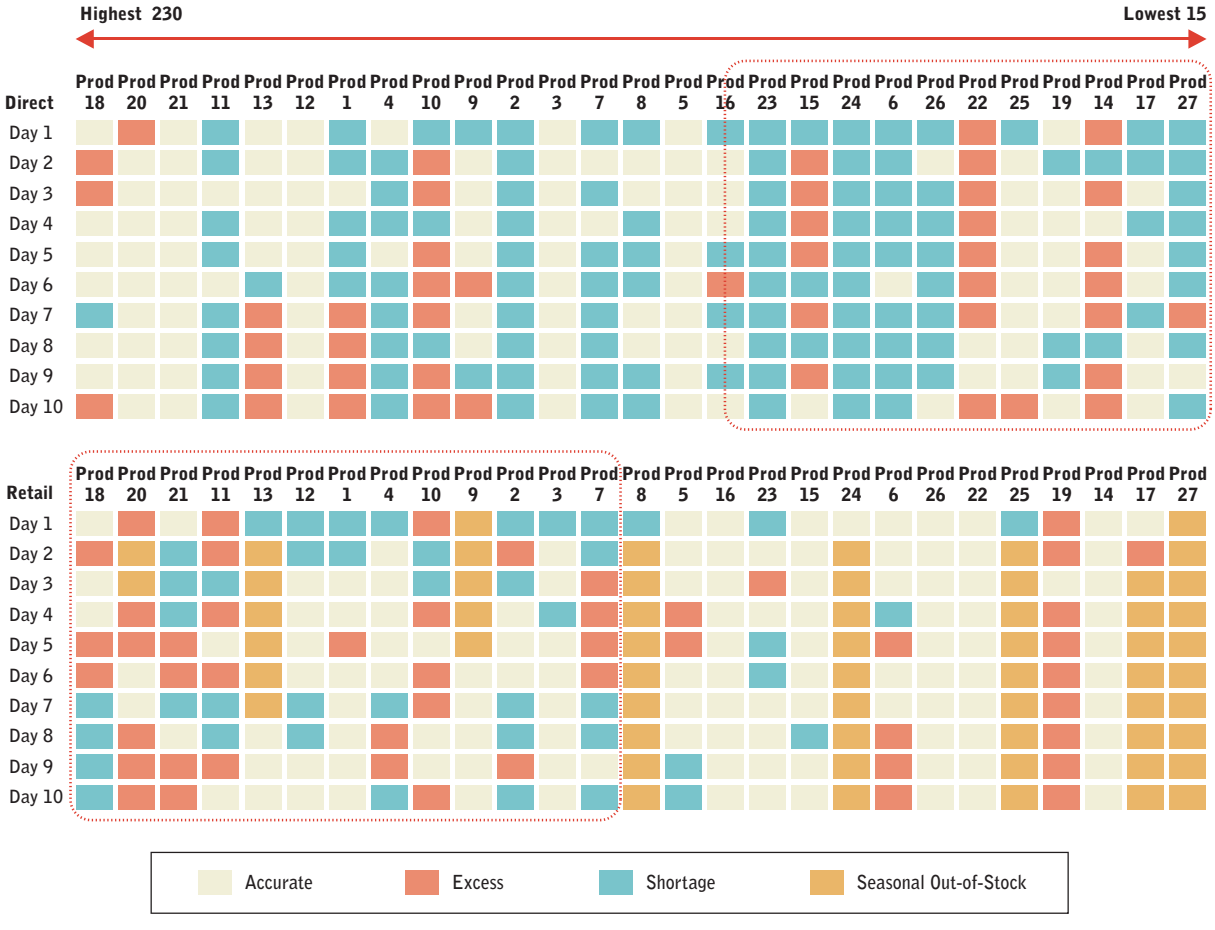
We would expect that the more transactions associated with a product, the more opportunities there are for inventory records to become inaccurate.[10] However, as we can see in Exhibit 5, there is considerable inaccuracy irrespective of the number of transactions in the direct channel. Unlike in the previous pilot study that we undertook, we saw many instances of IRI, especially in the slower moving items. This was not an encouraging finding. And while the research revealed no obvious patterns across the 27 SKUs, we noted a slightly higher level of inaccuracy in the direct channel. This may be explained by the high number of transactions in this channel than compared to the retail channel. Further worth noting in Exhibit 5 are the many instances where SKU records experienced conditions of accuracy, shortage and overage—all in the space of ten days.

Impact of Inventory Review and Replenishment Policy on IRI

Frequency of inventory review has been found to negatively correlate with inventory record inaccuracy. The reason: discrepancies are easier to spot when inventory reorders are being placed, or when inventory is being physically replenished. Inventory review policies in which reorder points are close to the maximum levels carried in stock (that is, a small min/max gap) will require frequent reviews. This is because the depletion of inventories will cross the inventories' reorder point threshold more frequently as the difference between the maximum inven-

EXHIBIT 6

Inventory Records Accuracy by Inventory Review and SKU



tory levels carried and the inventory reorder points narrows.

An increase in the gap between the inventory reorder point and the upper inventory level will lower this frequency. Accordingly, we would expect that a reduction in the review frequency will increase both the magnitude of IRI and the amount of time record inaccuracies will persist for the SKU. Accordingly, Exhibit 6 shows that an increasingly narrower min/max gap will lower the magnitude of IRI in the direct channel, thus broadening the difference that exists in IRI between channels in a mixed retailer.

Impact of Frequency and Magnitude

Overall, our research results show that the SKUs in the direct (Internet-based) channel are much more frequently inaccurate than in the traditional channel. Specifically, the frequency of discrepancies between SIR and physical inventory in the direct channel was 58.1 percent, compared to 30.7 percent in the brick-and-mortar channel.

In terms of magnitude of errors, SKUs in the brick-and-mortar channel, while less frequently at error, have a higher magnitude of error. The average magnitude of discrepancy between SIR and physical inventory is 31 units vs. 3 units for the direct Internet-based channel. We also observed considerable volatility in both channels throughout the 10 counting days, further suggesting a significant degree of system instability.

What is behind these differences in frequency and magnitude across the direct and retail channels? So far as the differences in frequency are concerned, the direct channel incurs many more transactions (albeit small in size) than the retail channel. This sheer frequency of transactions appears to account for the heightened frequency of IRI. Although the direct channel takes on the appearance of a nervous of "agitated" state, it is relatively more stable than the retail channel.

A program that effectively addresses IRI should aim to minimize inaccuracies for high value items because this is where the higher margins typically lie.

As for the differences in magnitude, the retail channel incurs considerably fewer—but significantly larger—transactions than the direct channel. These comparatively larger transactions appear to account for the heightened magnitude of IRI. While the brick-and-mortar retail channel is stable for periods of time, it is actually more volatile when IRI occurs because of the magnitude involved.

Managerial Implications

The managerial implications and lessons learned from this research are far reaching. Some of the most important include the following:

- The research shows that direct internet-based channels may have more frequent errors than brick-and-mortar channels, but at lower levels of magnitude. This strongly suggests that managers need to develop spe-

cific control plans to more consistently track inventory levels and changes in their records over time for their online channels. These plans should include mechanisms to enable adjustments in the records to reflect current inventory conditions. This capability is especially important for those items that are part of brick-and-mortar channels where mismatches in the magnitude of accuracy in inventory records are prone to be high.

• The research also shows that cycle counting, the main method currently used to manage and control the accuracy of inventory records, cannot capture the dynamic and often volatile nature of inventory record inaccuracy in a DC setting. This shortfall typically triggers premature ordering, leading to excess inventory. To ensure records accuracy, cycle counts need to be supplemented with continuous inventory audits that keep track of variations in stock levels to prevent premature or unnecessary inventory replenishments. Cycle counts also can miss the occurrence of interim stock-outs during the times when inventories are not being audited. The use of continuous review periods to track IRI during extended time windows can identify these occurrences and help uncover their root causes.

• The research reveals that managers need to address the issue of process "lags—that is, the time delays between physical actions and updating of systems records that may be amplifying, or even diminishing, the existence and magnitude of some of the errors behind the inaccuracies. Ideally, the warehouse management system (WMS) should be able to handle this situation. But based on evidence from this research, the pilot research, and other anecdotal evidence, it's not happening. This represents an opportunity for WMS providers, especially in view of the increasing demand for real-time visibility of inventory.

The options on how to treat inventory record inaccuracy are stark. If firms choose not to address the dynamic aspects of IRI, they expose themselves to numerous inefficiencies— reordering too much or too little, losing customer goodwill because of phantom stock-outs, continuing to operate under high levels of uncertainty, and more. If firms do choose to address the dynamic aspects of IRI, their efforts may take the form of adopting incentive programs, deploying a new WMS, implementing continuous improvement programs, redesigning DC layout, and so forth. It is critical to recognize that with such initiatives come trade-offs: The resulting increased availability, improved customer service and overall improved inventory management, requires an investment. It could be the addition of new or more proficient personnel; an upgraded or entirely new WMS; a new set of operating processes.

Without accuracy, firms bounce between the opposing risks of holding more inventory than is necessary or alternatively running out of inventory and not being able to meet customer demand.

Perhaps most important for mangers to keep in mind, any successful initiative to improve inventory record accuracy will entail a major culture change and will require the wholehearted support and involvement of top management.

Endnotes:

1 Economics and Statistics Administration (2009). http://www.esa.doc.gov/ei.cfm.

2 DeHoratius, N., A. Raman, 2008. Inventory record inaccuracy: An empirical analysis. *Management Science* 54(4) 627-641.

3 Lee, H., Ö. Özer, 2007. Unlocking the value of RFID. *Production and Operations Management* 16(1) 40-64.

4 Piaseki, D.J. (2003) "Inventory Accuracy: People, processes and technology." Kenosha, Wisconsin. OPS Publishing.

5 DeHoratius, N., A. Raman, 2008. Inventory record inaccuracy: An empirical analysis. *Management Science* 54(4) 627-641.

6 Raman, A., N. DeHoratius, Z. Ton, 2001. Execution: The missing link in retail operations. *California Management Review* 43(3) 136-152.

7 DeHoratius, N., A. Raman, 2008. Inventory record inaccuracy: An empirical analysis. *Management Science* 54(4) 627-641.

8 Kang, Y., S.B. Gershwin, 2005. Information inaccuracy in inventory systems: stock loss and stock-outs. IIE Transactions 37(9) 843-859).

9 DeHoratius, N., A. Raman, 2007. Store Manager Incentive Design and Retail Performance: An Exploratory Investigation. *Manufacturing and Service Operations* 9(4) 518-534.

10 Bernard, P. A. 1985. Cycle-counting. *Production Inventory Management* 26 27–41. DeHoratius, N

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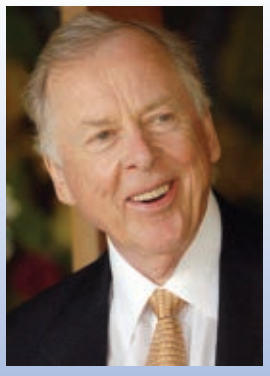

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The world financial crisis that froze business for most of 2009 has passed, and growth appears ready to stage a comeback. But global business opportunities look radically different now as we enter the second decade of the 21st century. Infrastructure needed to tap emerging markets is being built just as an overhaul in our energy networks and manufacturing plants is beginning to accelerate. Supply chain executives are looking ahead to a smarter, more connected, and more sustainable physical and information infrastructure as they plan for 2010 and beyond. This means huge new business opportunities for industrial manufacturers as well as new challenges for consumer and retail leaders who must master a very different global supply network. Please join us in Scottsdale as we convene supply chain leaders from across sectors to look ahead at what this new infrastructure means to business growth.

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6 Procurement Actions that Can Boost Your Business

By Justin Reaume

Justin Reaume is the director of purchasing & supplier development at Magna Electronics North America, and can be reached at Justin.Reaume@MagnaElectronics.com.

There has been plenty of discussion over the years about how to reduce inventory. Generally, the perspective is from the office of the material planning manager or supply chain manager, since inventory performance is usually thought of as a production metric.

However, there are many aspects of inventory management that are directly influenced by decisions made in the procure-

When demand sags, inventory can all too easily pile up, putting pressure on the financial performance of the organization. The procurement team can do much to relieve the situation—and in the process exert a powerful impact on overall business performance. The six action steps outlined here can help supply management executives make that difference.

ment department. Many of the variables that are tied to the reliability of the logistics network are directly related to the locations of the suppliers and to their delivery performance. In addition, contractual agreements that specify high minimum order quantities or long lead times—or both—can prevent the materials organization from making the necessary adjustments to raw material inputs when demand does not merit high volumes.

It may seem obvious to say that procurement managers must understand the impact of their decisions and strive to accommodate the goals of each operating unit in sourcing arrangements that are effective for all parties. The decisions made within the procurement department have lasting effects on the rest of the organization; they become part of legally binding contracts that govern the way a company conducts business with its supply base. Unfortunately, it is still common practice to optimize the effectiveness of one function, such as procurement, at the expense of the effectiveness of others.

This article presents six checklist actions to help procurement professionals play more integrated roles in the management of inventory. Managed well, these actions can help improve profitability. Collectively, they can have as great a financial impact on an organization as does a reduction in purchased cost.

1. Reduce Minimum Order Requirements

Many suppliers specify a minimum order quantity (MOQ)—that is, the minimum amount of material that can be ordered at any given time. Determination of the MOQ is a balancing act between allowing the supplier to make long production runs in order to realize economies of scale and ordering the minimum amount of material required to sustain production and maintain low inventory levels. When there's a drop in demand, previous minimum order quantities that met material planning requirements no longer meet those objectives. In short, the MOQ is now excessive.

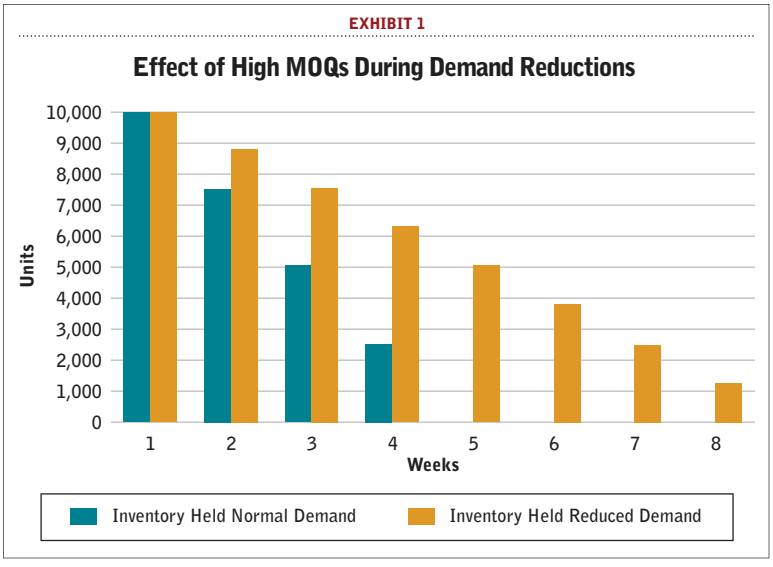
Here's a quick example. Imagine an MOQ of 10,000 units for a product with a yearly volume of 120,000 units; that translates as one shipment per month. Now imagine that annual demand drops to 60,000 units. Under the current MOQ arrangement, there would then be six shipments a year, or one every two months. Then, since two months of material is shipped to the customer at a time, the amount of ongoing inventory is doubled, as seen in Exhibit 1.

Essentially, low MOQs allow an organization to make more flexible adjustments to component shipments; the result is that the material planning organization can more effectively match material flow to customer demand reductions. Prohibitive MOQs, such as the one described above, will result in increased inventory levels in any scenario—and especially in a declining market.

Contractual adjustments offer the most straightforward way of addressing excessive minimum order quantities. However, renegotiation of supplier contracts will almost always have cost implications; it's common for purchasers to hear about price increases since the suppliers' economies of scale will be affected by the cutbacks in demand.

A widely used method to avoid paying price increases is to authorize the supplier to make longer production runs. Part of that authorization must include an agreement to ship only what is immediately required by the customer. The purchasers require the supplier to hold the remaining inventory. In turn, that requirement usually triggers a request from the supplier for a guarantee that the excess

EXHIBIT 1



material will be purchased. Naturally, the supplier also needs to maintain the lowest inventory levels possible in order to achieve an acceptable cash flow. The supplier may request that all material must be purchased within a specific period of time to ensure some level of inventory turnover in case of a significant drop in demand.

Another approach is to work with minimum order values (MOVs). This option is usually used by suppliers that sell standard components through a wide range of part numbers or stock keeping units (SKUs). The MOV is predicated upon the total value of all part numbers shipped to a single customer. In this scenario, production volumes are based on the demand of many customers, so production scheduling does not normally fluctuate to match the needs of one particular customer.

An alternative is to consolidate multiple SKUs with a few strategic suppliers in order to more easily achieve the minimum-order-value requirement. This approach allows for more flexible ordering; because the overall spend at each supplier is larger, lower volumes of each part number can be purchased while still achieving each supplier's total order value minimum.

Here's a quick example: Let's say that Company A buys six SKUs from four suppliers, each of which has a $100 MOV requirement. That means Company A must buy $400 worth of product in total. Yet it needs only $50 worth of each part, so it should be spending only $300 for them. But Company B buys its six SKUs from two suppliers, each with the same $100 MOV. Like Company A, Company B needs $50 worth of each per part. But in B's case the $300 total requirement translates into $150 to be spent at each supplier, easily meeting their MOV stipulations.

2. Improve the Reliability of the Supply Chain

In an ideal world, there is no need for safety stock because the buying organization is guaranteed that it will always receive the requested amount of material at the scheduled time. But this guarantee is almost impossible to make. The practical approach is to carry out a risk analysis to determine how much stock should be maintained to cover a potential interruption in supply. The less reliable the supply chain, the higher the risk and the more safety stock is required.

Let's touch on the external and internal variables that contribute to the reliability of supply. External variables—those over which the supplier has little or no direct control—include customs delays, port strikes, lost shipments, damaged shipments, and so forth. The simplest way to reduce the number of external variables is to reduce the distance of each inbound shipment. Shipping product from across the Pacific certainly carries more risk of delay shipping from state to state or province to province. Safety stock levels can be drastically reduced when the logistics channel is cut from six weeks to six hours.

Internal variables, which deserve significant scrutiny from purchasing teams, include poor delivery performance, defective product, mislabeled boxes, incomplete customs forms, and so forth. The selection of a supplier that performs unacceptably on one or more of those variables will create big swings in supply chain performance and may precipitate the need for additional safety stock.

In such cases, companies can address the reliability of supply by using a disciplined set of supplier performance improvement activities. (See also the article in this issue of *SCMR* on "Creating the Ideal Supplier Scorecard.") One of the earliest activities is formal notification to the supplier that its performance is substandard and must be improved if it is to continue to do business with you. And one of the most important follow-on activities: tracking the supplier's fixes and its subsequent performance in enough detail to be able to take action quickly and decisively if necessary. Ultimately, if the supplier's performance does not improve, the procurement department must find a suitable replacement.

3. Increase Material Ordering Flexibility

A common material planning practice is to order material through a schedule of future requirements, sometimes known as a release. The release authorizes production for deliveries to occur in the coming weeks. The longer it takes to build and deliver product, the more material needs to be released for production. If end-user demand drops suddenly, the manufacturer can be left with excess inventory.

One approach is to negotiate for lead times that have some flexibility. This is not easy: Lead times are not generally an area of significant focus for the procurement organization, and the lead time accepted by the buyer is likely to be what the supplier requested. The approach begins with development of a standard lead time matrix. The matrix is segmented by commodity and indicates an acceptable lead time for each type of component—for example, 10 weeks for plastics, or six weeks for stamped steel parts. (See Exhibit 2.) It takes suppliers' locations into consideration because delivery times will vary.

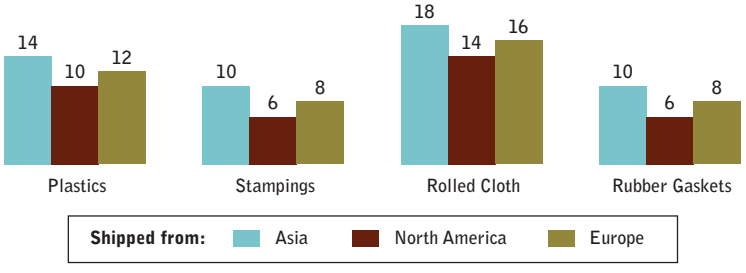
Once reasonable lead times have been decided, they should be communicated to the supply base with the intention that outlying lead times will be renegotiated. Also, future requests for quotes will specify acceptable lead

times, and those numbers will be built into negotiations.

Another means by which to address long lead components is to purchase product through a distributor. The distributor will maintain an inventory level that can handle fluctuations in customer demand, and will act as the buffer between supplier lead times and variability in the customer's ordering patterns. As demand drops, the distributor is typically more agreeable to delaying shipments or can transfer that inventory to support another customer's requirements. Conversely, the distributor can generally provide product quickly when demand ramps up.

EXHIBIT 2

Example of a Commodity Lead Time Index



Any supply contract should be designed to allow some flexibility in how and when the customer receives its material. However, the contract must also be fair to the supplier. A maximum period of shipment delay should be negotiated and included in the contract. Items to consider include the material's shelf life, payment terms, warehouse space, and specificity of product—that is, whether it can be sold to other customers, and if so, how easily.

4. Make More Use of Local Warehousing and Local Production

As discussed earlier, one of the primary benefits of using suppliers that are physically closer to your receiving point is that supply chain risk is reduced. In addition, local sourcing arrangements typically involve more frequent shipments, further lowering inventories and supporting just-in-time (JIT) manufacturing.

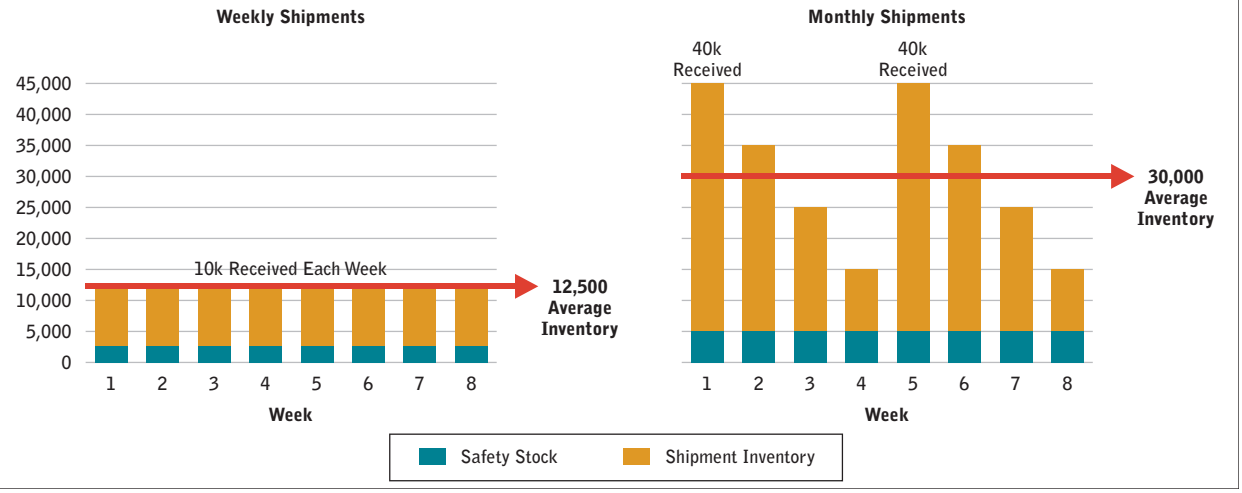
Overseas production is fraught with inventory challenges, as supply chain managers have been learning to their disadvantage in recent years. Before foreign producers actually ship, they often stockpile product at consolidation facilities until a container can be filled. In some cases, suppliers are asked to ship larger volumes in order to spread shipping costs across more units. Not only do these actions increase the quantity of product in the supply chain, they also reduce the frequency of shipments. The result: an increase in the organization's perpetual inventory.

The following example clearly shows the problem of perpetual inventory. (See Exhibit 3.) An organization receiving monthly shipments to meet weekly demand for 10,000 units will hold 17,500 more units in perpetual inventory because it is incurring additional safety stock levels and receiving higher per-shipment quantities. Its safety stock levels were increased to accommodate the fact that the monthly shipments were coming from an overseas supplier.

One proven localization practice is vendor managed inventory (VMI), also known as consignment. With

EXHIBIT 3

The Problem of Perpetual Inventory (As Seen in the Cost of Monthly Shipments)



VMI, the supplier maintains its finished goods inventory on-site, at or near the customer's facility. The customer is responsible for the material only when it is pulled from the warehouse for production. Usually, the VMI supplier is allowed to ship into the warehouse in whatever quantities it wants to ship. As a result, the supplier bears the burden of analyzing the customer's production efficiencies in the context of its own inventory-carrying costs.

VMI also has the advantage of no out-of-pocket costs for warehousing or floor space and quick access to material in case of unforeseen shortages. Delivery times are minimal; the material is right there, ready to be pulled. And of course, customer-owned inventory is eliminated. VMI agreements are initiated and negotiated within the procurement group. The typical topics of conversation will be payment terms, insurance responsibility, maximum shelf time, and increases in piece price to support the additional service provided by the supplier.

VMI can produce some striking benefits. At one company, the procurement organization allowed a 4-percent increase in purchase price in exchange for placing 15 percent of a supplier's inventory in VMI. The supplier benefited from the immediate price hike; the customer was able to immediately reduce inventory value by $500,000.

5. Manage the Accretion of Value Using Postponement Strategies

The value added to materials at each stage of production also increases the cost of holding the evolving product in inventory. As the supplier continues to produce material that the customer does not require immediately, inventory exposure increases. Eventually, the supplier will pressure the customer to buy product that has not been procured as originally planned.

Therefore, it is imperative to communicate production requirements to the supplier using a partial release in order to minimize the amount of material in the supply chain. When components are ordered under an ongoing release schedule, the customer does not always order in finished goods quantities. A partial release will authorize the supplier to procure raw material in preparation for production, but it does not necessarily authorize it to add further value to the components. This arrangement allows the supplier to procure the material required to meet production timing, and reduces the amount of the customer's exposure. (See example of exposure in partial vs. full authorization in Exhibit 4.)

A partial authorization can be managed in much the same way that overall lead times are negotiated, since a standard authorization by commodity can be developed. However, such levels of detail require the buyer to understand how much value is added to the component at each step.

When production is cut back, the cutbacks should be immediately communicated to suppliers so they too can halt additional processing of the product. A firm contract with a clear ordering schedule will prevent further processing of material when orders have diminished.

In situations where product is ordered from an internal supplier, such as another division in the same company, the postponement approach can also work well. When a drop in demand leaves a division with excess raw material and idle production lines, managers may be inclined to utilize the material to keep the equipment running. However, given that value is added to the product during each stage of its manufacture, the value of the finished goods becomes progressively greater than the original inventory cost of the raw goods. The determination should be whether the increase in assembled-product inventory cost is worth the benefit gained in making otherwise idle machinery productive.

EXHIBIT 4

Comparing Partial and Full Authorization of Raw Material

Partial Authorization

Authorization	Quantity	Value
Finished	1,000	$4,000
Finished	1,000	$4,000
Finished	1,000	$4,000
Finished	1,000	$4,000
Raw	1,000	$800
Raw	1,000	$800
Raw	1,000	$800
Raw	1,000	$800
Raw	1,000	$800
Raw	1,000	$800
Raw	1,000	$800

$20,800 in Exposure

Full Authorization

Authorization	Quantity	Value
Finished	1,000	$4,000
Finished	1,000	$4,000
Finished	1,000	$4,000
Finished	1,000	$4,000
Finished	1,000	$4,000
Finished	1,000	$4,000
Finished	1,000	$4,000
Finished	1,000	$4,000
Finished	1,000	$4,000
Finished	1,000	$4,000
Finished	1,000	$4,000

$40,000 in Exposure

6. Adjust Payment Terms

An increase in supplier payment terms can be considered a blanket approach to inventory cost reduction. While this approach does not directly reduce the amount of inventory on hand, it does delay the amount of cash tied

up in carrying inventory. Some questions to ask when discussing the subject with the supply base include: What should be offered in exchange for the extension? What effect will it have on a supplier's financial stability? Will this send the wrong signal about your company's financial stability? Will it damage supplier relationships so that the cash gain is offset by less cooperation from the supply base?

Extended supplier payment terms can also become a profit center for an organization. Imagine, for example, that Company A pays its suppliers 90 days after receipt of product, and is paid by its customers 60 days after delivery. If that product is processed quickly and shipped to the customer with minimal time spent in process or finished goods inventory, Company A will receive payment for its product before it makes payment to its suppliers. (See Exhibit 5.)

In this example, Company A holds its cash from the customer for 24 days before a portion is used to pay its supply base. The benefits of these 24 days are twofold: (1) overall cash flow is improved and (2) there is no need for an open credit account with a lender to bridge the gap between supplier payments and customer receipts. The improved profitability stems from the value of holding cash that otherwise would have not been available. The incremental profitability is generally computed as 1 percent of the cash held for a given month.

Of course, the reverse applies; even the most efficient supply chain cannot recover from unfavorable terms. A company that enjoys 60-day customer payment terms is forced to use its own cash or acquire loan capital if its suppliers must be paid within 30 days of when material is received.

During the recent recession, payment terms have certainly garnered plenty of scrutiny throughout the manufacturing sector. Prior to the downturn, one forward-thinking organization was able to re-negotiate its supplier payment terms for both production and maintenance and repair components. The company's average days paid increased from 35 to 52 days. With a yearly spend of $70 million, this 17-day improvement yielded $3.2 million in additional cash flow.

Procurement as Path to Success

Because suppliers become more rigid in the concessions they are willing to give during downturns—agreements such as the extension of payment terms or participation in a vendor managed inventory program, for example—it is imperative to address each of these expectations at the outset of the relationship. In fact, they need to be written directly into the supply agreement in order to avoid difficult negotiations after production has commenced.

At the same time, it is essential to compare apples to apples. If one supplier is part of a VMI program and another is not, the VMI supplier's prices will likely be higher. Thus, an analysis on price alone may disadvantage that supplier—and rob the customer of a valuable opportunity to reduce inventory.

However, proactive communication and strong contracts are only part of the solution because a chosen supplier can add peripheral costs that cannot be contained by a legal agreement. It has been shown that the peripheral costs associated with supplier selection can have a far greater financial impact on an organization than does the achievement of a purchased cost objective. The best practice is to use a total acquisition cost analysis. The ultimate goal of a total cost analysis is equal consideration for each variable that may add cost.

The creation of a world-class supply chain is heavily dependent upon the procurement organization's understanding of the total cost associated with each supplier and its contracts. With the full support of the purchasing group, the material supply chain can become a source of profitability as well as a competitive advantage.

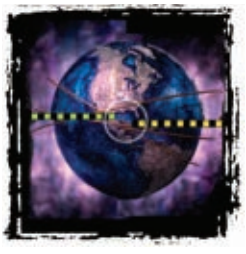
EXHIBIT 5

Positive Cash-Flow Cycle from Favorable Supplier Payment Terms

The Three Dimensions of Distribution Excellence

To achieve the potential of distribution excellence, companies need to think outside of the box.

By Joachim Ebert, Kumar Venkataraman and Michael Hu



What allows certain companies to deliver best-in-class distribution performance while others turn in only average performance or fail altogether? From our work in this area, we've observed that the leaders in distribution—those that deliver on a defined set of quality and service levels at the best possible cost—consistently think outside the box. They push their competitiveness to an efficiency frontier, achieving a 15 to 30 percent distribution cost advantage over competitors while delivering equal or better service levels. Some of these leaders go a step further and leverage successes in distribution optimization as a catalyst to improve performance across the entire value chain—from demand planning to logistics—both to improve the top-line and unlock additional savings.

We characterize the approach as "3D" outside-the-box thinking because it requires the following three dimensions: Benchmarking beyond industry boundaries, challenging preconceived views, and triggering a chain reaction in supply chain optimization.

1. Benchmarking Beyond Industry Boundaries

Solid distribution requires first establishing an accurate picture of your distribution competitiveness vis-à-vis true peers. The leaders establish a competitive gap assessment whereby they neither underestimate their distribution capabilities (devoting valuable resources without an adequate return on investment) nor overestimate their performance and thus get lulled into a false sense of complacency.

The leaders understand their true peer group and compare their distribution performance against these peers. Determining which companies are your true peers, however, can be difficult. It is not unusual to find after years of benchmarking that you've been comparing performance against the wrong peer group. For example, a firm in the motor-vehicle sector we studied historically benchmarked its after-market distribution against the automotive industry and ranked its cost-to-serve in the top 90th percentile. But was this motor-vehicle firm really performing in the 90th percentile? We didn't think so. This company, like many others, was mistakenly defining its peer group largely by its overall business profile rather than by its after-market business requirements. When benchmarked against firms in other industries with similar distribution requirements—mid-scale apparel retailers and after-market parts firms—the company discovered that its distribution performance lagged well behind others.

Rather than rely on proxies for selecting a peer group for benchmarking such as "what industry do I play in?" or "who are my direct competitors?" distribution leaders use segmentation metrics to identify the correct benchmark peer group. The segmentation variables should have sufficient detail to (1) capture the key operational dimensions that characterize the underlying distribution requirements and (2) align with the company's overall business strategy as well as customers' needs.

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2. Challenging Preconceived Views

In order to achieve breakthrough distribution performance, companies need to overcome entrenched biases. Often, organizational biases lead to sub-optimal decision making across two critical components of a distribution solution: determining the right level of technology and deciding on keeping distribution in-house vs. outsourcing (make vs. buy). The right distribution solution thus requires an objective and systematic assessment of both components: technology and a make-vs.-buy assessment. Let's discuss each:

Matching technology to requirements. Distribution technology includes a holistic suite of warehouse automation, material handling systems and warehouse management system (WMS) software that collectively enables distribution, from product receiving to shipping. Determining the appropriate level of distribution technology—or whether or not you need it at all—requires considering several trade-offs, including capital investments, productivity, and longer term flexibility.

Exhibit 1 depicts the key criteria to inform the degree of flexibility vs. the degree of complexity. Note that the optimal configuration may not require a homogeneous solution across the entire distribution network. Certain network nodes (or distribution centers) can have a less automated, less technological setup while others can have a more automated high-tech configuration.

Performing the make-vs.-buy assessment. Distribution gaps can be closed by tapping into the external market for key capabilities. Third-party logistics providers (3PLs), for example, can help reduce costs and allow companies to offer differentiated services. Finding the optimal make-vs.-buy balance and then executing an outsourcing initiative requires the following mindset:

- *Adopt a strategic view.* Before either dismissing outsourcing as too risky or embracing it as a silver bullet to achieve best-in-class competitiveness, systematically weigh the risks and the benefits. The three main questions to answer: Is product distribution a core competency? Is there a cost advantage to outsourcing? Is there a third-party provider that could handle the job?
- *Understand the 3PL market trends and capacity early.* Third-party logistics provider capacity must be understood at both the industry and individual levels. Performing a capacity assessment early on—before launching an official supplier bid process and due diligence—can save significant time and resources and better inform downstream bargaining power, which is crucial to capturing cost advantages from outsourcing.
- *Recognize technology differentiation in the 3PL market.* Although all large integrated third-party logistics providers possess broad capabilities and can arguably play across the entire technology spectrum, many tend to have a technology "sweet spot." Rather than go with the low-cost or the most high-tech provider, look for 3PLs that have solutions and technology aligned with your distribution requirements.
- *Consider strategic fit in the due-diligence process.* Some questions to ask in this regard include: Are my distribution requirements and capabilities a focus area for the 3PL? How will my business affect the provider's overall revenue base? Is my industry vertical a key sector for the 3PL? Answers to such questions will not only provide a stronger bargaining position but also ensure that the 3PL continues to be responsive and flexible after the contract is signed.

3. Triggering Chain Reaction in Supply Chain Optimization

Early successes in distribution can be a catalyst for change across the broader supply chain. Transformational change usually requires first getting past organizational impediments such as silos where key decision makers sit in different functions and there is very little collaboration among departments. Focusing on a particular activity such as distribution can create a "wedge" to break down organizational and functional silos and drive broader transformation across the entire supply chain—from demand forecasting to inventory and freight management.

EXHIBIT 1

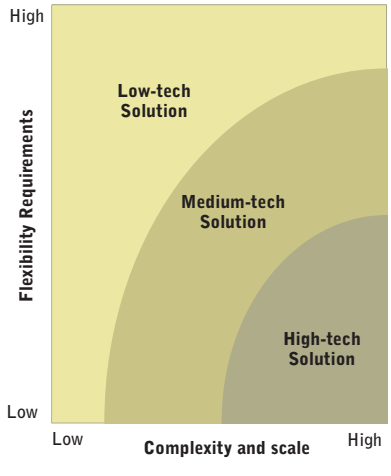
Mapping Technology to Distribution Requirements

Distribution Complexity and Scale

- Geographic coverage (regional or national customers served)
- Number of distribution channels served
- Number of orders and breakdown of labor-intensive activities (break pack and unit picking)
- Order fulfilment lead time (average time and variance from order drop to shipment)
- Daily orders predictability
- Variation in order basket
- Inbound suppliers and shipment variation

Flexibility Requirements

- Percentage of volume from stable business compared to emerging or risky business
- Role for distribution center in context of the the long-term business strategy
- Material change in channel mix (for example, growth in the online channel)



Source: A.T. Kearney analysis

SPECIAL SUPPLEMENT TO
SUPPLY CHAIN MANAGEMENT REVIEW

Why "Green" Equals Good Business

More and more companies are discovering that a greener, more sustainable supply chain is good not just for the environment but also for the business.

By Bridget McCrea

When Wal-Mart threw its hat into the "green" ring a couple of years ago, corporations around the world sat up and took notice. After all, the retailing behemoth wasn't talking about just installing energy-efficient light bulbs or cutting down on paper waste…it was taking square aim at its supply chain. That meant all trading partners up and down the chain would be assessed—and ultimately affected—by Wal-Mart's dogged determination to become a green enterprise.

That determination goes beyond mere rhetoric. Already known for its innovative supply chain strategies, Wal-Mart in partnership with the Carbon Disclosure Project, asked suppliers across seven product categories to report how much energy they use when manufacturing the products that they sell to the retailer.

More recently, Wal-Mart asked suppliers to meet stricter quality and environmental standards. It also awarded the World Resources Institute (WRI) a $420,000 grant to develop tools that companies can use to measure their supply chains' carbon footprints (defined as the total set of greenhouse gas emissions caused directly and indirectly by an individual, organization, event or product).

Many other companies are following in Wal-Mart's footsteps and developing their

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own green supply chain strategies. "Pretty much everyone is trying to figure out how to do this, namely because the marketplace is demanding it," says Dale Rogers, director of the center for logistics management and a foundation professor of supply chain management at the University of Nevada.

Rogers says that while much of the focus is on developing environmentally-friendly or "green" practices, the bigger target should be long-term sustainability. "At the end of the day, companies should be looking to their supply chains as a source of sustainability and operational continuity," says Rogers, "with green being just one part of that overall picture."

Technology vendors like LeanLogistics of Holland, Mich., are helping supply chain managers paint those pictures in the most efficient way possible. Chris Timmer, the company's senior vice president of business development and marketing, says he's seeing an increasing number of firms making "very practical decisions to reduce energy consumption," thus creating an immediate and significant impact on the overall supply chain and on bottom-line costs.

Supercenter retail chain Meijer, carrier Con-way Freight and pallet and container pooling service CHEP rank among those companies that are using LeanLogistics' technology to achieve their green supply chain goals. CHEP, for example, has reduced empty miles through collaborative strategies, while food manufacturer Dannon has adjusted routes to reduce miles and optimize backhauls.

"Right now we're working with a number of clients to identify additional opportunities for backhauls and reduction in miles," says Timmer. "It just makes great business sense, as well as environmental sense."

In this article, we'll delve more deeply into the greening of the supply chain, show why its eco-friendly practices make good business, sense and lay out the challenges and rewards associated with going green.

Green Now a Competitive Necessity

Ask Cathy Rodgers why companies would spend the money and time going green in an economy where orders are down and margins are thinner than ever, and her answer is simple and to the point: "It's a competitive necessity," says Rodgers, vice president of global opportunities for IBM and chair for the Institute for Supply Chain Management's committee on sustainability and social responsibility.

Rodgers credits the emergence of the ethical consumer and the growing interest in green initiatives, carbon footprints and sustainability with driving that competitive necessity. "To no one's surprise, all of this has had a significant impact on supply chain professionals," she explains, "and how they're driving strategic change for their companies."

Also directing the need is the perception that green is no longer "leading edge" or "pioneering," and is expected by many to be a normal part of a company's operations. "People realize that sustainability and socially responsible initiatives are good for business," says Rodgers. "Firms that want to stay on top of their games need a cohesive and comprehensive sourcing strategy that addresses environmental issues and the challenges we're facing in this realm."

David Marsh, chief marketing officer at Hub Group, Inc., a Downers Grove, Ill., provider of intermodal shipping, transportation management and supply chain solutions, says green supply chain initiatives fall under a much larger umbrella that finds people doing what they can to leave behind a healthy, clean, safe environment for their children.

Marsh says the retail, consumer products and durable goods providers the Hub Group works with are all looking at how to make that happen across the supply chain. "What we're seeing is that the retailers, from a business perspective, are requiring the durable goods providers and consumer product organizations to become more green," he says.

Achieving that goal isn't always easy. Marsh says firms that have been most successful at it are the ones that give their supply chains a thorough review, and that identify areas that could benefit from green efforts. "There are usually myriad different areas—from the transportation component to the warehouse to the plant—where improvements can be made," says Marsh. He points to heating, cooling and lighting (within a warehouse, for example) as three obvious areas for companies to consider.

Looking outside of their own walls, supply chain managers can expedite more effectively, work only with reliable suppliers, strive to reduce lead times and—like Wal-Mart is already doing—demand to see exactly what business partners are doing to be more green themselves.

Profitability a Main Requirement

Supply chain managers looking to implement the most effective green strategies need to remember that, "If the green initiatives aren't profitable, they won't be sustainable," says Rodgers, who cautions companies against using green policies and procedures for the sake of going green.

"Don't just implement or try something out that makes no sense, and that won't pay for itself in the long run," says Rodgers. "Before testing anything out, ask yourself what your supply chain partners are doing

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to go green, what new initiatives might fit under the green banner, while also reducing your costs or your customers' costs and where you can remove both energy and materials out of your operations."

To get the most accurate answers to those questions, companies must first take a step back and knock down a few roadblocks. Perceptions that green is a "transient" strategy, or one that will cost an awful lot of money, for example, tend to stand in the way for many shippers—despite their supply chain manager's good intentions. Stephen Stokes, vice president of sustainability and green technology for Boston-based AMR Research, says those issues can often be overcome by establishing a benchmark of organizational performance.

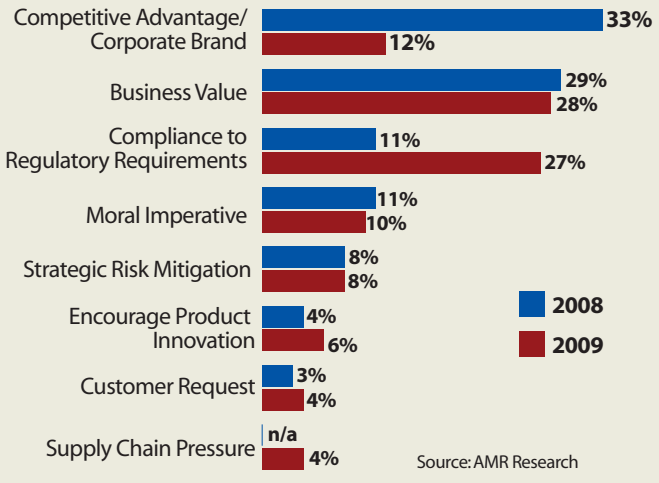
"You have to get a sense of where you are right now before you can look at where you want to go," says Stokes. "The greatest part of a sustainable transformation is deciding what that journey is." Start with a firm baseline of operational performance, he explains, and then use it to plot on a short-term, medium-term and/or long-term time scale exactly what targets you want to hit.

Stokes points to Dow Chemical's "Human Factor" program as a good example to follow when working through the early stages of a green supply chain initiative. Dow uses the program to track 15 environmental, sustainable-rated KPIs, says Stokes. Those KPIs range from energy usage to greenhouse gas emissions to the number of miles that toxic chemicals have traveled.

"By setting long-range targets in these 15 areas, and by making those targets very public throughout the organization, Dow has been able to exceed its [green supply chain] goals on a regular basis," says Stokes, who notes that the company has also shaved about $8 billion off its fuel bill over time as a result of its efforts. "Even a small amount of savings can make a big difference in a firm's bottom-line costs."

EXHIBIT 1

Top Drivers for Participation in Enterprise Sustainability: 2008 vs. 2009



Source: AMR Research

Creating a Sustainable Future

Expect more supply chain managers to don their "green" hats in the coming months as consumer demand for sustainable, eco-friendly business practices and products continues to expand. Also expect to see green standards developed in the near future, says Rodgers, as well as an upswing in the regulatory requirements surrounding sustainability.

"Consumers have access to, and a desire for, information about sustainability—information that influences their buying decisions," says Rodgers. "The sooner companies recognize this and provide that data in a relevant, transparent way, the better off they will be."

Stokes concurs, and says that companies that want to stay in business should put green supply chain initiatives at the top of their "to do" lists. "It's indisputable that we're going through a substantial economic transformation that encompasses issues like energy consumption and optimization," says Stokes, who sees compliance (with government regulations, for example), environmental regulation and increased operational efficiencies as the three areas of sustainability that companies should be looking at right now.

Eventually, Stokes says the branding and messages being created to promote companies' green supply chain efforts will go the way of the 8-track, namely because everyone will be doing it. Much like the "organic" label was once a great differentiator for a select few food producers, green will eventually become mainstreamed into every aspect of society. (For a look at the key drivers for sustainability in 2008 and 2009, see Exhibit 1, which shows the results of a study by AMR Research.)

"It's going to become harder and harder to differentiate oneself solely on sustainability efforts in a world where the entire marketplace is going green and concerned about the environment," says Stokes. "The good news is that the companies using the sustainability mantra as a basis for operational efficiency, and to reach their compliance goals, will also achieve cost savings while doing their part to help create a more sustainable future for everyone."

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