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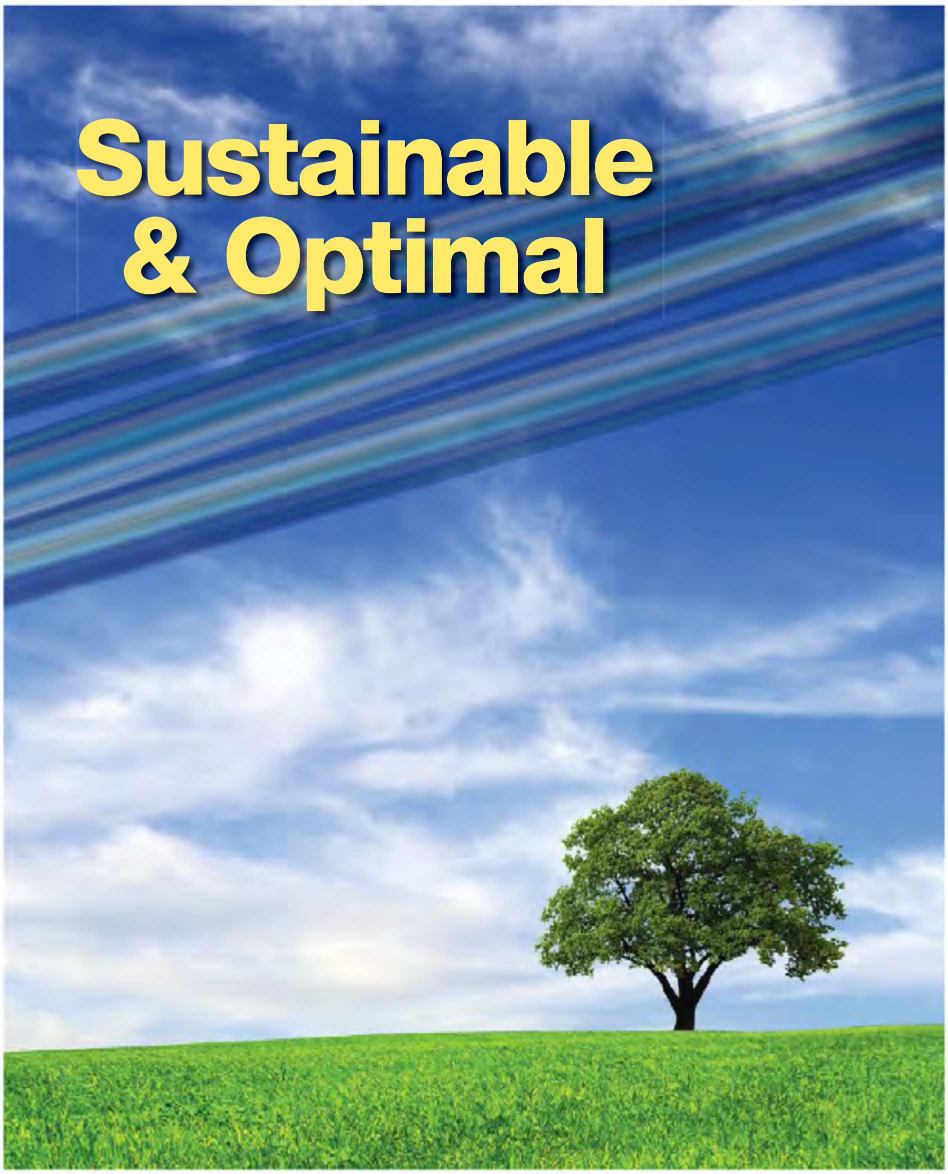

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Sustainability: Taking a pause or moving forward?

Are we all about to hit the pause button on sustainability? It's a question that's much in the news these days, and the signals can be confounding. As I write this column, the *New York Times* recently reported the EPA's plans "to repeal President Barack Obama's signature policy to curb greenhouse gas emissions from power plants." On the one hand, the administration has declared that coal is now back in vogue. On the other, the *New York Times* has also reported that even in coal country, renewable energy sources are in demand. Exhibit one: The Kentucky Coal Mining Museum is installing solar panels.

At least some businesses seem to remain committed to sustainability and corporate responsibility. Major automakers like Volvo, GM and Ford have announced plans to expand their fleets of electric vehicles, while distribution center operators like Amazon continue to install solar panels on their rooftops, even in coal country. The question is: Will commitments to sustainability and good corporate citizenship remain if regulations are rolled back?

I put that question to the four senior executives who participated in *SCMR*'s first roundtable on sustainability. The answer from all four is summed up by something Keith Kenny of McDonald's said: "McDonald's emphasis is on leadership. We try to move ahead of legislation and are led instead by the work we do with academic and NGO partners and the expectation of our customers." I hope you'll learn as much from these industry leaders as I did.

Bob Trebilcock,
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There are strands of sustainability and corporate responsibility through much of this month's issue. James T. Prokopanko, the former CEO and president of The Mosaic Company, details how corporate responsibility became his compass for leadership when he took over the reins of the company back in 2007. Similarly, Joseph Ludorf, the executive director of supply chain for Cipla Medpro, details how revamping the planning process enables the South African pharmaceutical company to profitably supply drugs to underserved populations on the continent as part of its corporate mission.

We round out the issue with five tips for intelligent risk taking in your procurement practices from frequent contributor Mark Trowbridge. You may not think of procurement as an issue of sustainability or corporate responsibility, but think of the impact on your corporate reputation when things go awry in your supply base.

What are your company's sustainability and CR plans for 2018? I hope that like our four supply chain leaders, they are to forge ahead and not move backward. As always, I look forward to hearing from you with any comments or suggestions for future stories in *SCMR*.

Bob Trebilcock

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FEATURES

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Advocate for responsible outsourcing

Dr. Lapide is a lecturer at the University of Massachusetts, Lowell and an MIT research affiliate. He has extensive experience in industry, consulting, business research and academia as well as a broad range of forecasting, planning, and supply chain experiences. He was an industry forecaster for many years, led supply chain consulting projects for clients across a variety of industries and has researched supply chain and forecasting software as an analyst. He is the recipient of the inaugural Lifetime Achievement in Business Forecasting & Planning Award from the IBF. He welcomes comments on his columns at llapide@mit.edu.

I joined the supply chain community in 1990, following my initial career in marketing. SCM has been my profession since.

My first position was in Arthur Andersen's Logistics Strategy Practice, part of the consulting group that eventually evolved and spun out from the accounting firm into Accenture's supply chain management (SCM) practice. I was fortunate to be in the right place at the right time. The rise of globalization and consumerism led to the evolution of global supply chains that strived to source, transport, make and deliver goods from any country in the world and to sell in any other. Like many of my colleagues, I felt like we were solving world hunger and raising the economic conditions of citizens around the globe.

Using practices such as just-in-time, integrated operations and cross-functional business processes, we developed highly efficient and effective supply chain operations to meet the global demand for goods and services. In the United States we helped to satisfy the demand from affluent American consumers for products from faraway places. Our European colleagues did the same for their countries' appetites for imported goods and services.

Initial doubts about outsourcing

Without question, outsourcing played an important part in the evolution to global supply chains. Thorough analysis and planning needs to be done on what to outsource, but given my history, I've been an advocate of outsourcing, when it makes business sense. I've argued with naysayer friends that companies were just outsourcing low-paying, low-skilled jobs, while at the same time growing the highly-skilled, high-paying jobs that Americans needed to maintain their opulent lifestyles.

After the worldwide financial meltdown and Great Recession, however, I started having doubts about whether companies were doing "responsible" outsourcing—were we over-outsourcing? I once dubbed the period the "Other People's Bubble."* During this bubble, the financial industry was taking big risks using other people's money, and consumers where taking on more debt, assuming future buyers would help them pay it off. I wondered whether supply chain managers were also culpable in over-outsourcing, as their companies were relying more on other people's manufacturing and service operations, or other people's efforts.

The outsourcing trend seemed to have gotten out of hand when I read an article suggesting that health care costs can be saved by outsourcing medical services. Patients would travel to other countries for procedures because their doctors get paid less, or we would just import foreign doctors and pay them less; that is we would use other people's doctors. The author's idea was especially troubling because a knowledge-based economy is needed to support an affluent society. If we outsourced jobs such as medical care, what knowledge-based jobs would be left for our children? Thankfully, we haven't outsourced product innovation and also live off other people's ideas.

The recovery from the Great Recession has been good for the affluent-elite, but not the working class who are economically no better off. This apparently led to these "forgotten Americans" coming out to elect President Trump whose campaign resonated with them. America's economy was starting to resemble what is termed a third world economy, in which the top 1% are rich, and the bottom 99% are poor—with the elite political class colluding with the rich. Thus the election led me to believe American companies had over-outsourced for a variety of factors.

Factors contributing to over-outsourcing

The lack of a sound thorough analysis and support plan is the most common factor that drives over-outsourcing. Some companies chased cheap labor costs from country to country without considering outsourcing's effect on productivity, product quality, demand-responsiveness and the safety of foreign workers. Supply chain managers had to hide the fact that they deployed an additional tier of "stateside" inventory stock to buffer against the vagaries of ocean freight coming from halfway around the world. Others flew goods that ought not to be flown because of energy inefficiency and increased CO2 emissions.

In a prior column,[**] I discussed three possible future scenarios of the world that the MIT Supply Chain 2020 Project Team had developed: Synchronicity, Spin City and Alien Nation. Our supply chain community had been banking on a future that would look like Synchronicity—"a world in which globalization and democratization are the norms, as are trustworthiness and integrity." Remember, SCM managers were acting as citizens of the world wanting to save world hunger. We thought outsourcing was a good thing, but were possibly complicit in the over-outsourcing.

The Alien Nation future is one in which people "think and act locally with a high level of mistrust and security concerns, with global trade restrained by nationalistic pride, protectionism, and limited immigration." While the rise of Trump might portend the United States headed toward that future, it is probably moving from a path to Synchronicity, onto a path to Spin City—in which "governments intervene on a selective basis, through a web of conflicting regulations designed to protect some industries, while leaving others open to free trade. Globalization exists, but it is highly regulated." So companies might still outsource, however, more carefully.

Another factor leading to over-outsourcing was the executive view that outsourcing serves shareholders. In a college class on managerial decision-making, I discuss how simple quantitative models can help identify ways to improve business performance. For example, let's take the equation for Return-on-Assets (ROA), which many believe represents what shareholders want to maximize.

The equation for it is: ROA=profits/assets. I ask: How might one increase ROA? One way is to increase the numerator, profits. This might be done by having sales and marketing increase revenues, or having operations reduce operating costs. The other way is to decrease the denominator, reducing assets such as inventories. I point out that outsourcing is very effective in increasing ROA because by outsourcing operations, a company raises the numerator and reduces the denominator—doubling down on increasing ROA. In fact, if a company could shed all of its assets, the denominator would be zero, making ROA infinity.

Thus a focus on ROA makes outsourcing attractive to executives. During globalization this outsourcing might have led to increasing a company's share price, pleasing shareholders. In addition, an executive team with stock options might get a significant boost in compensation, while employees were losing jobs. There were likely greedy teams that did not share the benefits of outsourcing by raising employee salaries. Thus, outsourcing situationally contributed to increases in income inequality.

The missing factor is justice

Several years ago, I started watching a PBS series titled, "Justice: What's the Right Thing to Do," a course given to undergrads at Harvard University by Professor Michael Sandel.

Students pondered weighty issues such as "the moral side of murder" and "affirmative action." The course is about the philosophical struggles with living in a society pursing "life, liberty, and justice for all." The professor postulated, for example, if slavery is defined as owning the rights to the fruits of one's labor, then does that mean taxpayers are partial slaves of taxing governments? Answers to these questions are not black and white. Justice evolves over time with much dialogue to develop answers for a society. We pay taxes and do public service to cover governmental services, but also cover our national debt. As a resident of the United States, I am fortunate to be getting the benefits prior citizens built up for a long time, thus I'm beholden to them.

As we make moral decisions in our life that affect our social communities, we need to prioritize those that are most important to us. My priorities, for example, are family and friends first, Boston area residents second, my countrypersons third and all global residents next.

Companies, like people, also owe national debts, as well as have similar priorities. A multinational company that has successfully built a business in a country should not favor foreign residents over domestic ones. Responsible outsourcing involves favoring domestic labor over foreign labor. In addition, companies hiding trillions of dollars in other countries ought to invest some of it domestically. Lastly, a company that avoids paying taxes by just changing the location of its headquarters to another country is acting unjustly. Why? Because a company is beholden to its home country.

I recently wrote a column[***] asking supply chain managers to be protectors of their company's brand image. They should also be active participants in all corporate initiatives regarding outsourcing. Part of this is in helping to do sound analysis and planning to support outsourcing decisions that lead to responsible outsourcing. Make sure your company's executive team recognizes that the company is obligated to pay back the national debt it owes. The company public relations department will surely thank you.

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* L. Lapide, "Bursting the Other People's Bubble," *SCMR*, September 2009.

** L. Lapide, "Flat" Future? Don't Bet on It," *SCMR*, September 2008.

*** L. Lapide, "Defend the Company Brand, Too," *SCMR*, November 2016.

A model approach to last-mile distribution

There are lessons about a data-driven approach to last-mile network design and operation from Brazil's largest online platform.

By Matthias Winkenbach

In 2012, a capacity crisis in Brazil's e-commerce distribution channels delivered a wake-up call to the country's largest online retail platform, B2W Companhia Digital. The company decided that its last-mile distribution strategy had to become more systematic and analytically grounded.

This year, B2W began implementing a re-engineered network design, based on a model developed in collaboration with the MIT Center for Transportation & Logistics (MIT CTL). For the first time, the company is using a network optimization model to assess its operational footprint and provide actionable insights on how to make the network more cost efficient and improve service quality.

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B2W's journey reflects the changing nature of the Brazilian e-commerce market, and how companies must evolve in line with dynamic online commercial environments. Along the way, the enterprise has learned some important lessons about adopting a data-driven approach to last-mile network design and operation.

Course change

B2W delivers packages to tens of millions of e-consumers in urban, suburban and rural areas of Brazil. The company began operating in 2006 and since then has developed four different online platforms. It commands around 27% of the Brazilian e-commerce market.

The market has evolved rapidly in recent years. Package volumes have increased—reflected in B2W's 30% year-on-year growth—and customers have become more demanding. Competition is fierce.

In addition, Brazil is beset by a number of factors. For example, the threat of package theft is a perennial problem in Brazilian cities. Chronic traffic congestion in sprawling urban centers such as São Paulo is another major issue that Brazilian e-commerce companies face in the last-mile segment of their supply chains.

B2W's distribution network developed organically in response to the above challenges. Changes in the availability of carrying capacity and other resources, market shifts and ad hoc fluctuations in demand in urban areas, were among the uncertainties that shaped its delivery services.

Starting with the national capacity crunch in 2012, it became apparent that the company's approach to designing and managing distribution over the last mile was no longer tenable. Logistics managers were finding it difficult to cope with the market's growing complexity using management methods that were largely manual and inflexible.

The enterprise needed to address the complex tradeoffs in urban last-mile distribution much more systematically, using detailed information on delivery service performance, customers and the infrastructure environments in which it competes.

Implementing change

Concentrating initially on its top market, São Paulo, the company worked with MIT CTL to build a last-mile distribution optimization model.

Prior to the project, B2W deployed a distribution network consisting of a sorting center, transshipment centers (OCs) and a fleet of vehicles to serve some tens of thousands of customers located across São Paulo per day.

The mathematical model developed with CTL analyzes large volumes of internal transactional data blended with external data such as road network and traffic reports. The model enables B2W to identify optimal network designs and fleet compositions, as well as the most efficient route configurations in the company's territories.

After calibrating the model, the team carried out an in-depth analysis of B2W's last-mile distribution network in São Paulo. Based on this analysis, the project team identified several key revisions that would raise performance levels and make the distribution network more cost effective.

- Close 30% of the company's transshipment centers, and optimize capacity utilization in the remaining centers.
- Reduce the number of vehicles in the delivery fleet by 15%, and revamp the fleet's composition so that it consists predominantly of minivans and compact cars.
- Redesign facility-specific service areas in addition to the route territories assigned to delivery vehicles within the city.

The operational footprint redesign was projected to reduce the cost of B2W's last-mile operations by 6%.

Implementation was scheduled in two phases. In Phase One, 30% of the OCs would be closed, the affected drivers transferred to the remaining OCs without a redesign of delivery routes, and OC staffing levels reduced by 14%. The initial phase is expected to yield annual cost savings of 3%.

Phase 2 was completed in May 2017. Delivery routes were redesigned and the number of drivers reduced by 15%. The delivery fleet was reconfigured in line with the recommendations, and the operation of OCs was revamped to better align the centers with peak season demand. The second phase is expected to deliver a further 3% in annual savings.

Lessons learned

The model represents a major shift in the way B2W plans and manages product deliveries. For the first time in its history, the company has the analytical capabilities required to fully leverage its own operational data combined with public data to improve network performance and control costs.

It's been a steep learning curve, but there are three key takeaways from the experience that can benefit any enterprise faced with a similar change management challenge.

Detail and data integrity are critical. Building, calibrating and continuing to develop a model of this sophistication requires high-resolution data. Collecting tons of operational data is not enough; the input from the field must be extremely granular. For example, B2W already collected GPS location data from delivery vehicles but these traces were collected every few minutes, which was inadequate. And the story told by the operational data was too shallow. It's not enough, for example, to indicate that a vehicle has stopped—the data must indicate why a vehicle is stationary. Did the driver come to a halt at a traffic light or stop to serve a customer? Were multiple customers served during a single stop, and if so, how long did it take the driver to visit each one? And, of course, the data must be of high-quality and free of noise. The project team developed a mobile app for collecting delivery data.

In-house technical expertise is another critical success factor. From the outset, B2W's analytics team was fully engaged with the project. Their ongoing involvement ensured that team members understood the structure of the model and its capabilities. Moreover, their expertise helped in the model's early development. B2W's in-house analytics team will continue to support the model, and help the company to develop and refine it going forward. This is extremely important. It means, for example, that B2W can scale the model in line with the company's growth and future market demands without the need to call on the original developers. Also, the company's in-house IT experts will make sure that the input data for the model continues to meet the required quality standards.

Acquire the right tools. Creating, operating and developing a sophisticated network optimization engine is not possible without the right IT tools. Companies that are not familiar with this type of technology—especially those that are accustomed to working primarily with spreadsheets—probably don't possess the commercial-grade software required to build and fully use such a high-level resource. Be prepared to invest in the right toolbox before embarking on such a development project.

Unlocking competitive gains

B2W's new last-mile distribution strategy is being implemented in other Brazilian cities including Rio de Janeiro and Salvador. There are plans to extend the model to include additional delivery options such as customer pick-up and drop-off solutions. Furthermore, to help it keep pace with rising customer expectations, B2W wants to include alternative delivery times and windows in its logistics analyses, and to study the impact of these additions on network design, logistics costs over the last mile, and pricing policies.

Importantly, the gains made so far have solidified the support of the company's leadership for using advanced analytics and operations research tools and methods to achieve further logistics improvements.

Over the next five years or so, the model-based strategy will help the enterprise to leverage its urban distribution services to maintain an edge over its competitors. Customers in the e-commerce space expect excellent service at the lowest cost, and a high-performing distribution network can become a competitive weapon in this environment.

Tech innovation creates some jobs, puts others at risk

The opening of the global economy, along with the rapid pace of technological change, have improved the living standards of billions of people. But it has also been accompanied by an upheaval in the jobs market.

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The World Trade Organization (WTO) has just produced this year's annual report addressing "Trade, Technology, and Jobs." As one might expect, tracking all three trends is no easy task, especially when seeking solutions to global supply chain challenges. "The evidence collected in the report suggests that success in facilitating adjustment involves finding an appropriate balance between labor market flexibility and employment security," says Roberto Azevêdo, the WTO's director general. "While there is a range of approaches, and different policies will be appropriate in different circumstances, the core elements tend to include steps to facilitate labor adjustment and ensure that the benefits of economic progress are spread more widely."

The upcoming wave of technological advances, in particular artificial intelligence and robotics, raises a number of issues, including their impact on the future of jobs.

Some experts argue that history will repeat itself and the next wave of technological advances will replace many existing jobs but create new ones. Other experts disagree, arguing that the new wave of technologies is without precedent (in terms of speed, scale and force) and will replace human jobs at a massive scale, leading to a "jobless future."

While several studies and reports have attempted to estimate the share of jobs that are at high risk of automation, various methodologies and underlying assumptions lead to substantially different estimated shares of jobs vulnerable to automation. Furthermore, the estimated share of jobs at risk of automation tends to be larger in developing countries than in developed countries.

The estimated probability of automation does not, in any event, equal future unemployment, WTO analysts write. This is because the development, adoption and diffusion of future technologies will hinge on a number of factors, including feasibility, affordability and the managerial culture within firms, as well as legal and regulatory frameworks and public acceptance.

While the debate remains unsettled and controversial, the upcoming technological progress is likely to continue being disruptive by having an impact on skills development, by making some skills obsolete but enhancing others and creating a need for new skills.

Autarky concerns

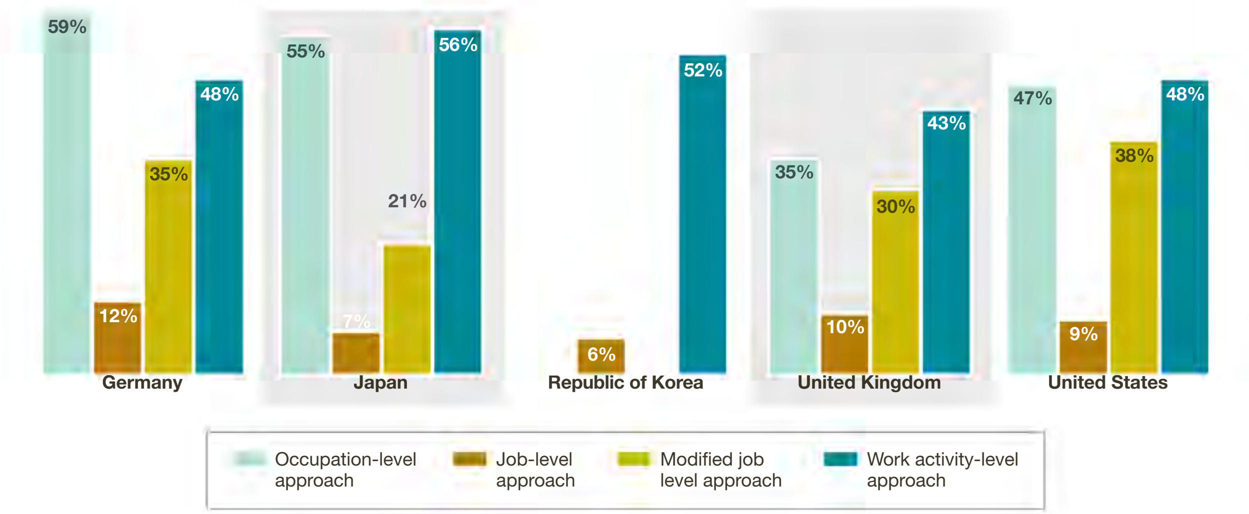
WTO analysts also maintain that like technological change, trade increases productivity and welfare.

Opening up trade increases a country's welfare in a number of ways: through static gains—for example, by allocating productive resources more efficiently through greater specialization—and through dynamic gains—by encouraging the exchange of ideas that in turn accelerates innovation. The static gains from trade alone are significant. Some estimates indicate that gains from trade can be as high as one-third of a country's GDP compared to autarky, otherwise known as "a closed economy."

FIGURE 1

Comparison of approaches to estimate the share of jobs at risk of automation

Share of jobs at high risk of automation



Source: WTO Secretariat based on occupation-level analyses (Brzeski and Burk, 2015; David, 2017; Deloitte, 2015b; Frey and Osborne, 2017); job-level analyses (Arntz et al., 2016b); modified job-level analyses (PricewaterhouseCoopers LLP, 2017); and work activity-level analyses (McKinsey Global Institute, 2017).

Trade helps to allocate resources to the most productive activity in each country; however, like technological change, it simultaneously requires workers to adjust. The costs of these adjustments may be significant at the individual level and may require a policy response, but if considered for the whole economy, they are less than the overall gains from trade.

Many factors affect the costs of adjustment to trade or technological change, including aggregate savings and investment behavior, business cycles, the initial industrial structure and the tariffs applied to particular sectors, and labor mobility.

Labor mobility is not just a matter of regulation, analysts stress. The ease with which import-competing workers adjust to rising imports also depends on how diversified their own local labor markets are.

High tech “gig” jobs

Finally, another global trend gaining traction is the “Uberization” of supply chain providers and how that is creating jobs in a new sharing economy.

Gartner analyst, Kevin O’Marah, notes recently in his SCM World newsletter that from a purely economic perspective, the easy crossover rests on an extraordinarily efficient mechanism for matching volatile, momentary demand for relatively commoditized assets and labor with supply in a high-visibility, open market.

“Preliminary 2017 data from our annual ‘Future of Supply Chain’ survey confirms a steep growth trend of acceptance in practitioner circles that sharing economy innovations are disruptive and important to supply chain strategy,” he says. “In fact, the share of supply chain professionals worldwide who view uberization favorably has increased more than fourfold since 2014.”

Because the stated purpose of the WTO is to ensure that global trade commences smoothly, freely and predictably, we look forward to how its economists will address this unprecedented phenomenon in its next annual report. Advances in apps and liberalization of labor laws deserve greater scrutiny by this august body as it creates and embodies the legal ground rules for global trade among member nations and thus offers a system for international commerce, according to the WTO.

Technological advances and trade opening have yielded enormous benefits for economies overall, but they can also adversely affect specific groups and regions—a problem that a number of countries are currently struggling to address. A key problem is the mismatch, or “friction,” between the new skills demanded by an increasingly information-driven global economy and the older skill set of many workers. People need more creative and effective help in adjusting to economic change, regardless of whether it is driven by technology or trade.

Today’s labor market problems are largely traceable to domestic policy shortcomings, but a failure to find answers could have global ramifications. By providing a forum where governments can meet, talk and negotiate, the WTO may still offer the best platform for governments to arrive at cooperative approaches to the opportunities of ongoing global economic change.

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Corporate responsibility and SUSTAINABILITY MAKE THEIR MARK

Sustainability and the broader umbrella of corporate responsibility (CR) mean many things today. In some quarters, it's a marketing message. In others, it's a cost of doing business driven by a firm's customers. In others still, they are embraced as a competitive advantage and a compass for business leadership.

MODERATED BY HARRY HANEY

To learn more about how some of today's leading companies are approaching sustainability and CR, *Supply Chain Management Review* brought together executives from four members of the Supply and Value Chain Center (SVCC) at Loyola University Chicago for a roundtable discussion. From fast food restaurants to motion control systems, they represent a diversity of industries. They were: Bill Abington, president of operations for Medline; Craig Espevik, vice president of operations for Yaskawa America, Inc.; Keith Kenny, vice president of sustainability for McDonald's; and Betsey Nohe, vice president of supply chain for Morton Salt.

The discussion was moderated by Harry Haney, associate director of the SVCC.

Loyola: Let's start with a broad question for Bill and Betsey. Over the years, sustainability and corporate responsibility have evolved and there is no one model as to where it resides. In your organizations, are sustainability and CR integrated or are they separate?

Abington: At Medline, our corporate responsibility effort is an umbrella that incorporates both sustainability and corporate responsibility.

Nohe: Morton takes a little different approach because we are heavily focused on manufacturing and logistics. Sustainability reports to our operations leader and corporate responsibility reports to our corporate communications function. But the two leaders work hand in hand.

Loyola: Craig, at Yaskawa America, are sustainability and corporate responsibility driven from the top down, from the bottom up, or from your customers?

Espevik: That's an interesting question. Part of it is being driven externally. We have some very big customers in the semi-conductor arena that are members of the non-profit Electronics Industry Citizenship Coalition. The coalition is not just about environmental sustainability, but also community engagement, regulatory compliance and other concerns. As a supplier to two or three of the key members of that group, we needed to develop what we call our responsible business platform, which our executive leadership team supports. Parallel to that you had the Dodd Frank Act, which included compliance with conflict minerals. That involved a significant amount of research down to the component level for every item we manufacture. Those two things—our customers that are involved in the EICC and conflict minerals compliance—were the initial drivers of our responsible business platform.

Loyola: Keith, where does sustainability fit at McDonald's?

Kenny: We look at what sustainability means across our entire business, so not just in our supply chain but also how we treat our restaurant employees; giving back to the communities where we do business; and how we work with our many thousands of franchisees across the globe. Right now, we're spending a lot of time on our sustainable procurement programs. We have a corporate team that works on strategy with dedicated sustainability people who work closely with our global supply chain colleagues. And we all report to Francesca DeBiase, who is our chief supply chain and sustainability officer. Francesca has sustainability and supply chain reporting to her.

Loyola: Can you tell us about one of those procurement programs?

Kenny: One of the things that's different about McDonald's is that we don't have thousands of different products on our shelves. We sell a relatively small number of menu items for which we buy significant amounts of a few key raw materials, such as a large amount of raw materials, including beef, chicken, fish and potatoes. Similarly, our philosophy of how we work with our suppliers is different. We call it the three-legged stool, and that's McDonald's, our franchisees and our suppliers. To be successful, all three have to do well. We don't squeeze our suppliers and we don't change suppliers very often. Many have been with us since we started and many have grown with us globally. That's a huge benefit when we talk about sustainability. Many initiatives we undertake require an up-front investment, but our suppliers know we'll be with them for five or ten years to make that investment count. That's critical because many of these initiatives take years. The types of initiatives we take on are different based on where our supply is located. Beef is a great example. There are many different ways of raising beef animals, so the impacts and opportunities are different according to where in the world you're located. In South America, for instance, preserving forests is a key priority so we are working with our supply base there to help to do that. In Ireland, that is not so much of an issue but pasture management is. We're also working on many other initiatives, ranging from cage free eggs to sustainable fish.

Loyola: Bill, I know that Medline just released its first ever corporate responsibility report with some really impressive achievements. How did that come about?

Abington: This was a first, but Medline has had a focus on corporate responsibility for years. We just never formally publicized our efforts. We created a new position to provide a higher level of resources and expertise. After reviewing what we're doing, that individual realized there are a lot of great things happening that we weren't sharing and there were other projects that we could do in the future. So, this first report was a way for us to share what we're doing, set a base line for the projects that are currently underway and then keep it moving into the future. I will tell you that most of our larger customers are specifically asking us what are our plans in this area and that's also been a driver behind our initiatives.

Loyola: Tell us about one of those initiatives.

Abington: Project C.U.R.E is the largest provider of donated medical supplies and equipment to developing countries around the world. These are items that were going into landfills, but can now be used to save lives and improve the quality of health care in those countries. A few years ago, a group of us from Medline, along with the former CEO of a large Chicago hospital group, went to Denver to meet the founders of Project C.U.R.E., and then to visit with some of their team who had been on the ground in these developing countries. After a detailed meeting and reviewing their mission, processes and the huge need they were serving, we realized they were a natural partner for us and so we kicked off a Chicago pilot. We developed a process in which the hospital sets aside product that is either surplus or may be expired but still good. We pick up the bags and cases of medical supplies when we make a delivery, consolidate them at our warehouses and then deliver them to Project C.U.R.E. The organization has thousands of volunteers around the country who come into their warehouses and help sort these products and then prepare outbound orders and load containers to be shipped. Some of our team members are among those volunteers and we have a supply chain excellence team that is working with Project C.U.R.E. to more efficiently lay out their processes. We are also introducing some of our key vendors to Project C.U.R.E. to help provide transportation and other warehouses-related products and services. We started this in 2015, and while we're still just scratching the surface, we've saved over 70 tons of medical products from the landfill through this partnership with Project C.U.R.E and participating hospital groups. We are excited to expand this effort to other cities.

Nohe: I'd like to build on that. Like Medline, Morton Salt has products that aren't being fully utilized. A non-profit in Haiti reached out to us because they have a real need for salt. We were able to provide them with iodized salt with labeling in French. That was very exciting and it led to establishing a relationship with this organization where we continue to provide them saline related products. We have also partnered with Feeding America. We donate products near the end of their shelf life that are then provided to local food banks, and we donate ice melt to keep the food banks safe in winter weather.

Loyola: Attracting and retaining people is our industry's biggest challenge, particularly with Millennials. What impact, if any, are your sustainability initiatives having on attracting and retaining people?

Abington: I'll say that we aren't specifically measuring that as an area of retention. But we're judging our results on the engagement of those who volunteer and send in ideas. When we set out on our first mission-related trip to Central America, the number of team members who volunteered to help in a third world environment was tremendous. The hard part was in deciding how we select who gets to go and we are excited about plans for our next trip.

Nohe: As Bill said, it is a difficult thing for Morton Salt to measure. However, we know that one of the best things that can happen is when a current employee recommends their family or friends to work for us and that happens often.

Espevik: The people that have responsibility for gathering data and doing some of the detail work, which at times can be difficult and even monotonous, feel that this is of significant value beyond their job. And sustainability is basic to the products we put into marketplace; for instance, we manufacture converters that convert the DC from solar farms to put power in the grid; we have products in wind energy and energy efficiency; our robots are used in medical rehabilitation. As a result, our employees and customers expect us to be a good corporate citizen. If we aren't, people would see a chasm.

Kenny: This is a huge issue, especially if you think about the fact that McDonald's along with our franchisees employs about 1.8 million people annually, many of whom are young. Our HR team estimates that we have to engage with approximately 5 times that number to fill all of the positions. So, our corporate image can make a real difference. I will say that we recently had five vacancies on our global sustainability team, and we were inundated with applicants. When I asked why they were interested in McDonald's, nearly all of them said it was because we have the scale to make a difference.

Loyola: There's been a lot of talk in Washington about rolling back environmental regulations. But consumers want to do business with companies that are viewed as environmentally sound. Would those roll backs, if they happen, change the way you do business?

Abington: Speaking for Medline, when we started talking to vendors about these initiatives, we didn't call it sustainability. We asked: "What is the right thing to do?" Many of the projects that we're working on, like keeping products out of the landfill, we know are the right things to do. And, we want to keep partnering with vendors who are doing creative things. An example is an initiative our steamship line partners are engaged in with the California Air Resources board, working on reducing the carbon output of ships as they're being unloaded at the ports. In the past, they ran their engines to keep generator power going while they we're being unloaded. A simple solution to this was to plug into electric power, or shore power, to keep from spewing diesel fumes all over our harbors, especially when you're next to some of the largest population centers in the country. By equipping their vessels with shore power connectors, the shipping lines are helping reduce carbon emissions. I think with pressure coming from cities and port management, the shipping lines realized that they needed to put resources in that direction and with our very large volume of imports, we are telling our valued shipping line strategic partners that we are supporting this initiative as well.

Nohe: Our position is that operating in a sustainable way is not something that needs to be regulated by the government. It is much in line with our company value to do the right thing. We believe that customers and stakeholders will recognize that and reward us by being customers for life. One of the things I found particularly exciting is that one of our facilities replaced an old coal fired boiler with a natural gas boiler and the results have been amazing. Not only do we have lower emissions, but we also have significantly lower costs. The boiler takes up so much less space that we can utilize that space to add capacity to grow our business.

Espevik: Yaskawa America will keep our platform going because we feel it's the right thing to do. And in order to compete globally, we need to do it. I do worry that rollbacks in regulation will impact compliance by some companies. For instance, it might be harder to go to your suppliers for data, because they don't face a penalty for not tracking it. They may still collect data for you as a customer, but there could be a different cost structure to it. Whether that will happen or not, I don't know. There may be momentum within organizations to keep it going.

Kenny: Environmental and sustainability legislation generally brings in the laggards. McDonald's emphasis is on leadership. We try to move ahead of legislation and are led instead by the work we do with academic and NGO partners and the expectation of our customers. In the United States, for instance, we voluntarily moved to cage free eggs because of our customer expectations. I'm sure that at some stage legislation will follow but it will take some time.

Loyola: As corporate responsibility programs become more common in large organizations, sometimes companies provide a significant share of employment in the community. If, for whatever reason, an organization has to pull out of a community, the effects can be far reaching. Can you share how companies ought to approach those situations to mitigate the impact?

Nohe: So, I can say that when that happens, we believe we should be open, honest and transparent and provide as much lead time as possible. As a result of this, we often get our employees to stay with us all the way through the shutdown and help us make a successful transition to a new way of working. Right now, we're working on a project to change our transportation model to a managed services model. We have a number of field logistics reps whose positions will essentially go away. Some of them have found jobs in the plants and we're keeping future jobs open for them. Some will choose to leave the company. But we gave them two years of notice for this and they have been appreciative.

Abington: I admire the way you're handling that, Betsey. We take the same approach. Whether or not we meet the legal size requirements under the WARN Act, we always notify our team of any changes well in advance of those changes happening. Depending on circumstances, we have a number of ways we help employees and maintain our team. We offer retention bonuses and we pay for relocations for salaried and hourly team members. If an hourly team member is driving further for a new position, we'll put in a monthly bonus for a year or so to pay for the additional gas and may offer other incentives in addition to those I previously mentioned. We also actively encourage our team members to bid on jobs all over the country. One of the things I'm proud of is that hourly team members fill more than 50% of the salaried jobs within our operations group annually

Kenny: McDonald's is a little different in that we don't have large manufacturing plants and our restaurants have a relatively small number of employees. The impact we do have is that we are a big employer of young people, and for many, we're their first job. We have quite a large turnover of people and have many part-time employees. This is one of the advantages of a job at McDonald's, flexibility in hours, for example, for people who are working their way through school or perhaps are single parents and need that flexibility. We also train our employees in different areas of the restaurant and teach them about work. They learn basic skills so they can go on either to have a career at McDonald's or else are better positioned to go on and get that next job. That is why we believe our impact on the community is much broader than just the number of people who work at a McDonald's, and we're proud of the fact that we employee some 1.8 million people globally.

Loyola: Thank you for addressing that. I know it's not an easy question. If I could go back for just a second to the discussion about port idling and so forth; I know that both Medline and Morton Salt are partners in the EPA SmartWay program.

Nohe: Yes, we are a SmartWay partner and we prefer to use SmartWay carriers. We also undertook a warehouse network optimization program several years ago. As a result, we drove about 300,000 less miles in 2016. We're now in the process of redesigning our distribution network: We're looking at the optimal places for us to locate our distribution centers; at what size warehouses we need; and we're building that new network with state of the art third-party logistics providers. We're about a third of the way done and we hope to be finished in 2018.

Abington: We do similar things. For instance, we have a very aggressive load consolidation program. If someone is inbounding product to us, say on a daily basis, in a less-than-truckload quantity, we'll allow that to be consolidated and get a delivery every second or third day to get truckload volumes. Additionally, we've invested in a new transportation management system and a new dynamic route planning system for our fleet of 650 semis around the country. That system actively plans every load as orders come in to maximize the cube on our vehicles and minimize the miles driven. As well as making sure that we're selecting the most optimal delivery, whether that's on our own fleet or parcel. We've seen a substantial increase in cube and a reduction in miles driven on our own fleet as we implemented that. Additionally, when products are not moving on our own fleet, we maximize the use of SmartWay carrier partners to help ensure our goods are delivered using low carbon tractors.

Loyola: Many people reading this are not going to be as far along in their programs as you four. What advice do you have for them?

Kenny: I would probably say, work in partnership with other like-minded organizations. It's impossible to do things by yourself. For instance, we try not to view sustainable sourcing as a competitive advantage. We're very open with the work we do and are happy to share that with others. Beef is a classic example. We don't purchase the whole of the animal. We purchase portions that are minced to form hamburgers. The other cuts of the animal needs go to other customers, so sharing sustainability standards and working together to help achieve them makes complete business sense.

Espevik: Think of where you can make an impact. For instance, we can make an impact with our supply base, so we qualify every supplier of significance. And, we audit any qualified or key supplier. In the old days, we looked at whether a supplier was financially sound and could make our part. Now, in addition, we look at what are they doing around sustainability, how safe are their operations, how do they treat their employees and engage with the community and are they making continuous improvements. Another thing we're doing is training our people to think about the quote to cash cycle. For instance, there's a lot of activity on the front end about keeping conflict minerals out of our products, but are we thinking enough about disposal and what happens on the back end. There are a lot of questions to be asked.

Abington: I would tell a company first to try and not overthink to the point of taking no action. They may already be doing things that they don't even realize. And I would start with projects where they can not only improve their footprint but also have a cost-saving impact. If you do that, you'll find a win-win, and even those individuals who may not have been excited by the initial idea of sustainability will see how you're getting a better product or service for a lower cost and at the same time you are helping future generations and maybe others in lesser developed countries. Then, you'll find the program will naturally expand as everyone sees it is the right thing to do

Nohe: My recommendation would be to make sure that you're building CR into your culture. Look to your employees for inspiration. They'll share with you what's important. And, as Bill said, think about the long run. One of the things that we're working on is education. We're really excited about a training center that we opened in our facility in Weeks Island, Louisiana where we can develop and grow the people who will run our operations in the future. That's patience and that's planning for the long-term because we want our sites to remain operational for the long run.

SCMR would like to thank all panel participants.

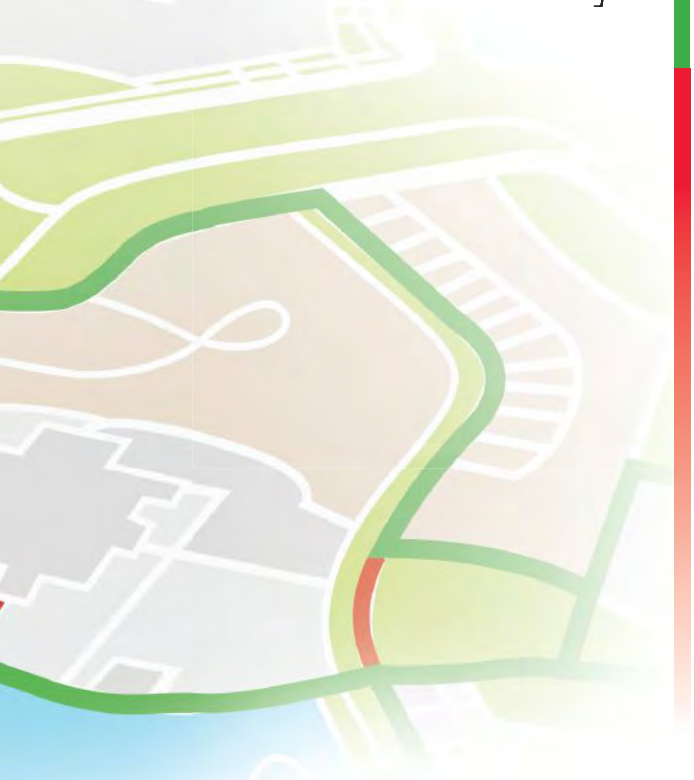
Dynamic Network Management:

The "WHAT'S NEXT" in NETWORK OPTIMIZATION

Successful supply chains use technology, data, processes and communication to create a truly dynamic supply chain solution that is optimized on an ongoing basis.

BY PAN CHEN AND NIKHIL THAKER

"Change is the only constant in life" [and in supply chain networks].



More often than not, tasks that should be simple in theory are, in fact, challenging. A routine commute from home to work can quickly become difficult and circuitous if unexpected lane closures and detours are presented. Inclement weather and uprooted trees in the road may cause more reroutes on the drive home.

While a supply chain manager's goal is quite simple in theory (get the right products to the right location, at the right time, for the best price possible), often times achieving this goal can, in fact, be difficult. Despite the best laid plans, changing variables can affect supply chain efficiencies and present challenges to supply chain managers just as construction, traffic and detours can disrupt a commuter's usual driving route and force him to find an alternative path in real time so as to minimize the risk of arriving late to work, missing a meeting or finding himself stuck in gridlock traffic.

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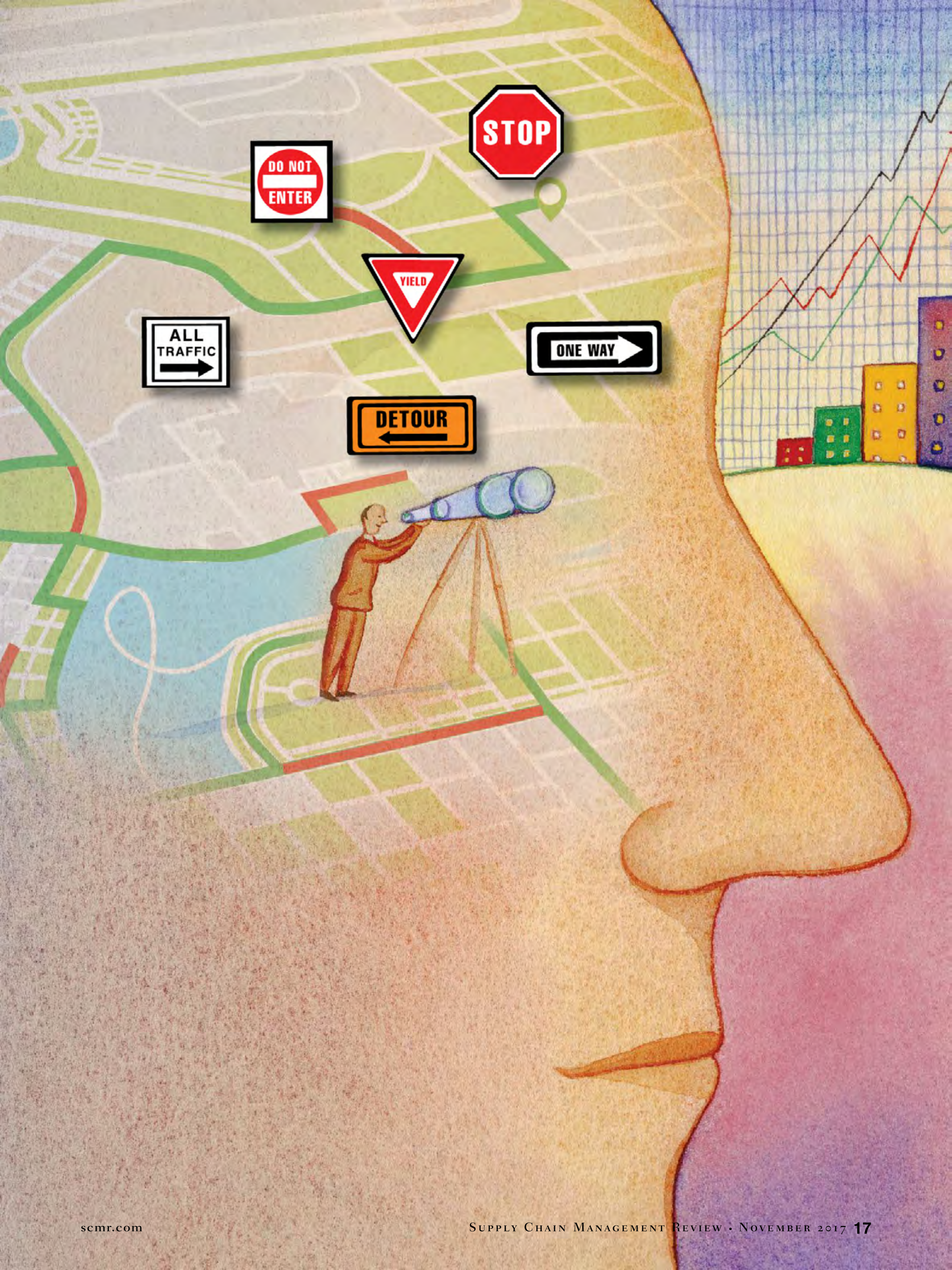
STOP
DO NOT ENTER
YIELD
ALL TRAFFIC
ONE WAY
DETOUR

Unfortunately, many organizations are not as well prepared to respond in real time when confronted with changes to their supply chain networks—and change is the only constant in life and supply chain networks. They struggle to adjust their networks to mitigate the effects of changing variables. While the commuter in the above example can simply select another route to work or home, stopping, starting and rerouting entire supply chain networks is not as easy or without cost, especially when the changes to be made are significant, such as identifying a new supplier in the middle of a promotion. Organizations also may lack the discipline or technology to routinely monitor for minor incidents and changes along the network that could signal an impending major event.

Organizations successful at using the supply chain as a competitive advantage use technology, data, processes and communication to create a truly dynamic supply chain solution that is optimized on an ongoing basis.

This is not to suggest that many organizations are not already implementing strategies and setting up processes to ensure their supply chain networks are optimized to achieve their defined business objectives. On the contrary, many are. They are taking the time to design networks where suppliers, manufacturing facilities, warehouses and distribution centers are optimally arranged. The process is often complex, requires organizations to make many assumptions and changes are most likely capital intensive. Because of this, organizations typically undertake these network design studies and optimization exercises only once every three to five years.

The challenge with this "fix it and forget it" approach to network design is that networks are not static and companies are vulnerable to risk when variables affecting the supply chain network fluctuate drastically—and inevitably they do. In a global market characterized by instantaneous changes, it is critical to design a supply network flexible enough to respond to changes in supply availability and demand fluctuation. When organizations conduct a network study every few years and map where assets along the chain will be located, they are operating on assumptions about transportation costs, demand patterns, material costs, etc. As market conditions change over time and reality diverges from the assumptions that formed the framework for the initial network design, inefficiencies, waste, cost and brand degradation can result. Organizations soon find that conditions have changed and what was once an optimally designed network is now suboptimal.

Compare these organizations to businesses that respond quickly and nimbly to variables affecting the supply chain. Why are some organizations more adept at managing their supply chain networks and resilient to shifts in supply and demand?

Organizations successful at using the supply chain as a competitive advantage use technology, data, processes and communication to create a truly dynamic supply chain solution that is optimized on an ongoing basis. This dynamic approach to network optimization enables organizations to maximize the utilization of their supply chain assets and reduce costs without opening or closing additional fixed locations.

Consistent variability

Consumer demand is typically the most rapidly changing variable within supply chains, and predicting, analyzing and responding to it is extremely complex. Demand changes are faster and more frequent than ever because consumers expect instantaneous response and reaction. Most companies can create generalized forecasts of what their businesses will look like over the next 12 to 24 months based on trends, but it is tough to anticipate what will drive these trends and how they may change throughout the year. Having the ability to adopt new plans and make changes, from shifting logistics within an existing supply chain to moving different products to different locations to keep up with changes in demand in real time is important.

Consider consumers' growing interest in acai bowls and poke as evidenced by the number of images of and comments about these foods on social media. As these foods grow in popularity and are promoted by influencers (think friends, celebrities, chefs, medical professionals), they are likely to affect the supply chain. As demand for these foods increase, availability and price likely will be affected. And, while the costs on a per-product basis may not be significant, the impact on profitability could be substantial when multiplied thousands or even millions of times for each production unit.

In addition to changing consumer demand, which is affected by outside influences such as seasons and holidays as well as social media, flash trends and sales, there are countless other variables that should be evaluated on an ongoing basis to ensure an optimized network. These include oil and gas costs, changes in supplier base (acquisitions, plant closures, market exits, etc.), carrier capacity and availability, and processing capabilities of assets such as distribution centers. And, there are some variables such as geopolitical issues, weather related transportation disruptions and natural disasters that are uncontrollable, meaning a system must be able to adapt regardless of consumer demands and trends.

Monitoring supply chain networks on a regular basis means being vigilant to variables at a granular level and perceiving the nuances that signal more ostensible change is about to occur. Dynamic network management requires that organizations detect and react to granular changes in a timely fashion before they noticeably affect the network.

Steps to achieve dynamic network optimization

Optimizing networks requires companies to take different approaches to manage the characteristics of their commodities or goods. Implementing a dynamic network approach means having processes in place for monitoring supply and demand information on a monthly, weekly or even daily basis, having the technology to provide data in real time and having consistent processes of communication between marketers, planners, supply chain managers and partners throughout the supply chain.

Although there is no single approach to executing network optimization, there are general steps that should apply to most organizations across various industries. Each step is dependent on the efficiencies of data collection, strategic processes, and clear and consistent communication across all channels.

STEP 1: Incorporate flexibility

Organizations should adopt a flexible mindset from the start, anticipating and planning for variability in the initial network design process and ongoing. As the late Spencer Johnson wrote in the allegory “Who Moved My Cheese?” change happens and the best course of action is to accept the inevitability of change, anticipate, monitor and adapt to change; then, change and enjoy it. Perhaps it is foolish to expect organizations to enjoy changes that affect their supply chain networks, especially when change has the potential to negatively affect profitability and brand. But, accepting the inevitability of change is necessary and should influence an organization’s approach to network design and management.

Organizations successful at using the supply chain as a competitive advantage use technology, data, processes and communication to create a truly dynamic supply chain solution that is optimized on an ongoing basis.

Whenever possible, companies should strive to incorporate as much flexibility as possible when constructing the design of supply networks. This can take the form of utilizing multiple suppliers rather than just one and drafting supplier and distributor contracts with ranges rather than precise targets of product volume, market shares or service levels. Or, this can simply depend on setting clear expectations that the company requires flexibility from its supply chain partners, in the form of openness to changes brought about by shifts in underlying business or broad market conditions.

STEP 2: Define scope

Organizations should define the scope of their supply chain capabilities and determine the metrics they will monitor. These may come in the form of volume metrics (rate of change in the regional demand for a product), supplier share metrics (contract compliance), freight cost metrics or other metrics that can point to underlying changes in network parameters.

STEP 3: Identify relevant data sources

Sequencing out the supply chain network, companies should determine where their information sources lie and collect the relevant data necessary to monitor the network as well as analyze and implement changes. Key areas to define relevant data may include: Product volumes, item hierarchies and category definitions, suppliers, business awards and parameters, product costs, current network structures, current freight rates and current product flow paths.

Organizations should regularly review the monitoring dashboard reports with key supply chain partners to develop and maintain a consistent flow of information. This will assist in prioritizing where to optimize.

STEP 4: Develop a network monitoring platform

Organizations should collect relevant data from the information sources identified throughout the supply chain. Working from a single source of truth is crucial to the overall health of the network and to ensuring visibility and promoting collaboration across the chain. When everyone has the same information, it is easier to see where issues are likely to arise and to make decisions that mitigate the impact on the chain. Companies can summarize the metrics in consistent and concise dashboard reports. Once the dashboards or reports have been produced, it is important that a company develop automated processes to generate them on a consistent basis. This constant flow of new information ensures the process remains dynamic.

STEP 5: Prioritize and optimize

Organizations should regularly review the monitoring dashboard reports with key supply chain partners to develop and maintain a consistent flow of information. This will assist in prioritizing where to optimize. Next, define the scope and identify constraints of the optimization based on monitoring results. Align with supply chain partners on lead times for implementation and the prioritization of optimization within broader project commitments. Finally, companies should execute the optimization process, validate the results and review the associated proposed changes with the key stakeholders. Organizations should repeat this as necessary for additional product categories or areas according to monitoring results.

Consider a major foodservice provider that was experiencing regional shifts in consumer preferences and demand for its products. These shifts in demand caused the percentage of category volume serviced by each of the foodservice provider's suppliers to shift, skewing costs and capacity. Dashboard reports gave category managers total visibility into how much product was coming from each supplier and enabled them to quantify the degree to which the suppliers had drifted from their contract market shares. HAVI, the organization we work for, constructed supply chain optimization models to determine the most preferable network changes to rectify these imbalances. By rebalancing supplier market share such that nearby distribution centers likely would have enough demand to meet the supplier's designated national market share, and thereby reducing related product and distribution costs, we helped the foodservice provider save 2% of overall category spend without additional capital investment from supply chain partners.

STEP 6: Implement changes

During this step, organizations should review and implement changes based on the relevant data they have collected and analyzed. Once data is collected, it is then important to put changes into practice by pulling specific levers to optimize the company's supply chain. Examples of information processes and changes necessary to optimize a network range from different modes of transportation to modified purchase agreements and different types of suppliers. In the example of the foodservice provider above, we leveraged the geographic locations of the supplier plants to assign "regions" of the product's network in a manner conducive to each supplier's national market share targets. A supplier with a plant in Nevada, for instance, received assignments for West Coast distribution centers with enough demand to meet the suppliers designated national market share target.

STEP 7: Identify flexible partners

Organizations should identify partners that have the flexibility to meet their changing needs. With so many variables, it is critical to have supply chain partners that can work with the company to respond to variations such as changing oil prices, fluctuating consumer demand, labor strikes at ports, or even help to source and ship goods that the company might not traditionally manage. Remember, an optimized network is not simply about getting the products to consumers, it is also about getting the materials to the manufacturing and/or assembly points.

It is essential to complement new processes and technologies with clear organizational goals and open communication with marketing, supply chain, suppliers, distribution and consumer facing groups. Transparency with partners and shared access to information is important for capitalizing on real-time optimization opportunities identified through real-time data analysis. Aligning with financing and leadership or sponsorship support ensures the success of the new process.

Strategic advantage instead of a cost center

Supply chains can and should be a strategic advantage rather than just a cost center. Dedicating time and resources to properly understand the critical drivers of cost and value represents a necessary first step down this path. As the market continues to evolve and become more dynamic, it is important for companies to evolve the management of their supply chain assets from a static and traditional approach to a dynamic system in order to achieve defined objectives from a cost and efficiency standpoint.

Companies must be able to respond quickly and nimbly to variables and this is achieved through proactive, regular monitoring and collaboration and by adapting plans in response to dynamic market conditions.

Dynamic network management, where companies are making decisions that allow them to adjust and adapt proactively on a regular basis through optimization, is essential. Supply chains work best and most cost efficiently when they utilize consistent processes and minimize variations in supply and demand. The goal is to achieve those efficiencies. But also, to be able to adapt when the environment that businesses operate within changes. A critical ingredient to adding value is the frequent interaction and collaboration with business teams.

Infrequent network design studies and intermittent monitoring of demand shifts are never going to yield optimal supply chain efficiency. That is because variables are capable of fluctuating drastically and frequently and they demand equally as quick evaluation and response. Companies must be able to respond quickly and nimbly to variables and this is achieved through proactive, regular monitoring and collaboration and by adapting plans in response to dynamic market conditions.

Network optimization is complex, but for organizations that commit to the time and discipline that it demands, their supply chains become a competitive advantage. Constant small revisions and tweaks made to the system can have a significant impact on the overall network and enable companies to drive top-line business growth and profit margins.

SUSTAINABILITY *as a* COMPASS *for* LEADERSHIP

Sustainability is often seen as a cost of doing business. At The Mosaic Company, a former CEO relied on sustainability to turn a struggling organization into a leader.

BY JAMES T. PROKOPANKO AND KINGSHUK K. SINHA

Leading an organization today requires navigating the pushes and pulls of multiple stakeholders: generating shareholder returns, delivering value to customers, recruiting and engaging a talented work force and being socially and environmentally responsible to name just a few top-of-mind demands. The leaders of The Mosaic Company—the world's largest combined producer of potash and phosphate fertilizer—faced many serious challenges when it was founded in 2004. By the time James Prokopanko, one of the authors of this article, assumed the reins as chief executive officer and president in 2007, it was burdened with excessive debt; the prices of the products it produced and sold were at break-even or close to cost of production; its customers—the world's farmers—were struggling financially; the company's cash flow was the cause of sleepless nights for the CFO; safety performance was not what its employees deserved; and the company's operational performance was nothing to boast about. That the company was beset with a barge load of problems was an understatement. In this environment, sustainability was nowhere near the top of the company's "worry list."

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Since those early years, Mosaic has found its footing and has emerged as a growing, financially-sound enterprise with engaged employees making a remarkable positive difference to many lives around the world—an organization that is strong, resilient and enduring—a truly sustainable enterprise. What makes Mosaic's journey remarkable and unique is that it is substantively grounded in:

- the learnings around the notion of "sustainability" and the importance of developing a clear understanding of this important word; and
- the idea that a clearly defined, broad and inclusive understanding of "sustainability" can serve as a valuable compass to help leaders navigate the increasing challenges and vagaries of an ever more inter-dependent global economy.

In fact, Mosaic's definition of the word "sustainability" evolved over the past decade to mean: "achieving lasting success from making smart choices about the stewardship of the environment, how we engage our people, how we manage resources, and how we bring value to the communities we serve." Defining the concept was easy. Aligning the organization to adopt and achieve at times contradictory goals was much more challenging. Yet, as a result of Mosaic's continued commitments to accountability and responsibility, sustainability today is at the heart of all that the company does.

Defining the concept was easy. Aligning the organization to adopt and achieve at times contradictory goals was much more challenging.

The Mosaic Company

The Mosaic Company was formed in 2004 by the combination of two separate companies: IMC Global, a miner and producer of potash and phosphate fertilizers, and Cargill, Inc.'s fertilizer business unit, which produced phosphate and nitrogen fertilizers. The new company operates underground and solution potash production mines; compaction and granulation operations in the United States and Canada; and surface mining of phosphate fertilizers in the United Sates, Peru, and now in the Kingdom of Saudi Arabia. The finished fertilizer products are sold for agricultural applications in bulk to more than 40 countries.

Fertilizer production is a water- and energy-intensive process that requires the mining of ore followed by an extensive chemical process in the case of phosphate fertilizer and a separation and compaction process for potash. Once the finished product is produced, the fertilizer is shipped in bulk by ocean vessels, river barges, railway and trucks to distribution points around the world. Lastly, it is sold to individual farmers, who then apply the product to well in excess of 100 million acres of cropland.

The mining and production of fertilizer products have a real impact on the environment. During the mining process and until the mined lands are rigorously reclaimed following the mining, the landscape is disturbed; waste is created, treated and contained on the company's properties; large volumes of water and energy are consumed; extensive logistics systems are required, including extensive marine, barge and rail loading facilities; and employees work in challenging environments requiring a high level of safety awareness and rigorous employee and environmental safety protocols.

The distribution of fertilizer includes an extensive and complex supply chain that includes shipping via a combination of 100 car rail trains and 60,000-tonne ocean going vessels to 40 countries and numerous ports around the world for distribution by importers and wholesalers to local dealers, and finally to individual farmers who may purchase as little as 5 and 10 kilogram packages or as much as 500 tons to be applied to farm fields. The supply chain is long, complex and involves a wide range of commercial parties. (See Figure 1.)

Mining potash and phosphate has an impact on our environment and communities that, if not thoughtfully planned, done well and with care, can create lasting damage resulting in considerable costs to remediate. The risks faced from poor and substandard operations are non-trivial.

Yet, the necessity of cost-effective manufactured fertilizer production is essential to feed the world. The Food and Agriculture Organization of the United Nations estimates that about 50% of all food in the world is produced as a result of the use of manufactured fertilizers. Supplying the world with the food it needs for a growing population and meeting the need for improved diets driven by growing economies in the developing world simply cannot be achieved without the world's farmers having access to the modern agronomic technologies that include manufactured fertilizers as a foundation stone.


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MINE-TO-MARKET VALUE

Mining, producing and delivering millions of tons of fertilizer each year to customers around the globe is complex. It requires teams of dedicated professionals working to make responsible decisions each day and at every step in the production and supply chains.

1 MINING

We work to safely extract phosphate and potash ore from the earth's extensive reserves

2 LAND RECLAMATION

We reclaim every acre of phosphate mined land, creating high-quality habitats and wildlife corridors for fish birds and other animals, and land suitable for agriculture and other diverse uses

3 MANUFACTURING

We refine, process, and blend phosphate and potash minerals to create crop nutrition products, then prepare goods for shipment

4 TRANSPORTATION

We move raw materials, phosphate, potash and finished crop nutrition products across the supply chain using pipelines, trains, trucks, river barges and ships

5 STORAGE AND DISTRIBUTION

We have port terminals, warehouses and storage capacity in key geographics, with global distribution

6 CUSTOMERS

We sell to retail customers and regional distributors, as well as large international growers

7 FARMERS

We provide large and small-holder farmers with the vital crop nutrients and micronutrients they need to grow healthy plants, achieve better yields and grow food, feed, fuel and fiber more sustainably

8 CONSUMERS

Our crop nutrients play a key role in growing crop yields and providing people with the healthy, affordable food they need to thrive

Source: Leading with Purpose: 2014 Sustainability Report Summary of The Mosaic Company, p. 7

Sustainability at Mosaic

Over the last decade, as sustainability became a greater part of the business lexicon, the term has taken on a wide range of definitions, but with no clear or singular definition. Mosaic's understanding of the relevance and value of sustainability to its success evolved as a result of a number of challenging and often costly experiences that began with the company's formation in 2004. The merger involved bringing together two separate groups of employees—totaling 9,000—each with unique cultures. One group of employees came from a struggling publicly traded company while the other came from a private company.

The mixture of the two enterprises—at a difficult time in the industry's economic cycle—gave rise to challenging integration issues within the workforce. One of the consequences was a workforce that did not have common work processes, lacked common standards of performance and did not have a shared common culture. Compounded by serious financial challenges, the Mosaic workforce was neither highly engaged nor aligned with the organization's objectives.

One outcome of the lack of employee engagement and common processes was sub-standard operational and safety performance that contributed to serious injuries and periodic fatalities. It became evident in the early years that without a much-improved level of safety performance, the company would not be able to engage its employees to deliver the operating performance needed to deliver strong financial results. It was also clear that Mosaic could not deliver sustainably excellent operating performance and results if it could not ensure the safety and wellbeing of its employees. The lesson learned from this was that safety and productivity are fundamentally linked to sustainability. As part of its corporate responsibility, an organization has an obligation to make sure it operates in the best interest of its workers' safety. In fact, an organization cannot sustain itself if it doesn't have a safe workplace and healthy workforce.

Sustainability of land and communities is also important. Mining of phosphate fertilizer requires large tracts of land. As a rule, that requires extensive approvals and mining permits from county, state and federal authorities. The permitting process is complex, involves many levels of government approval and encourages public comment and input. Successful approval requires adherence to rigorous regulatory standards. The process can take years. To ensure community and local support in granting of the permits, extensive consultation and input is solicited. The level of community support or lack thereof has influence on regulators assessing the mine permit success.

Although a company like Mosaic might technically and legally meet all of the regulatory requirements, a lack of community engagement and support can slow the permit granting and require further consultations and extensive delays. Even after a permit is granted by all of the required authorities, NGOs and interested parties can delay the permits by taking the granting authorities to court.

Based on the risk of future availability and cost increases, Mosaic's operations teams looked for ways to reduce and conserve water used in the process. Within a year—and at relatively minor cost—water used per ton of finished phosphate fertilizer was materially reduced.

This occurred in South Fort Meade in central Florida. There the company spent five years to secure a mine extension permit. Even so, legal challenges by NGOs to one of Mosaic's mine permit applications delayed the mining of the permitted land by 18 months and put at serious risk the company's ability to ensure a secure supply of raw materials to produce its products. This further court delay required Mosaic to purchase the necessary phosphate ore from competing non-U.S. phosphate producers at higher costs. Additionally, during the time the permit was held up in federal courts, Mosaic invested hundreds of millions of dollars in a new Peruvian mine outside of the United States.

This was a transformative series of events for Mosaic and its leadership. One key learning from this experience was that to sustainably and reliably acquire the permits to continue mining the ore necessary for producing phosphate fertilizer, Mosaic had to go beyond meeting regulatory requirements and include its communities, neighbors and NGOs in the company's outreach and mission. Leadership referred to this as a social license to operate. The definition of what constituted a neighbor also changed from just the house or land-owner next door to the plant or mine to include the potentially affected neighboring counties and regions. To build a sustainable mining and production enterprise, Mosaic had to broaden its view of who were its stakeholders and to address their concerns as part of the permitting process—and not look to build local support after the fact

To unify and align an organization to undertake these necessary programs in a coordinated and aligned manner with a view to achieving the greatest value, employees must understand their broader value for the long-term sustainability of the company.

of the mine permit being submitted for approval.

Another lesson learned, one that reinforced taking a broader view on sustainability, was that unintended benefits could emerge by undertaking actions that are not entirely fully justified in current economic terms but that are meant to mitigate a current or future risk. The phosphate production process requires large amounts of water—about 1,200 gallons to produce a ton of finished phosphate. Although the cost of the water input is comparatively low, the cost of storing and treating the affected water used in the process can be very expensive. It was the company's belief that at some point in the future the availability of water was at risk of being restricted and that the cost of the water could be significantly higher.

Based on the risk of future availability and cost increases, Mosaic's operations teams looked for ways to reduce and conserve water used in the production process. Within a year—and at relatively minor cost—water used per ton of finished phosphate fertilizer was materially reduced. This initiative was considered a success, with financial benefits to accrue in the future as the cost of water increased. What was not anticipated as a benefit was the reduction in related process water storage and treatment costs. The lesson learned is that the sustainability of the business would be enhanced by the reduction of input costs, and in so doing a virtuous cycle revealed itself, as a reduction in inputs resulted in a reduction of output wastes and their related treatment and disposal costs.

The principles of sustainability as a compass for leadership

Taken as a whole, these experiences led to an expansion of Mosaic's definition of sustainability and recognition of its power to harness and drive meaningful organizational change in an extractive industry. Specifically, the company concluded the following:

- A business cannot be sustainable if its leadership cannot ensure that its employees can come to work and go home safely and without injury.
- A business will not be sustainable if it loses its social license to operate. The communities it relies upon for trained and talented employees and infrastructure must feel that their needs and concerns are being considered and given due respect..
- A business will not be sustainable if it does not develop an employee base that is engaged in the purpose and mission of the enterprise. Without engaged employees, an enterprise will not achieve operational excellence, will not attain the control environment necessary, and will not be able to attract, satisfy and retain customers.
- A business will not be sustainable if its costs are not controlled and reduced to ensure its competitiveness.
- A business will not be sustainable if it is not a keen environmental steward by managing its inputs and reducing its waste.
- A business will not be sustainable if it does not manage its financial resources well.
- To achieve progress and success with sustainability, it is necessary that the enterprise track the metrics that will measure sustainability goals.

Inevitable dips in cyclical agriculture and extractive industries will strain the business' capacity to endure the difficult economic times and constrain the company's ability to take advantage of acquisition opportunities when competitors are hurting.

Put simply, sustainability is the ability to sustain a business and the multiple dimensions that requires to be tended to. To do that, the company must steward precious resources, make wise choices and consider more broadly who its neighbors and communities are and give them the due attention and consideration they deserve.

The execution of sustainability as a compass for leadership

While Mosaic belongs to the extractive and agriculture industry sectors, the lessons learned by the company are applicable, more broadly, to other industries and enterprises seeking to execute sustainability by way of initiatives and as a compass by which to lead. An enterprise-wide model of sustainability provides an effective compass to harness and align the enterprise's efforts. As well accepted, understood and proven as these many individual business and operational imperatives and initiatives are—safety, employee engagement, community relations and investment, cost controls, financial management, quality control—performing each of these tasks individually and in isolation will not optimize both the financial return and enduring value of these programs.

Here, the sustainability-based model for leadership in an enterprise has been discussed with regards to a commercial profit-based organization. In fact, these principles apply to any operating group of people—small teams, community organizations or public or private organizations. In any type of organization, there is value in sustainability based leadership.

While Mosaic belongs to the extractive and agriculture industry sectors, the lessons learned by the company are applicable, more broadly, to other industries and enterprises seeking to execute sustainability by way of initiatives and as a compass by which to lead.

To unify and align an organization to undertake these necessary programs in a coordinated and aligned manner with a view to achieving the greatest value, employees must understand their broader value for the long-term sustainability of the company.

These individual corporate initiatives are conventionally accepted to be necessary elements to any company's success and generally understood to be part of the enterprise's social contract with its communities. The view that has emerged at The Mosaic Company is that these objectives have the following value:

- financial benefits;
- improved operational performance and efficiencies;
- soft benefits such as increased customer satisfaction and more productive and engaged employees; and
- risk mitigation.

Enterprises often work to justify each of these initiatives individually, looking at their costs of implementation and their resulting benefits. However, what is not often considered is the value that is leveraged by the interdependencies of these initiatives, that is a more engaged workforce will be a safer workforce. The financial merits of any single initiative are often considered as the prime objective of the initiative. As a result, what can be missed is that the soft benefits and social value (social license to operate) of an initiative cannot be accurately measured and as such is not usually measured as a benefit. Moreover, the financial benefits of these initiatives are assessed in terms of net present value of the initiatives' cash flows, often neglecting the risks that are increased or removed. Finally, establishing a solid set of sustainability measures is essential to embarking on a leadership model of sustainability. Of all of the challenges Mosaic faced this was one of the most difficult and possibly most expensive elements. Measuring, tracking and reporting sustainability measures was devilishly difficult—tracking waste generation, water use, carbon emissions, employee safety, employee engagement and community and customer satisfaction are but a few of the measures necessary and not recorded and tracked by companies.

Today it is unimaginable to run a business without sound financial reporting. Running a sustainable organization will not be possible in the future without having a rigorous set of reportable sustainability measures.

Articulating and making clear to all members of an enterprise the benefits, value and interdependence of themselves is necessary to building an organization that is working to endure and excel in the future as well as in the near term.

The most important lesson might be that broadly, but clearly defined, sustainability serves as a valuable compass to lead an organization so that it creates value today and is equipped to endure and thrive in the future. It will allow the enterprises a myriad of socially and environmentally responsible initiatives and imperatives to be woven into a stronger and more impactful business plan for enduring success.

HOW THEY DID IT:

Cipla's journey to driverless forecasting

After it transformed forecasting, pharmaceutical supplier Cipla Medpro South cut inventory levels 25% and stock-outs to less than 1%. But it almost didn't happen. The initial challenge was gathering up the courage to change.

BY JOSEPH LUDORF

In the business of supplying life-saving medicines, nothing matters more than getting the right items to the right places on schedule. When that doesn't happen, poor forecasting and stock-outs are often the crux of the problem.

But the pharmaceutical supply chain is a little more complicated than managing just those planning variables at Cipla Medpro South Africa, where I am the director of supply chain operations.

We are constantly confronted with product limitations ranging from temperature control requirements to expiration dates. Both create their own supply chain challenges in Africa. And then there are the seemingly endless regulations from international and local agencies. These include standards from the World Health Organization and the South African Medicines Control Council, not to mention many local pharmaceutical and manufacturing standards.

We also have to factor in very long lead times for imported products and demand spikes from government contract tenders. And on the delivery side, we are faced with immense logistical difficulties that range from unpaved roads to armed bandits.

There are internal corporate pressures, too. We play a role in our parent company's broader mission to supply medicines for life-threatening diseases, including HIV/AIDS, to the world's neediest people. We need to free up as much working capital in our supply chain to support Cipla's overall investment and commitment to this vital mission. And I haven't even mentioned the pressure to control costs so we can supply affordable medicines in Africa.

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Needless to say, an optimized planning process would have a major positive impact on many of these challenges. But knowing what you need and actually getting there can be two quite different matters—especially if there is resistance to change. Worse yet, I was the culprit here.

The bigger picture: Cipla shrinks HIV medication costs below $1/day

Cipla is a global pharmaceutical company dedicated to ensuring that no patient shall be denied access to high quality, affordable medicine and support. It has been committed to the cause of HIV/AIDS for more than two decades, having developed more than 15 medicines that revolutionized HIV therapy around the world.

In 2001, Cipla introduced the world's first 3-in-1 combination medicine to fight AIDS. By bringing its costs down to less than $1 per day compared to treatments costing more than $12,000 (per patient, per year) prevailing in most countries, it has lifted the death sentence for millions across the developing world. The documentary "Fire in the Blood" tells this remarkable story.

Up until the end of 2011, my two full-time planners and I orchestrated our planning with a mix of business knowledge, common sense and spreadsheets. It wasn't always ideal. However, this system had served us well enough, especially in the early years when we supplied fewer products and managed a relatively small volume of orders. But we were, by the end of 2011, continuing to grow faster than our competitors for the ninth consecutive year. It was getting more difficult and stressful to maintain forecast accuracy as we scaled up.

Quite simply, our growing business was changing how our supply chain worked. Our planning process needed to catch up.

Nevertheless, I was quite apprehensive about transforming our process. My past experiences were of long, expensive grief cycles involving complicated software, change management and unmet expectations. Unfortunately, as cumbersome as our current system was, changing it required a huge leap of faith. That was the devil we needed to confront head on.

Given our planning variables, it should come as no surprise that our team didn't completely trust our manually generated forecasts. We spent a lot of time painstakingly double checking calculations against our own market intelligence to ensure we could fulfill our customers' orders.

Despite our efforts, stock-outs were running too high at just above 3%. We fought a constant battle to keep this figure down because the revenue losses associated with stock-outs can never be recovered. We knew we were at a critical junction, and needed to start down the path of transformation. This is the story of how we did it.

The leap of faith

Every link in our supply chain depends on the forecast, so getting it right is vital to the health of our business. Looking back on it now, the hardest part of improving this process was taking that first leap of faith to decide to change things.

Even though our system wasn't perfect, it was the devil we knew. No matter what bright, shiny future any vendor or consultant promised us, it was going to take time to build trust in a new system as well as new ways of working.

In those early days, our only priority was to reduce stock-outs. The cardinal sin in our business is not being able to fulfill an order—miss one and another supplier swiftly replaces you. Most companies avoid stock-outs by holding excessive safety stocks, but this isn't a sustainable option. The resulting waste and obsolescence costs would make our medicines too expensive for the markets we serve. (See sidebar on left about reducing HIV medication costs to $1 a day)

The first step we needed to take was to introduce a better planning system. Given my previous experiences, I definitely wanted to avoid putting myself and my team through a "Big Bang" implementation from one of the large ERP vendors.

After considering four different systems, we decided in January, 2012 to go with ToolsGroup for forecasting, inventory and replenishment planning. I chose the company because it had good people on the ground in Cape Town and its software seemed able to handle a high level of planning complexity. It was also a relatively low-risk investment because the software was part of the outsourced service, with no long-term commitment or high initial costs.

In those early days, ToolsGroup generated forecasts for us twice weekly from their office in Cape Town using a business process outsourcing service integrated with our ERP system, Pastel Evolution. This was relatively easy to set up, and within 30 days we were off and running. The fact that this happened so quickly started to chip away at some of my trust issues.

For the first time, we could forecast demand for our medicines. This was huge and opened up a whole new world for us because certain of our customers, such as large government contracts, demand exceptionally high service levels. Another first was the ability to do long-range cash flow projections against what-if scenarios at the press of a button. For example, we were able to take anticipated growth into consideration when planning five years out.

In just a few months, we managed to reduce stock-outs from 3% to less than 1%. The fact that there were stock-outs at all were due to situations beyond our control. At this stage, inventory reduction wasn't the main focus, but we were starting to see some definite improvements.

Despite all this good progress, my team and I certainly weren't prepared to switch off our own market intelligence, what we called the commercial override forecast. Confidence and outcomes were improving, however, and it felt like we were on the right track.

Simplifying distribution

When you have an inherently complex business, a logical transformation principle is to simplify those parts of the supply chain that can be controlled.

Between 2012 and 2016, we merged three of our warehouses into one new, state-of-the-art facility in Tableview, in the western part of Cape Town. The 172,250 square foot facility has a warehouse capacity of 22,000 pallets, meets strict new environmental controls and can handle 165,000 pounds of product monthly.

Besides ensuring more efficient delivery, consolidation in a single modern facility makes it much easier for us to comply with the many different regulations required by multiple African countries. We also introduced a new intelligent warehouse management system from our long-time partner, Cquential Solutions (Pty) Ltd.

Four key takeaways

Replacing an old forecasting process doesn't happen overnight. After a five-year journey, Cipla Medpro has identified four key takeaways:

1. Don't wait too long to take the first step.
2. Continuous supply chain improvement is never done.
3. A smart outsider can provide valuable perspective.
4. Technology shouldn't replace people, but instead, enable them.

Tuning the planning engine

We also started to see the potential to be much more ambitious with our forecasting.

At first, we only set out to simplify the ordering process and avoid stock-outs. Once the team got more comfortable using and fine-tuning the new system, we realized we could start controlling our inventory levels better.

As mentioned earlier, managing cash flow is paramount to our own success and that of the wider Cipla organization. The largest component of cash is always tied up in stock. So we would want to optimize that—but never at the price of compromising service.

Even though our system wasn't perfect, it was the devil we knew. No matter what bright, shiny future any vendor or consultant promised us, it was going to take time to build trust in a new system as well as new ways of working.

At this point, we decided to stop using ToolsGroup's outsourced service, buy a perpetual license for their software and install it on-site. At the same time, we engaged them for a consulting project to continuously improve our forecasts over time and support our sales and operations planning through this transition.

It's not possible for us to bring our entire cross-functional team together in a room regularly. Instead, breakaway groups meet every week and we consolidate the information. For a time, a local consultant based in Cape Town came in every Monday to help us apply this information to develop and implement a supply chain calendar.

The calendar breaks down every month into a set of actions. Each action in the calendar touched on part of the ordering and inventory cycle so that we gained the visibility we needed to determine the optimal level of stock in our warehouse. This process gave us a recipe in the form of a checklist that we run through every month. As long as we satisfy each component on the list, we have a very lean, smooth and predictable supply chain.

During this phase, we learned that the work of improving a supply chain is never done. Every week we look at our data from a different point of view and decide where we need to focus next. As an internal team, it's all too easy to get bogged down in details and firefighting. But an outsider will look at things from a different perspective and that has really helped us.

Cipla at a glance

Cipla Medpro is the fastest growing of the Top 10 pharma companies in the Republic of South Africa (RSA), having experienced 17% overall sales growth in its 2016-2017 fiscal year. Today, it is the fourth largest pharma company in the private sector in RSA, with a 5% share of the market.

FOUNDED: 1935
SALES: Owned by Cipla Ltd BSE (Bombay Stock Exchange)
PRODUCTS: Over-the-counter and prescription medicines
MANUFACTURING: The Cipla Medpro Manufacturing (CCM) facility in Durban is one of South Africa's largest pharmaceutical manufacturing plants that approved by the RSA's Medicines Control Council (MCC/PICs)
DISTRIBUTION: Cipla recently merged SA distribution into one 16,000 square meter state-of-the-art facility based in Cape Town
COUNTRIES SERVED: Namibia, Botswana, the Swaziland, Lesotho, Kenya, Uganda and Tanzania
SKUs: 650

Forecasts we can trust

Once we got to that point, it truly struck me how far we had come with the forecasting process. I mentioned earlier that prior to this initiative, we didn't trust the forecasts and spent a lot of time manually checking all the calculations. We're now finally confident enough to switch off our own market intelligence—the commercial override forecast.

We carried out a test on half our SKUs and discovered that our forecast accuracy is now as much as 20% higher than with our old system and processes. This is helped by the fact that we've been running and fine-tuning the system for long enough to be able to factor in variables such as seasonality and trends.

The positive changes we've made aren't just about saving money. Better planning capability along with our new state-of-the-art warehouse have put us in a much stronger position to win large national contracts. One such example is the 2 billion Rand ($150 million) contract we won with the Department of Health to supply antiretroviral drugs for the South African government's HIV/ Aids program from 2015 to 2017.

I believe we've achieved a stage in our transformation that's as close as one can get in our industry to what some industry watchers call the driverless supply chain. That's not to say that people are no longer involved—in fact they are more engaged now than ever.

Thanks to making that initial leap of faith and going on this journey the planning team is freed from a lot of the manual work and stress to manage exceptions and continuously improve for ever greater supply chain performance. This means we are contributing as fully as possible to Cipla's mission to make affordable, high-quality medicines accessible to people in need.

A healthier supply chain

Our continuously improving planning process lets us now operate in a way that's much better aligned with the business. Instead of measuring percentage of stock-outs, we've set a budget for ourselves that represents their sales value in Rand (the South African currency). As long as we don't exceed our target budget number, our sales team should be able to reach its goals.

We now run quite well within that number, which translates into only 0.08% of stock-outs due to problems outside our control. And now we're not just minimizing stock-outs, but doing that while carrying 25% less inventory than before we started.

Crucially, we are now able to give accurate supply chain intelligence up to 12 months in advance. This means that if anybody from business finance or one of our principals asks us what any part of our supply chain—inventory, stock, stocks-outs—will look like on a given date, we can give them the answer quite easily. That reduces problems to a manageable list with a focus on exceptions.

Five Techniques to Manage Supply Chain Risk

BY MARK TROWBRIDGE

If procurement executives don't take intelligent risks, they cannot provide maximum value to their companies. Here are five techniques to manage both anticipated and unanticipated events in the supply chain.

RISK has always been part of the supply chain. It's a reality inside and outside the four walls of any organization. It's no surprise then that as Enterprise Risk Management (ERM) programs proliferate, they have naturally begun to address anticipated and unanticipated events occurring both upstream and downstream in the supply chain.

Upstream of an organization are the suppliers who create goods and services used in a company's own operations. These include raw components or materials that flow into direct manufacturing as raw materials. There are also indirect products and services that facilitate the company's actual operations.

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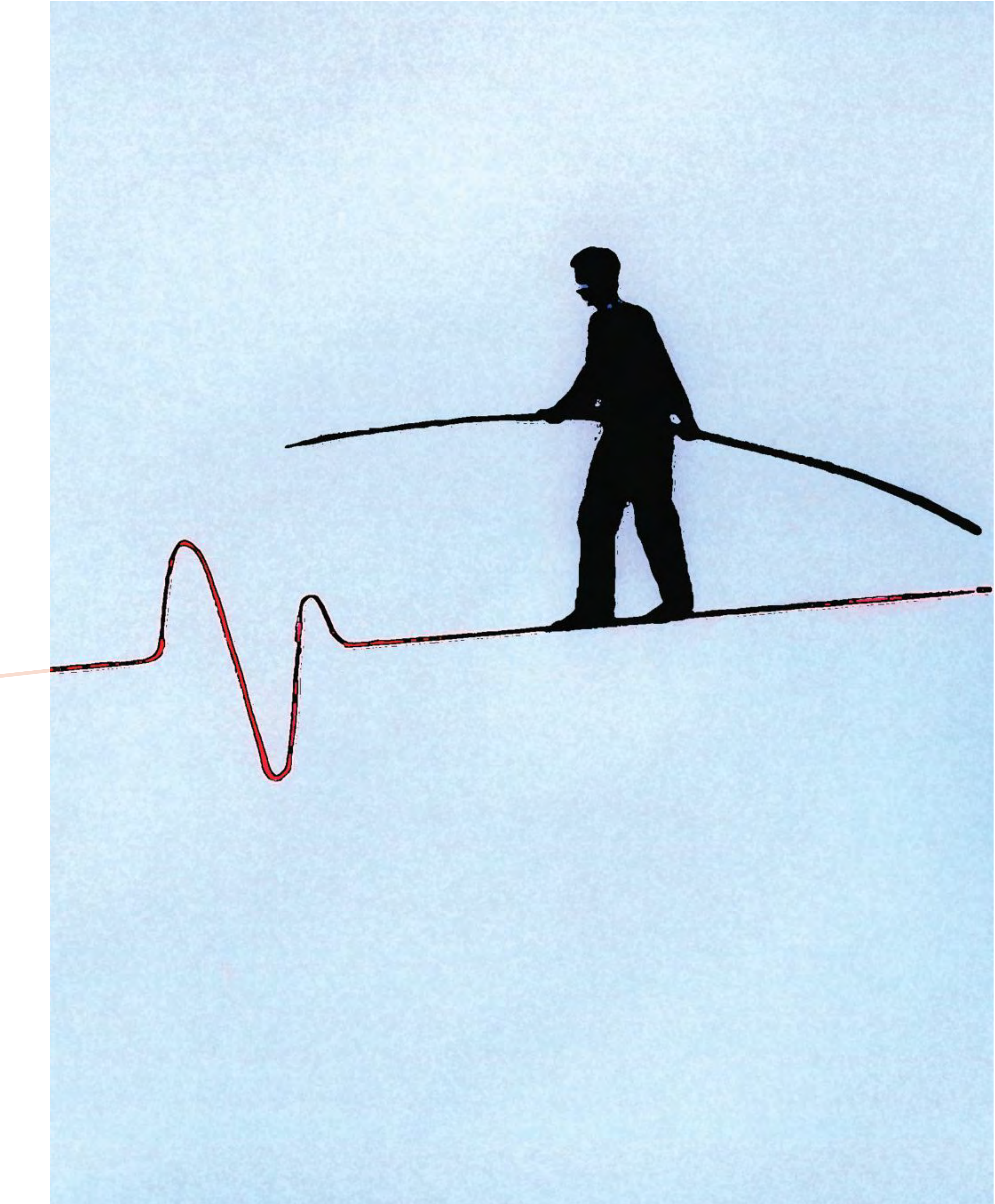

The downstream supply chain efficiently distributes a company's products or services to its customers. All contracted suppliers, both upstream and downstream, must be proactively managed to minimize financial, confidentiality, operational, reputational and legal risks.

You don't have to look any further than recent headlines to see potential fallout here. Did Equifax have proper data liability insurance coverage in place before 143 million accounts were hacked? And even if they did have coverage, how much was their reputation and customer account credibility damaged? This is still playing out, so not even Equifax management yet knows the impact of the risks taken.

Unfortunately, ERM is too often used as a weapon against procurement executives. They can be beaten down by their firm's own siloed ERM or legal groups and forced to develop and use cumbersome processes.

Ideally, if risk is properly managed, nothing occurs that has a negative impact on operations or profitability such as what happened to Equifax, Samsung, Chipotle or any of the other companies that have seen their share price fall and their value erode following an untoward event. But, after all, shouldn't the point of an ERM program be to eliminate all supply chain and legal risk for our employers? The answer is an emphatic "no." The only way to truly eliminate risk would be to never conduct any procurement or contractual activities using third-party suppliers. What private or public sector organization could operate that way? Not a one.

Instead, a rational objective for procurement and supply chain leaders should be to create a secure but high-performing supply chain. This is one in which risk can be minimized while value-added business relationships can flourish. Think of it as "intelligent risk management."

I learned this lesson in one of my early corporate positions directing sourcing and contracting management activities for one of the world's largest companies. My boss included an interesting objective in my job description. He insisted that I develop a willingness/ability to take "intelligent risks" and then included it in my annual evaluation. You see, he realized that an overly aggressive approach to contracting management for our enterprise with 195,000 employees and 110 subsidiary companies worldwide could shut down our ability to be fast and nimble.

Along with his mentoring, I learned ways to execute well-researched business plans while properly managing risk, which made a huge difference in my career. My success was measured by balancing well-researched supply management saving initiatives with carefully thought out fallback plans. I knew my performance evaluations would suffer if I did not consistently push the limit of what could succeed in the supply chain arena—if I didn't take intelligent risks.

My boss often reminded me of something that professional hockey star Wayne Gretzky once said: "You'll always miss 100% of the shots you don't take." During my last two years in that corporate role, my team was very successful in deploying this balanced approach, saving shareholders a quarter of a billion dollars and reducing external legal support expenses by nearly a million dollars annually, while not experiencing a single supplier lawsuit with a portfolio of several thousand sourced supplier relationships.

Now, on the surface, this all sounds good. Unfortunately, ERM is too often used as a weapon against procurement executives. They can be beaten down by their firm's own siloed ERM or legal groups and forced to develop and use cumbersome processes. Such precautions may give the appearance of diligence but in reality they actually reduce the company's ability to truly manage supply chain performance in a risk-averse manner.

Worse yet, this can create a culture with an outsized fear of failure. As a result, people:

- delay or avoid making difficult decisions;
- push responsibility onto others;
- fail to acknowledge/confront problems; or
- try and eliminate every conceivable chance of failure.

From a procurement and supplier relationship management perspective, examples of overly risk-averse procurement behaviors include:

- cumbersome or overly-restrictive approval processes;
- unwillingness to identify or "try" new suppliers, no matter how well-qualified;
- unwillingness to source from low cost country sources;
- an inclination to select established and bloated supplier organizations rather than investigating and qualifying

best practice supplier firms that lead their sectors (ignoring billionaire Warren Buffet's comment about industry evolution that, "first come the innovators, then come the imitators, and then come the idiots.");

- failure to empower user departments with user-friendly methods of ordering products and services;
- insistence upon excessive procurement involvement in low-value transactions;
- acceptance of excessive inventory levels for safety reasons; and
- failure to secure best pricing due to unwillingness to make long-term volume commitments.

It is now many years later and I'm privileged to work in the consulting realm with many world-class procurement organizations. The senior supply chain leaders I find most impressive are those who demonstrate a willingness to move forward with key supply chain improvement opportunities. These are people who are willing to take intelligent risks in order to generate profits for the bottom line.

So, what are key ways that procurement professionals can contribute to their organization's overall enterprise risk management strategy? I suggest five supplier risk management techniques that make a significant contribution to ERM security. These are:

- innovation and efficiency in contracting management;
- strategic requirements for supplier insurance, indemnification and limitations of liability;
- provider optimization and redundancy;
- supplier financial stability visibility; and
- proper diligence in operational supplier assessment reviews.

All five are of equal importance to making intelligent risk work. They are even effective at dealing with so-called "black swan" events that cannot be predicted using normal methods of statistical analysis.

For instance, did Apple know that an earthquake and tsunami would shut down critical component supplier manufacturing facilities in Japan during 2011? Probably not. But accounts of their prescient negotiation of protective Force Majeure language in key supplier contracts apparently guaranteed Apple first right of resumption, mitigating the effects of that black swan event.

Make these five techniques part of your process and your company can be in a similar risk management position across the supply chain.

Technique 1: Innovation and efficiency in contracting management

How a procurement group approaches contracting management sets the stage for managing risk intelligently.

As an example, the firm I work for often assists leading companies in revising or creating strategic portfolios of pro-forma contract templates. Contract streamlining is an emerging trend and is the outcome of better understanding the significant cost of creating and negotiating old-style "legalese" contracts. Many of these are unnecessarily onerous—written in legal prose, lengthy, difficult to understand, one-sided protections and the like. But newer styles of contract design and wording enable procurement teams to have a dramatically-higher success rate of executing well-drafted agreements. Procurement contract portfolios are a great example of how legal risk can outweigh business balance, extending the contracting cycle time and procurement efficiency. Instead, many legal and procurement groups find that it is better to rely on concise and well-balanced contract documents that result in easier acceptance by suppliers.

The senior supply chain leaders I find most impressive are those who demonstrate a willingness to move forward with key supply chain improvement opportunities.

Optimized processes and technology tools used in Contracting Lifecycle Management (CLM) also fit here. My team frequently performs reviews of how large enterprises manage their contracting processes and portfolios. They also sometimes find stunning gaps in the approaches that have evolved over time within company cultures.

One corporate example involved master agreements put in place by one company group. Then, another company group executed separate Statements of Work (SOW). But as our research showed, many of the SOWs expanded the list of services beyond those ever addressed by the master agreement, and thus lacked proper protection from the governing terms.

In one of these findings, the original master agreement only covered traditional delivery by ground trucking services. But a new SOW called for the use of a helicopter for the delivery and installation of capital equipment. The lack of aircraft liability insurance in the master agreement exposed the company to very significant risk.

During another engagement with one of the globe's ten largest privately owned enterprises, with more than 50 subsidiary companies, our team found sizeable gaps in process that frequently exposed the firm to legal risk. Simple to fix, but only when the firm's management understood the gaps and methods of fixing.

Failure to proactively ensure that each policy is renewed and continues in effect through contract expiration means that buffer of protection can disappear without the procurement organization's knowledge.

Technique 2: Strategic requirements for supplier insurance and limitations of liability

Use of any external supplier of products or services, either upstream or downstream, requires an evaluation of potential liability exposure. Every contract must address the three-legged stool of protections: limitation of liability, indemnification and supplier insurance. The last requires special administrative attention, but is frequently under-managed.

Suppliers should carry insurance for two reasons. First, it protects them from legal and financial exposure that could limit their ability to support contractual commitments. Second, it provides a buffer of protection to the procurement organization against direct or indirect claims from suppliers or other third parties that may be affected by contracted suppliers' actions or inactions. If a contracted supplier is allowed to utilize key subcontractors in the performance of services, those firms must also be required to provide insurance coverage compliance.

All too frequently, procurement groups fail to demand a properly executed and endorsed certificate of insurance (COI) from each contracted supplier before contracted actions occur. I'll admit, it's a pain to collect and properly review COIs from every contracted supplier. But studies performed by leaders in risk management groups indicate that 80% or more of initial COI submissions do not conform to the language in the customer's contract.

An even more frequent failure point is one of timing. Quite simply, a supplier's multiple policies of insurance will never expire on the same date as the contract itself. Failure to proactively ensure that each policy is renewed and continues in effect through contract expiration means that buffer of protection can disappear without the procurement organization's knowledge. Special risk occurs if the supplier switches policy types or insurance carriers when a policy expires, and the properly-worded endorsement of an organization as an "additional insured" fails to be implemented in the new policy.

Any procurement team that is proactively managing the three-legged stool of risk protection must have resources in place to proactively collect and knowledgeably review COIs. Fortunately, there is at least one new no-cost supplier risk mitigation resource that can do this at your supplier's expense. This model effectively outsources these reviews to a highly skilled team of professionals without any budgetary impact. The use of that type of outsourced service is dramatically better than trusting internal staff groups to perform this type of task, and provides superior visibility to this important area of supply chain risk.

Technique 3: Provider optimization and redundancy

As part of initial strategic sourcing and supplier selection, ERM principles should be employed to ensure that excessive consolidation of the supplier community does not occur. Too often, aggressive sourcing groups will push to award a contract to a single-source award contractor. That works fine until a disaster occurs, such as financial failure of the supplier or a plant shutdown.

Proper strategic sourcing works much better with a balanced supplier portfolio with either of two requirements. One is multiple plant or data center redundancy by the provider. This enables the provider to manufacture or perform services in multiple locations. The other approach is to segment the provider relationship across multiple suppliers in a primary and secondary contractual manner. This ensures sustainable supply chain operations even in the event of a failure in one production location.

Technique 4: Supplier financial stability visibility

In 2016, Han Jin Shipping, one of the seven largest maritime shipping companies in the world, announced bankruptcy and stopped operations that same day. Thousands of containers were literally locked aboard ships anchored in harbors or tied up at docks around the world. The impact was substantial. Han Jin processed nearly 10% of Asia-American container shipments. Furthermore, countless other shipments with other trade locations between other national trade partners were affected. The mess took months to sort out.

Most companies fail to have adequate visibility into the financial stability of their entire supplier community much less their key suppliers. Some companies do acquire financial reports from a leading provider on a case-by-case basis. However, the largest provider of these reports relies on data voluntarily submitted by the supplier company themselves, calling into question the accuracy of the data. They also charge a fee for their services, which is often beyond the budgets of most procurement teams.

The good news is that a new model for managing supplier financial stability has now emerged. It relies on predictive financial stability reporting that is provided by a major credit rating agency on thousands of potential suppliers. Much like the insurance COI collection services mentioned earlier, the availability of predictive financial stability data for a firm's entire supplier community can be outsourced without cost. The information is available in a Cloud information tool that warns procurement leadership of potential supply chain failure, providing highly positive ERM visibility to a firm's management team for free.

Technique 5: Proper diligence in operational supplier assessment reviews

When you were in school, you received report cards. There were three reasons for them.

First, report cards provided students with feedback on their educational accomplishment. Second, they provided parents with visibility into their child's performance. And third, report cards provided a useful reference tool for conversations between the teacher, parents and student about areas of potential improvement. And it worked. I'll be the first to say I would not personally have tried nearly as hard in school (all the way through college) if those report cards didn't keep showing up.

Far too many companies fail to provide their suppliers with any report card feedback on how they are performing. For most companies, the exceptional few suppliers that do receive any scorecard are a small fraction of those that don't. That is a problem. Any supplier that does not receive frequent feedback will probably assume that their performance is just fine even if it's not. And why shouldn't they?

Top companies are now separating their supplier portfolio companies into categories based on financial spend or assigned risk using techniques like the Pareto Principle. It breaks out like this:

- Class A suppliers, the 15% of suppliers representing 75% of total spend;
- Class B suppliers, the 25% of suppliers representing 15% of total spend; and
- Class C suppliers, the 60% of suppliers representing 5% of total spend.

Using this type of categorization, a strategy of scoring and providing feedback can be developed.

At a high level, one very useful strategy is to automate score-carding and reporting to Class B and C suppliers using systematized data capture and reporting. Class A suppliers can be given report cards that contain more subjective scoring feedback data.

Often Class A and some Class B providers meet with the procurement organization much like the old parent/teacher/student model. The objective, of course, is to identify improvement opportunities and corrective actions for deficient performance. Typically, Class C suppliers are rated and moved up or out based on their ability to meet objective performance objectives.

It's worth noting that performance reports are only noted for the company under evaluation. However, an overall scoring matrix for a segment of suppliers can be shared with all to provide a benchmark for expected performance among suppliers.

Using these five Supplier Risk Management Techniques is a solid starting point for building a supplier supply chain that can greatly contribute to your organization's overall ERM strategy. Obviously, this is only the tip of the entire supplier relationship management iceberg; however, it is a huge improvement over the typical methodologies used by far too many companies to manage supply chain exposure.

Taking intelligent risks doesn't mean we can fail to carefully research and structure our supply chain decisions. Writer John A. Shedd said: "A ship in harbor is safe—but that is not what ships are for." The same is true in supply chain management. If we don't take some intelligent risks, we're not going to provide maximum value to our employers.

No Shortcuts to Security

Measuring your threshold for risk has become more complicated than ever. However, industry analysts contend that we need to get better at it because concerns about cyber security, financial malfeasance, political exposure and climate change are here to stay.

BY **PATRICK BURNSON**, EXECUTIVE EDITOR

MONTHS BEFORE THE INFAMOUS MALWARE ATTACK known as "Petya" hit Maersk, Fedex and other logistics companies in June, commercial insurer Allianz Global Corporate & Specialty (AGCS) warned logistics and supply chain managers that breaches in cyber security were of utmost concern. As stated in its annual "Safety & Shipping Review 2017," the threat of cyber attacks continues to be real—and quite significant.

Prior to the Petya event, most violations of proprietary data had been aimed at breaching corporate security rather than taking control of a vessel or plane. Fortunately, the response by a handful of high-tech shipping specialists kept the episode from becoming a global catastrophe. For logistic managers, the lesson learned is that mitigating risk in this arena now needs to be a primary and ongoing goal.

"Many more enhancements to existing legacy IT networks are essential," says Captain Andrew Kinsey, senior marine risk consultant at AGCS.

Safety-enhancing technology is already making an impact on shipping—from electronic navigational tools to shore-based monitoring of machinery and crew welfare. Technology has the potential to significantly reduce both the impact of human error—which AGCS analysis shows accounted for approximately 75% of the value of almost 15,000 marine liability insurance claims over five years, equivalent to more than $1.6 billion—as well as machinery breakdown.

Despite this progress, however, shippers are urged to keep their guard up. "The global logistics marketplace is entering a period of considerable change and unrest from economic pressures, technology and political factors," warns Kinsey. "There's a perfect storm brewing of increasing regulation and narrowing margins."

Investment picture

Meanwhile, many analysts suggest that public sector logistics managers encourage their CIOs to benchmark against free market industries to mitigate risk.

According to a global survey of CIOs by Gartner, top performing organizations in the private and public sectors, on average, spend a greater proportion of their IT budgets on digital initiatives (33%) than government organizations (21%). Looking forward to 2018, top-performing organizations anticipate spending 43% of their IT budgets on digitalization, compared with 28% for government CIOs.

Gartner's "2017 CIO Agenda" survey includes the views of 2,598 CIOs from 93 countries, representing $9.4 trillion in revenue or public sector budgets and $292 billion in IT spending, including 377 government CIOs in 38 countries. Government respondents are segmented into national or federal, state or province (regional) and local jurisdictions, to identify trends specific to each tier.

Rick Howard, research vice president at Gartner, says that 2016 proved to be a watershed year in which frustration with the status quo of government was widely expressed by citizens at the voting booth and in the streets, accompanied by low levels of confidence and trust about the performance of public institutions.

"This has to be addressed head on," says Howard. "Government CIOs in 2017 have an urgent obligation to look beyond their own organizations and benchmark themselves against top performing peers within the public sector and from other service industries. They must commit to pursuing actions that result in immediate and measurable improvements that citizens recognize and appreciate."

Howard adds that one of the challenges most government

CIOs face is the age of their legacy business applications. "Gartner's survey data indicates that—depending on tier of government—51% to 60% of government core business applications were implemented between 1990 and 2009," he says. "Top performing organizations in the private sector report 42% of their core business applications date from the same time period."

Howard observes that this "aging portfolio" of government systems and applications make them increasingly expensive to modernize. Furthermore, they present a growing risk from a security standpoint and are a barrier to digital innovation.

"If recent reports in the media are accurate, then it appears the Trump Administration is committed to addressing the cyber security vulnerabilities of federal systems," says Howard. "This could serve as a catalyst to modernize or replace legacy systems at a faster pace than in the past."

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>
> *—Rick Howard, research vice president, Gartner*

Financial health

RapidRatings, a leader in "financial health" analytics for public and private companies, continues to track the trend of investment in risk management technologies across all industries and business areas. Along with several prominent industry analysts, they note the increasing role of board level and operational professionals' interest in risk management has accelerated growth in the predictive analytics market—one that's expected to reach $9.2 billion by 2020.

"We challenge leading commercial, industrial and financial services firms around the world to build business relationships founded on new standards in financial transparency," says James Gellert, chairman and CEO of RapidRatings.

The company's proprietary Financial Health Rating (FHR) is a predictive analytic represented by a 0-100 score that reflects a company's current financial health and predicts its future condition by projecting its long-term financial viability, short-term resiliency, and probability of default.

RapidRatings' analysis relies solely on financial statements to deliver what it describes as "a tailored and unbiased outlook" about the financial health of a company's public and private third-party logistics partners. This group includes carriers, suppliers, vendors and securities issuers.

"Unlike traditional methods of using payment history, data aggregation, or market inputs to predict a company's future performance, the FHR's forward-looking analysis allows companies to identify financial decline 12 months out and beyond," says Gellert. "This gives logistics managers a new set of forecasting analytics to work with."

Currently, clients and expanded existing relationships in multiple industries include financial services, insurance, aerospace & defense, manufacturing, automotive, biotech, energy, food and beverage, financial services and retail.

Logistics managers might have found some comfort in knowing that Maersk is judged as a "medium risk" player it the ocean cargo industry, says Gellert. "Had a serious cyber attack been launched on Hanijn two years ago, it would have hastened that company's bankruptcy," he adds. "So, we not only want to help shippers avoid weak supply chain partners, but also identify the strong ones who can be integrated into that transport ecosystem."

Political exposure

Current events chronicling abuses by supply chain partners is also creating anxiety, says Amber Road, a provider of cloud-based global trade management (GTM) solutions. As a response, the company recently added advanced politically exposed persons (PEPs) lists to its Global Knowledge database.

In addition to being a comprehensive database of government regulations and international business rules, Amber Road's Global Knowledge is designed to automate restricted party screening (RPS) processes to vet customers, suppliers and other trading partners against 570+ restricted party lists sourced from government institutions worldwide.

Ty Bordner, vice president of solutions consulting for Amber Road, says that this initiative was generated by logistics managers desiring another layer of security. "For a variety of reasons, there's a lot of apprehension in the marketplace these days," he says. "The consequences of doing business with the wrong people can be dire."

To ensure that businesses do not engage in bribery to obtain or retain business, many countries around the world have passed anti-corruption laws, such as the U.S. Foreign Corrupt Practices Act, the UK Bribery Act, the Canadian Corruption of Foreign Public Officials Act, Chinese Anti-Corruption Laws and more.

Some of these laws don't distinguish between small and large bribery payments, thus prohibiting any facilitation payments. With that in mind, the PEP screening is a risk-assessment tool to help businesses protect themselves from the regulatory, reputational and economic risk associated with these types of laws.

A PEP is defined by the Financial Action Task Force as "an individual who is, or has been entrusted with a prominent public function." Due to their position and influence, it's recognized that many PEPs are in positions that potentially can be abused for the purpose of committing money laundering offenses and related predicate offenses, including corruption and bribery, as well as conducting activity related to terrorist financing.

"Although persons or entities identified by PEP screening do not imply wrongdoing of any kind, PEP screening against official governmental sourced information allows businesses to be fully informed and vigilant during their global decision making processes," adds Bordner.

Climate change

In the wake of the U.S. pullout of the Paris Climate Accord, some weather experts are expressing even more concern about future climatic "events." Indeed, new information has recently surfaced on the impact of extreme weather on supply chains.

According to Nick Wildgoose, global supply chain product manager for Zurich Insurance Group, nearly 80% of corporations are not even checking their supply sites for exposure to natural catastrophe risks, leaving them vulnerable to future supply chain disruptions. To make matters worse, supply chain disruptions due to extreme weather have increased 29% since 2012, according to research from the Business Continuity Institute conducted in collaboration with Zurich.

"Our analysts discovered more than 50 incidents last year," says Wildgoose. "This can not only lead to lower profits, but brand erosion. That should be a serious concern, because it means that you've let a client down."

Zurich suggests that logistics managers look into an "all risk" policy to address weather-related events, but offers other cost-efficiency tools that represent another tool in your risk mitigation kit. "One set of risks may be worse in the food industry—floods, for example—than the microchip industry," says Wildgoose. "In the high tech manufacturing sector, earthquakes may be more of a concern."

> **For a variety of reasons, there's a lot of apprehension in the marketplace these days. The consequences of doing business with the wrong people can be dire."**
>
> *—Ty Bordner, vice president of solutions consulting, Amber Road*

Besides choosing the right insurance portfolio, Wildgoose encourages shippers to establish new protocols related to alerting suppliers. For example, he encourages companies to relocate to exactly where their critical suppliers and logistics hubs are based in advance.

"Because many extreme weather events are often known in advance, it's critical to know which of your supplier nodes will first feel the impact," says Wildgoose, adding that even after key suppliers have been mapped out, procurement teams only have a limited amount of time to execute a plan to minimize risk.

"Well before the proverbial—or literal—flood waters rise, companies need to determine what business continuity measures can be implemented to avoid damage and what inventory can be moved ahead of the weather to avoid monetary loss," says Wildgoose.

Finally, there's the triage issue, whereby critical suppliers are the ones who receive the first alert. "To best prioritize risk management when facing adverse weather, companies should focus first on those partners who play the most important role in the logistical network," Wildgoose adds. "These may also be companies who support your most profitable products and services."

Patrick Burnson is executive editor of SCMR

The wisdom of the crowd

Crowdsourced network design can transform logistics costs.

By Balika Sonthalia and Sean Monahan

Balika Sonthalia is a vice president at A.T. Kearney's Supply Chain And Logistics practice in Chicago. Sean Monahan is a partner and global practice leader of A.T. Kearney's Operations & Performance Transformation practice in New York. They can be reached at balika.sonthalia@atkearney.com and sean.monahan@atkearney.com.

A perfect storm is brewing for supply chain managers, third-party logistics suppliers (3PLs) and the carriers they work with. Despite a growing global economy and expanded consumer spending in 2016, U.S. logistics costs declined 1.5% due to overcapacity and rate pressures that had shippers asking for—and getting—rate reductions. There is less room for easy cost cutting in 2017-2018, however, and the traditional areas where shippers look for more value—warehousing and transportation—show less potential for optimization.

The ray of sunshine in this storm is an innovative approach to logistics network design that benefits both shippers and suppliers. Known as crowdsourced network optimization, it builds on traditional optimization, taking it further with crowdsourcing techniques and advanced analytics and strategy.

A closer look at current conditions listed below shows why we need a new approach.

1. Even as carriers and 3PLs improve margins, achieving rate concessions grows more difficult. Yet, shippers can achieve new ground by shifting from transactional pricing to end-to-end performance improvement.

2. As market capacity tightens, supply chains hesitate to change their mix of 3PLs to minimize operational risk. Greater value across the enterprise and lower risk are possible through closer collaboration with internal functional partners and businesses, especially when it starts at the beginning of the logistics planning process for the coming year.

3. At the same time, shippers will need to turbocharge their logistics cost and operations-management strategy to deliver savings and hit higher performance targets.

A crowdsourced approach draws on each party's insights and strengths, while it builds on successful optimization tools from the past.

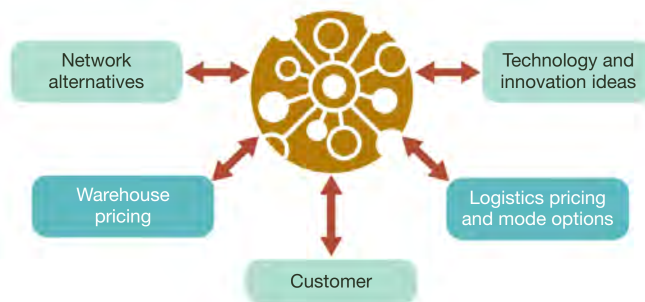
Collaborative and network optimization reach a new level

During the last decade, we have seen two logistics transformation approaches achieve various benefits. First, collaborative optimization, where companies optimize spend a single mode at a time, has brought 5% to 12% savings through expressive bidding instead of traditional auctions (see Figure 1). When a supply chain is transparent about its logistics requirements, future demand and constraints, the supplier can suggest pricing to meet its needs. This approach brings good value for one mode at a time, such as transportation, warehousing or air, but probably not multiple modes simultaneously. Second, network optimization, where companies use benchmarks to rationalize footprint and transportation lanes and expedite the design of future networks for sourcing, has generated 8% to 15% savings. However, it is often based on internal guestimates before talking to suppliers. Suppliers may come back with more efficient options for warehouse locations, but time and insights can be lost on how to maximize the overall network footprint.

By using crowdsourcing to collaborate with suppliers during network optimization, shippers can realize savings of 10% to 20% on logistics spend across all modes. This approach optimizes end-to-end distribution costs, from planning and procurement to warehousing and transportation. It relies

FIGURE 1

Crowdsourced network design taps the collective insight of logistics providers



Source: A.T. Kearney analysis

on real-time market input that meets actual supply-chain conditions while laying the foundation for strategic value-based partnerships with suppliers that generate continuous operational improvements for the shipper. We have seen crowdsourced network optimization perform well for companies in numerous sectors, from telecommunications to the chemicals industry, where a leading company we have worked with achieved more than $100 million in savings on $700 million in transportation and warehousing spend using this approach.

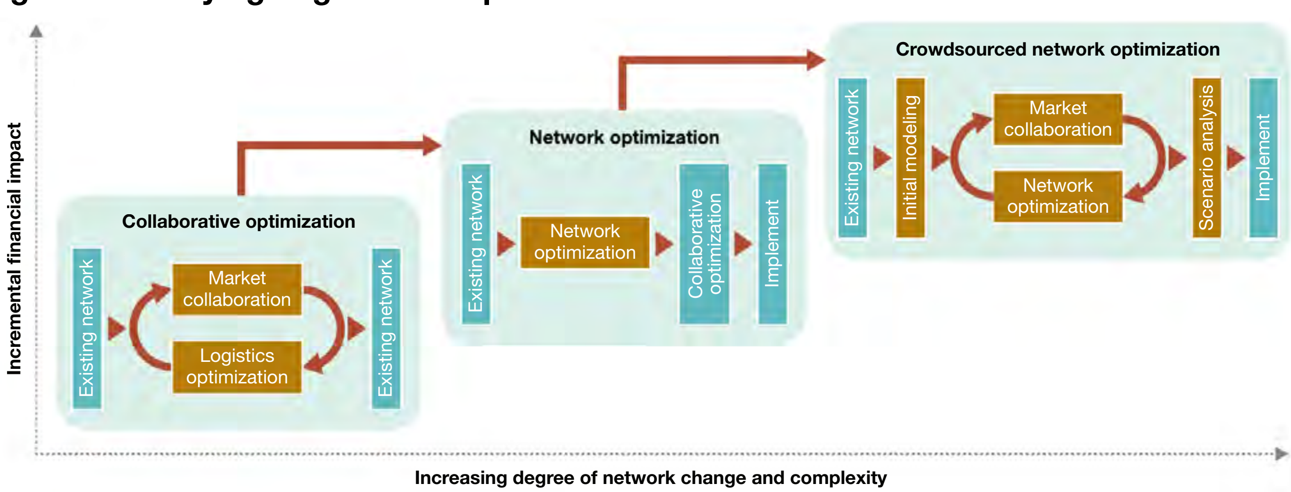
What makes crowdsourcing so effective?

Two factors largely determined the success of optimization and cost reduction in the past. Logistics often represents 2% to 9% of net sales and is key for driving cost reduction. Concurrently, the traditional process for optimizing networks may have a one-time impact, but planners start from zero the next year. Crowdsourcing changes all that.

Using crowdsourcing to design the network for transformational performance is the next logical step. It reveals new ways to drive efficient logistics alongside perpetual cost improvement. 3PLs and other service providers with intimate knowledge of their logistics capabilities can identify shipping options and potential efficiencies that a shipper designing its network in isolation may not have discovered. Crowdsourced network optimization brings various logistics providers in at the design phase and uses their combined intelligence to determine options and pricing for the most effective footprint (see Figure 2). From 3PLs offering

FIGURE 2

Different types of logistics transformation approaches generate varying degrees of impact



Source: A.T. Kearney analysis

the best solutions for alternative networks, warehouse pricing and freight modes, to those offering innovative ideas and technology, the crowdsourced approach is the logistics epitome of multiple heads being better than one or two.

The power of crowdsourcing comes from:

- collaborating with third parties to uncover networking strategies that would have been impossible to achieve in a vacuum;
- early engagement of 3PLs to accelerate implementation and minimize risk;
- encouraging procurement, the supply chain, and businesses to collaborate internally on the end-to-end process;
- the unlocking of greater value by all parties and a focus on continuous optimization; and
- the resulting long-term strategic value created for everyone, including 3PLs, through co-creation.

How it works

While the crowdsourced approach works slightly differently to meet each supply chain's unique needs, there is a general structure that each instance has in common. First, shippers share the state of their current network, operating constraints and future distribution needs with a select list of relevant 3PLs, carriers and other logistics service providers. They, in turn, are expected to develop solutions, including distribution node locations, transportation modes, routing options and pricing, all with the goal of revealing lower operating costs with no disruption to customer service levels.

Shippers also discuss strategic goals with providers and ask for solutions to operational challenges. These exchanges can reveal new possibilities for improving performance and reducing costs while advancing broader corporate goals. For example, a warehouse operator may know of a distribution center with available space in a critical market where other warehouses are full. A 3PL may know of a reliable local trucking company that can meet the stringent delivery demands of a key customer at lower rates than national carriers.

Shippers evaluate these options using advanced analytics to run scenarios and identify the best warehouse locations, shipping routes and carriers. The shipper's supply chain, procurement functions and business units collaborate throughout the process to arrive at the optimal network design and award scenario. The resulting network is easier to implement and generates transformative performance gains that turn logistics into a long-term profit driver and competitive advantage.

An excellent time to crowdsource

The current state of the logistics industry makes this an opportune time to crowdsource. In our experience, eight out of 10 network designs have failed for supply chain managers in the past in one way or another. It takes the right partner, the right network footprint and exacting implementation to move goods efficiently while supporting efficient operations. Shippers can tap the deep well of experience and resources that logistics providers possess by appealing to them for their best solutions through the competitive process of crowdsourced network optimization.

Shippers will find a receptive audience among logistics providers looking to play a broader strategic role with their customers. Most 3PLs now offer "one-stop shopping" for a full range of logistics services. They are motivated to design comprehensive solutions beyond discrete services, such as transportation management or warehousing. By engaging third parties in the design process, supply chain managers not only gain access to insightful solutions, but they can also reach an effective solution much faster, with scenarios built for long-term planning bolstered by input from procurement and other internal areas that are important to network design.

The crowdsourced approach works with the right set of analytical tools, thought leadership, and program management capabilities for co-creation of a solution. The right preparation, in effect, provides an ideal ship to sail through the perfect storm and find very favorable conditions on the other side.

The right distribution strategy affects logistics performance

Extensive implementation of a formal distribution strategy can yield both performance benefits and a competitive advantage

By Becky Partida, APQC

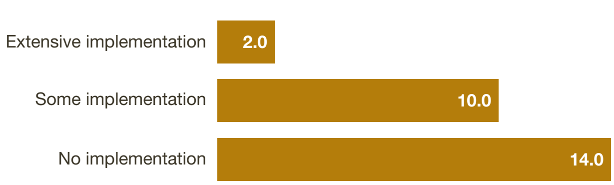
The ways in which organizations get their products to their end customers can vary based on industry, business model and financial goals. For some organizations, it may be best to sell directly to the end customer. For others, it may make more sense to distribute their products to customers through intermediaries. The creation of a formal distribution strategy enables organizations to determine the route that best meets their needs, as well as which customers to target and where.

By Becky Partida, Senior Research Specialist – Supply Chain Management, APQC

When creating a formal distribution strategy, an organization balances the right number and locations of distribution channels in addition to the types of distribution channels needed. The key is for organizations to consider their products and their customers to determine the distribution methods that are the most advantageous.

Having a well thought out distribution strategy yields many benefits for an organization's logistics performance. According to APQC's Open Standards Benchmarking data in logistics, a strong majority of organizations (about 90%) have implemented a formal distribution strategy. However, only about half have extensively implemented their strategy. The organizations with extensive implementation have much shorter cycle times associated with processing customer orders and incorporating components into their inventory. These organizations also spend less to define their overall logistics strategy.

FIGURE 1
Formal distribution strategy and customer order cycle time
(Median cycle time in days)



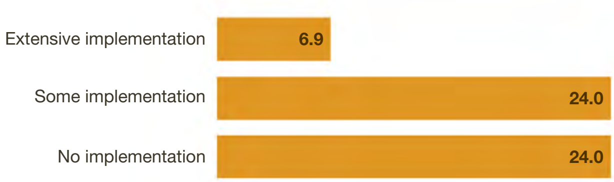
Source: APQC

Cycle times for customer orders

Organizations that have extensively implemented a distribution strategy have a clear advantage with regard to cycle times for their customer orders. When calculating customer order cycle time, APQC measures the days from when a customer places an order to when the purchased items are delivered to the customer. As shown in Figure 1, there is a large difference in the median number of days needed by organizations with extensive implementation of a strategy and the number of days needed by organizations without a distribution strategy.

At the median, organizations with extensive implementation need only two days to complete customer orders, whereas organizations with some implementation need a median of 10 days. Those organizations without a formal distribution strategy need a median of two weeks for their customer orders. These results indicate that the more extensively an organization has

FIGURE 2
Formal distribution strategy and dock-to-stock cycle time
(Median cycle time in hours)



Source: APQC

developed a formal distribution strategy, the more quickly it is able to process and deliver on its orders.

Those organizations with extensive implementation also have faster pick-to-ship cycle times for their customer orders. At the median, they need only 18 hours to pick ordered items within warehouses and prepare them for shipping. Organizations with some implementation of a distribution strategy need a median of 20 hours to complete this task, and those with no implementation need a median of 24 hours to complete this task—the equivalent of three business days.

The shorter pick-to-ship cycle times of organizations that have extensively implemented a strategy is one factor contributing to their shorter customer order cycle times. The big-picture thinking needed to extensively adopt a formal distribution strategy may also drive how these organizations design and implement their other logistics processes. This mindset can in turn impact the processes they use for picking items for customer orders and lead to a shorter pick-to-ship cycle time.

Dock-to-stock cycle time

Organizations that have extensively implemented a distribution strategy also have much shorter dock-to-stock cycle times for deliveries they receive from their suppliers. As shown in Figure 2, their median cycle time is about 17 hours shorter than that of organizations with some or no implementation.

Organizations that have extensively implemented a distribution strategy also have much shorter dock-to-stock cycle times for deliveries they receive from their suppliers.

This jump in performance indicates that organizations with more extensive implementation extend their efforts to ensuring that components for their products are quickly incorporated into their inventory to support efficient production.

FIGURE 3

Formal distribution strategy and cost to define logistics strategy

(Median cost per $1,000 revenue)

Source: APQC

This in turn has a positive effect on their ability to process and fulfill orders.

It is interesting that organizations that have implemented a distribution strategy only to some degree have the same median dock-to-stock cycle time as those with no formal distribution strategy. This implies that organizations with only some implementation have not yet extended their strategic focus to the more tactical aspects of order fulfillment and distribution. Those organizations in the process of implementing a distribution strategy could further improve their logistics performance by evaluating how efficiently delivered components are incorporated into stock.

Cost to define logistics strategy

Organizations with extensive implementation also spend less on defining their logistics strategy than their counterparts with some or no implementation. As shown in Figure 3, organizations with some or no implementation spend nearly the same amount per $1,000 in revenue at the median to define their strategy. Organizations with extensive implementation, however, spend about a dollar less on this activity.

For an organization generating $1 billion in annual revenue, this would mean a savings of over $1 million on defining a logistics strategy associated with the extensive implementation of a formal distribution strategy. These organizations have created a more in-depth strategy for distribution, and it is logical that their efforts have extended to the entire logistics process. Yet they have also found a way to make their strategy development more cost effective. As with their processes for fulfilling orders, these organizations have likely done an examination of their process for strategy development to identify areas of inefficiency. It may also be that they conduct extensive strategy development at regular, set intervals with only minor modifications as needed.

A competitive advantage

APQC's data indicates that organizations with extensive implementation of a formal distribution strategy perform better on multiple logistics measures when compared with organizations that have little to no implementation of such a strategy. However, APQC believes there is value in setting a formal strategy to any degree, even if it is not yet possible for an organization to achieve extensive implementation. Organizations with some implementation still perform better with regard to customer order cycle time and pick-to-ship cycle time than do organizations with no formal strategy at all.

As with many practices aimed at providing long-term advantages to a business, setting a formal distribution strategy does require the investment of resources and time. However, it also provides the potential for benefits that extend beyond logistics performance. Shorter customer order cycle times can lead to higher customer satisfaction, which can lead to repeat and increased business.

Extensively implementing a distribution strategy also gives an organization a competitive advantage. It spurs an organization to evaluate how best to deliver products to end customers, whether that be through direct sales, to an intermediary, or a combination of the two. It also enables an organization to identify certain geographic areas or customers to target in its sales, which results in the most effective use of its efforts.

The key to successfully using a distribution strategy is to ensure that it aligns with the overall business strategy. Even if an organization cannot invest in an extensive implementation, having that strategy align with broader business goals will yield the greatest benefit for logistics performance and beyond.

About APQC

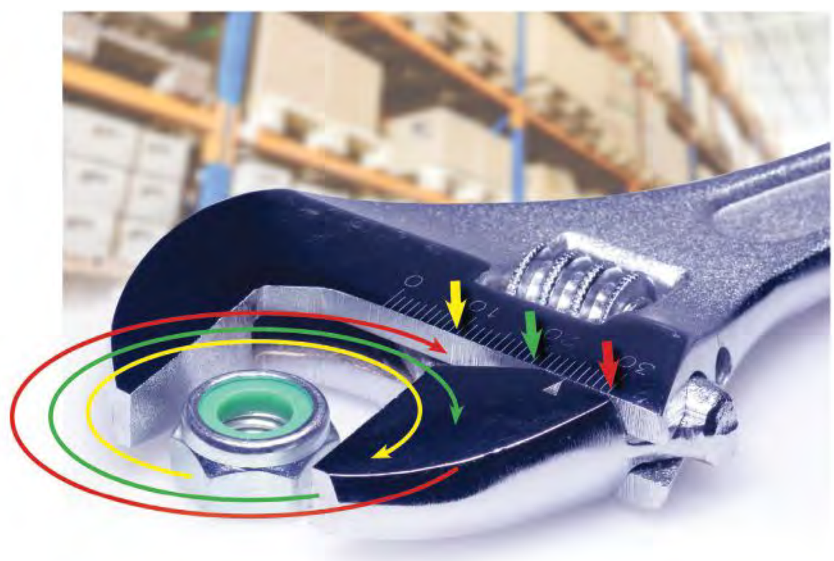
APQC helps organizations work smarter, faster, and with greater confidence. It is the world's foremost authority in benchmarking, best practices, process and performance improvement, and knowledge management. APQC's unique structure as a member-based nonprofit makes it a differentiator in the marketplace. APQC partners with more than 500 member organizations worldwide in all industries. With more than 40 years of experience, APQC remains the world's leader in transforming organizations. Visit us at apqc.org, and learn how you can make best practices your practices.

2017 Warehouse/DC Operations Survey:

In the thick of e-commerce adjustments

As e-commerce fulfillment pressure continues to climb, our annual survey points to the many changes taking hold—from more investment in automated approaches to piece picking, more use of robotics, increased interest in throughput metrics and general process improvement.

BY **ROBERTO MICHEL**, CONTRIBUTING EDITOR



During the adaptation of industry trends, there comes a point when you pass the early stages of adjustment and dive into really doing things differently. Our "2017 Warehouse and Distribution Center (DC) Operations Survey"shows us an industry that's now in the midst of that change—and we're getting into the thick of e-commerce adjustments.

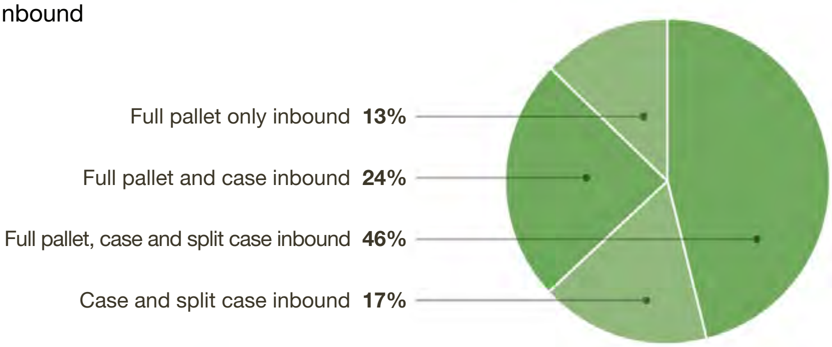
The tweaks include more investments in automated order picking, voice-directed systems and other technology. We're also seeing pain points continue to swell; foremost among these is the struggle to find qualified workers. Also emerging are data that suggest respondents may be reshaping their DC networks with smaller facilities to serve as fulfilment centers closer to the point of demand.

The survey, conducted annually by Peerless Research Group, drew more than 300 responses this year from professionals in logistics and warehouse operations management across multiple verticals. One of the clearest data points, and the issue that is likely driving change of many types, is the level of e-commerce involvement, according to Don Derewecki, a senior consultant with St. Onge Company, and Norm Saenz, Jr., a managing director with St. Onge Company, a supply chain engineering consulting company and

Nature of DC's inbound/outbound operation

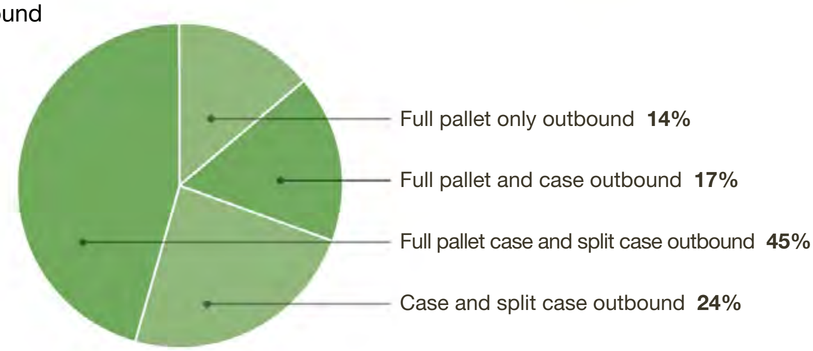
What is the nature of your distribution center's operation?

Inbound



In what unit load quantities are products shipped outbound?

Outbound



Source: Peerless Research Group (PRG)

partner for this annual survey.

In fact, 19% of respondents now say they do omni-channel fulfillment, up 3% from last year, while 37% say they do e-commerce, up by 2% from last year. This steady growth in e-commerce and all the pressures that brings around piece picking, labor management, and cycles times, is driving deep change for respondents, notes Derewecki. "Overall what we are seeing and what seems to be consistent with the study results is that there is more of requirement for speed and accuracy, driven very much by e-commerce expectations," says Derewecki.

In response, the survey shows that some technologies that had been flat the last few years are on the increase this year. Many of these involved each picking that is a hallmark of e-commerce fulfillment, notes Saenz. "The investments are increasing a bit more for certain areas like voice, pick-to-light, and put walls, which points to operators applying some technology to e-commerce pressures," says Saenz.

The annual survey of decision makers for warehouse/DC operations spans multiple areas, including facility, labor and other operations trends, use of technology, capital expenditure levels, use of metrics, and what respondents see as their most challenging industry issues. We also ask about disruptions from natural disasters, and with the disastrous hurricane season of 2017 fresh on people's minds when the survey was in the field, the response for this question jumped, with 15% saying they had experienced a catastrophic event, up from just 6% in 2016.

Most participating companies came from manufacturing (46%), followed by distributors (27%), third-party logistics providers (11%) and retailers (6%). Leading verticals included food & grocery, automotive & aerospace, general merchandize, electronics, fabricated metals, and paper products.

Operations snapshot

In recent years, the survey has trended toward "more" as the norm when it comes to factors like facility clear heights and labor forces. This year's survey results, however, has some data that runs contrary to these recent trends, but is consistent on others like the nature of inbound and outbound shipments, as well as the steady march of e-commerce.

For 2017, 14% of respondents handle full pallets on the outbound side, up from 9% last year. On the inbound side, full pallet was only at 13%, which is the same as last year. On the outbound side, 45% handle full pallet, case and split case, while 24% handle case and split case, for a total of 69% for those two answers, the same as last year. Thus, while the response for outbound "full pallet only" grew slightly, the outbound profile is relatively consistent.

Wholesale (67%) and retail (58%) remain the most common channels serviced, with wholesale staying equal to the previous year's 67%, and the response for retail down by 2%. This year, 37% say that they service an e-commerce channel, up from 35% in 2016. Additionally, 19% say they have an omni-channel service environment, up from 16% last year.

While there is likely some overlap on these answers, 56% now say they service omni-channel or e-commerce needs.

How channels are being fulfilled—in terms of using third-partly logistics (3PL) sites, servicing channels in-house (self-distributed) from one DC, or self-distributed with separate DCs for different channels—also experienced some change. Those saying they self-distribute for all channels from one DC fell from 42% last year to 37% for 2017, while 30% now say they self-distribute with separate DCs for different channels, up from 24% in 2016.

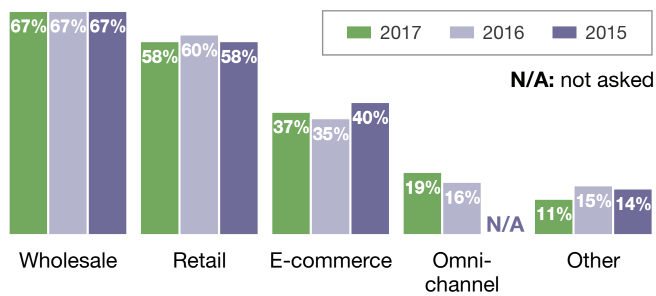
The survey's findings on inventory where slightly different from the previous year. The average number of SKUs declined to 13,130 this year from 13,774 the previous year. The percentage of SKUs that are conveyable or can be handled robotically was 29%, down from 36% the year previous. Annual inventory turns for 2017 came in at 8.5 turns, a decline from 9.2 turns the year previous.

While more turns is typically desirable, a couple of factors may be playing into the slower movement. One, notes Derewecki, is that the cost of financing remains low, so there is less cost involved in carrying more inventory than if rates were higher.

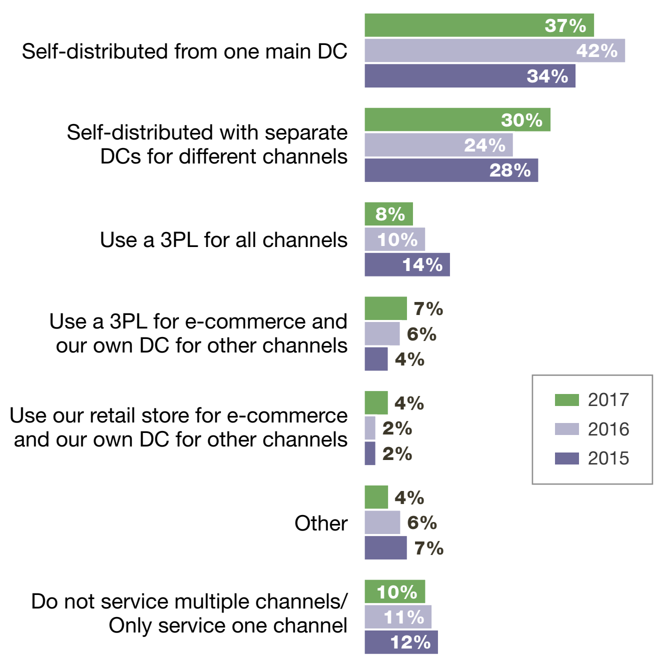
The widening of the Panama Canal and enhancements to some U.S. ports to accommodate larger freighters also has tended to increase the volume of cargo that can be imported at an attractive cost. Such factors may be contributing to a tendency to carry more inventory, notes Derewecki, in addition to the need to maintain high service levels for multiple channels.

At the same time that some of these macro-level factors may be driving inventory levels higher, respondents are after better, tighter inventory control. In fact, when asked about actions taken to lower operating costs, "improving inventory control" was the second most common answer, with a 63% affirmative response, up from 60% the previous year.

Market channels serviced by company



How multiple channels are being fulfilled



Source: Peerless Research Group (PRG)

DCs and labor forces

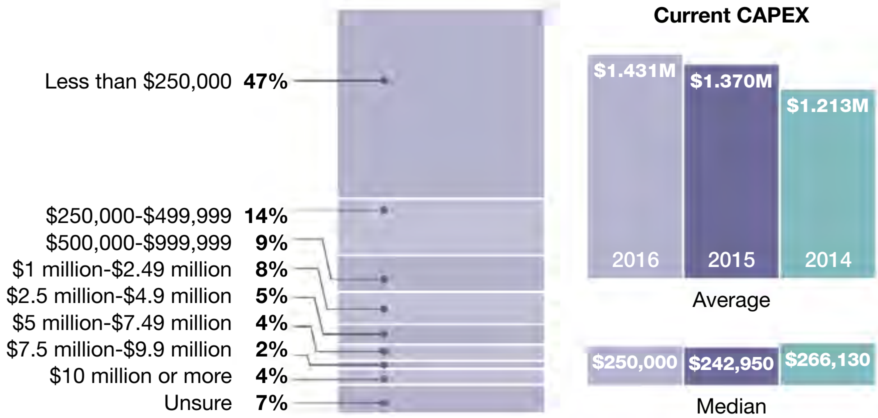
The trend toward "bigger, taller and more" when it comes to facilities and labor altered slightly for the 2017 survey. For example, when asked about most common square footage (respondents have square footage ranges to select from) for buildings in the DC network, the average for 2017 was 193,190 sq. ft., down slightly from 199,040 feet last year.

Average clear height of buildings was 29.8 feet for 2017, down from 31.1 feet in 2016, and 30.8 feet the year previous. However, 27% of respondents said that clear height ranged from 30 feet to 39 feet, up 1% from 2016.

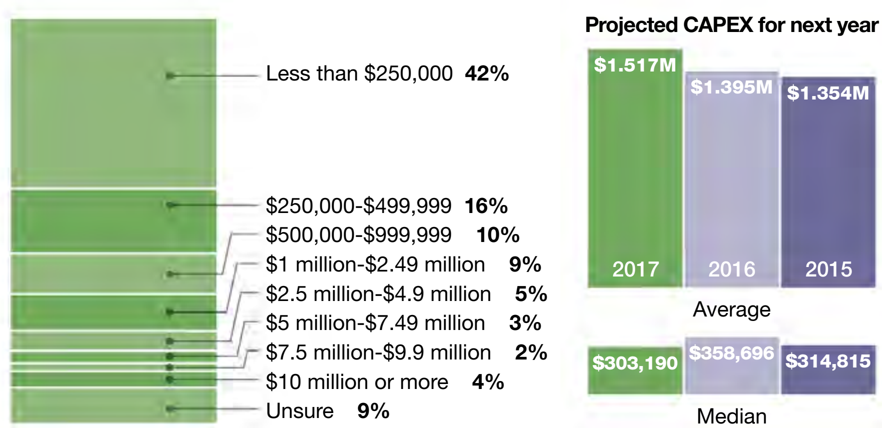
Total square footage in the network averaged 473,400 sq. ft., down from 539,00. The median dropped as well, from 240,410 to 176,600, while the "mega-sized" DC network response (two million sq. ft. or more) stayed at 10%.

When it comes to the most common square footage for a single DC, when the network is four buildings or more, the average square footage for 2017 was 264,675, up slightly from 264,445 last year. For networks of three buildings or less, the average square footage was 159,510 in 2017, down from 178,090 last year, but very close to the

2016 capital expenditures for warehousing equipment and technology



Estimated capital expenditures for warehousing equipment and technology in 2017



Source: Peerless Research Group (PRG)

158,955 sq. ft. back in 2015.

Why the shift in facility and DC network sizes? To some extent, there is natural variation year to year due to different sets of respondents. Another factor at play may be the growth of e-commerce, notes Saenz. With industrial real estate availability tight, and a growing need to service e-commerce orders quickly, it may be that some operators are opening relatively smaller fulfillment centers versus big DCs that service traditional channels and large regions.

"I think e-commerce is really starting to drive some of the survey results we're seeing, even in areas like clear heights or smaller facilities," says Saenz. "Buildings last a long time, so some smaller facilities built decades ago may be getting repurposed as fulfillment centers for e-commerce. Also, I think the growth in e-commerce volume has pushed the need to have the inventory and processes set up in a separate building. As a result, some of the findings that at first glance seem confusing start to make sense once you realize that e-commerce growth is driving various changes."

When asked about DC expansion plans, 23% said that they plan to expand square footage, down slightly from 27% last year. However, 17% say they plan to expand the number of buildings, up 3% from 2016. Employee/labor expansion plans for DCs also are on the rise. Over the next 12 months, 36% are foreseeing expansion in the number of employees, up from 33% last year.

The number of employees in a DC network trended slightly downward (respondents pick from brackets their headcount falls within). For 2017, the average number of employees for a network was 228, down from 278 in 2016. However, the 1,000-plus employee bracket drew a 12% response, up slightly from 10% in 2016.

The "less than 25" employee bracket grew significantly, while the 500 to 999 employee range decreased from a 11% response in 2016, to just 5% this year. These changes might be due to a different mix of respondents, or deeper shifts in DC networks that may be developing.

Capital expenditures continued the general growth pattern of recent years. The average current capex reached $1.43 million in 2017, up from $1.37 million last year. Median capex increased from $242.95 million last year to $250,000 this year.

When it comes to estimated capex for the next year, the average projection is $1.51 million, up from $1.39 million from last year, while the median for projection comes to $303.19, down from $358.69 the previous year. "There's some new level of investment that's indicated," notes Saenz. "It's not an outrageous increase, but consistent with what might be expected in trying to handle e-commerce more efficiently."

Solutions and metrics

The types of technology investments respondents are interested in generally align with the pressures of e-commerce order picking and fulfillment. For instance, 10%

indicated that they use some form of automated order picking, up from 3% from last year and the 7% from 2015.

Among specific picking technologies, 12% say they are using a "parts-to-person" system, up from 10% in 2016.

Voice assisted solutions with no scanning came in 7%, up from 3%, while voice with scan verification was also 7%, down 1% from the previous year. Robotic or other automated technology was in use by 5% of respondents, up from 3% last year. Use of automated storage and retrieval systems was up by 1%, while automated guided vehicle use grew from 3% to 6%.

When it comes to "order filling" techniques, 20% use a "put" to order method, up from 15% in 2016. Use of put walls also grew by 2%.

Use of warehouse management system (WMS) software, from various types of vendors as well as legacy/homegrown, grew from 83% across all types last year to 87% this year. Best of breed WMS grew slightly from 11% to 13%, but somewhat surprisingly, so did the response for use of legacy systems, up by 7%.

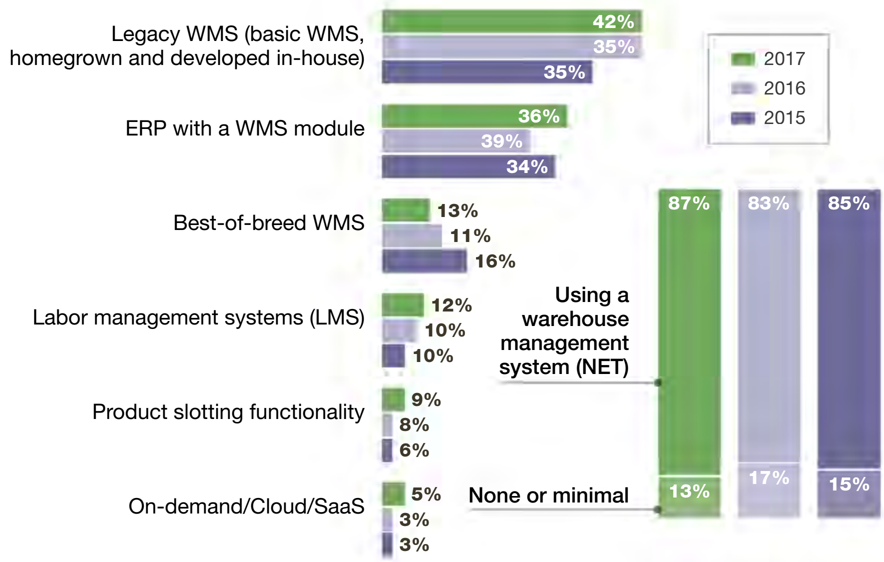
While it's possible that packaged solutions from ERP and WMS vendors have been around so long that some consider older packaged solutions as legacy, the overall trend is that WMS is in use at the vast majority of respondent locations. In keeping with that use level, 60% of respondents say their primary data collection method to gauge productivity is "automated through a WMS," up from 59% last year. Manual data collection methods are used by 55% of respondents, down from 57% last year.

Overall, the technology portion of the survey reflects that operators are layering in more automation, though not necessarily big ticket, fixed automation systems. "The e-commerce world drives the need for more labor, and as a result, you have the need to use some forms or automation to give you the productivity gains you need," says Saenz.

Derewecki agrees that there is strong interest in technology as a means of dealing with the labor-intensive requirements of e-commerce, especially solutions that are quick to reconfigure and change as DC workflows evolve.

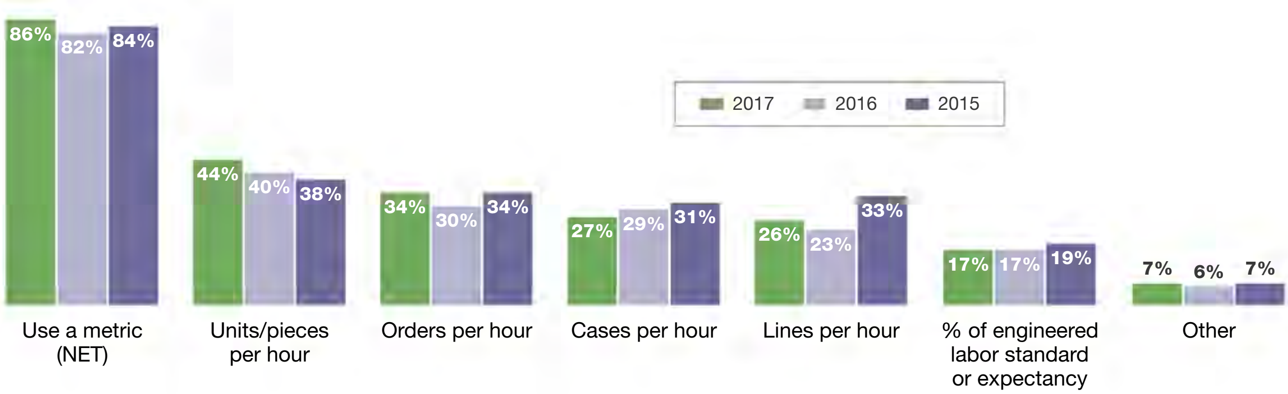
"There is greater interest in flexible

Warehouse management systems in use



Source: Peerless Research Group (PRG)

Productivity metrics in use



Source: Peerless Research Group (PRG)

technology solutions like voice-directed solutions or RF-directed picking, and to some extent, robotics," says Derewecki. "Generally, the technologies of interest are all trending with the piece picking volumes associated with e-commerce. Companies are interested in finding ways to fulfill orders with fewer people, because people aren't easily available right now."

The percentage of respondents using some type of productivity metric grew from 82% last year to 86% this year. Common metrics used include units/pieces per hour (44%), orders per hour (34%), cases per hour (27%) and lines per hour 26%. Use of "percent of an engineered standard" remained at 17%, the same as last year. Metrics that gained a bigger response this year were units/pieces per hour, orders per hour, and lines per hour.

Respondents continue to take a range of actions to lower operating costs, with 95% taking an action of some kind. Common actions include improving warehouse processes (70%), while 63% tell us they're trying to improve inventory control, an action that grew by 3% over 2016. Changing racking and layouts increased by 5%, while reducing staff as a means of lowering costs decreased to 21% this year from the 23% who used that as a cost reduction measure in 2016.

Survey findings show continued strong use of metrics as well as interest in cost management methods such as improving warehouse processes and inventory control—pointing to an industry that wants to streamline and standardize as much as possible, both to manage costs and to respond to customer expectations.

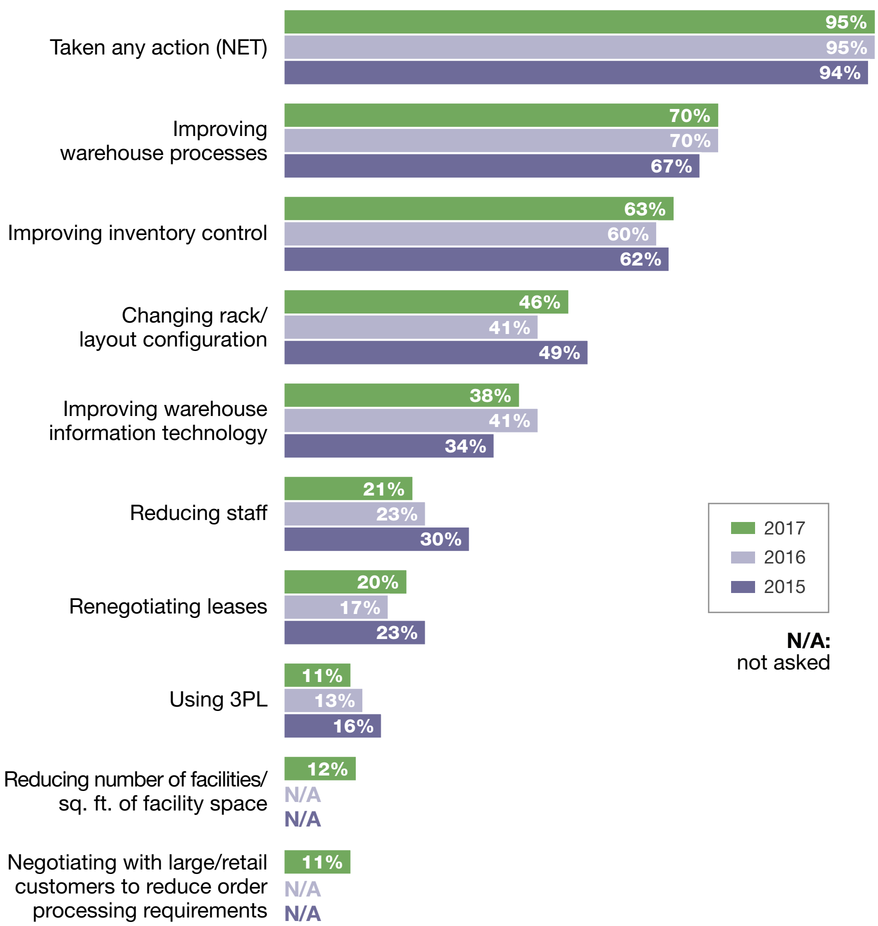
"Companies are looking to standardize processes as part of making it easier to comply with rising customer expectations for quality and turnaround time," says Derewecki. "There is an increasing emphasis on continuous improvement—on streamlining and standardizing—as a means of managing costs and delivering more value to customers."

Labor as top issue

Given the picking, packing and shipping tasks associated with e-commerce, it's not surprising that the inability to attract and retain labor has become the top industry pain point. Whereas last year, "insufficient space for inventory or operations" remained the leading pain point, this year it gave way to the inability to find hourly workers, which grew from 41% last year to 49% this year.

The insufficient space issue—at 40% this year—still

Actions taken to lower DC operating costs



Source: Peerless Research Group (PRG)

ranked number two on the list of major issues, followed by inadequate information systems support (36% this year) and outdated storage, picking, or material handling equipment (33%). What's more, the fifth most cited issue—the inability to attract and retain qualified supervision—shot up from 11% in 2016 to 25% this year.

"There is a lot of competition to find and retain good, quality employees, so DCs are struggling to find good people," says Saenz. "This issue is driven in large part by the increase in smaller order handling. E-commerce is driving change in terms of space, different types of facilities, for people, as well as automation."

For the first time in recent years, the percentage of respondents performing value added services (VAS) reached 90%. Frequently cited types of VAS include special labelling (54%), lot number control (34%), product assembly (31%), serial number control (30%), and kitting (29%). Of these, assembly was up by 4% and kitting by 3%.

The majority of respondents (64%) report that their systems have SKU weight and dimension data in their item masters. This is down from 68% last year, but only 12% see it as a major industry issue, just like last year.

The survey includes an open-ended comment section about "significant change" respondents are seeing. And while responses vary, common comments included adding 3PLs, becoming more automated, adding space or racking, implementing technologies like voice picking or RF scanning, concerns about finding labor or improving the workforce, improving warehouse processes.

These types of comments make sense in the current environment. E-commerce is marching on, the economy is good, so challenges operators have been experiencing the last few years are only accelerating, concludes Derewecki.

"E-commerce has really become a game changer in warehouse operations," says Derewecki. "When you couple that with the expectation that the general economy will get better, it puts increasing pressures on DCs on many fronts—on turnaround times, on being able to find more space on short notice, or finding good hourly workers and supervisors."

As a result, Derewecki adds that we will continue seeing operators trying to standardize and upgrade processes, and applying some automation. "They're automating where it's justified, to reduce the long-term dependence on a large labor force, and also, to be readily be able to absorb surges in demand."

Roberto Michel is a contributing editor to SCMR

A SPECIAL SUPPLEMENT TO:

SUPPLYCHAIN MANAGEMENT REVIEW

Top 20 AUTOMATIC DATA CAPTURE SUPPLIERS

After two years of sluggish sales, ADC suppliers saw sales increase as a growing number of companies turn to ADC to accommodate the demands of e-commerce operations and omni-channel initiatives.

BY **BRIDGET McCREA**, EDITOR AT LARGE

As **the fully wireless workplace** continues to come into focus, and as warehouse and DC managers are tasked with doing more with less while exceeding customers' ever-evolving demands, the global market for automatic data capture (ADC) solutions is growing exponentially. Global sales for such products, which are used in factories, warehouses and logistics applications, reached $6.131 billion in sales in 2016 and are on track to hit the $6.358 billion mark in 2017, according to Massachusetts-based VDC Research Group.

Breaking those numbers down, sales of rugged mobile devices reached $2.756 billion last year, while sales of bar code hardware (scanners and printers) were $3.375 billion. Between 2016 and 2021, VDC is projecting a compound annual growth rate (CAGR) of 3% and 5% respectively in those sectors between 2016 and 2021, with sales of rugged mobile devices reaching $3.189 billion and bar code hardware growing to $4.301 billion over the next five years.

Top 20 ADC suppliers

2016 RANK	2015 RANK	COMPANY	TOTAL 2016 REVENUES (in millions)	TOTAL 2015 REVENUES (in millions)	North American Headquarters	Web site	Bar code printers	Handheld scanners	Stationary scanners	RFID	Mobile computers
1	1	Zebra Technologies (includes Motorola Solutions, Psion)	2,130	2,150	Schaumburg, Ill.	zebra.com	X	X	X	X	X
2	2	Honeywell (includes LXE, Intermec, Datamax-O'Neil)	1,022	1,189	Morristown, N.J.	honeywellaidc.com		X	X		X
3	3	Datalogic	556	524	Eugene, Ore.	datalogic.com		X	X	X	X
4	4	SATO	200	192	Charlotte, N.C.	satoamerica.com	X			X	
5	5	Toshiba TEC	158	165	Irvine, Calif.	toshibatec-ris.com	X			X	
6	6	Denso Wave	123	123	Southfield, Mich.	denso-adc.com		X			
7	7	Cognex	105	99	Natick, Mass.	cognex.com		X	X		X
8	8	Casio Computer Co. Ltd	78	88	Dover, N.J.	casio4business.com		X			X
9	9	SICK AG	86	87	Minneapolis, Minn.	sick.com		X	X	X	
10	10	Fujian Newland	68	74	Fremont, Calif.	newlandna.com				X	X
11	11	Avery Dennison	65	69	Glendale, Calif.	averydennison.com	X			X	
12	12	TSC Printers	77	62	Pomona, Calif.	tscprinters.com	X			X	
13	13	Bluebird Corp.	77	59	Palisades Park, N.J.	mypidion.com	X				X
14	14	Shandong New Beiyang	70	54	Shandong, China	newbeiyang.com	X		X		
15	15	NCR	57	50	Duluth, Ga.	ncr.com	X	X	X	X	
16	16	Unitech	46	49	Los Angeles, Calif.	us.ute.com		X		X	X
17	17	Opto Electronics Co. Ltd. (Opticon)	39	42	Renton, Wash.	opticon.com		X			X
18	18	cab Produkttechnik GmbH	41	40	Tyngsboro, Mass.	cab.de/en	X				
19	19	M3 Mobile	34	35	Iselin, N.J.	m3mobile.net		X	X	X	X
20	20	CipherLab	31	27	Plano, Texas	us.cipherlab.com		X	X		X

Source: VDC Research

AutoID market analysis

Estimated global shipments of AIDC hardware (in millions of dollars)

	2016	2017	2021	CAGR 2016-2021
Rugged mobile devices*	2756	2846	3189	3%
Bar code hardware (Scanners and printers)	3375.8	3512.2	4301.5	5%
TOTAL	**6131.8**	**6358.2**	**7490.5**	**4.1%**

*Includes forklift, handheld/PDAs and wearables
Source: VDC Research

Richa Gupta, senior analyst for AutoID and data capture at VDC Research, says in 2017 she's seeing "a bit of a downward trend" in the markets that she covers, which include bar code scanning and printing. "This is primarily due to the performance of some of the leading players within these markets," says Gupta, who adds that end user customers are "really pushing back" on refresh cycles for such investments right now and that some product lines have become dated.

Despite those dips, Gupta says 2017 kicked off better than expected for the ADC market, both for bar code scanning and printing. "We've seen a lot of new product announcements being made by some of the leading vendors, and that's helping to accelerate investments in ADC solutions," she explains. "There are also some macroeconomic trends in place, namely a better overall business environment that's more conducive to making such investments."

Leading the pack

Comprising handheld and stationary bar code scanning and imaging devices, bar code printers and ruggedized mobile computing solutions, the ADC market tracked by VDC doesn't include consumables associated with automatic data collection (i.e., bar code labels). Two top vendors continue to reign in this marketplace, although a number of smaller players are also making positive inroads.

Zebra ranked No. 1 with total 2016 revenues of $2.130 billion in ADC sales, followed by Honeywell ($1.022 billion) and Datalogic ($556 million). SATO, Toshiba TEC, Denso Wave, Cognex, Casio Computer Co., SICK AG and Fujian Newland rounded out the top 10 by revenues in 2016.

For the handheld scanner sector, Gupta says early-2017 results indicated that overall revenues are 9.6% higher than the year-ago period, following a "greatly improved revenue performance by both Honeywell and Zebra Technologies, market leaders who had a less-than-stellar 2016," she notes. From a scanning technology standpoint, camera-based imager sales continue to drive overall market growth (up more than 16% in the first quarter of the year), making up for sharp declines in laser scanner sales (down almost 9%). Camera-based 2D imagers will account for 74% of overall handheld scanning revenues by 2021, up from 61% in 2016, according to VDC Research.

Honeywell and Zebra, market leaders through acquisitions, have seen their combined vendor share position in this segment drop from more than 60% in 2011 to 53.7% during the first quarter of the year. "During the same period, companies like Cognex, Datalogic and Fujian Newland have seen a marked increase in their overall share contribution," Gupta notes, adding that for the incumbents to maintain and grow their market share, it will be "very important to refresh and update product lines to compete with emerging contenders."

This year, Datalogic, Honeywell and Zebra Technologies are all making strategic investments toward expanding and refreshing their handheld scanner portfolios to address competition in this fragmented marketplace. "The focus is also on setting apart product portfolios by thinking beyond conventional solution types and form factors," Gupta says. "This includes sleds, companion scanners, multipart form scan applications like Zebra's SimulScan, and device management platforms for maintenance and support like Honeywell's Remote MasterMind and Zebra's Operational Visibility Service (OVS)."

Thermal printing and bar coding

Desktop printers generate a higher percentage of overall revenues at the expense of high-performance and relatively more expensive industrial printers, according to VDC. This speaks to the broader applicability of the lower cost form factor. "Honeywell, SATO, Toshiba TEC and Zebra Technologies cannot rely on brand name recognition and product quality alone to achieve their sales and profitability targets," Gupta points out, noting that competition is especially acute in high-growth regions like China, Germany and South Korea, where the vendor landscape is a healthy mix of market leaders and emerging contenders.

"It will be critical for hardware vendors to meet compliance legislation, pricing and application-specific labeling requirements of leading end-user verticals in every region in which they compete," says Gupta, who expects the global stationary thermal bar code printer market will grow 4.4% in 2017. "Our research indicates that revenues are picking up so far in 2017 compared to the year-ago period, due to factors including new product introductions by vendors like Honeywell, TSC Printers and Zebra Technologies, and efforts to address traceability-related requirements in manufacturing and warehousing."

In the printer segment, Gupta has seen a growing interest in on-demand color label printers (e.g., for chemical manufacturers that use red warning labels on their products and/or packaging). So where traditional thermal bar code label printer makers focus on monochrome products, companies like Epson (on the inkjet side) are "discussing the possibility of including color in labels," says Gupta, "which is not something that your typical or traditional bar code label printer would be able to accomplish."

On the mobile thermal printing front, Gupta says the market will grow this year at a CAGR of 6.4%, but says revenues for the mobile printer market were relatively flat in 2016 (compared to the prior year, when market leaders experienced a significant sales bump). The limited growth reflected weak demand in the Americas and Europe due to macroeconomic concerns and conservative spending, as the US economy expanded 1.6% in 2016 (the lowest since 2011), and the Eurozone grew at 1.7%, VDC reports.

"Americas, the biggest market for mobile printer solutions by global revenue share, will grow at a 6.5% CAGR through the forecast period," Gupta adds. "Asia Pacific continues its stellar growth path, up 9% year-over-year backed by investments into the growing retail and logistics segments in the region, and will be the fastest growing region through 2021."

Faster shipments, lower labor costs

David Krebs, vice president of VDC's enterprise mobility and connected devices, says the key trend driving the mobile market over the last couple of years has been the impact of e-commerce operations and retailer omni-channel initiatives on warehouse/DC development and the expansion of these facilities. According to a recent VDC survey, the top two warehouse improvement initiatives for 2018—which are consistent with years past—are on-time shipments/getting orders shipped faster and reducing labor costs.

With the average warehouse space in the United States increasing by more than 40%—and during the same period, the average number of workers per warehouse has increased by 20%—Krebs says companies are adopting higher levels of automation and efficiency for their warehouse workers and overall operations.

Within the ADC market, Krebs says the key players have remained constant over the last year. "We are seeing some traction for rugged tablets mounted onto forklift trucks, and that's bringing companies like Dell, Xplore, Panasonic and Getac in the warehouse in addition to Apple and Samsung," he says, adding that demand for wearable computing and voice interfaces also continues to grow as organizations look to benefit from fully hands-free computing solutions.

"The real key here is the adoption of modern mobile computing solutions and adoption of next generation mobile operating systems like Android for warehouse operations," Krebs says. "Outside of 'Big Windows' solutions, Windows is a dead-end for mobile computers supporting warehouse applications."

While much of the rest of the market is migrating toward either Android or iOS to meet their mobile (handheld/smart phone) requirements, the ubiquitous Windows CE/Telnet solution remains resilient, says Krebs. "However, the aging installed base of legacy systems and their poorly designed user interface are keeping organizations from meeting their performance goals." This will be a driving force moving forward and particularly in 2018-2019, he adds.

Although VDC doesn't anticipate the Windows CE terminal to completely disappear, Krebs expects mobile modernization initiatives to accelerate over the next couple of years. "The top factors driving investments in next generation mobile solutions in the warehouse are the shift to Web-based backend applications; the age of installed base of mobile devices; the optimization of mobile workflows; improved ease of use of mobile devices," he says, "and mobile OS on existing devices nearing end of life."

Overall market trends

In looking at the overall market, Gupta says it's being driven by e-commerce and the various investments companies have to make to keep up with the rapid growth in online sales. "Across several industries, firms are investing in more data capture and labeling solutions to accommodate this explosive growth," says Gupta, "and namely from the warehouse/DC fulfillment perspective, which plays a critical role in supporting omni-channel distribution."

Noting that both 2015 and 2016 were largely flat in terms of overall performance within the ADC market, Gupta says things have picked back up in 2017. "Vendors seem to be doing much better this year, given all of the overarching trends that are governing these marketplaces that tend to invest in ADC solutions," she adds.

Editor's note: VDC Research Group no longer reports RFID market information. The analysis and graphs in this article reflect only the markets for rugged mobile devices and bar code scanners and printers.

Collecting the data

This is our 15th-annual look at the leading manufacturers of ADC hardware and solutions. Because the industry includes public and private companies, this is the ninth year that VDC Research Group compiled our data; since they are covering this technology every day, they are closer to the market. To make our list, companies must sell in North America, though the chart includes worldwide revenues. *Modern* does not include resellers, systems integrators or other companies that do not manufacture ADC hardware. Since our readers are primarily focused on supply chain solutions, we do not include companies whose primary focus is the retail checkout counter or non-industrial settings, like hospitals, libraries or resorts. Nor do we include companies that only manufacture consumables like bar code labels and RFID tags.

STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION

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15. Extent and nature of circulation:	Average No. Copies Each Issue During preceding 12 Months	Actual No. Copies of Single Issue Nearest Filing Date
A. Total no. copies (net press run)	12,911	13,864
B. Legitimate paid and/or requested distribution (by mail or outside the mail)		
1. Outside County paid/requested mail subscriptions stated on PS Form 3541	11,484	11,251
2. In-County paid/requested mail subscriptions stated on PS Form 3541	None	None
3. Sales through dealers and carriers, street vendors, counter sales and other paid or requested distribution outside USPS	134	121
4. Requested copies distributed by other mail classes through the USPS	None	None
C. Total paid and/or requested circulation (sum of 15B (1), (2), (3) and (4))	11,618	11,372
D. Nonrequested distribution (by mail and outside the mail)		
1. Outside County nonrequested copies stated on PS Form 3541	512	568
2. In-County nonrequested copies stated on PS Form 3541	None	None
3. Nonrequested copies distributed through the USPS by other classes of mail	None	None
4. Nonrequested copies distributed outside the mail	687	1,773
E. Total nonrequested distribution (sum of 15D (1), (2), (3) and (4))	1,199	2,341
F. Total distribution (sum of 15C and 15E)	12,817	13,713
G. Copies not distributed	94	151
H. Total (sum of 15F and 15G)	12,911	13,864
I. Percent paid and/or requested circulation (15C divided by 15F times 100)	90.60%	82.90%

16. Electronic Copy Circulation	Average No. Digital Copies Each Issue During Preceding 12 Months	No. Copies of Single Issue Published Nearest to Filing Date
A. Requested and Paid Electronic Copies	3,471	3,683
B. Total requested and paid print copies (line 15C) + requested/paid electronic copies (line 16A)	15,089	15,055
C. Total copy distribution (line 15F) + requested/paid electronics copies (line 16A)	16,288	17,396
D. Percent paid and/or requested circulation (both print & electronics copies) (16B divided by 16C x 100)	92.60%	86.50%

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Michelle McKeon (signed), Senior Audience Marketing Manager, 9/30/17