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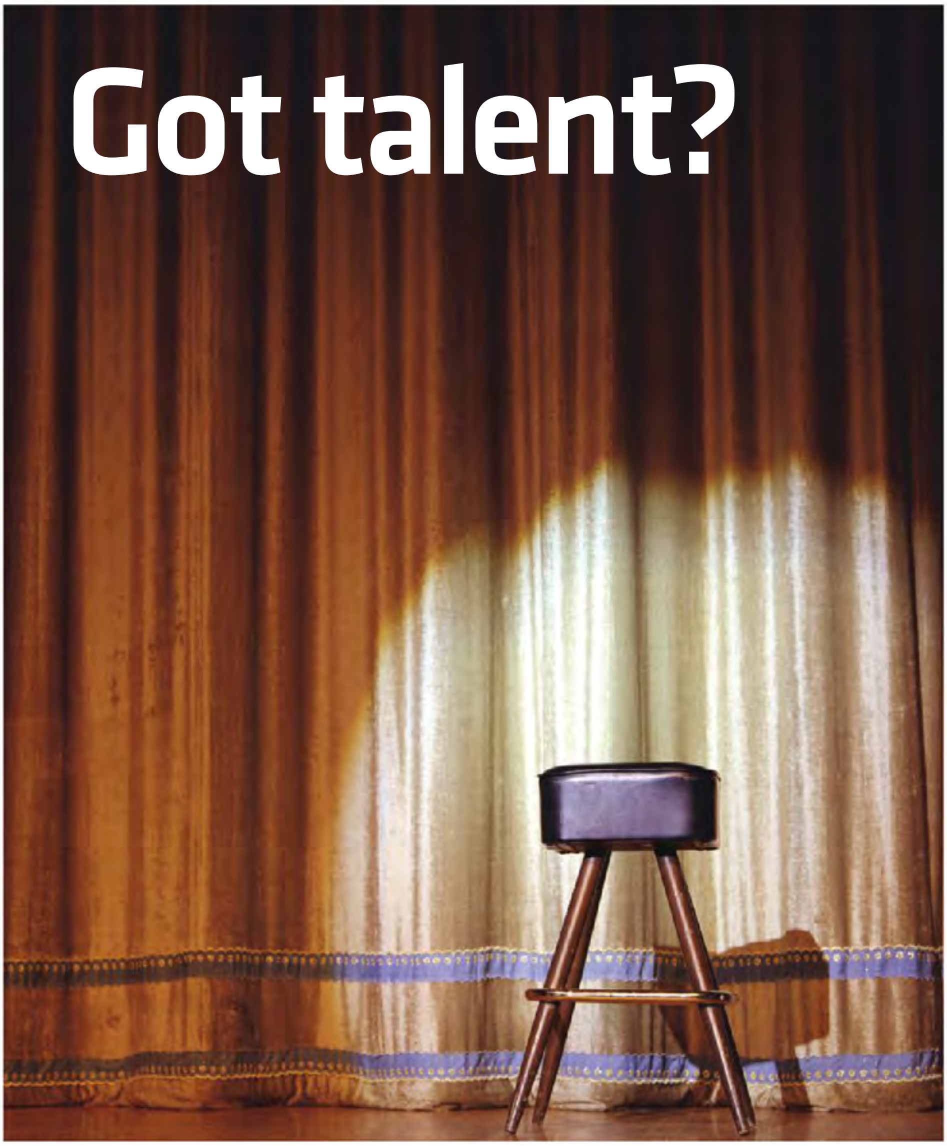

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Finding and keeping talent

A few years ago, a *Harvard Business Review* cover posed the question: What's the secret to winning in the global economy? The answer: Talent.

Without question, talent—or the lack thereof—was a leading theme at every session of every conference I attended this past year. I remember sitting through a compelling presentation on the Internet of Things and Big Data at APICS last fall. At the end, one of the attendees remarked that this was all well and good, but when it came to the skill set required to make IoT and Big Data a reality, her organization was like an empty stage. "I don't know where I'd find them," she added. If we'd been in church instead of a supply chain conference, you would've heard some "amens." Given the changes taking place at the speed of business, finding talent is perhaps the most important challenge facing supply chain managers.

Talent is the theme for the July/August issue of *Supply Chain Management Review*. We lead off with the second in a series on the strategic supply chain co-authored by Michigan State's Steven A. Melnyk. In this piece, Melnyk and Daniel J. Stanton write that the future of our profession is the customer-centric supply chain. That is one where cost-cutting is no longer job No. 1. Rather, running a supply chain aligned with your customers' metrics is the goal. Making that shift will require a new kind of manager.

In a similar vein, Accenture partner Michael A. Meyer explains why a continual focus on improving the current workforce and attracting new talent must be the new mandate for supply chain executives.

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Supply chains aren't just challenged at the executive level. As Tim Engstrom, a supply chain practitioner and adjunct professor at Elmhurst College, points out, supply chains are also facing a severe shortage on the operations floor. He and his co-authors contend that one untapped resource for the workforce of the future is people with disabilities. They present a manageable framework for adding these overlooked resources to your workforce.

We round out the issue with an article on how Google designed and implemented a unique supplier diversity initiative, co-authored by the executives and consultant who made it happen, and a roadmap for end-to-end planning from Ernst & Young's Can A. Dogan.

Finally, we've updated last year's listing of the supply chain certification programs offered by academic institutions and professional associations in North America. As with last year, we are publishing the full program description as a PDF available on scmr.com. It was one of our most read articles from 2016.

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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Outsource forecasting? Be careful.

Demand forecasting should be done in-house for effective and efficient integration with planning processes such as S&OP, and also for competitive and financial disclosure reasons.

I believe that planning and forecasting processes are cerebral, and in effect are both the brain and the heart and soul of a company's strategic business model. Managers that participate in these processes are usually the smartest and most analytically minded in a company. Therefore, these processes should be outsourced very minimally—if at all.

However, I've recently had a couple of conversations about companies that are experimenting with partially outsourcing their demand forecasting processes to external consultants. Apparently these companies want to leverage Big Data to forecast customer demand and are having a difficult time finding, hiring and keeping "data scientists."

Generally, I believe demand forecasting needs to be done internally for effective and efficient integration with planning processes such as sales and operations planning (S&OP). More importantly, it should be kept in-house for competitive and financial disclosure reasons. I would be less concerned with outsourcing some of the mechanistic aspects of running complex computer systems that support purely statistical forecasting processes. For example, generating the baseline forecast is an initial statistical forecast based just on historical demand data. (The baseline forecast is adjusted for factors such as future sales and marketing activities to collaboratively come up with finalized consensus-based demand forecasts.)

The forecasting process

A company's S&OP team needs to work collaboratively with a professionally run and independent forecasting organization.[*] Forecasters and planners must work hand-in-hand to help a company navigate toward corporate financial objectives. However, because forecasters must be unbiased, they should be not be subject to the pressures involved in demand achievement. Their main job is to develop quantitative forecasts (often weekly and monthly) based on marketing and sales activities, as well as other factors that affect future demand. This requires continual collaboration among forecasters and marketing and sales management. And, this collaboration should not be outsourced to external consultants.

There are various ways to organize a forecasting function. Some companies have a single centralized forecasting organization, while others have forecasters distributed throughout them, for example among business units. The latter sometimes has a "center of excellence" group that supports the distributed forecasters. Centralized forecasting departments and centers of excellence might report into any of a company's functional departments.

There are five skill sets required in a forecasting organization.[**] A forecaster might possess only one or a few of them. However, as a collective team, the forecasting organization should have all. The skills are: 1) an understanding of the business; 2) oral communication skills; 3) process management skills; 4) quantitative skills; and 5) computer skills. The first three are necessary to efficiently and effectively collaborate with a company's marketing, sales and management teams in order to develop and get a consensus of finalized demand forecasts. These should not be outsourced to external consultants.

Knowledge about the specifics of the company's business is paramount among these. Knowledge about business in general, a competitive company's business and a company's industry doesn't suffice. Outsourcing this skill is not even an option. The knowledge needs to come from forecasters that have worked at a company for a number of years,

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because it has a unique way it goes to market in terms of products, distribution/sales channels, pricing and promotional activities. Oral communication skills are necessary for collaboratively obtaining consensus among managers and executives, and also shouldn't be outsourced. Lastly, process management skills require the discipline needed to ensure that forecasts are developed and published on a timely basis. Meetings conducted to enable this need to be routinely scheduled, attended, productive and achieve objectives. The meetings, among executives and managers, should be moderated by a seasoned manager, not an external consultant.

The last two types of skills might be reasonable to outsource. In order to generate a baseline forecast, a forecasting organization expects its computerized forecasting system to have imbedded in it standard statistical forecasting techniques used to project historical demand. The system might also incorporate promotional and new product business into a baseline forecast. If internal forecasters know how to use the system, there is little need for external forecasters to be involved because incorporating internal market intelligence into the baseline forecast ultimately produces the finalized consensus-based forecasts. However, there are some reasons that external skills might be needed. A company might not be able to hire and retain forecasters with the requisite quantitative and computer skills needed to run the system. Another important reason to outsource is that standard forecasting techniques imbedded in software are not sufficient—especially for incorporating Big Data. Often, off-the-shelf forecasting software cannot easily incorporate downstream supply chain demand signals such as POS data, e-commerce sales and distributors' sales and inventories. In addition, the software is typically short on incorporating social media data, such as on-line product ratings and qualitative demand signals, leveraged to enable quick response to unexpected, short-term changes in demand.

At first blush, outsourcing to obtain external quantitative and computer skills to help generate a statistical baseline forecast makes sense, while all activities that involve collaborative forecasting need to be done by company employees. A caveat to this outsourcing is that there is significant risk in having customer demand forecasts reside outside the protection of a company's computer firewalls, put in place to bar the outside world from accessing internal proprietary data.

Risks outside the firewalls

S&OP is the connective tactical planning process between long-term strategic planning and short-term operational planning.*** If an S&OP plan is driven by strategic goals and objectives, the S&OP plan is aligned with a company's strategic intent. Because the operational plan is driven by the S&OP plan it, in turn, would also be aligned to the corporate go-to-market strategy. Thus S&OP becomes the connective or lynchpin process that helps enable strategy to be executed on plant floors and in distribution centers.

However, this type of strategy alignment means that all planning information (including plans and demand forecasts) should be kept away from individuals outside a company. Outsiders might use the information to a company's detriment. Thus the information ought to be kept internally and well protected by company firewalls. This helps to keep a competitive strategy from being comprised, potentially winding up in the hands of competitors and Wall Street financial traders.

Outsourcing forecasting to an external consultant comes with risks like these. It might happen despite a consultancy's assurances that your forecasts "are safe with us" because we have "Chinese Wall" barriers between our consulting teams. These walls preclude the teams from discussing your business among colleagues that are potentially working with your competitors or financial industry analysts. Given today's ubiquitous hacking, one possibility is that the consultant's system (that stores the forecasting information) can get hacked by competitors and inside information traders. Other ways this could happen involve greedy consultants that might be compromised with money and other favors, as well as other consultants that might take a job in these industries.

Competitors can use demand forecasts to reverse engineer a company's go-to-market strategy exposing its competitive advantages. Forecasts provide a telling peek into the details of a company's business model. They provide a window into the projected future of product lines, strategic customers, pricing, geographic focus, new product introductions and promotional activities; as well as highlighting important growth opportunities and sales/distribution channels. Competitors could use this type of information against a company. Competitor sales and marketing groups can put together tactical demand plans to help them win competitive battles in the marketplace.

Meanwhile, financial inside information traders can use this type of information to invest in the future prospects of a company. If the traders see the company is forecasting substantial new revenue growth they will be enticed to invest heavily. Or, if the future picture is showing a decline in revenue, they could short the company's stock. Surely when this type of insider trading is uncovered, the traders and consultants involved would have a lot of explaining to do. But also, the company itself could be viewed as complicit to the inside information trading stemming from the carelessness with which it treated demand forecasts.

To summarize, outsourcing forecasting quantitative and computer skills to a consultant may have some benefits, but they should be carefully weighed against the risks of demand forecasts becoming comprised.

* "Navigating a Course with Planning and Forecasting," *SCMR*, May/June 2014

** "Organizing the Forecasting Department," *Journal of Business Forecasting*, Summer 2003

*** "S&OP: The Linchpin Planning Process," *SCMR*, November 2011

Filling the void in the manufacturing supply chain

The Manufacturing Institute, Deloitte and APICs recently released a study, "Women in Manufacturing: Stepping up to make an impact that matters." The supply chain implications make this a "must read" for managers.

Patrick Burnson is the executive editor at *Supply Chain Management Review.* He welcomes comments on his columns at pburnson@peerlessmedia.com

Lest there be any doubt, women are going to be an important asset in the manufacturing supply chain going forward. That is among the conclusions of more than 600 survey responses from women professionals in the manufacturing industry, along with nearly 20 manufacturing executive interviews, conducted by the Manufacturing Institute, Deloitte and APICS.

The insights contained in this survey point to how companies can effectively recruit, retain and advance talented women in manufacturing, and illustrates ways that women in manufacturing are making an impact in the industry through programs like STEP (Science, Technology, Engineering and Production) Ahead.

The supply chain implications are clear industry experts says. "This study is an important step in understanding how we as an industry can make supply chain careers more attractive to women," said Abe Eshkenazi, APICS chief executive officer. "At APICS, we are dedicated to workforce development initiatives that address the supply chain talent gap. Ensuring that more women join the manufacturing workforce and find a path to success is a key part of the solution."

The study confirms why it's important to increase the number of women in the worldwide manufacturing workforce and that many players in the global marketplace are missing a critical talent pool, which could aid in closing the skills gap. Some key highlights from the study include:

- nearly three fourths (70%) of women indicate they would stay IN manufacturing if they were to start their career today;
- some of the most important employment characteristics for women in manufacturing include opportunities for challenging and interesting assignments, attractive pay and work-life balance; and
- the most impactful programs to help retain women in manufacturing include formal and informal mentorship programs, flexible work practices and increasing the visibility of key leaders who serve as role models.

The study also examines the positive effect of STEP Ahead, reporting insights from former honorees and emerging leaders who indicate STEP Ahead has helped raise the visibility of opportunities for women in the industry, manufacturing opportunities in the community and opportunities for women within their companies. The STEP Ahead honorees and emerging leaders number an estimated 300,000 individuals—from peers in the industry to school age children—as a result of their active industry engagement. For instance:

- nearly 90% indicate that they are

engaged with individuals to raise the visibility of the industry;
- 92% are engaged in efforts in the development of women; and
- 70% are engaged with K-12 system to encourage young girls and boys to consider careers in manufacturing.

Unleashing the potential

Deloitte notes that the cumulative manufacturing skills gap—or the positions that likely won't be filled due to a lack of skilled workers—is estimated to grow to two million between 2015 and 2025.

"The industry is missing out on a critical talent resource to help advance innovation in manufacturing, increase America's competitiveness in the global manufacturing landscape and close the skills gap," says Trina Huelsman, vice chairman, Deloitte & Touche LLP and co-author of the research. "Unleashing the potential of women in manufacturing can reap big rewards. Organizations that make recruitment, retention and advancement of women a strategic priority can bring diverse decision-making perspectives, drive innovative and creative solutions and can achieve overall better business performance."

While there has been an overall positive change in the industry's attitude toward women employees, women still make up 29% of the U.S. manufacturing workforce, while they make up approximately half of the total U.S. labor force. In an effort to improve this, The Manufacturing Institute is promoting the role of women in manufacturing through mentoring, recognition, research and leadership with the STEP Ahead initiative.

"Many outstanding women leaders are making huge strides in building and promoting the manufacturing industry and are demonstrating what modern manufacturing offers—rewarding and fulfilling careers with limitless opportunity for growth," says Jay Timmons, president and CEO of the National Association of Manufacturers. "Today's manufacturing employees are building and designing the future, and women in manufacturing serve as ambassadors to move this industry forward."

Researchers tell *Global Links* that they were pleased to see that women are noticing an increased effort by universities, businesses and the industry to promote a positive attitude toward women in manufacturing and supply chain.

Blazing a path

The results show that there has been positive change in the industry and that there is more of a focus on ensuring that more women join the manufacturing workforce and find a path to success:

- 58% of women surveyed noted a positive change in the manufacturing industry's attitude towards female professionals over the last five years;
- 29% of women (up from 12% in 2015) think the school system actively or somewhat encourages female students to pursue a career in the manufacturing industry; and
- 42% (up from 24% in 2015) would encourage their daughter or female family member to pursue a career in their industry.

The report identified pain points that still need to be addressed—under-representation of women in leadership roles, consistent performance standards for both men and women, and a work/life balance that allows women to meet family/personal commitments without impairing their career, according to the researchers.

Global Links also learned in an interview that despite progress, there is still room for improvement in the manufacturing industry's efforts to attract, retain and develop its female workforce.

The report identified pain points that still need to be addressed—under-representation of women in leadership roles, consistent performance standards for both men and women, and a work/life balance that allows women to meet family/personal commitments without impairing their career, according to the researchers. What's more, they tell *Global Links* that future reports will "dive deeper into these pain points," what smart companies are doing to address them and how the industry can improve retention of women in manufacturing jobs.

THE customer-centric supply chain

BY STEVEN A. MELNYK
AND DANIEL J. STANTON

The importance of dissolving the "wall" between the customer and the supply chain.

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THE AMERICAN MIDWEST is home base for a company that manufactures industrial equipment. Its customers include engineers, designers and maintenance personnel. In the past, the relationship between the customer and the supply chain ran through marketing—the customer talked to marketing and if the information communicated from the customer involved changes to orders, these changes were communicated to supply chain through the sales and operations planning system (S&OP) and the master production schedule (MPS). This relationship was not that unusual: marketing worked with the customer; the planning system coordinated activities; supply chain worked to the schedule. No need for supply chain to talk to—or even know anything about—the customer.


LOGISTICS
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WAREHOUSE

The problem, however, was that this system was not working. It took too long for changes and requests to work their way to the supply chain. Even when they were communicated, the changes were often distorted as marketing added their "spin" to the information. Even worse, the supply chain and the customer were not even aligned. The supply chain focused on cost and meeting the schedule; the customer often wanted responsiveness and flexibility. Ultimately, customers became frustrated; supply chain personnel became confused (if we met the plan then why was the customer upset); and top management was concerned with competitive pressure increasing and long-term customers buying from the competition. In response to these developments, top management formulated a radical solution: Cut out the middleman. Instead of the conversation beginning with marketing, supply chain would get to know the customers up close and in person; supply chain would focus on those things that customers wanted (and would be willing to pay for).

Due to a perfect storm of forces including changes in the market, changes within the customer base, changes in technology and changes within the supply chain itself, companies are discovering the power of having supply chains where there is direct contact with key customers.

The new system delivered unexpected results. Customers now began to see the firm in a far more positive light relative to the competition. In addition to strengthening their brand, they discovered that customer complaints dropped, lead times fell and performance improved. For the first time, the supply chain team was able to align its goals with their customers' needs because they understood whom they were serving from first-hand experience. When there was a problem, the supply chain team had a new perspective on the issues, and could think more creatively about how best to resolve them. Unlike in the past, cost was no longer the primary driver. Ultimately, the company had discovered the power of the customer-centric supply chain.

That firm is not alone. The conventional wisdom that supply chain should focus on fighting fires and reducing costs is now being challenged. Due to a perfect storm of forces including changes in the market, changes within the customer base, changes in technology and changes within the supply chain itself, companies are discovering the power of having supply chains where there is direct contact with key customers. In this article, we explore these changes, their implications for supply change management and their implications for managers—both within the supply chain and within the firm. The wall between the customer and the supply chain is coming down and things will change.

Welcome to the customer-centric supply chain

So, what is the customer-centric supply chain? We define it as a supply chain where managers know their key customers, where they work closely with these key customers and where the supply chain is structured to meet the ever-changing needs of those customers.

Such supply chains are increasingly becoming a feature of the strategic supply chain of the 21st century. Its presence was observed in the recently completed "Supply Chain Management: Beyond the Horizon"—a three-year project, jointly sponsored by the Department of Supply Chain Management at Michigan State University and APICS, that focused on identifying the developments that will affect the supply chain of the future (for more information, see the description found at the end of this article). One of the findings involved the increasing importance of the customer to the new supply chain.

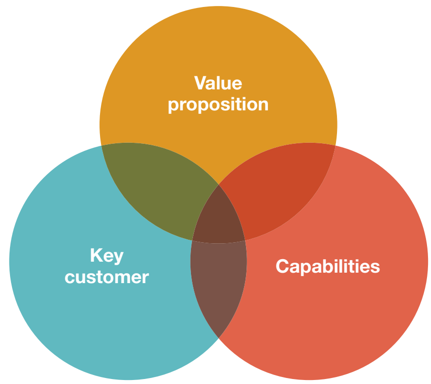
In a recent article in *Forbes*, SCM World's Kevin O'Marah contended that the supply chain should be aligned with the desired outcomes prized by the key customers and the strategic promises made by the firm, as contained within the value proposition. In another recent publication, KPMG recognized the critical and increasingly important role played by the customer in the supply chain.

Like many things that have emerged in supply chain management, the customer-centric supply chain is the result of the convergence of major forces. We have identified five: (**1**) the emergence of the strategic supply chain with its integration in the corporate's business model; (**2**) the Amazon effect; (**3**) changes in the customer base; (**4**) changes in technology; and, (**5**) changes taking place in the supply chain.

What does it all mean? This paper is driven by a very simple premise: If the supply chain is to be strategic and if it is to be effective (i.e., excel at doing the right things rather than doing things right), then it must become customer-centric—any other position is inconsistent with the notion of the strategic supply chain. Therefore, it makes sense to start our discussion of the customer-centric supply chain with the business model.

FIGURE 1

The business model



Source: The authors

The customer-centric supply chain: The role of the business model

There is much discussion today of the strategic supply chain—unfortunately most of it takes place without telling the reader what exactly is meant by the term. We have a very specific definition of the strategic supply chain: It is a chain that is integrated into, supportive of and aligned with the firm's operating business model; it is a supply chain where the focus is on business, not supply chain excellence. When we link supply chain to the business model, which operationally defines corporate strategy and objectives, we make the supply chain inherently strategic.

The business model (see Figure 1) identifies three critical components that must be consistently maintained in alignment for the firm to compete.

- **The key customer.** The customer is the ultimate judge of what is produced. What is important about this component is that the business model recognizes that while all customers are important, some customers are more important than others. These become the key customers.
- **The value proposition.** This is what the firm offers to attract and retain key customers.
- **Capabilities.** These are the resources, skills, processes and assets that the firm draws on to deliver the value proposition. The supply chain resides here, along with corporate processes, measurement, capacity and corporate culture.

The business model strives to ensure consistent alignment between the three elements—what the key customer expects, what the firm has promised (the value proposition) and what can be delivered (capabilities). Two points must be made. First, maintaining this alignment is no easy task given that most firms are operating in environments characterized by aggressive competitive forces, changing technology and government actions that are often difficult to predict. Second, and important from the perspective of this article, the business model demands that the supply chain know who the key customers are, what they want (recognizing that not all outcomes are equally important) and how they will use the outputs generated by the supply chain. Simply put, you cannot be strategic without knowing who your key customer is.

The Amazon effect

Amazon is a modern retail juggernaut. Since its founding in 1998, Amazon has grown from being simply an on-line bookstore to a one-stop omni-channel retailer for everything from furniture to food to streaming entertainment services. In addition to a global footprint, Amazon has also expanded successfully into Cloud computing and storage. More importantly, it has changed how customers shop and what they expect—regardless of whether the customers are end users or a business. These changes are most evident in the following areas.

- **24/7 customer service.** Amazon's customer service is always available by various means—on-line chats, telephone or e-mail. In addition, Amazon service is very accommodating with customers.
- **Easy to place orders.** A second area where Amazon has developed a unique reputation with its customers is the ease with which orders can be placed. Once you set up your account, establish the method of payment and allow one click shopping, then all that you have to do is click on the place order button and your order is placed.
- **Continuous flow of information about the order.** Once an order has been placed, Amazon continuously communicates with the customer regarding the status of the order (it has shipped, it will arrive by such a date). There is continuous visibility regarding the order.
- **A relentless focus on improving customer service.** Amazon realizes that its customers want products that are priced fairly but delivered quickly (and are willing to pay for it). Consequently, Amazon is always searching for and experimenting with new ways of reducing delivery lead

times when the customer needs the product now. Amazon Echo, experimenting with drone deliveries and the use of bicycle messengers and Uber carriers for product delivery are examples of this relentless focus on improving customer service.

- **An informed buying process.** When you buy from Amazon, you are faced with customer reviews and alternative/complementary products. You are also given the option of buying from non-Amazon sources.
- **A trusted source.** Ultimately, with Amazon, you get a good price, although it is not always the lowest. However, what you also get is access to a source that you trust and that you know will honor its sales.
- **Reliable deliveries.** Amazon Prime customers know that their orders will be delivered in two days—free. And, if you want next day delivery, it's extra. The result is one of the most predictable delivery systems in the retail market. This trait has also helped to set customer expectations for delivery—no more than four business days from the time an order is placed.
- **Easiest return process.** Finally, no one offers an easier return policy. If you don't want a product, simply go on line, click on the order placed and then indicate the item that you wish to return. After recording the reason for the return, Amazon sends a preprinted, prepaid UPS label. More importantly, your money (less shipping) is credited back to your account when the package has been scanned as received by the UPS pickup service.

One result of this change in customer base is the increased importance of supply chain visibility. Visibility, something previously demanded by the corporate buyer as a way of dealing with supply chain risk, is expected by the new consumer.

These various attributes have not only shaped how customers view their interactions with Amazon but also their interactions with other companies. For example, at the 2015 Supply Chain Outlook Summit conference, sponsored by *Supply Chain Management Review*, one of the participants—a manufacturer of automation equipment—observed that his customers were now demanding the same things that Amazon was offering: full information, reliable deliveries and 24/7 service. The Amazon effect is real and it is changing what customers expect from supply chain management.

Changes in the customer base

Writing in *Forbes*, Micah Solomon noted that a major marketing change took place in 2015—the Millennial customer, born between 1982 and 2004, replaced the Baby Boomers as the key consumers. Numbering about 80 million, Millennials now make up over 25% of the U.S. population. More importantly, unlike Baby Boomers, this generation is growing in size. Millennials are fundamentally different from baby boomers in their demands and these demands are directly affecting and shaping the supply chain. Consider the following:

- **The customer is the star.** Millennials expect the buying and shopping experience to be focused on them. They want the marketing experience to differentiate between buying (a regular activity that involves fairly standard products) and shopping (where the act of identifying the product to be delivered is critical).
- **They crave a true, authentic personalized experience as customers.** Shopping is important to these consumers. They want to be involved in the design and delivery of the product. They don't want a transaction; they want an experience. That is why we see the rise of providers such as Blue Apron, Fresh Now and M-Tailor. In these experiences, the supply chain is highly visible and the buying experience highly personalized.
- **They care about your company's values.**
- **They expect your technology to work.**
- **They want to collaborate and co-create with your brand.**
- **Convenience and speed are key.** They want systems with which placing orders is easy—and speed, not cost, is king.

One result of this change in customer base is the increased importance of supply chain visibility. Visibility, something previously demanded by the corporate buyer as a way of dealing with supply chain risk, is expected by the new consumer. As one senior Starbucks executive noted on a PBS special about coffee: "Today's consumers increasingly want to know about the provenance of the products that they consume."

Changes in technology

Technology has always played a major role in supply chain management, whether it was computers and MRP planning of the 1970s and 1980s or robotics and the Internet. Yet, the technology that promises to bring the supply

chain closer to the customer is the Internet of Things (IoT). IoT refers to the network of physical objects, or "things," that are embedded with software, sensors and network connectivity that enable the collection, exchange, analysis and communication of data in real time. IoT includes smartphones, sensors in cars, equipment, appliances, fitness monitors, smart watches and product tags. To get an idea of the impact of IoT, consider the following: By 2020, it is estimated that there will be over 201 billion such devices. Along with RFID, improved analytics and social media, what IoT brings to both the supply chain and the market is: (1) the improved ability to quickly sense and seize opportunities taking place on both the supply and demand sides, and, (2) the ability to offer the market new services that are derived from this sensing and seizing capability.

The first opportunity was recognized in a 2017 SCM World Report on the digital supply chain. With IoT, the authors noted, smart sensors can now be embedded in products to quickly identify how customers use these products and more importantly to flag potential faults in the products—flaws that by themselves and occurring in isolation may seem random but are indicative of systematic problems in the products when aggregated. This allows supply chain managers to get out in front of potential problems.

This is exactly what the tire manufacturer Pirelli has done with its Connesso tire, an integrated tire and software platform that collects information about the condition and use of tires. This information is then relayed to the Pirelli Cloud for storage and analysis. The data can be used to help Pirelli flag the presence of any potential design flaws. Simultaneously, Pirelli is able to offer its customers a new service based on this sensing capability. Using an app, drivers can now access real-time performance information. If there is a problem, the app directs the driver toward the closest available repair shop where the tire can be fixed or replaced. And, the app can automatically book an appointment with the shop. In this example, we see the two capabilities offered by the new technology in action.

However, there are two important impacts. First, these new technologies enable organizations to quickly identify (sense) changes both in supply and demand, often without relying on other organizations to participate. Second, and more important, these developments short-circuit the "bullwhip" effect that has persistently plagued the supply chain manager.

Both researchers and practitioners have long realized that a simple, small change in a customer order becomes amplified as it moves through the various components of the supply chain. More importantly, as the order moves through the system, it consumes time (thus delaying responsiveness) and the information becomes distorted. Consequently, what's received is dated and you can't be sure whether you are dealing with actual customer issues or are seeing the impact of the actions of the various parties downstream. This changes with the new technology. Information that took weeks to become available to supply chain managers can now become available in days; information that was corrupted now clearly reflects what is actually taking place in either the supply or customer spaces.

Both researchers and practitioners have long realized that a simple, small change in a customer order becomes amplified as it moves through the various components of the supply chain.

The challenge for supply chain managers in this new world is two-fold. First, to reduce the time from the moment that this information is collected until that information is made available to the supply chain manger. This means addressing the extent to which the firm's own planning system is a source of delay as the various systems interface with each other. The second is to shift from deliberate management to fast management—from waiting until all of the information is in and then acting after thorough analysis, to acting quickly on the basis of incomplete and changing information (recognizing that you will be wrong some of the time but that your supply chain has sufficient robustness to absorb any errors created by "wrong decisions" and that the costs of waiting until you are certain outweigh the costs of acting quickly).

One computer company experienced first-hand the power of this new technology. Previously, it took between 45 days to 80 days for the company to become aware of problems involving its personal computers. Even then, the information could not be trusted. By reviewing social media comments, review boards and other comments posted by the customers of its newly released personal computer, it was able to identify a design/quality problem in its power adapter within five days.

Before leaving this discussion, we should note that the visibility created by these new technologies into both the demand and supply spaces is not only critical to the supply chain manager, it is also being increasingly demanded by the customers who want to know more about the products they use and consume.

To drive home this point, consider how several leading automakers responded to a recent revelation by the *Guardian*. In 2016, the British newspaper published an article that linked the supply chains of some of the largest European automakers to illegal mines in India where child labor and debt bondage was widespread. In fact, according to this article, children as young as 10 years old were being used to extract and sort mica—the mineral that made car paint shimmer. This was dangerous, hard labor. In many cases, the children were working at the mines rather than going to school because their families needed the money.

Three Indian exporters—Mohan Mica, Pravin and Mount Hill—seemed to be the major transgressors. These companies, in turn, sold their raw materials to customers such as Fujian Kancai, a company whose customers

There is now a direct relationship between the customer and supply chain management. However, this new relationship brings with it certain key implications for both the supply chain manager and for corporate management overall.

included cosmetics giant L-Oreal, P&G, PPG and Axalta (the last two customers are leading car paint suppliers in a $19 billion world car paint market). In response to the *Guardian* article, Vauxhall (part of the GM group), BMW and Volkswagen launched investigations into their paint supply chains, because this finding, if supported, is against company policies that prohibit such practices.

Why did these carmakers respond as they did? Because they knew that these practices mattered to their customers. They also realized that they were responsible not only for their actions, but also for the actions of their supply chains. Ignorance was no longer acceptable.

The new manager

If these prior four factors were not enough, there is evidence emerging that supply chain managers themselves are recognizing the need to become customer centric, according to data generated from the Beyond the Horizon research project. After talking with managers from over 60 leading supply chain management systems, the research team began to realize that a critical test of the effectiveness of the supply chain was the extent to which the supply chain and its management was customer centric. This test focused on performance measurement.

Specifically, those supply chain managers that used their key customers' key measures as their own seemed to continuously excel in performance. The epiphany for this came out of an interview with the top management team of a Midwestern manufacturing and design company. As presented by the vice president of supply chain management, prior to this change, meetings with the firm's key customers were often contentious and drawn-out affairs. Each company came to the meeting armed with their measures (that often did not align). Consequently, the first two hours of every meeting were devoted to deciding on which measures to use and how to "translate" between the various measures. The meetings went downhill from there. This all changed when the supplier hired a new, more strategic head of supply chain management.

One of the first actions taken was to use their key customer's measures as their own measures. While initially greeted with surprise, people began to see the benefits offered by this approach. First, meetings with customers became shorter and less contentious. Gone were the two hours needed to decide whose measures to use. Second, the supplier began to recognize what constituted value for its customer—it was anything that caused the customer's key measures to go up. The supplier began to build a strong case for why working with them was not simply good for costs; it was also good for them. By the way, it goes without saying that this approach works best when the customer's measures align with the firm's value proposition and strategic statement. When this alignment fails to occur, there are problems. This led to an interesting observation about supply chain management in the 21st century: Previously, good customers could fire bad suppliers; in today's environment, good suppliers can and do fire bad customers.

Another innovation involving managers is that for the

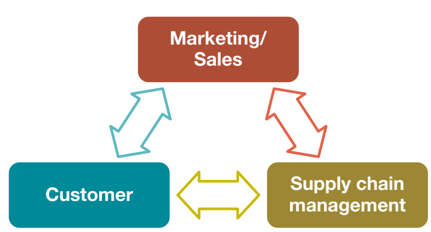
FIGURE 2
Traditional relationships

Source: The authors

supply chain to be truly customer centric, its personnel had to think of the key customer not as a market segment, but as an actual person. This point was driven home in an interview with a manufacturer of inexpensive bicycles that were sold through large retailers such as Meijers, Toys R Us and Walmart. Previously, the manufacturer had thought that its key customers were parents and children. This focus turned out to be wrong. Parents bought their bikes based on availability and not on brand recognition. Availability, in turn, was influenced by two specific people working within the customers' organizations: the store manager and the purchasing agent. So, the managers goals became to make it easy for them to place orders and for the sales to be profitable. With this change in orientation, the bike manufacturer's sales increased.

Finally, supply chain managers have recognized that they are the prime determinant of Moments of Truth (MOT) in their companies, a concept first proposed by Jan Carlzon, the former CEO of SAS Airlines. Carlzon noticed that the customers' views of the company serving them were strongly influenced by their last direct interaction, or Moment of Truth, with that company. They were strongly influenced by factors such as the frontline personnel, inventory and capacity—factors under the control of the supply chain. His goal was that every MOT should enhance the airline's reputation with its customers. If that is the goal (it appears to be so given the factors discussed under the change in customers), then the supply chain by definition must become customer centric. When the supply chain misses a delivery, the result is a negative MOT; when a delivery driver goes out of his or her way to ensure that an order is delivered on time and with quality, that is a positive MOT.

FIGURE 3
Customer-centric relationships



Source: The authors

From straight lines to triangles: Implications of the customer-centric supply chain

In the past, our relationship with our customers was a straight-line relationship similar to that found in Figure 2.

The new relationship at the heart of the customer centric supply chain is illustrated in Figure 3—a triangle. There is now a direct relationship between the customer and supply chain management. However, this new relationship brings with it certain key implications for both the supply chain manager and for corporate management overall. These include the increasing need for fast management, acceptance of the "preferred status" as the new black and the need to embrace the new realities of the customer-centric supply chain.

Fast management

Managers must now manage fast rather than manage deliberately—a fact that was first realized during the Korean War. Then, the U.S. military was shocked by the losses suffered in air-to-air combat. Advances in technology from propellers to jet fighters, combined with the best pilot training system in the world, should have given the U.S. Air Force a huge advantage over its adversaries. Yet, the Air Force found that pilot mortality was distinctly bimodal in distribution—with many pilots being shot within days of their introduction to combat. To understand this situation, the Air Force brought in one of the best "out-of-the-box" thinkers—Colonel John R. Boyd. After reviewing the data, he determined that the reason for many new pilots being shot down lay in their decision-making process, which was too deliberate. That is, they waited until they were sure that they were facing an enemy. With closure speeds in excess of 1300 mph, pilots were left with little if any reaction time. By waiting, they became victims, not victors. Boyd realized that jet propulsion technology had changed the rules of air-to-air combat. Pilots needed to make faster decisions, with less information. So, the Air Force began training pilots to make decisions using the OODA loop procedure—a four step cycle, consisting of Observe, Orient, Decide and Act—to guide their decision making.

The same thing is happening in supply chains. Technology gives us the capability to see further and faster. Supply chain managers need the equivalent of an OODA loop to take advantage of new technologies and make decisions at the new speed of business. This new strategic response cycle consists of the following steps: (**1**) sense (the threats/developments); (**2**) assess (are these developments important now or in the future); (**3**) formulate (a response); (**4**) deploy (the response); (**5**) evaluate (did the response work?); (**6**) recalibrate (are our original goals still appropriate or do they have to be re-evaluated?); (**7**) learn (by asking: What went wrong? What went right? What was missing?); and, (**8**) repeat. In today's world, the coin of the realm is management by speed, not by cost reduction.

Preferred status is the new black

Today's key to success is achieving "P" status, or "preferred" status. For customers, this means that they are viewed as the preferred customer by their suppliers; for suppliers, this means that they are viewed as the preferred supplier by their customers. In practical terms, this means that whenever a customer has a need to meet, they will consider you first.

Achieving "P" status provides a strategic advantage, even in an environment where customers have many choices in suppliers. If you understand what has the greatest value to your key customers, and if you align your supply chain to these metrics, then you will be in the best position to grow the preferred status relationship—increasing top line revenue and increasing market share. This is the lesson that Amazon has painfully taught its many competitors—because it is the "P" supplier to many of its customers, these customers always turn to Amazon when they have a need to fill.

Embrace the change

While many firms will chose to ignore these developments and continue to do business as usual, other firms —and managers—will embrace the change. The latter will flourish as they discover new ways to better serve their key customers. For the former, survival will be more problematic. For these firms, we offer the advice given by W. Edward Deming when he was confronted by a Board from a large multi-national that wanted to know if they had to do everything that Dr. Deming recommended regarding Total Quality Management: "No, you don't have to do everything that was recommended. Survival, after all, is not mandatory."

The brave new world of the customer-centric supply chain

The business landscape is changing quickly. New business models, changes in the customer base, the powerful Amazon effect, new technologies and changes in the supply chain itself are all forces that need to be addressed strategically.

Adapting to these changes will require companies to implement strategic, customer-centric supply chains. To enable this transformation, companies must first identify their key customers, and then structure their organizations so that the supply chain team is side-by-side with sales and marketing in building and managing those relationships. When faced with decisions and trade-offs, the key question should always be "what would make us the 'P' supplier for this key customer?"

Deming's admonition is not just directed at firms:

The business landscape is changing quickly. New business models, changes in the customer base, the powerful Amazon effect, new technologies and changes in the supply chain itself are all forces that need to be addressed strategically.

The brave new world of the customer-centric supply chain will require supply chain managers to embrace the change, drive it in their organizations and learn to manage with their customers in mind rather than focusing strictly on costs.

About Supply Chain Management: Beyond the Horizon

Strategic Supply Chain: Beyond the Horizon (SSC:BTH) is a long-term project aimed at identifying and exploring emerging issues in supply chain management both domestically and internationally. This project, jointly sponsored by Department of Supply Chain Management, the Eli Broad School of Business and APICs, has over a three-year span studied over 60 leading supply chain management organizations. The results and insights obtained from this project have been fine-tuned and tested in a series of focused workshops. This project has been led by David Closs and Pat Daugherty of the Department of Supply Chain Management at Michigan State University.

THE Supply Chain Workforce *of the* FUTURE

Supply chain executives agree that future supply chain performance will rely to a great extent on talent. A continual focus on improving the current workforce and attracting new talent must be the new mandate for supply chain executives.

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BY MICHAEL A. MEYER

The supply chain is in the midst of an evolution. Digital technologies hold the potential for increasing competitive agility by dramatically changing how businesses design, source, make, move and service products. Most executives understand how essential these changes are to the business and 85% of supply chain executives are already working to introduce new digital capabilities into their operations.

Supply chain "digital trendsetters"—top performers in terms of both profitability and revenue growth—are already transforming their linear operations into digital supply networks that are more connected, intelligent, scalable and rapid than traditional supply chains. These networks enable people and data—as well as materials, products and supplies—to work together across the extended enterprise to meet business objectives. Consider how these trendsetters are raising the bar.

- Trendsetters are designing their supply chain operations around the intersection of suppliers, products and customers. Unlike digital followers, who say that giving customers a unified experience remains their primary supply-chain objective, trendsetters strive to deliver a tailored customer experience: highly individualized, focused products and completely customized services providing buy-anywhere, collect anywhere, return anywhere capabilities via flexible channels.
- Trendsetters are leveraging the full spectrum of digital technologies, investing in analytics, mobility and Cloud. But they also take digital further than digital followers by investing significantly more in the higher-order digital technologies that facilitate hyper-flexibility like Artificial Intelligence, the Industrial Internet of Things and intelligent products.

- Trendsetters are leveraging their digital investments to build new levels of collaboration—well beyond their four walls. Unlike digital followers, whose focus remains on enabling collaboration among internal functions, trendsetters' ecosystems encompass all stakeholders, including start-ups, in a broad, fluid and proactively managed network.

The companies that are doing digital differently are transforming their supply chains into super-fast, digitally disruptive, hyper-flexible and highly collaborative enablers of superior customer service and profitable enterprise growth.

The companies that are doing digital differently are transforming their supply chains into super-fast, digitally disruptive, hyper-flexible and highly collaborative enablers of superior customer service and profitable enterprise growth. The supply chain talent pool is greatly impacted by this transformation. Different generations of workers are entering and exiting the workforce amidst a rapidly changing technological landscape. To succeed in this new environment, companies need to ensure that the right talent and culture is in place to drive effective execution of these new digital supply networks.

Supply chain talent, the key to future performance

Research from Accenture Strategy shows that 90% of supply chain executives agree that over the next three years, supply chain performance will rely to a great extent on their supply chain talent. A continual focus on improving the current workforce and attracting new talent to drive innovation, efficiency and productivity must be the new mandate for supply chain executives.

A key component of that mandate is enabling the supply chain workforce to move beyond traditional roles and responsibilities. With a growing demand for deep digital and technical experience in supply chain processes, the workforce must be comfortable with data-driven decision-making and have a complete understanding of true end-to-end supply chains. In this new environment, supply chain executives have an unprecedented opportunity to drive a deep shift in supply chain operational performance by building the future workforce. Leading companies are already capitalizing on the promise that this future workforce offers.

Humans + machines = The multiplier effect

Over the past decade, basic automation and analytics, coupled with the widespread adoption of enterprise resource planning (ERP) and Cloud computing technologies, have improved the operational efficiency of supply chain processes. Now, digital technologies like artificial intelligence (AI), robotics and predictive analytics are expanding that efficiency even further. And the future supply chain workforce will need workers who are highly engaged with digital. They need to be able to flourish in a future augmented by new technologies in a way that drives real business value in the form of productivity, new talent acquisition and retention, as well as innovation and creativity.

Research shows supply chain executives expect robots, together with AI and the forecasting power of prescriptive analytics, to have a significant impact on the supply chain workforce's responsibilities and tasks. In particular, the collaboration between humans and machines will create new sources of value. Most executives (65%) expect the combination of technology and humans to enable more forward looking and strategic decision-making to support business goals.

Take robots, for example, which are playing an increasingly significant role in the supply chain. One retailer has empowered its fulfillment centers by using robots to bring products and racks to workers, which reduces the processing costs of an average order. Beyond the factory floor, robots are now supplementing and augmenting human roles in such knowledge-intensive areas as supply chain planning, customer order management and inventory management. Robotic process automation (RPA) is enabling companies to reduce costs and improve performance by using software to automate routine tasks like data collection and aggregation. By enhancing and extending human cognition and capabilities, robots are already driving greater operational excellence. In time, robots also promise to deliver significantly better business outcomes by harnessing the power of artificial intelligence and using prescriptive analytics to help people re-frame how crucial business decisions are made.

Another important technological advancement in the supply chain—prescriptive analytics—delivers critical business insights in a fraction of the time that it takes humans working alone. They also reduce the scope for human error and thus improve compliance. In fact, prescriptive analytics, which not only anticipate what will happen but also suggest options to capture opportunities and mitigate risks, can be applied across multiple supply chain areas to enhance the chances of human planners achieving optimal outcomes. For example, companies expanding across markets could use advanced network modelling techniques to evaluate multiple configurations and determine optimal routes, markets and product selection. To leverage the power of prescriptive insights and improve day-to-day operations, companies should also adopt collaborative sales and operations planning. This technique connects statistical forecasting methods for demand planning with rough-cut, multi-level supply planning. These in turn help to determine the right amount of inventory, achieve targeted service levels and boost productivity.

As routine tasks become automated, humans can focus on more decision-intensive activities. Consider a big chemicals player with more than 1,000 employees in its central supply chain function. By automating transactional activities like import/export management, customer order management and outbound transport management, the company can free up more than 50% of its workforce's time, and reallocate employees to focus on other tasks.

For humans, this concept of digital and new technologies liberating the supply chain workforce heralds an exciting freedom to focus on what people do best: the abstract thinking and contextual reasoning that still eludes machines. Though some jobs will change, new, value-enhancing roles will emerge—roles that may not have even previously existed. With change occurring at an unprecedented pace, it is more important than ever that supply chain workforces are continuously trained and educated on the latest processes, techniques and technologies. Organizations that ignore this basic prerequisite risk being left behind in an increasingly competitive environment.

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Finding the "intrapreneurs"

As technology improves human productivity, such uniquely human qualities as judgment, empathy, collaboration and persuasion will increase in importance. According to Accenture Strategy research, more than four in five supply chain executives (87%) believe that digital advances will drive major changes in the supply chain job mix over the next three years. To compete, human workers will need to move well beyond their traditional roles and skills as efficient order takers and function increasingly as internal entrepreneurs, or "intrapreneurs."

Intrapreneurs are dynamic innovators who can proactively identify growth opportunities and manage the risks associated with them. One critical role ripe for intrapreneurship is supply chain demand and supply planning. Sixty-five percent of business and supply chain executives anticipate that advances in analytics will enable planners to make more forward-looking, strategic decisions and spend less time on reactive problem-solving. Executives also envision planners moving into category, or segment, roles that reflect an end-to-end business focus.

Over the next three years, other top emerging supply chain roles will reflect a similar focus on profitability and performance improvement, as well as strong analytical skills that can leverage the algorithms and advanced simulations powered by AI and prescriptive analytics to create new value for the business. These roles include process improvement managers, business development leads, risk managers and data scientists.

Investing in talent and technology to manage this complexity, while providing seamless service to the customer, is at the heart of the deep shift in supply chain operational performance now underway.

Advanced technologies will be needed to support the human intrapreneurs tasked with driving future innovation and growth. Although still evolving, some of these technologies are already available and leading companies are beginning to deploy them in support of specific supply chain strategies. The most promising opportunities for value realization will align operational goals—such as reliability and efficiency, or speed and flexibility—with customer characteristics and business objectives. Targeted investments can then be made to increase the competitiveness of the supply chain.

Now is the time for change

Automation of routine activities like data processing and cleansing is low-hanging fruit: a good place to start, but not to finish. Some 46% of supply chain executives anticipate more automation of daily transactional activities and exception handling. But the real value comes from leveraging technologies to drive innovative supply chains that support growth by offering new products and services to customers—particularly ones that are customized to their preferences and needs. This is the primary business objective for 54% of supply chain executives in the next three to five years. The human workforce is a crucial element in meeting this objective.

Above all, the supply chain needs to be standardized, stable and reliable, and operate in a highly cost-sensitive business environment. For instance, a commodity chemicals player can drive significant value from basic analytics pertaining to statistical forecasting, inventory control and transport consolidation. However, when flexibility and speed are paramount—a downstream chemicals player offering engineered and customer-specific products, for example— advanced AI with the power to predict, prescribe and shape demand is especially necessary.

Faced with increasingly demanding customers across a variety of markets, the smart money is on running multiple types of supply chains across businesses simultaneously. That means not only efficiently operating either a stable or flexible supply chain, but one that adapts as needed to support personalized, differentiated services. Investing in talent and technology to manage this complexity, while providing seamless service to the customer, is at the heart of the deep shift in supply chain operational performance now underway.

Positioning for success

Integrating AI, robots and prescriptive analytics into the supply chain workforce today will allow companies to better capitalize on these revolutionary technologies tomorrow. The following three recommendations are a good place to start:

1 **Attract the future workforce.** Companies need to ensure the workplace reflects the ethos of the new supply chain. The demand for multi-talented professionals is only going to continue to grow. To meet that demand, companies need to focus on training the current workforce and keeping employees engaged. Mobility, technology and collaboration tools need to be integrated into the training process and everyday employee functions, and executives must reinforce new behaviors and mindsets throughout the talent development lifecycle.

To fill the roles of the intrapreneurs and innovators, companies need to identify exceptional talent within their organizations, including people who may never have considered a career in supply chain before. Individuals from other parts of the business can be enormous assets to the supply chain function, bringing new thinking, strong analytics skills and innovative ideas to increase efficiency and productivity with digital technologies.

Companies should also put a strong emphasis on recruitment efforts to consistently find new talent that have the digital skills required. Faced with a graying workforce, companies need to uncover opportunities to attract and retain the next generation of workers. The industry needs to come together to promote the positive aspects of a career in supply chain, not only to new graduates, but also to employees outside of supply chain.

Another important part of attracting and retaining the future workforce revolves around viewing performance metrics and career advancement through the lens of technology-driven innovation. Employees need to see the potential that a career in supply chain offers and be rewarded accordingly.

2 Extract the robot from the human. Implementing robotic process automation software that automates routine tasks traditionally performed by humans is a quick way to reduce costs and improve performance. Supply chain executives need to start prioritizing and defining the immediate RPA opportunities in their organizations. The first place to begin is with the most routine and transaction-focused activities, based on specific roles and tasks. An RPA "bot" can execute well-defined processes like data entry and aggregation by acting like a super-efficient human that can work 24/7. Furthermore, leveraging analytics, cognitive equipment and smart apps provides the right information for decision-making, while seamless human-machine interactions increase operational efficiency.

Once those tasks are automated, the focus needs to shift to redirecting the "liberated" human worker to focus on the customer, service level promises and new products and services. And digital technologies can inspire and abet humans to uncover innovations in design, operations, and customer relationships.

3 Place your innovation bets. Companies know that investing in new technologies that will enable the current workforce to drive innovation and promote a flexible, efficient supply chain is essential, but many don't know where to begin. A good place to start is by mapping opportunities to existing technology solutions according to their maturity and availability (e.g., explorative vs. ready-to-implement). They can use multi-echelon inventory optimization technologies that are already on the market, as well as techniques like game theory and non-linear or stochastic dynamic programming. These technologies incorporate complex algorithms to help optimize planning. The first step is to start exploring the potential of these specific technologies. Talk to their inventors and consider implementing pilot programs to test how they work within your supply chain. They key is to think big, but start small. Once the pilot programs are showing ROI potential, take the leap to invest further in the technologies that show promising results.

Companies should also put a strong emphasis on recruitment efforts to consistently find new talent that have the digital skills required. Faced with a graying workforce, companies need to uncover opportunities to attract and retain the next generation of workers.

Significantly better supply chain operational performance lies ahead—and what a shift it will be. However, a new perspective and workplace dynamic will be needed to fully realize the benefits. Digital technology has the power to drive a convergence of supply chain elements that can help companies capture huge savings and competitive advantage. The process starts with leveraging digital to inspire new ways of thinking and working, and by enhancing visibility, collaboration and innovation across workforces. Supply chain employees are at the core of this shift. The leaders of tomorrow are re-imagining the supply chain workforce for the digital era with the goal of transforming it to meet the needs of this new digital business.

ALTERNATIVE WORKFORCE:

People *with* Disabilities

Outside the standard supply chain labor pool, people with disabilities have already proven themselves, typically raising the performance levels of all around them. The HOPE Handbook: A Guide for Disability Hiring offers a manageable framework for adding these overlooked resources to your workforce.

BY TIM ENGSTROM, JEREMY SHAW, SABRINA AJANEE, GEOFF EDWARDS AND KATHRYN KOLINSKI

"Help wanted" is not an uncommon sign these days in business parks. In fact, a recent talent shortage survey conducted by ManpowerGroup says 40% of employers globally are having difficulty filling positions. And a quarter of those companies can't find enough available applicants if they can find any at all.

Worse yet, the problem may be more acute than it needs to be. ManpowerGroup also reports that only 36% of companies recruit outside their traditional talent pool while just 28% bother to explore alternative sourcing strategies.

Which raises the question: For distribution and manufacturing jobs, are employers looking for people in all the right places? The honest answer is: not always.

One of the most overlooked groups is people with disabilities. Often, this segment of the workforce is not even considered for supply chain work. That's unfortunate for many reasons, not the least of which is the availability of workers with disabilities. According to the most recent statistics from the U.S. Bureau of Labor Statistics, the unemployment rate for persons with disabilities is more than twice that of able-bodied workers.

There is an irony here for the supply chain. Several companies have quite successfully included workers with disabilities in their workforces. Walgreens is the highest profile success story. Despite this, getting buy-in from human resources, floor managers and even top management is typically difficult if not impossible.

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But it doesn't have to be that way. *The HOPE Handbook: A Guide for Disability Hiring* offers a framework for creating an inclusionary environment for hiring employees with disabilities and making them an enabler of higher corporate performance.

The *Handbook* was completed at Elmhurst College in May of this year as a Master's Capstone Project in supply chain. The lead author of this article, Tim Engstrom, is the adjunct professor who guided the student team of Jeremy Shaw, Sabrina Ajanee, Geoff Edwards, and Kathryn Kolinski, co-authors of this article and the *Handbook*. Engstrom was previously involved in Walgreens' workers with disabilities program in their distribution centers.

Every day companies intensely search for better talent to meet tight fulfillment deadlines while maintaining accuracy and consistency. This pressures both an organization's human resource department as well as management to find and put the best talent available to work.

HOPE defined

Every day companies intensely search for better talent to meet tight fulfillment deadlines while maintaining accuracy and consistency. This pressures both an organization's human resource department as well as management to find and put the best talent available to work.

As the cover of the *Handbook* says, HOPE brings a new outlook to hiring and employment that can help in that pursuit. The traditional hiring model provides only a partial view of the available workforce. A better idea is to open up the potential employment pool to include people with disabilities, abandoning the conventional view that only certain types of individuals are qualified to work in the supply chain.

A person with a disability, whether it is mental or physical, can perform tasks like any other individual with the proper training and coaching. Furthermore, the same performance levels can be expected of all employees.

Many local, state and national programs as well as human resource companies are dedicated to teaching and coaching people with disabilities in their job functions. State agencies or the local Chamber of Commerce also assist along with community partners to facilitate such a cultural change.

The *Handbook*, the most recent resource available, is built on the acronym HOPE: "H" stands for hiring, "O" for opportunity, "P" for preparation and "E" for execution. Those four words highlight key focus areas required for a successful people with disabilities initiative.

Throughout the *HOPE Handbook* are processes and checkpoints that facilitate the process. These include:

- self-diagnostic analysis;
- analysis of current standard operating procedures (SOPs);
- survey evaluation of current employees for working with disabled team members;
- consultation with professionals in the field;
- awareness training for current staff for working with a disabled team member; and
- partnership agreements.

Taken as a whole, the tips in the *Handbook* offer a running start for a successful hiring and employment program for people with disabilities.

"H" is for hiring

Just getting started is, perhaps, the most important step in hiring. And that requires some high-level upfront work from determining leadership to reviewing costs. This is the time to consider the possible. For workers with disabilities, there is very little that is not possible.

Hiring people with disabilities is clearly an important addition to a company's workforce. It is a cultural change too. In other words, such a program requires a strong champion for the project to succeed. That cannot be understated. Someone has to own the program and strongly advocate its importance to the company's overall success.

That doesn't mean this single person needs to be responsible for all of the program. But there needs to be a leader who is the pilot.

One of the early challenges to success faced by many companies is the myth that hiring people with disabilities will increase costs due to the requirement to provide reasonable accommodation. Fortunately, hiring people with disabilities is not extremely expensive in certain areas, and reduces costs in others.

In most cases, an appropriate reasonable accommodation can be made without difficulty and at little or no cost.

According to ergonomic and job accommodation experts, 31% of accommodations cost nothing, 50% cost less than $50, 69% cost less than $500 and 88% cost less than $1,000.

Other costs can even be reduced. A study of Walgreens' distribution centers by the American Society of Safety Engineers found that medical costs for workers with disabilities were 67% lower than able-bodied employees while time-off expenses dropped 73%. Meanwhile, the turnover rate for those with disabilities were 48% lower than the non-disabled population.

In California's San Mateo County, a study shows disability hiring directly led to an 85% employee retention rate on jobs that typically have the highest turnover. Decreasing turnover with a steady, motivated individual will have lasting productivity impacts. The swing from the hiring/re-hiring cycle to retaining fulfilled employees leads to above average productivity that can deliver more dollars to the bottom line. That certainly helps both HR and management to reduce hiring, training and retention costs.

What about insurance costs? Insurance rates are based solely on the relative hazards of the operation and the organization's accident experience, not on whether workers have disabilities. A study conducted by the U.S. Chamber of Commerce and the National Association of Manufacturers showed that 90% of the 279 companies surveyed reported no effect on insurance costs as a result of hiring workers with disabilities.

There are also a variety of state and federal tax credits and incentives available for companies that hire disabled workers.

"O" is for opportunity

Adjusting the hiring path also opens up several unexpected opportunities. Some are internal and affect overall operations as well as specific departments. There are also benefits to how the company is viewed by customers and the community, which includes prospective future employees, whether they are disabled or not.

The Institute for Corporate Productivity has identified five top benefits for hiring employees with disabilities:

- addition of highly motivated employees;
- inclusive culture attractive to other talent pools;
- improved customer satisfaction;
- improved communications between and across employee cultures, and
- enhanced employer brand.

A great example of a positive impact on entire operations occurred at Walgreens some time ago. Then senior vice president of supply chain and logistics, Randy Lewis, advocated hiring more individuals with disabilities to improve overall efficiency.

At one Walgreens location in particular, 40% of the 400 employees have physical or cognitive disabilities. Yet the facility's efficiency rose by 20%. Technology and process changes originally intended to accommodate workers with

There are also benefits to how the company is viewed by customers and the community, which includes prospective future employees, whether they are disabled or not.

disabilities improved everyone's efficiencies.

It's also important to note that over time a disabled individual will become more comfortable with the surroundings and environment too. That leads to greater speed and efficiency on the job. Competency will continue to rise as the comfort level increases.

Meanwhile, there are many external benefits to hiring adults with disabilities. According to a 2005 study published in the *Journal of Vocational Rehabilitation*, 92% of Americans view companies that hire people with disabilities more favorably than those that do not. Similarly, 87% of consumers prefer to give their business to companies that employ people with disabilities, according to *Disability Inclusion Pays Dividends* by Kathy Bernhardt.

"P" is for preparation

This step may be the most important of the *Handbook*. It is the detailed execution plan for implementation of the program. Key process checks that need to be put in place include a hiring self-diagnostic, current SOP analysis, employee evaluations and awareness training capabilities. All are a matter of knowing beforehand where a company stands on these issues and how it intends to cope with this shift in corporate culture.

Other key steps in the preparation phase include:

- define type of employment;
- establish a hard and soft timeline;
- coordinate and implement necessary accommodations;
- establish organizational changes;
- set onboarding steps; and
- determine performance and success metrics.

Adding the disabled to the workforce might even be a step that a company is not entirely prepared to undertake on its own. That brings into play partnership agreements with one or more outside organizations to formalize training.

Outsourcing leaves the responsibility to another organization that will prepare workers for work through training guidelines and timelines established in the partnership agreement. This alleviates in-house responsibilities for training, but relies upon current coaching and training standards to suit the employee.

A business's front line employees know the intricacies of the day-to-day operation. They should be included in assimilating new hires and making them feel part of the team.

Insourcing the training requires a current trainer to work alongside and individually job coach while learning how to adapt established coaching methods to suit the needs of the disabled. Typically, insourcing more easily customizes the experience for the new employee.

Two organizations that assisted in the research and creation of the *Handbook* perform the function of partner and/or job coach for individuals looking to enter the workforce.

The first organization is ELSA (Elmhurst College Learning and Success Academy (elmhurst.edu/elsa). It offers a four-year program to provide a full-time, post-secondary educational experience to young adults with developmental disabilities.

Upon completion of the ELSA program, students participate in the College's commencement ceremony and receive a certificate of completion with a transcript of their course work. ELSA alumni are invited to attend evening support seminars offered periodically by the College. What's more, graduates are better prepared to find employment and live with greater independence in the community or with their family.

The second organization is Aspire Chicago (aspirechicago.com/). It is recognized as a leader at providing bold, pioneering and uncompromising services to children and adults with disabilities, their families and the Chicagoland community. It is composed of four enterprises: Aspire Kids, Aspire Living, Aspire Careers and Aspire CoffeeWorks.

Regardless of the inhouse/partnership path chosen, it is essential to identify, plan and utilize the key resources needed to hire workers with disabilities.

"E" is for execution

Execution is both the final phase of getting started and an ongoing essential of the program.

Introducing a new strategy that affects the culture of your company is something that should not be taken lightly. Don't underestimate the importance of communication to all in the company. Employees produce the company's results, making clear and concise communication with them an underpinning of everyone's success. Key elements here are the reasons for the program in the first place and its benefits to all.

Once the plan is underway, the execution phase does not simply stop. It requires constant review and adjustments. The goals and objectives should be measured and evaluated. These are the pillars that support long-term success.

Always keep in mind that improvement is driven from the bottom up in small steps by people on the front lines. A business's front line employees know the intricacies of the day-to-day operation. They should be included in assimilating new hires and making them feel part of the team. Since these employees are the ones who are in the best position to know the detailed processes, they should be involved in creating solutions and strategic implementations in their areas of expertise.

Some aspects of the cultural changes may be harder to measure than others, but do not overestimate the power of a simple conversation with those affected by it. Ensure that employees are encouraged to provide honest and critical feedback necessary for improvements and continued success. It's a matter of constant communications throughout the life of the program.

Clearly, current workforce challenges will increasingly require continued improvements in all aspects of hiring, training and retention of employees. This is no time for cruise control. Instead, this is a time for new HOPE in so many ways. Get it right and the business and its people, both those with and without disabilities, will be rewarded with a heightened level of excitement, energy and business accomplishments not previously possible.

For more information, visit elmhurst.edu/hopehandbook

How They Did it:

Google's Innovative Approach to Supplier Diversity

BY ADRIANNA SAMANIEGO, ADAM GARDNER, CHRIS GENTEEL AND LEONARD GREENHALGH

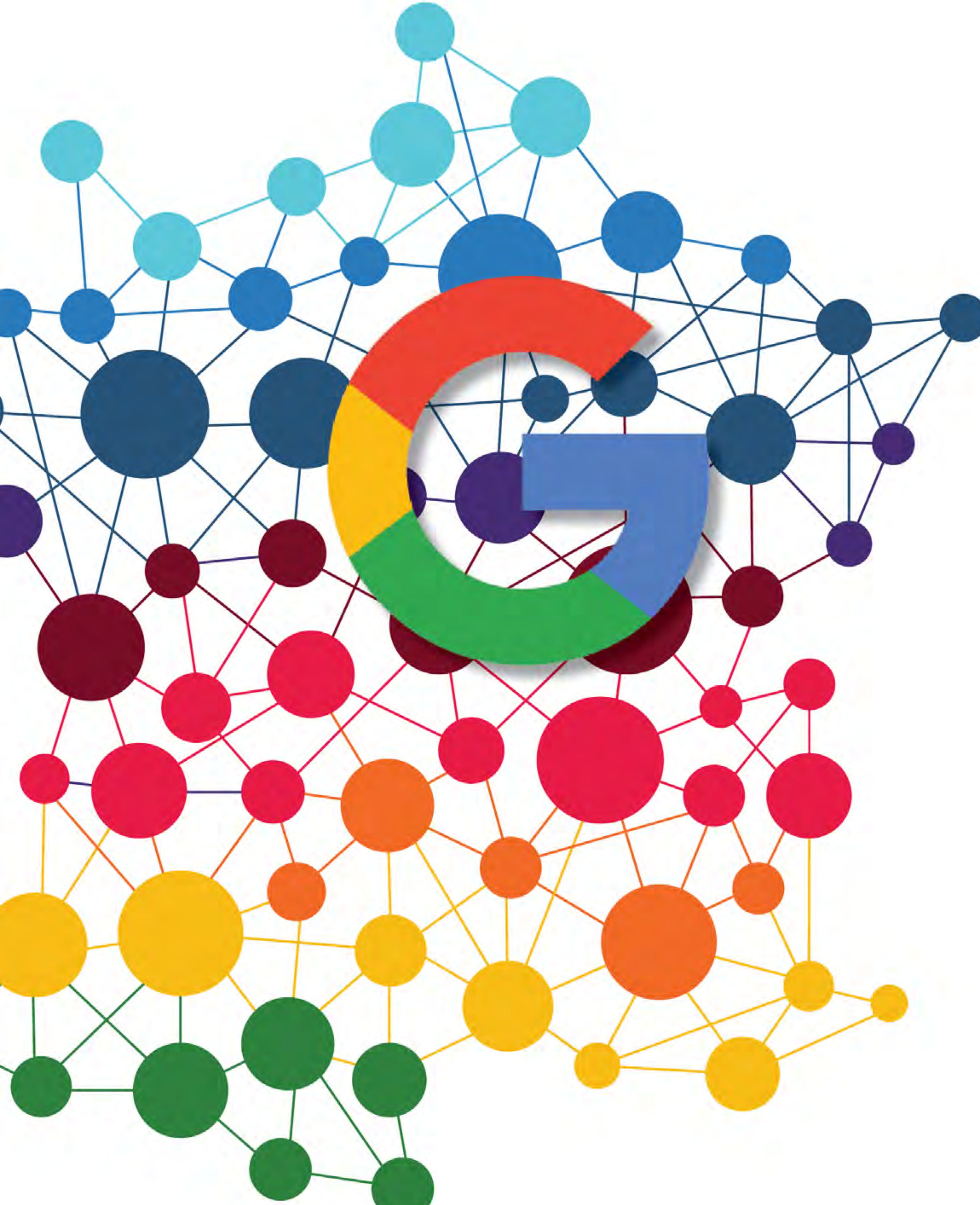
In 2014, Google launched its own fresh take on supplier diversity, designed to drive economic impact for small businesses and fit Google's uniquely nimble culture.

Adrianna Samaniego is senior global program manager of Google Small Business Supplier Diversity. Adam Gardner is the former program manager of Small Business Supplier Diversity and now the Seattle site lead. Chris Genteel is head of business inclusion at Google. They can be reached at smallsuppliers@google.com. Leonard Greenhalgh, Ph.D. is a professor of management and director of the Programs for Minority- and Women-owned Businesses and Native American Business Programs at the Tuck School of Business at Dartmouth University. He can be reached at Leonard.Greenhalgh@tuck.dartmouth.edu.

When employees of Google decide to purchase a product or service—from a desk to catering to electronic components—they can work with suppliers they already know or discover from a Google search. Or, "Googlers," as Google employees call themselves, can also turn to a tool the company developed to find small businesses. Defined as U.S.-based companies with $15 million or less in annual revenue and 50 or fewer full time employees, these are the kinds of businesses that often have a specialized service or game-changing innovative product, but that might never come to the attention of a global technology leader because of their small size.

Yet, as a company that emphasizes constant innovation, Google has a vested interest in working with small, unique suppliers. To fulfill its mission to make the world's information useful and accessible for all requires diverse perspectives from suppliers of all size. And while Google is an engineering-centric business that develops many of its new products in house, like other major corporations, it outsources services and products that aren't best provided from within—such as food and transportation.

Diverse suppliers bring a number of tools to the table as value chain partners. Small businesses, for instance, are adaptable and less likely than big companies to cling to what has worked well in the past. What's more, when these suppliers use Google tools and interact with Google systems, the company receives feedback on user experiences and brand perceptions from communities that may be currently underrepresented online. That is critical data to Google, whose culture is focused on building products



that will work best for everyone, tomorrow and the next day.

This is the strategy behind Google's Small Business Supplier Diversity program. Launched in November 2014, Google's first foray into supplier diversity seeks to: 1) connect more Google employees with diverse-owned small suppliers, 2) connect those diverse businesses to opportunities within Google, 3) help those suppliers grow on the web and improve their business skills, and finally, 4) to foster innovation at the supply-chain level.

Google's take on supplier diversity is different from the typical program in that it does not require certification for women- or minority-owned businesses, to name two common categories.

Google's take on supplier diversity is different from the typical program in that it does not require certification for women- or minority-owned businesses, to name two common categories. The application process was designed to be simple and comprehensive. By not restricting participation to certified small businesses, Google is open to working with a wider variety of diverse-owned businesses; it was built to be "universally accessible and useful," just like Google's products. The application encourages all minority-owned, women-owned, LGBT-owned, disabled-owned and veteran-owned businesses, as long as they fit the other criteria.

The program is also adaptable and evolving, an approach in keeping with a company that lives by the motto "Launch and Iterate," meaning there's always room to adjust and fine-tune an application or service after it has gone live.

This article, co-authored by two of the Google executives who worked on the project and a management professor and supplier diversity consultant from Dartmouth College's Tuck School of Management, is the story of how Google does supplier diversity the "Googley" way (the adjective that Googlers use to describe their company's collective creative qualities).

The world that was

There is one big reason that supplier diversity is different at Google: Procurement works differently, especially compared to other similarly-sized companies. For example, there is no formal procurement or purchasing function. Google's Procure to Pay (P2P) team owns and maintains procurement processes and systems, but procurement doesn't actually make buying decisions. Rather, all 65,000 Googlers are empowered to make their own purchasing decisions, based on their specific needs. This open approach, coupled with encouragement to do business with a broad spectrum of suppliers, helps ensure that innovations being developed outside of Google can be noticed, considered and become an element of Google's value proposition—as an integrator of technology as well as a provider of cutting-edge digital services.

But how does a Googler learn about and gain access to that broad spectrum of suppliers? That question was one of the catalysts for the Small Business Supplier Diversity program back in 2012, according to Adrianna Samaniego, senior global program manager of Google's Small Business Supplier Diversity program and one of the co-authors of this article. At the time, Google was working on a "business inclusion" initiative—in other words, efforts that help level the playing field for businesses and individuals without equitable access to technology—aimed at its customer base. "Initially, we were looking at the diversity of our customer base and the diversity of our workforce, but not the diversity of our supply chain," Samaniego recalls. "We realized that if we want small and diverse businesses as customers, we should also want them as suppliers. We wanted to be open for business and have economic impact."

At the time, Google was the equivalent of a "black box" to small and diverse suppliers—perceived as mysterious or even inaccessible. And similarly, small and diverse suppliers were not easily accessible for Googlers. With no formal supplier selection process, Googlers often learned of suppliers by word of mouth or from colleagues. To get listed on Google's internal corporate supplier registration site required a supplier to already have a contact inside the company. Finding that contact required patience and persistence. "One small business spent two and a half years asking around at our bus stop areas for the right person to talk to about their company before they found a contact," Samaniego says. Obviously, not all companies would have the time or tenacity to find a contact within a corporation to pitch their services.

That year, Chris Genteel, Head of Business Inclusion at Google, attended the National Minority Supplier Development Council (NMSDC) conference to learn more. Based in Ann Arbor, Mich., Genteel was a long-time Googler who had previously worked with the U.S. Black Chambers. The takeaway from the NMSDC conference was that Google should commit to supplier diversity to drive measurable economic impact in communities that are under-represented online. But it was also clear that the company had a lot to learn if it was going to create a program that was not simply a cookie cutter of what was done at other organizations. It would have to fit with Google's fast-moving, fluid and highly data-driven culture.

Samaniego, along with Genteel and Adam Gardner, a site program manager at Google, each began to devote 20% of their individual work weeks to develop the program. This is a common practice at Google, which encourages employees to devote part of their days to passion projects; the policy has resulted in some of Google's best-known innovations, including Gmail.

From the start, Samaniego says, the supplier diversity program was jointly owned by both diversity and finance, with the team reporting to Ruth Porat, senior vice president and CFO of Google and Alphabet. Porat remains actively involved in supporting the program and learning from diverse suppliers. She recently held a brief round-table discussion with five suppliers from the program at Google's headquarters in Mountain View, asking them for candid feedback on the program that the team will implement to meet suppliers' needs.

Designing diversity

Genteel, Samaniego and Gardner spent 2013 designing the program. The objective, Genteel recalls, was "to build out a program that was meaningful and not just symbolic." From the start, it was clear that an unorthodox, decentralized approach to procurement called for something other than a traditional supplier diversity program focused on quotas and certifications.

"Googliness is the core of our culture," says Samaniego. "Many of our successes as a company have been the result of innovation teams that had the autonomy to go out and find suppliers rather than work from a list. That matches our culture, and not quotas and certification processes."

Data is also core to Google's culture because it grounds creativity in practicality—as well as identifying measurable results. To build a business case for supplier diversity, Genteel, Samaniego, Gardner and their teammates collected as much data as they could about the current state of Google's supply base as well as the number of African-American, Latino and other minority-owned businesses in the United States. They then tied that to the impact Google could make in this area, based on the amount of money it spends each year.

The team spent the first five months of 2013 exploring what constituted a best-in-class supplier diversity program. They documented what Google's peers in high tech were doing (they learned that other than Intel and Dell, few had programs); how the certification processes work at organizations such as NMSDC and the Women's Business Enterprise National Council (WBENC); and finally, what was happening at the governmental level.

"Googliness is the core of our culture. Many of our successes as a company have been the result of innovation teams that had the autonomy to go out and find suppliers rather than work from a list."

—Adrianna Samaniego, senior global program manager, Google Small Business Supplier Diversity

Google also reached out to the business community across the United States to hear what diverse-owned small businesses wanted and needed. There were several key learnings. One was that suppliers didn't want to spend hours completing applications, updating certifications or mining through complicated portals; they simply wanted a foot in the door. Second, many suppliers weren't sure whether investing in their Web presence as a marketing tool would yield a return, but they wanted to grow their digital skills because they want an equitable opportunity to participate in today's online economy. Many didn't know where to start. This feedback directly influenced the way the Google team designed the program and set its goals.

While key members of the team were based in different parts of the United States (Genteel in Ann Arbor, Mich., Gardner in Seattle and Samaniego in Mountain View, Calif.), they held several long workshop sessions, sketching out their ideas for the new program with erasable markers on giant white boards during video conferences. By May 2013 they had a road map. And by that July they had defined the elements of the program:

- Instead of certified minority-owned businesses, the Google program would focus on small businesses using the EU definition of $15 million in revenue and 50 full time employees.
- Simplicity was top of mind: They needed a program and a technology tool, or portal, that was easy to use by suppliers and Googlers alike.
- Communication and partnerships were critical if Googlers and diverse suppliers were going to sign on. For example, suppliers complained that they often entered data into online portals and then never heard back. Google promised a response within two weeks after supplier information was received; whether any of the documentation, such as tax information, was missing or wrong; and what they could expect next.
- Provide clear value and benefits for participation beyond the potential for business, such as a discount on AdWords, faster payment for participating suppliers and, eventually, a training program to improve the business skills of small suppliers.
- Finally, Google created an advisory board it could leverage for guidance. Members received a one-page description of the program and its potential impact because the team recognized that they were creating something different from industry norms.

"People told us that they weren't surprised Google was doing this, that we'd built alignment with our culture and it made sense from an external standpoint."
—Adrianna Samaniego

While Samaniego oversaw the marketing efforts, Adam Gardner focused on development of the technology behind the initiative. In addition, the finance operations team signed up to help connect more Google employees with small, diverse-owned suppliers and the diversity team set a goal to design program benefits that would help mobilize program participants on the web. This hybrid team, combined with the program's dual-pillared strategy, resulted in each group bringing different competencies to the program, as well as to participant suppliers. It represented the Googley approach of having a diversity of perspectives and skills at the table to solve a problem.

Early feedback from the first reviewers was positive. "People told us that they weren't surprised Google was doing this, that we'd built alignment with our culture and it made sense from an external standpoint," says Samaniego.

Going live

Google's Small Business Diversity Program officially launched in November 2014 in Orlando, Fla. at NMSDC's annual conference. To prepare for the go-live, Google conducted a small pilot in Texas with the Greater Austin Hispanic Chamber of Commerce and the Dallas/Fort Worth Minority Supplier Development Council. Both organizations sent out an e-mail to invite a subset of its members to apply to the program and stress test the portal to make sure that it would stand up to traffic. Google also created a partner launch kit and social media presence to drive awareness. Those went to regional and national organizations such as NMSDC, WBENC and the National Gay & Lesbian Chamber of Commerce (NGLCC) to let their members know that Google would be in attendance.

While specific numbers were not made public, Samaniego described the event as "our coming out party to the industry." Internally, it was considered a success, as measured by the number of applications to the Supplier Diversity program garnered at that event, as well as the number of press and social media hits covering the event.

Over the next year, the Google team continued to drive awareness and applications through partnerships and attendance at physical events. In 2015, for instance, the Supplier Diversity team attended an estimated 20 events with 12 partners across 20 states and cities, because suppliers wanted to see someone from Google at an event. They also hosted online Webinars to offer more access to information to a wider variety of suppliers who couldn't attend these events The supplier diversity team undertook similar marketing and education efforts internally with Googlers. The most important takeaway was that Google had to be physically present in communities to hear first-hand from community members and to build their trust.

"It was critical to meet diverse businesses where they do business," Samaniego says. "That's where we heard feedback and that's where we demystified the process. A lot of small businesses think that because they're not a technology business, they don't have anything to offer to Google or they may not be ready to do business with Google."

The big learning internally was a better understanding of how Googlers make their decisions and what type of information they needed to make it easy. "Initially, we thought that because we had a tool, they would use it," Samaniego said. "But we had to do a learn-a-thon internally."

Launch and iterate

One of the hallmarks of Googliness is to launch and iterate—that is, to get a program going and then reassess and tweak to make improvements. The same held true for the Supplier Diversity program.

When a 2015 review with Googlers found that many employees were only "Googling" on the public Web to find suppliers to meet their business needs, the Supplier Diversity team decided to build an internal tool to make this easier. The Google employees wanted a system that surfaced existing, approved Google suppliers who sold what they needed. The program team also wanted to make sure that small and diverse-owned suppliers were part of those search results to give them an equitable change to be considered. The project, headed by Gardner, was called Pivot.

What resulted was a combined supplier search and rating tool that accomplished several main goals:

- provided Google employees the ability to "rate" supplier interactions, and therefore surface better information on the best suppliers to other Google employees at scale, thus offering valuable data to help employees make decisions on whether to hire a certain supplier;
- offered an opportunity to provide Small Business Supplier Diversity Program participants a "foot in the door" by including them in search results, even though they hadn't yet worked with Google employees. Each supplier in the program was provided with a unique icon identifying it as a member in Small Business Supplier Diversity program; and
- connected Google employees with the suppliers who could provide products and services quicker, easier and more directly than just a random supplier found searching on the web with no clear reference of reputation or vetting to see if their culture would align with Google's culture.

The Pivot tool launched in July 2015, and the program team is tracking the way that Google employees are using it. Of key interest is the number of searches that include program participants, and whether Google employees reach out to program participants using the tool. Of secondary interest is whether the interaction leads to a purchase. Because the core program goal is to connect Google employees with participants, the supplier owns the process from the connection point to the sale.

Google's innovative supplier development program

Supplier diversity was the first important step in the development of the Small Business Supplier Diversity program. The second step was an innovative skills development program. To make that happen, Google began collaborating with the Tuck School of Business at Dartmouth College in 2015.

"A lot of small businesses think that because they're not a technology business, they don't have anything to offer to Google or they may not be ready to do business with Google."

—Adrianna Samaniego

The Tuck School has deep expertise in the structure and management of supply chains, but the school also has unique experience in developing diverse suppliers as value-chain partners. Since 1980, Tuck has been providing custom learning experiences tailored to the needs of minority business owners. Its short programs—none of them longer than a week—offer a "boot camp" experience for small business owners. The design of these programs reflects the fact that the typical entrepreneur knows more about manufacturing a product or delivering a service than about running the business and taking a strategic role in a supply chain.

More important is the fact that poorly run businesses are not good supply chain partners. The Tuck School programs are heavily focused on making participants' own businesses better, which is why the case study for each program is the participant's own business. The participant learns what needs to be done, then applies the learning to improving his or her business. The "deliverable" of these programs is always a to-do list. It is with this development philosophy that the school approached the emerging challenge of achieving digital excellence. And the school collaborated with Google to achieve measurable results.

By the same token, Google is in a strong position to make a difference in the effectiveness of its suppliers.

The business world has changed radically over the last 20 years. Since Google was founded in 1998, digital information has become central to how a business is controlled, and how customers and suppliers interact with the business. Google has a broad array of business tools available to make suppliers more effective and efficient by accessing and analyzing information.

The collaboration is led by Tuck Professor Alva Taylor, the faculty director of the school's Glassmeyer/McNamee Center for Digital Strategies, and draws on the distinctive competencies of both organizations. The Center keeps track of emerging digital capabilities and how these are applied to business challenges in a way that generates competitive advantage. That's exactly what small, diverse businesses need to do to become valued members of corporate supply chains.

"My main takeaway from the three-day course was that even as a small business, I can compete with the biggest companies if I have a solid digital strategy."

—Matthew Moses, owner, Shalimar Media Group

Sessions at the three-day program range from constructing a digital strategy and marketing businesses online to managing a digital community. The topics include Website design, search engine optimization and successful digital business models and intensive sessions on analytics. The sessions are led by Googlers and Tuck faculty members, depending on who has superior expertise in a particular domain.

To date, the program has hosted four graduating classes since its launch in 2015, hosting more than 200 entrepreneurs as participants. Among the outcomes:

- all respondents surveyed found the program valuable to the growth and development of their business;
- all included implementing or creating a digital strategy in the "top 3 things" they will change when they return to the office;
- belief that a digital strategy to reach the business' fullest potential grew from 17% before the program to 88% after the program; and
- 125 of the participants in the supplier diversity program received scholarships from Google to date. Both Tuck and Google view the program as a success.

Supplier diversity today

The Google Small Business Supplier Diversity Program is now over two years old. Successful suppliers have benefitted not only from the business they have gained with Google, but the growth of their businesses as a result of the tools and training provided through the program. Take two examples:

- Andre Leftwich, the CEO of Every Merchant, a digital marketing and strategy provider, has utilized Google Maps to create 360-degree virtual tools for local businesses after going through the Tuck program. "We have grown more than 100%," he says. "I attribute this directly to the projects we've secured with Google and the tools that they have given us to help the companies we serve."
- Matthew Moses, the owner of Shalimar Media Group, a provider of corporate apparel, began working with Google several years ago to design a shirt for Black History Month and now does a few projects for the tech giant each month. Through his participation in the supplier diversity program, Moses took advantage of the Digital Excellence Program offered by Google and Tuck. "My main takeaway from the three-day course was that even as a small business, I can compete with the biggest companies if I have a solid digital strategy," Moses says.

Large corporations have sophisticated supply chains that are digitally enabled. Small suppliers need to be equally sophisticated if they are going to successfully interface with corporate value chains. This innovative program shows that small, diverse suppliers can be taught to catch up and present themselves as competent participants in today's and tomorrow's major value chains. Still, Google continues to look for ways to launch and iterate to continue to grow the program.

"We now want to invest more in education; we're digging into our data to understand where we are compared to our metrics of success; and we're drilling down by community into the community of diverse suppliers to uncover the areas where we can improve," Samaniego says.

To that end, the team launched the program in Ireland in March 2017, and plans to launch in five other locations globally this year. "Google and our parent company Alphabet are now expanding into almost every industry you can think of," Samaniego adds, referring to the company's extension into hardware, self-driving cars, health, shopping and others. "In order to continue to be innovative, our supply chain needs to be inclusive."

How to get end-to-end supply chain planning right

Far too many companies invest time and money in their planning capabilities with little to show for the effort. There is a better way.

BY CAN A. DOGAN

For decades, supply chain planning (SCP) has been a major challenge for companies of all sizes. A common theme plays out in most cases: Organizations invest substantially—both in time and money—in their planning capabilities, only to see poor results.

Let's take a recent example. A large consumer packaged goods company was struggling with less than ideal inventory performance and relatively high case fill rates. But because their performance metric was defined to favor the efforts of execution, rather than truly meeting demand on time and in full, their supply chain costs were higher than their peers.

This company had made years of investments in multiple SCP technologies that were only partly satisfactory. Spreadsheets were still persistent across the organization and were commonly used for key parts of the SCP process. When the organization uncovered gaps in their SCP technology capabilities, it remedied these shortfalls with temporary workarounds and the allocation of additional resources.

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The company's planning organization itself was large by standard benchmarks, with redundant roles that inflated the numbers. Moreover, the company did planning in a siloed way, with the expected links between departments best described as manual, with little to no consistency. Work was getting done, but the effort required to achieve results was significant, while the quality and accuracy of plans was always in question. Each cycle required a major manual effort and finessing of plans. In the end, the results were disappointing.

A combination of data-driven root cause analysis, behavioral changes and internal and external collaboration can strengthen an organization's ability to plan effectively and reduce supply chain variability that puts additional pressures on the planning functions.

To compound the problem, the organization suffered from process and plan compliance issues. While the end-to-end process may have looked acceptable on paper, the vision was not unified or solidified across the various functions of the company. An inconsistency between the objectives of production and the rest of the supply chain meant that inventory was not being deployed as needed. Furthermore, there was little uniformity in how products and customers were treated, with segmentation in some areas, but not in a consistent and stratified manner across all functions.

Unfortunately, the dilemma of this CPG company is an all too common situation—across nearly every industry segment.

Happily, there are steps that organizations can take to help remedy their SCP challenges. But often the first step is to simply acknowledge that the issues exist. A combination of data-driven root cause analysis, behavioral changes and internal and external collaboration can strengthen an organization's ability to plan effectively and reduce supply chain variability that puts additional pressures on the planning functions. True SCP excellence may take longer to achieve, but it can happen if a prioritized plan is put in place and followed diligently.

Barriers to planning

Before addressing solutions, it might be helpful to think about the range of issues organizations confront that can result in poor supply chain planning.

Often, the genesis of the problem is failure to properly align the supply chain strategy with the planning capabilities and strategies. Planning needs to be tailored for different sourcing, manufacturing and fulfillment business models to enable execution and synchronization across the supply chain. This may require a segmentation strategy for customers and products, routes to market and regulatory requirements. Localization and customization requirements may also necessitate planning and execution for multiple supply chains.

In most cases, organizations allocate significant resources to planning, but inherent challenges, such as high variability in the demand signal and added variability within the echelons of the supply chain, lead to poor-quality plans and a lack of synchronization. In many organizations, considerable effort has been expended to develop inaccurate demand plans. The issue can be compounded when demand plans are updated and overwritten by different parts of the organization, with each update introducing another layer of error and bias. Meanwhile, less effort is made to develop formal processes with trading partners that could potentially reduce guessing and bias.

Technology can present another barrier to accurate planning. SCP systems are decision support systems, but too often they are treated as an extension or as an enterprise resource planning (ERP) system that is transactional in nature, with limited decision-making capabilities. A lack of a planning system maintenance strategy can also lead to expenditures on multiple solutions that fail to meet the needs and the realities of the supply chain, as companies search for a "silver bullet" solution.

Finally, the people dimension of the problem cannot be overstated. The best planners are highly skilled, analytical individuals with numerous career options. Recruiting, retaining and developing individuals with strong planning skills requires sustained effort and investment.

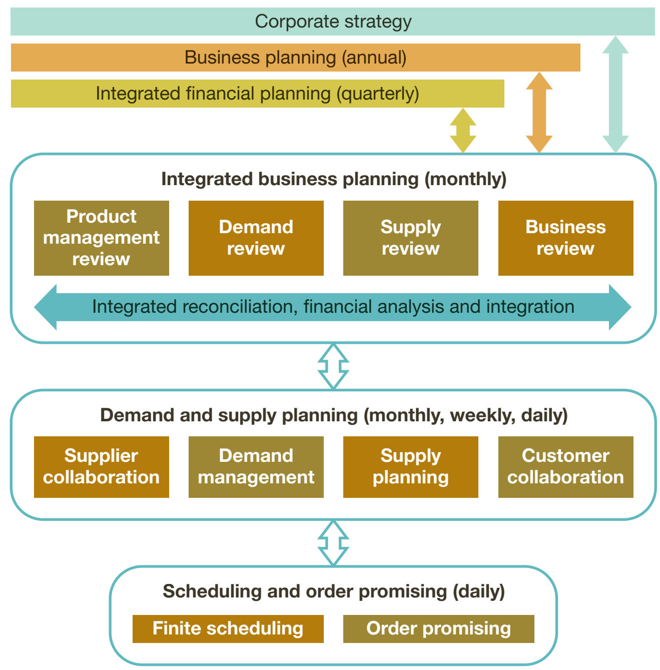
What is end-to-end supply chain planning?

End-to-end supply chain planning, or what we'll refer to as e2e SCP, begins with demand management—an understanding and forecasting of the demand picture from short-, mid- and long-term perspectives. The granularity of this demand picture may vary based on the time horizon chosen and could incorporate both product life cycle planning and promotions. It is a cross-functional process that, if approached correctly, can generate a consensus forecast that can serve as a solid basis for planning.

The main objective of supply planning should be to develop realistic plans (weekly and/or monthly) that determine where and how much to produce; where, when and how much material should be moved between the various supply chain nodes; and when and how much of the raw materials will be required to support the plan. All of this information feeds into the decision of how much inventory the organization needs to hold in stocking locations (Figure 1).

FIGURE 1

Planning and scheduling



Source: EY

This sounds quite simple in theory, but there are many ways to handle SCP depending on the needs and the objectives of the organization, the characteristics of the supply chain and the products, the profile of the customers and other constraints of the physical supply chain and the resources.

Another key component of the supply side of planning is scheduling. Scheduling assets and resources on a day-to-day, hour-to-hour basis requires the development of short-term production schedules to meet the customer and replenishment orders while best utilizing assets and minimizing costs.

Supplier collaboration may be as simple as an information exchange on components and raw materials, or it may involve more complex synchronized planning, with significant data exchange and execution to meet contractual obligations. Proper customer collaboration requires forecasting and replenishment planning with the key customers. Core planning capabilities such as demand and supply planning are essential prerequisites for successful customer collaboration.

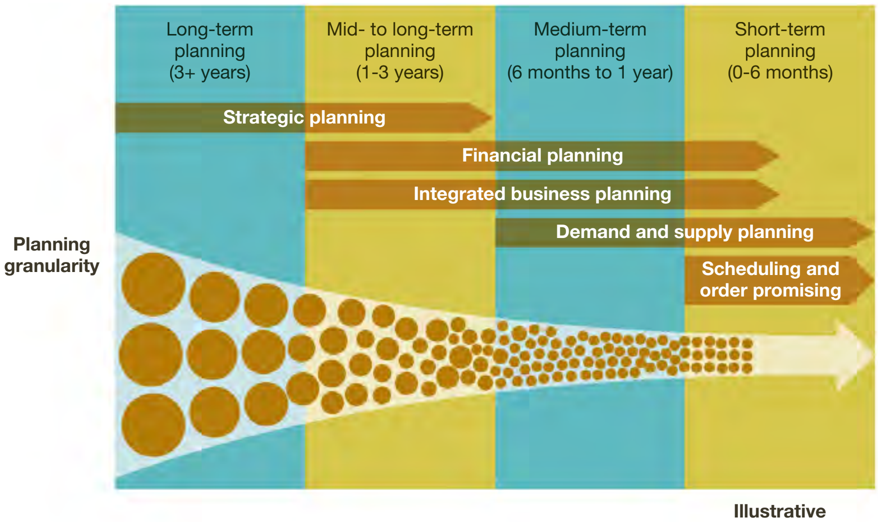
Even in "make-to-stock" environments, order allocation and promising is a core function, since it focuses on allocating products and promising delivery (or shipment) dates to customers. Sound demand/supply balancing and scheduling capabilities can produce better order allocation and promising processes.

Integrated business planning (IBP), more commonly known as sales and operations planning (S&OP), is a cross-functional process that supports the way a corporation functions and does business (Figure 2). It allows synchronization between product development, marketing, sales, finance and supply chain, with common goals and objectives. IBP/S&OP is essential in translating corporate strategy and enabling and achieving business objectives and targets.

It could be argued that IBP/S&OP can be the starting point for e2e SCP; as a practical matter,

FIGURE 2

Integrated business and operations planning



Source: EY

Visualizing risks and opportunities ahead of time can help the organization align procurement, production, customer service and logistics to model and respond to different scenarios. Playing out future scenarios and developing a range of response options can be a powerful tool for hitting performance objectives.

however, core planning capabilities need to be in place to support this level of integration and synchronization in a corporate environment. What's more, the focus of IBP/S&OP is on mid-to-long-term planning and provides direction to core planning functions and supply chain execution. The IBP/S&OP process uses aggregate level data to reduce the noise in mid-to-long-term planning. The idea: Focus on aligning the demand and supply while meeting corporate financial objectives, such as growth targets, revenue projections and factoring in constraints related to capacity and resources.

The benefits of end-to-end planning

An end-to-end planning strategy can provide numerous benefits, but the foremost advantage is that it allows the organization to make the most of all available resources, with minimal waste and cost leakage. Synchronizing plans with trading partners can also help companies reduce expedited shipment costs, avoid redeployment of inventory and product availability issues and, ultimately, experience fewer lost sales.

Furthermore, the ability to plan ahead can influence the approach the organization takes toward demand, shaping it into a competitive advantage.

E2e SCP can also strengthen the ability to execute on the organization's broader corporate strategy by supporting the development, analysis and accuracy of annual and financial plans. Too often, these processes are de-coupled. Rather than agreeing on a common forecast, it becomes a painful process of reconciliation and adjustment replete with surprises, inaccuracies and manual efforts.

Finally, e2e SCP can help better align the organization with its key suppliers and customers, reducing the cost of out-of-sync plans, lowering manufacturing and distribution lead times, and facilitating smarter inventory deployment decisions.

Pitfalls and remedies

Building an e2e SCP capability requires a strategy, as do all transformational change initiatives. A clear vision needs to be defined for the capability, and often this vision can be complex, with time and effort necessary for internal alignment. But once this vision is articulated, companies often lose their way. These are common pitfalls and potential remedies that you can undertake in your organization:

Lack of service stratification. Few companies consistently stratify their services based on customers and products, cost to serve or other priorities. That is because prioritizing customers and/or products within each discrete segment of the company, from customer service to production, requires significant internal collaboration and alignment. Things you can do:

- **Establish that a service stratification strategy is in place;** align all planning functions to support this strategy with both process and technology enablement.

Sequence and evolution in capability building. Companies often follow trends and market hype, embarking on complex solution implementations before defining and building the core capabilities that can potentially leverage and make use of technologies. Things you can do:

- **Establish that core demand and supply planning processes and capabilities are in place.** For example, advanced capabilities in multi-echelon inventory optimization can be valuable, but only if a core supply planning capability that can make use of the inventory targets generated by such a tool is also in place.
- **Evolve from simple to complex within each capability.** You may have a simple supply planning process from which sourcing decisions are made, with constraints applied manually. Eventually this may evolve into a more complex optimization model that can determine the right sourcing location and apply all constraints in a single step, but that gain in capabilities might require complex mathematical modeling and additional maintenance.

Lack of career development. Like most corporate specialty jobs, planning requires people with the right education, the right skills and an ongoing strategy for learning and growth. Some key planning disciplines can only be learned through hands-on experience. It is difficult to find skilled planners, given that those with experience are in high demand and tend to move upward rapidly. One of the most persistent issues across industries is that planners do not have well-defined career paths. Things you can do:

- **Develop an internal training curriculum customized for each planning role.** This curriculum can allow every new planner to learn not only basic to advanced concepts, but also leading practices within the company.
- **Cross-train planners in both demand and supply; move them between planning areas to achieve broad coverage as needed.**
- **Consider planning as a service.** This may sound like an extreme measure, but companies have been outsourcing parts of their supply chains for cost and efficiency purposes. This option offers a service bureau to fill in your skill gaps and enhance your ability to plan better, so you can focus your time more on high-value items such as dealing with exceptions, synchronizing plans and scenario analysis. Most analytical components of planning can be purchased as a service.

It is difficult to find skilled planners, given that those with experience are in high demand and tend to move upward rapidly. One of the most persistent issues across industries is that planners do not have well-defined career paths.

Lack of global organization and coordination. When organizations expand their operations globally, they often fail to adapt their planning capabilities accordingly. Things you can do:

- **Determine your balance of global, regional and local planning needs based on the way your supply chain works and serves your customers.** Consider centralization to leverage scarce resources, plan globally and reduce costs.

Lack of data governance and maintenance. Data is everything in planning. The process is data-driven and unforgiving. Lack of data or inaccurate data will inevitably result in poor planning and performance. Things you can do:

- **Get your data house in order.** In addition to developing a governance process for data creation and maintenance, perform periodic comprehensive audits on the completeness, quality and accuracy of the data. Try to automate these audits for less effort.

Lack of planning model and parameter maintenance. ERP master data typically would contain most or all of the planning parameters such as lead times; however, since these may be only used by planning, they are typically overlooked and not maintained, leading to significant planning inaccuracies. Things you can do:

- **Develop a planning data, model verification and validation process during the development of the planning capability.**

The wrong technology can hinder your ability to plan better and do it efficiently at scale. Selecting the right technology should be a result of your planning vision and not the other way around.

Periodically verify and validate your planning data and models. Automate the process of developing planning parameters to increase quality and speed.

Poor technology selection decisions. Technology selection has been debated extensively in the planning world. Poor planning leads to desperate attempts to try anything to improve the results. Software vendors tend to provide one size fits all solutions to all industries. Typically, these solutions (best of breed or not) were designed for a few industries, and yours may not be included. Things you can do:

- **Develop a vision of your solution before considering vendors.**
- **Your requirements most likely land in one or more of the finite number of planning paradigms available.** Make sure your set of vendors under consideration can support these paradigms successfully.
- **Make sure the solution will be scalable, configurable and sustainable to serve current and future needs.**

Incorrect technology implementation methodology. One of the key reasons for failure with SC planning and SC planning technology is the implementation methodology. This issue stems from all parties involved—IT departments, vendors and system integrators. Implementing ERP and implementing planning technology are very different things. Things you can do to improve your implementation methodology:

- **Design and prototype at the same time and do it iteratively.** This is not only good for the quality of the solution that is being built but also great for winning the hearts and minds of the planner early on in the project.
- **Use a full set of data from day one to make sure the solution can be validated and scaled and so that performance can be observed and adjusted as needed.**
- **Train your planners, but also be sure to conduct knowledge transfer sessions to enable them.**

The planning advantage

E2e SCP can provide a significant advantage, but it requires investments in process, people and technology. These investments need to be made in a progressive manner. People development is an essential part of the planning capability, but it goes beyond recruiting. A sound, continuous training and learning program needs to be in place.

The wrong technology can hinder your ability to plan better and do it efficiently at scale. Selecting the right technology should be a result of your planning vision and not the other way around. Furthermore, implementing planning capabilities and technology requires a more iterative, data and modeling focused, and people-centric approach than standard technology implementations.

A flexible and competent planning capability is an essential element for improving supply chain performance. Companies face increasingly complex business conditions, such as omni-channel models, cost pressures, global demand and supply, outsourced manufacturing and distribution; however, most do not identify planning as a core competency. By remedying their areas of weakness, companies can do a lot, in a relatively short time, to turn planning into a differentiating cross-functional competency.

The views expressed herein are those of the authors and do not necessarily reflect the views of Ernst & Young LLP.

Strategic supplier relationships benefit procure-to-pay and beyond

Organizations building stronger relationships with a broader group of suppliers have clear advantages.

By Becky Partida, APQC

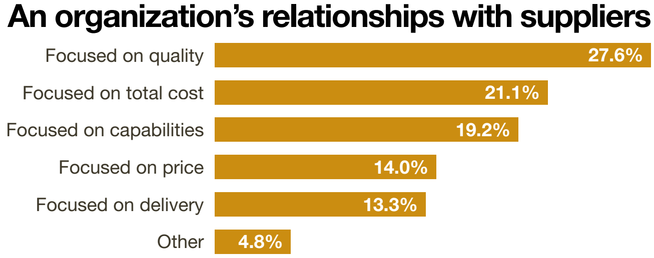
Becky Partida is senior research specialist, supply chain management, APQC

When it comes to improving performance, many organizations focus too much on tactical processes for regular activities such as ordering materials. They neglect the front-end steps they can take to benefit these internal processes and help them run as smoothly as possible. This includes improving processes for appraising and developing suppliers. By conducting these processes effectively, an organization can weed out unnecessary, inefficient or ineffective suppliers and foster stronger relationships with suppliers that are beneficial for the organization. The relationships that come out of a strong supplier development program lead to highly efficient procurement efforts both at the tactical and strategic level.

APQC recently looked at its Open Standards Benchmarking data in procurement to determine how practices aimed at evaluating the capabilities of suppliers affected the procure-to-pay process and procurement efforts overall. APQC found that organizations focusing their supplier relationships on more strategic factors and organizations more broadly and more frequently using supplier scorecards have clear advantages in their procurement efforts overall and in their procure-to-pay processes.

FIGURE 1

An organization's relationships with suppliers



Source: APQC

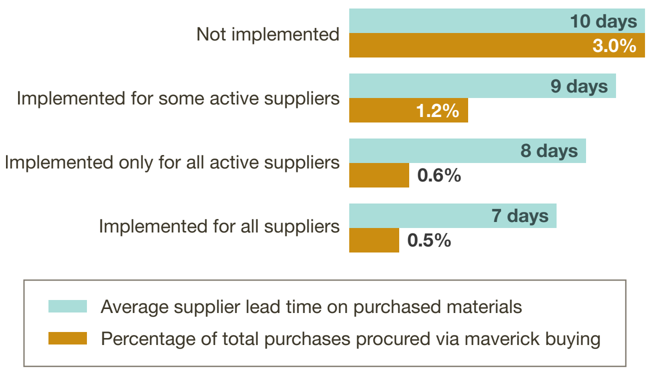
Supplier appraisal practices

APQC examined several aspects of how organizations evaluate suppliers. First, it looked at the nature of organizations' relationships with suppliers. As shown in Figure 1, these relationships are focused on a variety of factors. However, the top three factors are quality, total cost and supplier capabilities. Only 14% of responding organizations indicate their supplier relationships are focused primarily on the price of purchased materials. These results indicate that many organizations are looking at the bigger picture when selecting and retaining suppliers.

When it comes to assessing suppliers, APQC's data indicate that the majority of participants in its survey use supplier scorecards with their active suppliers. Specifically, 38.4% use supplier scorecards with some of their active suppliers, and 31.6% use scorecards with all of their active suppliers. In a related practice, many organizations conduct formal reviews of their top-tier suppliers using scorecards as the basis for communication. The largest

FIGURE 2

Implementation of formal supplier scorecards and procurement performance



Source: APQC

groups of organizations with this practice conduct these reviews quarterly (38%) or annually, (24.1%), but some even conduct these reviews on a weekly basis (3.9%).

Impact of supplier relationships

APQC has also found that organizations with a more strategic approach to supplier relationships have clear advantages over organizations with a more traditional approach. For example, they have some of the shortest procure-to-pay cycle times. Organizations with supplier relationships focused on capabilities have the shortest, with a cycle time of 16.0 days at the median, followed by organizations with a focus on delivery (17.5 days at the median) and organizations with relationships focused on quality (26.0 days at the median). Although different factors can affect procure-to-pay cycle time and even lead to an organization wanting a longer cycle time, for many organizations a shorter time for the procure-to-pay process is beneficial.

Organizations having more strategic supplier relationships have an advantage with regard to strategic suppliers as a percentage of all active suppliers. Again, organizations with supplier relationships focused on quality perform best, with a median 25% of their active suppliers being strategic ones. This is followed by organizations with supplier relationships focused on delivery (17% at the median) and organizations with supplier relationships focused on capabilities (16.1% at the median). The higher percentage of strategic suppliers may be a result of a broader focus on strategy within procurement that extends to the focus of individual supplier relationships. However, it may also be that developing more strategic relationships leads organizations to do business with fewer non-strategic suppliers.

Impact of scorecard practices

APQC's data also reveal procurement benefits for organizations that broadly use supplier scorecards. As shown in Figure 2, the more widely organizations have implemented formal supplier scorecards, the better supplier lead times they achieve and the smaller percentage of maverick purchases they make.

Organizations that use supplier scorecards with all of their suppliers have a median supplier lead time three days shorter than those of organizations that have not implemented supplier scorecards at all, and two days shorter than those of organizations that have implemented supplier scorecards for only some of their active suppliers. The shorter supplier lead time can have a clear benefit to an organization's procure-to-pay process because the organization spends less time waiting on delivery and is able to complete transactions faster.

Similarly, organizations that use scorecards with all of their suppliers have better results with regard to the percentage of their total purchases made via maverick buying. The difference between the median amount of maverick purchases these organizations make and the amount made by organizations that do not use supplier scorecards is over 2%. When compared with organizations that use supplier scorecards with some of their active suppliers, organizations with the widest use of scorecards still make nearly 1% less of their purchases via maverick buying. By reducing maverick buying, an organization ensures it does business with familiar suppliers with which it has established expectations. This ensures that the organization avoids surprises in delivery, such as delayed or incorrect shipments.

A related practice is the use of formal reviews with top-tier suppliers using scorecards as the basis for communication. This goes beyond simply tracking supplier performance to discussing performance on a regular basis with suppliers of greatest importance to the business. As shown in Figure 3, organizations that conduct formal reviews of top-tier suppliers on a weekly basis have the greatest percentage of supplier on-time delivery, as well as the lowest total cost to appraise and develop suppliers per $1,000 in purchases.

At the median, organizations performing weekly reviews of top-tier suppliers have 95% of their supplier deliveries made on time. APQC recognizes that some organizations may not be able to achieve weekly reviews of suppliers, no matter how strategic they are to the business. Organizations in APQC's data conducting monthly reviews also perform well, with 93% of their supplier deliveries made on time at the median. This interval may be more achievable for organizations wanting to keep resource levels down. Less frequent reviews (quarterly, annually, sporadically and never) have the same percentage of supplier on-time delivery, although their performance level may be acceptable for organizations wanting to limit the amount of resources needed for reviews.

Perhaps counterintuitively, organizations conducting weekly reviews of their top-tier suppliers spend less to appraise and develop suppliers per $1,000 in purchases than organizations with reviews at any other frequency. At the median, they spend one dollar less on this activity than the group conducting monthly reviews, and over two dollars less than organizations conducting reviews sporadically. These results indicate that organizations conducting such frequent reviews have streamlined their supplier appraisal and development processes to minimize cost while increasing frequency. It may also be that these organizations focus most of their appraisal and development efforts on their top-tier suppliers, which can offset the cost associated with frequent reviews.

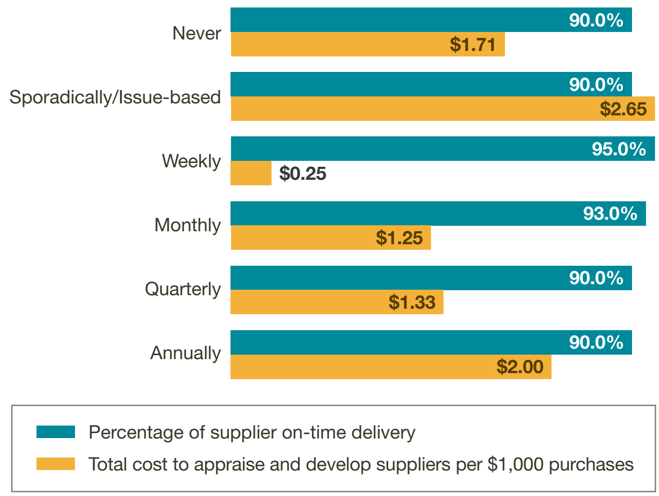
Re-evaluate supplier relationships

Data collected by APQC reveals that organizations considering strategy when appraising suppliers and building supplier relationships see benefits to their overall procurement efforts, as well as to the procure-to-pay process. These benefits range from shorter procure-to-pay cycle times, to more supplier on-time deliveries, to a smaller percentage of purchases attributable to maverick buying.

APQC's data also indicate that growing strategic relationships to include a broader group of suppliers can lead to even greater advantages for organizations. However, how an organization implements these types of relationships can vary. To keep costs down and to minimize the amount of resources needed to manage these closer relationships, organizations can take a tiered approach, as done by pharmaceutical organization Merck. Merck identifies the suppliers critical to the business, and then gives them the greatest amount of oversight and proactive management. With this arrangement, an organization can then allocate an appropriate amount of oversight to the suppliers

FIGURE 3

Frequency of formal reviews with top-tier suppliers and procurement performance



Source: APQC

that are not as critical. The organization can still focus its supplier relationships on more strategically important factors, such as quality or total cost, and it can still use supplier scorecards with all of its suppliers, but perhaps with less frequent or detailed oversight.

Clearly the degree to which an organization can create and manage strategic relationships with its suppliers will vary depending on its resources and capabilities. However, with the potential for benefits within the procure-to-pay process and to procurement efforts overall, organizations would do well to consider whether they can re-evaluate the focus of their supplier relationships to determine what would best serve the business.

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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.

Who will lead the "Fourth Industrial Revolution?"

Companies that leverage these emerging technologies will transform their operations and business models. Those that fail to do so risk the future of their firms.

By Sean T. Monahan

Sean Monahan is a partner and global practice leader of A.T. Kearney's Operations & Performance Transformation practice. He is based in New York and can be reached at sean.monahan@atkearney.com.

Digital supply chains, smart factories, Industry 4.0: However you describe the change upon us, the key point is just that—a change is upon us. An exponential change, at that. Klaus Schwab, founder and executive chairman of the World Economic Forum, refers to the change as the "Fourth Industrial Revolution." To understand its implications, it is helpful to review the three prior revolutions. The First Industrial Revolution, which began around 1760, refers to a transition from manual to mechanized work, particularly though water and steam power. The Second Industrial Revolution, beginning in the later third of the 19th century, saw the advent of mass production, the growth of the steel and oil industries and electrification. Almost 100 years later, the 1950s saw the beginnings of the Third Industrial Revolution with the transition from analog to digital technologies.

In the 2010s we find ourselves in the midst of a Fourth Industrial Revolution. In it we see not only advances in science and biotechnology but also the cyber-physical systems of smart factories and the end-to-end value chains that encompass everything from raw-material extraction to conversion to distribution to use and reintegration. And whereas prior revolutions tended to be inter-generational, allowing successive generations to absorb and adapt to the changes, the pace of the Fourth Industrial Revolution will be intra-generational, with compelling new opportunities for sustainable prosperity.

But, there are challenges. Technology breakthroughs in areas such as mobile connectivity, artificial intelligence, the Internet of Things, robotics, 3D printing, biotechnology, genetic engineering, nanotechnology and advanced materials, to name a few, are radically transforming global production systems, from the individual worker on the factory floor to the globally distributed networks of suppliers and manufacturers that characterize today's typical supply chain.

Then consider the stakes for companies and governments. Companies that leverage these emerging technologies will transform their operations and business models, creating new sources of value for customers and stakeholders. Those that fail to do so risk their firms' futures. Similarly, governments that successfully craft policies and regulatory frameworks to cultivate innovative technologies can spur economic development that benefits all of their citizens. Conversely, government miscalculations can threaten a national economy with decades of lagging performance.

What companies can do

Two defining factors for success are: a willingness to disrupt legacy ways of working and speed. More specifically:

- **Provide a top-down mandate.** While embraced by some, the disruptive change of the Fourth Industrial Revolution faces scepticism and resistance in legacy organizations. To enlist support and break up silos that are barriers to end-to-end transformation, the C-suite needs to communicate its vision and demonstrate its commitment to all stakeholders.

- **Ensure the initiative is holistic.** Many organizations focus on a single aspect of their transformation. Retailers and many CPGs concentrate on consumer engagement; heavy manufacturers look to transformation within the factory walls (Industry 4.0); product-centric organizations hone in on, you guessed it, the product. Leaders who embrace holistic transformation embrace initiatives across all aspects of their businesses.
- **Establish a network of partners.** The pace of change is fast and some of the best technology solutions are relatively narrow in application. Establishing a network, or ecosystem, of partners (suppliers, customers, peers) can help access, and at times co-create, the broad and developing array of capabilities that catalyze a holistic transformation.
- **Gain scale and speed via one accelerator.** Many organizations proudly point to numerous "entrepreneurial sparks" that experiment with emerging technologies. Unfortunately, in most cases these sparks fail to ignite because they are redundant, overly narrow, focused on interesting but non-value-added areas and unable to build the insight and momentum required to be truly transformative. Leaders establish an accelerator to coordinate, develop, test and scale new ideas.
- **Enable a start-up culture.** Allow bottom-up entrepreneurship, attract new talent and re-frame failure as learning, not as a cause for blame. Agile working methods can accelerate growth and shorten time to market at scale.
- **Apply active change management.** Foster a creative, positive culture that emphasizes transformation as opportunity rather than as threat. Change agents can energize teams and build organizational buy-in and harness their power.

What governments can do

- **Think broadly.** Recently, industrial policy has become fashionable again, with governments using increasingly sophisticated and assertive policies to promote structural change. However, narrowly prescribed Industry 4.0 strategies that pick winners and save losers may not yield the greatest chances of success, given the uncertainties surrounding technological development and where the likeliest prospects of monetizing particular innovations and sectors lie.
- **Foster research, innovation and technological readiness.** Many technologies have yet to be fully developed—indeed, many have yet to be conceived—and the current prevailing picture will not last long. That makes it critical for governments to engage not just innovators and business managers but all areas of civil society in mapping multiple, flexible paths to future development.
- **Democratize production knowledge.** Many producers, entrepreneurs and SMEs have a limited grasp of production principles, technologies and tools. This knowledge is spread across a disparate range of sources, including tradespeople, books, suppliers, engineers and firms, which creates a major barrier to scaling up production. Governments can help coordinate and centralize access to this information.

The pace of change is fast and some of the best technology solutions are relatively narrow in application.

- **Create pathways to production careers.** The production industry suffers from a global talent gap. Preparing for a future career in advanced production requires both formal education and plenty of hands-on training. A diverse skill set is essential, as the new production paradigm requires workers to show creativity, adaptability and inventiveness as they produce highly complex, evolving products. Governments and companies need innovative partnerships that address apprenticeships, internships and higher education, along with workforce re-skilling and up-skilling programs.
- **Embed a whole-of-government approach.** The multiple facets of the Fourth Industrial Revolution and the multidisciplinary challenges and opportunities it raises, mandate that government agencies work together across portfolio boundaries to achieve shared goals and an integrated government response. Some governments are creating committees with the task of developing and overseeing strategy implementation and coordination for the Fourth Industrial Revolution.

The mounting pressures could tempt governments to pursue simplistic solutions intended to make them look strong and decisive in the near term. But no single government can control what is unfolding in the world. The wisest course for policy makers is to become stewards of their national production ecosystems and to collaborate with their global counterparts.

While companies and governments have their respective roles, future success requires both to collaborate. A change is upon us, and change can be daunting. But, by managing it well we can make the most of its opportunities and even lay the foundation for that inevitable sequel, the Fifth Industrial Revolution.

A SPECIAL SUPPLEMENT TO: SUPPLYCHAIN MANAGEMENT REVIEW

2017 TOP 50 3PLs:

INVESTMENT AND CONSOLIDATION MAINTAIN TRACTION

The trend set over the past few years for mergers and acquisitions has hardly subsided, and a fresh injection of equity investment is transforming the marketplace. At the same time, shippers may expect to see 3PLs continue to purchase high-tech "solutions" and hire young professionals for implementation.

By Patrick Burnson, Executive Editor

SPECIAL REPORT

2017 Top 50 U.S. and Global 3PLs

Leading industry analysts maintain that the "mega-deals" witnessed over the past two years in the third-party logistics provider (3PL) sector have abated, but that certainly doesn't mean that mergers and acquisitions (M&A) will fall out of the picture.

According to Evan Armstrong, president of the consultancy Armstrong & Associates, the 3PL market is also still ripe for equity investment. "The one outstanding example of this was when Aerospace, Transportation and Logistics [ATL Partners] bought a controlling share of Pilot Freight Services late last year," he says. "We also anticipate more M&A activity as 3PLs strive to expand geographic scale and provide integrated solution offerings."

At the same time, says Armstrong, technological changes are having a dramatic impact on 3PL operations. Companies such as project44, MacroPoint and others are driving improved transit status data and carrier capacity information from transportation providers to lead logistics companies.

"This year's electric logging devices [ELD] mandate could also be a boon for shipment tracking and carrier capacity monitoring information," says Armstrong. "These types of advances allow for more process automation and increased operational efficiencies. They're also increasing the quality of information available to customers of non-asset based transportation managers."

Specifically, industries such as pharmaceuticals are increasing their digitalization needs, Armstrong's research reveals, putting more emphasis on 3PLs to match these new technological demands. To better ensure counterfeit products are not being sold within established sales channels, for example, the pharmaceuticals industry has a 2017 mandate to begin capturing product serial numbers across its supply chains.

"While this mandate has presented a challenge for many value-added warehousing 3PL operations, the ones we've met with are implementing the required operations changes and will meet the deadline," says Armstrong.


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2017 Top 50 3PLs

Armstrong & Associates Top 50 U.S. 3PLs (April 2017)

2016 Rank	Third-party Logistics Provider (3PL)	2016 Gross Logistics Revenue (USD Millions)*
1	C.H. Robinson	13,144
2	XPO Logistics	8,638
3	UPS Supply Chain Solutions	6,793
4	J.B. Hunt (JBI, DCS & ICS)	6,181
5	Expeditors	6,098
6	Kuehne + Nagel (The Americas)	4,909
7	DHL Supply Chain North America	4,200
8	Burris Logistics	3,629
9	Hub Group	3,573
10	FedEx Trade Networks/SupplyChain Systems/GENCO	2,916
11	Ryder Supply Chain Solutions	2,659
12	DB Schenker (The Americas)	2,630
13	Coyote Logistics	2,360
14	Total Quality Logistics	2,321
15	CEVA Logistics (The Americas)	2,310
16	Panalpina (The Americas)	2,209
17	GEODIS (The Americas)	2,200
18	Schneider Logistics & Dedicated	2,125
19	DSV (The Americas)	1,798
20	Echo Global Logistics	1,716
21	Transportation Insight	1,710
22	Landstar	1,632
23	Transplace	1,620
24	Americold	1,555
25	Penske Logistics	1,500
26	Swift Transportation	1,431
27	NFI	1,250
28	Werner Enterprises Dedicated & Logistics	1,156
29	OIA Global	1,150
30	BDP International	1,090
31	APL Logistics Americas	1,055
32	Yusen Logistics (Americas)	1,044
33	Cardinal Logistics Management	1,006
34	Mode Transportation	949
35	SunteckTTS	900
35	syncreon	900
35	Lineage Logistics	900
36	Radial	800
36	TransGroup Global Logistics	800
37	Ruan	796
38	Nippon Express (The Americas)	790
39	Radiant Logistics	783
40	Damco (The Americas)	773
41	Neovia Logistics Services	763
42	Worldwide Express	750
43	ArcBest	677
44	Odyssey Logistics & Technology	650
45	Hellmann Worldwide Logistics (The Americas)	640
46	Kenco Logistic Services	626
47	Crane Worldwide Logistics	616

*Revenues are company reported or Armstrong & Associates, Inc. estimates and have been converted to US$ using the average annual exchange rate in order to make non-currency related growth comparisons.


ArcBest

Armstrong & Associates Top 50 Global 3PLs (April 2017)

2016 Rank	Third-party Logistics Provider (3PL)	2016 Gross Logistics Revenue (USD Millions)*
1	DHL Supply Chain & Global Forwarding	26,105
2	Kuehne + Nagel	20,294
3	Nippon Express	16,976
4	DB Schenker	16,746
5	C.H. Robinson	13,144
6	DSV	10,073
7	XPO Logistics	8,638
8	Sinotrans	7,046
9	GEODIS	6,830
10	UPS Supply Chain Solutions	6,793
11	CEVA Logistics	6,646
12	DACHSER	6,320
13	Hitachi Transport System	6,273
14	J.B. Hunt (JBI, DCS & ICS)	6,181
15	Expeditors	6,098
16	Toll Group	5,822
17	Panalpina	5,276
18	GEFCO	4,800
19	Bolloré Logistics	4,670
20	Kintetsu World Express	4,415
21	Yusen Logistics	4,169
22	CJ Logistics	3,662
23	Burris Logistics	3,629
24	Agility	3,576
25	Hub Group	3,573
26	Hellmann Worldwide Logistics	3,443
27	IMPERIAL Logistics	3,352
28	Kerry Logistics	3,097
29	FedEx Trade Networks/SupplyChain Systems/GENCO	2,916
30	Ryder Supply Chain Solutions	2,659
31	Damco	2,500
32	Coyote Logistics	2,360
33	Total Quality Logistics	2,321
34	Sankyu	2,275
35	Schneider Logistics & Dedicated	2,125
36	Wincanton	1,720
37	Echo Global Logistics	1,716
38	Transportation Insight	1,710
39	APL Logistics	1,700
40	NNR Global Logistics	1,676
41	Mainfreight	1,640
42	Landstar	1,632
43	Transplace	1,620
44	arvato	1,615
45	Americold	1,555
46	Fiege	1,550
47	Penske Logistics	1,500
48	Swift Transportation	1,431
49	Groupe CAT	1,328
50	NFI	1,250

*Revenues are company reported or Armstrong & Associates, Inc. estimates and have been converted to US$ using the average annual exchange rate in order to make non-currency related growth comparisons.

"Adapt or die"

Logistics managers should also expect more 3PL consolidation, says Armstrong, pointing out that the global market is finding it exceedingly hard "to grow and scale" their networks organically.

"Acquisitions are required to leapfrog into and move upward within the Top 50 Global 3PL rankings," says Armstrong. "This will continue to drive acquisitions like we have seen with DSV/UTi; XPO/Norbert Dentressangle, and Con-way with Geodis/OHL."

Finally, the "adapt or die" imperative is still with us—and will be for the foreseeable future. To keep pace with omni-channel fulfillment and disruptive technologies like drones, 3D printing, Internet of Things, driverless vehicles, advanced robotics and wearable technology, it's become painfully clear that 3PLs must constantly evolve to anticipate shipper demands.

> **"Acquisitions are required to leapfrog into and move upward within the Top 50 Global 3PL rankings."**
>
> —*Evan Armstrong, president, Armstrong & Associates*

"Fortunately, 3PLs are amazingly good at embracing change," says Armstrong. "For example, we've been in operations utilizing PINC Solution's drones for improved trailer yard management and Google glasses for warehouse picking. In addition, many applications, such as HubTran, are adapting machine learning to automate mundane freight bill payment tasks."

In the meantime, Armstrong adds that 3D printing remains mired in its growth stage, but will continue to impact spare and service parts logistics operations. "However, we will see some type of human-overseen driverless vehicles hit the streets in the near term, and that could be especially beneficial in long-haul trucking operations."

For Armstrong, the "Uberization" of trucking, or what he prefers to call "digital freight matching," is still trying to find its legs. "However, we see that there's significant progress being made to build improved real-time lane pricing information with companies such as CargoChief, and improved carrier management applications from industry stalwarts such as C.H. Robinson and Coyote Logistics," he says.

Building a portfolio

Many of the same observations are shared in Gartner's annual "Magic Quadrant" report that was released last month at its supply chain conference in Phoenix. The aim of the report is to provide a qualitative analysis of the market, its direction, maturity and its participants.

Greg Aimi, Gartner's director of supply chain research and co-author of the "Magic Quadrant," says that logistics managers are still pressing for consolidation in their 3PL portfolios, but not until providers can demonstrate that they have a truly global network.

"For this to happen," says Aimi, "there must be a significant air and forwarding capability. Furthermore, 3PLs in the Asia Pacific region have yet to get started with western acquisitions—but I assume they will." He adds that the report revealed that logistics managers are seeking out a high-degree of industry vertical expertise and specialized solutions, thereby driving a number of "tuck-in" M&As.

"At the same time, the technology area for 3PLs is just getting started," adds Aimi. "Let's just forget that they were laggards when it came to unifying software systems to a single global platform in the past. Today, global operational transparency requirements and digital business drivers from their shipper customers are just going to increase the need for 3PLs to be top dogs when it comes to tech and innovation."

New journey

According to Aimi, this is the second iteration of the "Magic Quadrant" for North American 3PLs. Since the first report, Gartner made significant changes in the criteria definitions to better identify what makes a 3PL valuable to shippers seeking a North American regional provider.

Researchers note that the 3PL industry is "progressing along a maturity spectrum," and trying hard to accommodate increasing shipper requirements


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through a combination of acquisition and organic growth strategies. However, not all are at the same place in their journey.

According to Gartner, there's a transformation underway across today's logistics industry, and perceptions of logistics service providers are changing. Relationships historically have been transactional, pragmatic and "physical activity oriented."

Researchers note that 3PLs contributed by

competing head-to-head in low-margin pricing wars and assumed the role of an interchangeable commodity. Consequently, the idea of leveraging specialized services seemed out-of-reach—until recently.

"As acceptance has grown for an increased amount of logistics outsourcing, companies are

3PL: Cultural shift underway

Gartner analysts note that in the North American logistics market, most 3PLs started business by predominantly providing deep capabilities in one of three major logistics service roots: transportation services, warehousing and fulfillment services, or international freight forwarding and customs brokerage.

In fact, many providers today still predominantly offer services from just one of these main service lines or "root services." Other providers, especially the larger ones, have expanded their offerings to include services from one or both of the other roots to have a more comprehensive offering.

The truckload brokerage business, for example, has been regarded as one of the stodgier business models in the logistics sector for some time. However, one firm that appears to be breaking out of that mode recently came to our attention when we learned of its "new age" culture and young leadership.

Nolan Transportation Group (NTG) is a company in this high-growth, fast-paced industry, providing third-party logistical services to over 8,000 customers across the United States, Canada and Mexico. Founded by Kevin Nolan in 2005 as a truckload brokerage with a box of cash and two employees, the company posted $278 million in revenue in 2016.

According to Nolan, it's all about culture. He notes that the brokerage business is built on effective sales with a high volume of transactions happening every minute of every day. He's built a successful sales organization by hiring recent graduates who believe in a high energy, collaborative work culture with ample opportunity for growth and promotion from within.

Supply Chain Management Review (*SCMR*) recently sat down with Nolan to gain his observations on the journey so far.

***SCMR*: Do you expect barriers to entry in the 3PL space to come down, or will it be tougher for new players to emerge?**

Kevin Nolan: I believe the legal—bond, insurance and background—barriers to entry will stay consistent with current levels due to the new administration. However, the difficult barriers to compete with players of scale will grow as consolidation and investments continue. Examples of this are technology, hiring and paying vendors faster.

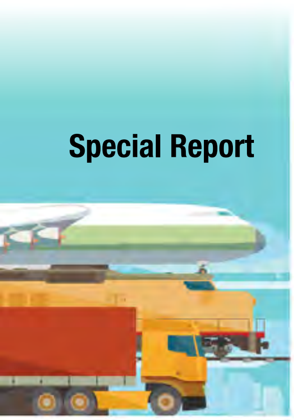
***SCMR:* What advice can you give to new players breaking into this business?**

Nolan: Balance…plain and simple. Being a 3PL means we're in the middle of customer and vendor. Treat carriers and customers the same, because you can't exist without either. It's easy to gravitate to the customer side more, but the great 3PL sees both sides as equals.

***SCMR:* How important is trust in the supply chain?**

Nolan: For non-asset and asset light, trust is everything. Production, construction time lines, and end-user satisfaction are all based on delivery of product. If you don't give correct information, the trickle down will ruin your reputation across their whole organization. In supply chain, surprises and breakdowns happen. You have to face these problems head on and communicate with all parties so they can plan accordingly as well.

—Patrick Burnson, executive editor



realizing that their performance is more dependent on not only their 3PL providers' capabilities and execution, but also the manner in which they are managed," says Aimi. "This mandates a transition in the roles and responsibilities of tomorrow's logistics professional from being a master of logistics execution to a master of provider orchestration; and it puts an importance on the relationship between customer and 3PL."

"Logistics managers should be ever mindful that 3PLs are partners who are re-examining their supply chains and looking for useful ways to innovate and transform."

—John Langley, Jr., Ph.D, clinical professor of supply chain management, Penn State University

Shareholder pressure

Interestingly, while the importance of resource integration is widely acknowledged, it's not uncommon for logistics companies to continue to operate their systems separately, notes John Manners-Bell, chief executive of the London-based consultancy Transport Intelligence (Ti).

For example, Manners-Bell notes that companies like DHL, UPS, Deutsche Bahn and SNCF continue to operate despite the fact that there is little integration between many of their operations or functions. He maintains, however, that this is a less than optimal situation and has often led to a significant lag in the realization of costs savings or to the absence of expected cooperation.

"What's more," says Manners-Bell, "this lack of cooperation makes disposals likely if and when management comes under pressure from shareholders. While contract logistics companies typically integrate well, due to their asset-light nature, they still need to work on the daunting challenge of integrating the IT systems of the acquired company."

Ti researchers say that the logistics industry maintains the consolidation trend, suggesting that acquisition remains the most favored route towards building global portfolios of integrated services. Their analysts agree with Armstrong and

Examples of major contracts in early 2017

Client	Company	Duration	Sector	Country	Region	Description
Mercedes-Benz	CEVA	3 years	Automotive	Brazil	South America	CEVA renewed its existing contract with Mercedes-Benz for a further three years. It also signed two new agreements which will extend elements of the contract for three and five years respectively.
Carlsberg	DHL Supply Chain	2 years	Consumer/Retail	UK	Europe	Carlsberg awarded a two-year contract to DHL Trade-team for the management of UK distribution services.
Groupe SEB	XPO Logistics Europe		Consumer/Retail	Global		XPO secured a multi-million pound, long-term contract with global domestic appliances and cookware giant Groupe SEB.
SAS Scandinavian Airlines	Kuehne + Nagel (K+N)	3 years	Aerospace	Global		SAS Scandinavian Airlines extended its contract with K+N for global logistics services until 2020. K+N will manage the international transport of spare parts for the SAS airplane fleet.
Neue Halberg-Guss (NHG)	Yusen Logistics		Industry and Manufacturing	Germany	Europe	Yusen Logistics won a contract for a total supply chain solution for NHG. The contract covers the movement of engine blocks from Germany to the production plant of a car manufacturer in Ohio, as well as the provision of a closed loop supply chain back to Germany.

Source: Ti database of major contracts

Gartner that the level of consolidation in 2017 is estimated to drop compared to 2016, both in terms of total deal value and volume.

"However, looking ahead, the outlook for consolidation activity in the industry remains positive," says Manners-Bell. "In addition to being driven by the search for growth through global presence and expertise in high-margin sectors, the continued growth of e-commerce will also drive M&A activity in the logistics industry."

John Langley, Jr., Ph.D., clinical professor of supply chain management at Penn State University, agrees with many of the points raised by Armstrong, Gartner, and Ti, but concludes that logistics managers must be aware of other imperatives as well.

"Three factors will contribute to a greater reliance on technology as 3D or additive manufacturing comes into play," says Langley. "We have the same forecast for issues related to block chain, visibility, and optimization."

At the same time, Langley cautions managers to consider disruption and risk when choosing a global 3PL, particularly if they're operating in a politically unstable environment.

"Also of significance is that the 'Amazon concept' is resulting in a great need for providers of all types to reassess their existing capabilities and essentially transform their strategies and operations to better fit into the future needs of shippers," says Langley. "Logistics managers should be ever mindful that 3PLs are partners who are re-examining their supply chains and looking for useful ways to innovate and transform."

—Patrick Burnson is executive editor of SCMR

New Transport Intelligence report finds that Asia's outsourcing needs accelerated contract logistics

According to "Global Logistics 2017," a recent report released by the London think-tank Transport Intelligence (Ti), the overall contract logistics market is estimated to have grown by 3.9% in real terms in 2016.

Despite stronger global growth during this period, many developed markets struggled to match even the modest growth rates seen in their contract logistics markets in 2015. This reflects trends in the global economy, where growth rates in advanced economies slowed overall.

According to Ti analysts, it would be "too easy" to match these struggles to the impacts of political events such as the U.S. presidential election and the Brexit vote. In 2016, Barack Obama was still U.S. president and the European Union had 28 members. Instead, weak real wage, productivity and consumption growth dampened global economic growth.

"Manufacturing production and retail sales volume growth remain fundamental drivers of contract logistics," says Ti Economist, David Buckby. "Manufacturing expansion in advanced economies remains weak while Asia Pacific, including China, is seeing the lion's share of growth."

According to Buckby, retail is a different story. "To an extent, e-commerce has bailed out contract logistics in advanced economies," he said. "And I expect these trends to continue to shape the background of the contract logistics sector for the next few years at least."

Despite stronger global growth in 2016, many developed markets struggled to match even the modest growth rates seen in their contract logistics markets in 2015. This reflects trends in the global economy, where growth rates in advanced economies

slowed overall.

Meanwhile, multinational manufacturers increasingly consider options outside China (especially nearby ASEAN) as production locations, primarily thanks to cheaper labor costs, all the while ingraining Factory Asia more deeply, a spur for the region's manufacturing contract logistics.

That being said, even with rising wages, manufacturing in China is still undeniably strong, add Ti analysts. As low cost manufacturing has departed, this has been offset by China moving up the chain to more value-added production.

"While Europe and North America suffer from both stagnating retail sales and manufacturing production growth, Asia is taking advantage, driving growth for the global market as a whole," adds Buckby. •

—Patrick Burnson, executive editor

Damco unveils new digitized service for freight forwarders

While a bevy of high-tech outfits have threatened to disrupt the current freight forwarding marketplace with its their digitized offerings, older established players are hardly standing still as far as innovation is concerned.

Witness, say analysts, the recent moves made by Damco, the third-party logistics subsidiary of Danish shipping conglomerate A.P. Moller/Maersk. Starting last month, "Twill," the provider's digital freight forwarding startup, became openly available to shippers in the U.K. market and will later be open to shippers worldwide.

John Klompers, the Damco's global head of freight forwarding, told Logistics Management that he sees the modern freight forwarder changing into a global freight supply chain "orchestrator."

"Service reliability, space allocation guarantees and a multi-carrier platform have become much more important to spread risks and to avoid supply chain disruptions," said Klompers. To that effect, Damco has positioned itself to compete with Twill by enabling logistics managers to book, manage and monitor shipments online with a simple keystroke.

"Damco is a frontrunner in the digitalization of the supply chain and does this by co-creating with customers," says Klompers. "The focus is on the customers' immediate need, using technology to provide insights and trends and to spot potential problems and supply chain stresses before something goes wrong. We have developed Apps to provide the visibility needed to effectively manage supply chains."

Klompers noted that, as the supply chains become increasingly more complex, one may never be able to take risk completely off the table. "But we believe freight forwarders are the key solution for logistics managers to avoid supply chain disruptions in the ever changing freight market," he added.

So far, the beta model has been focusing on managing ocean shipments within the China to U.K. trade lane. Damco spokesmen said that it will add more shipping routes and products over the coming months—and, in the first part of Twill's expansion, all of Asia-Europe trade will be addressed.

—Patrick Burnson, executive editor

CBRE data shows decent, but changing trends for logistics & industrial real estate in the Americas

While many key market themes remain intact as they relate to the industrial real estate market, there are also some apparent changes as well, according to the recent edition of CBRE's "Americas Industrial & Logistics Trends Report."

The report's data points, which are based on feedback from more than 950 CBRE brokerage and investment professionals, highlight the current

state of the industrial real estate market, which continue to hit, or approach, all-time highs for certain benchmarks, including:

- net absorption growth of America's industrial and logistics space continued for the 28th consecutive quarter in the first quarter, with occupancy at 95.2% for its highest level since 2002, while slowing on the heels of near-record user demand in 2016;
- while net absorption fell sequentially and annually, the vacancy rate dropped 10 basis points to 4.8%, with the availability rate up slightly at 8%;
- due to tight supply, the net rent index rose 1.6% in the first quarter and 6.7% annually to $6.24 per square-foot, its highest level since 1980;
- new development at 46.5 million square-feet in the first quarter was down 11% compared to fourth quarter of 2016 and up 17.4% annually; and
- industrial and logistics was the only CBRE sector to see a gain in investment volume, up 3.2% to $13.9 billion in the first quarter, with individual asset sales rising 15% annually.

David Egan, CBRE head of industrial and logistics research in the Americas, told *Logistics Management* that the biggest takeaway is the first quarter decline in user demand in leasing across the Americas markets, specifically in the United States.

"It is low and noticeably lower than the numbers that came before it," says Egan, "and it raises some red flags, with people wondering if it is an ominous sign for the state of the market. In fact, there isn't a slowdown in users looking for space in the market.

It has more to do with there not being much space left, and vacancy rates are so low that the ability to get a deal done is getting difficult."

CBRE says the dominant users leasing space in most markets are in the e-commerce, 3PL and food & beverage markets. The needs for users in these markets, says Egan, are getting more diverse, with those three markets "dominating" demand in the industrial space.

Earlier in this cycle, from 2012-2014, most of their attention was focused on super big box facilities that were 500,000 square-feet and above and largely in major core markets like Chicago, Los Angeles, Dallas and Atlanta with big regional population centers.

"There is still plenty of activity happening in those types of buildings and markets, but we have seen a significant shift in the diversity of demand from those types of users from the major markets to secondary and tertiary markets, which are smaller and don't have as big of population centers," added Egan.

—Jeff Berman, group news editor

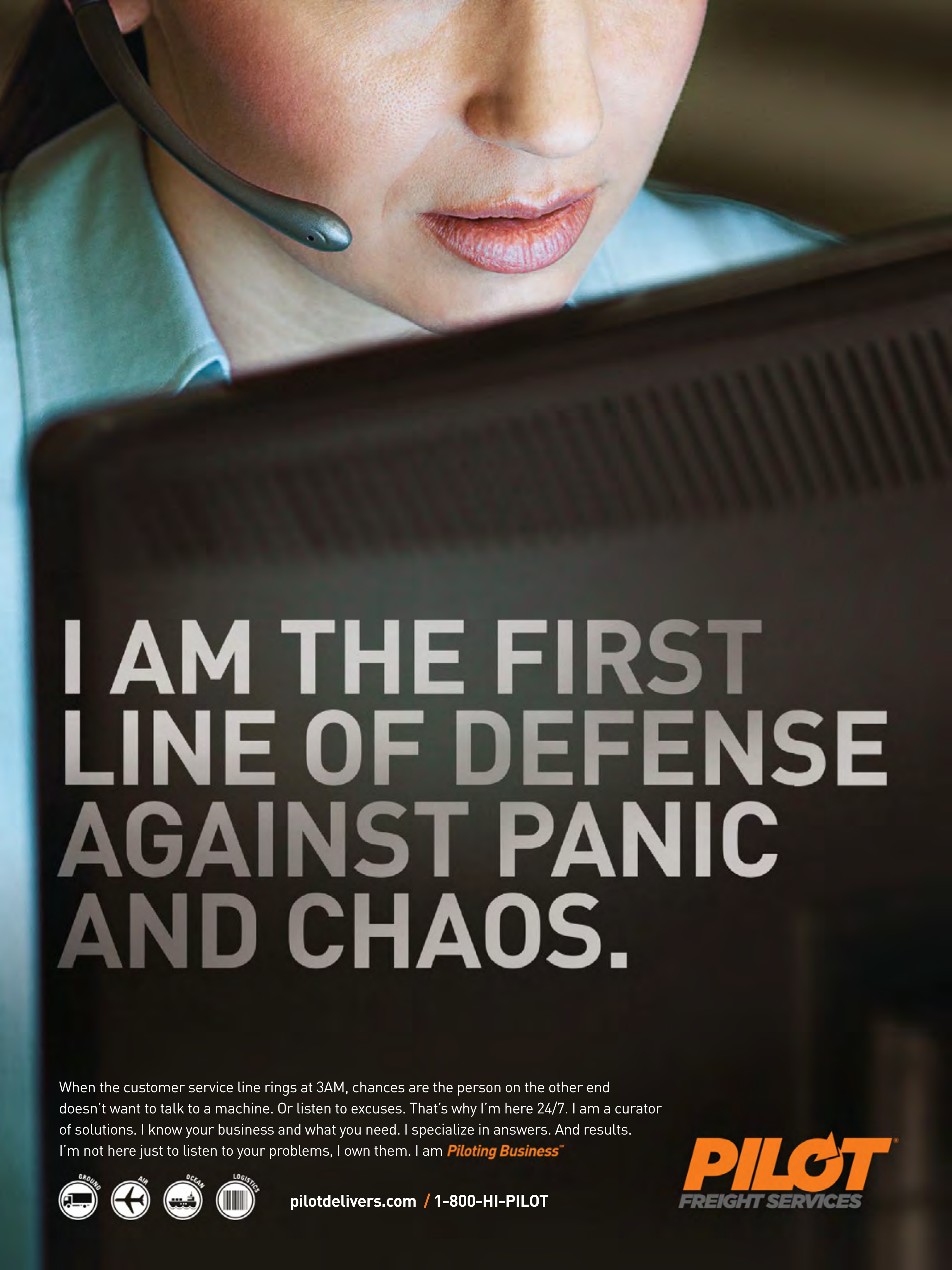
XPO Logistics takes steps to expand last mile network in Chicago area

Taking steps to expand its last-mile logistics network, freight transportation and logistics provider XPO Logistics announced that it has expanded its "Chicagoland" facility in Bollingbrook, Ill.

Company officials say that this new facility doubles the capacity of XPO's Chicago-based market delivery center (MDC), which serves

large retailers, e-commerce service providers, and heavy goods manufacturers, to almost 100,000 square feet.

XPO defines the MDC as a facility that receives product, schedules product, and, as needed,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prepares and assembles product at that site before it heads out to delivery. It also takes care of customer service issues, and conducts a "check in" of product that comes off of trucks for reverse logistics products that need to go back to a retailer or manufacturer for any reason.

In an interview with *Logistics Management*, Charlie Hitt, president of XPO's last mile business unit, said that Chicago is one of XPO's three busiest and fastest-growing markets nationwide. "We need to invest in what our customers are having happen in the growth of their business, particularly in e-commerce."

The impact of a rapidly growing e-commerce market on the last mile sector, especially for heavy goods, is something that cannot be overstated, stressed Hitt.

For XPO, that e-commerce activity, in terms of client relations, continues to grow.

"We have had 15% to 20% growth in the last quarter alone in e-commerce business," Hitt says. "Traditional brick and mortar retailers are expanding out with more e-commerce offerings, and they want it to be seamless and they want it fast."

Prior to this announcement, the Chicagoland MDC was roughly 50,000 square-feet and handled last-mile for retailers, as well as business that came in from Internet sales than can plug into the XPO system.

"We think this business will grow 30% to 40% next year in Chicago, but it could be more and we're going to be opportunistic about that if that happens," said Hitt. He explained that this forecast is reflective of an ongoing "do it for me" theme among consumers in that they don't want to do something like pick up a TV at a store and hook it up on their own.

"Now, they want someone to take the old TV or washer and dryer away or have it done for them," notes Hitt. "That is what they want; they want things to be simple."

—Jeff Berman, group news editor

UPS rolls out new service in Europe for time-critical shipments

Last month, UPS announced that it rolled out a new service in Europe focused on urgent, time-critical shipments requiring special handling. Called UPS Express Critical, the company said examples of these shipments include things like aircraft parts or surgical tools that are particularly germane to the industries like healthcare, manufacturing and aerospace.

As for how this service works, UPS explained that a UPS team assesses a shipping request though a 24x7 contact center and then identifies transportation alternatives and implements a delivery plan meeting customer time and cost requirements. Services provided through UPS Express Critical include air, charter and surface, as well as a personal courier who can carry the shipment by hand from origin to destination on a commercial flight.

Daniel Gagnon, vice president of global logistics and distribution for UPS, told *Logistics Management* that increasing customer demand drove the development of this new service.

"Most major market segments UPS serves often require overnight express services," says Gagnon. "This service appeals to customers when next-day service is not fast enough. Highly specialized services are needed to meet the unique requirements of customers shipping extremely valuable or time-critical—and this is the case in growing industries such as life sciences, aerospace and high-value retail."

Prior to introduction of the Express Critical Service in Europe, Gagnon explained that the UPS forwarding group offered services on a shipment-by-shipment basis, whereas now the network of third-party couriers and air carriers will be integrated into the new system.

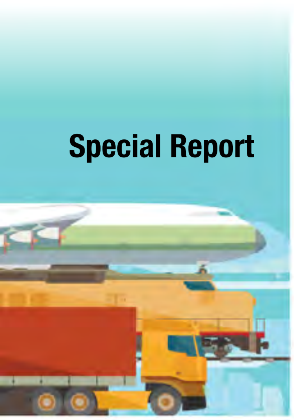
When asked what the competitive advantages of this service are from a UPS perspective, Gagnon cited the company's experienced industry teams are able to quickly assess a cost effective delivery solution that meets its customers' specific time and delivery requirements. "Having this flexibility from a single, trusted source is an advantage," he added.

—*Jeff Berman, group news editor*

INSIGHT

Global 3PL Management: Factors to keep top of mind

Global third-party logistics providers (3PLs) are not a dime a dozen; in fact, there are only a few truly global supply chain managers—and they are a part of large, diverse global transportation networks. Most of the major players, such as UPS, FedEx, DHL and DB Schenker, all have IT platforms interfacing with their customers to provide global



visibility from origins to destinations; they're experts at Customs clearance around the globe; and they're active in all transportation modes and regularly adjust between ocean, air, trucking and same-day delivery to best accommodate individual orders.

However, global shippers need to keep in mind that supply chain management capabilities—even those managed by the most expansive global 3PLs—vary greatly between countries. The biggest challenge is often managing expectations within a region's physical limitations.

Managing geographical expectations

Advanced economies generally have better highways, ports and railways as well as better communication systems and technology. Political changes can especially complicate matters, but those issues are normally limited to emerging market and developing economy countries.

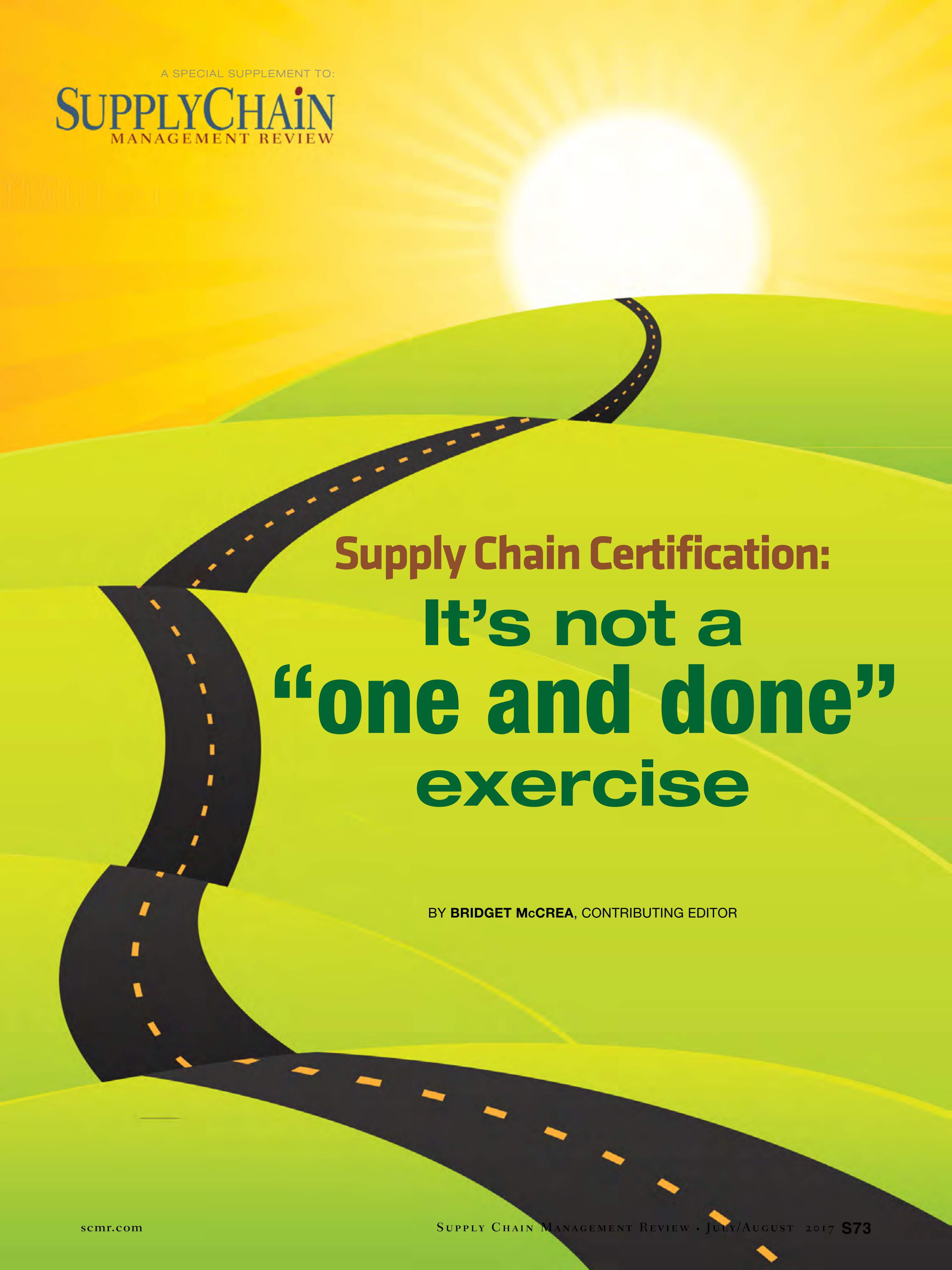
As a general rule, logistics costs as a percent of GDP are lower in advanced economies and higher in emerging market/developing countries. Not surprisingly, the countries with the largest economies dominate infrastructure statistics.

The United States has the most miles of highways, railways and pipelines. Meanwhile, China, with the second largest economy, has the third largest amount of highways and railways. India is second in the total miles of roadways; however, only 2% to 3% of India's roadways are modern highways. Even some of these, like Highway 9 from Mumbai to Pune, have uneven surfaces and transportation obstacles.

These persistent infrastructure challenges create opportunities for modern, sophisticated 3PLs. Global shippers who seek to succeed in today's landscape should remember the following: Even when a global supply chain is managed by an experienced and expansive global 3PL, many regions and countries have limitations such as infrastructure, technology and carrier service levels. It's important to manage expectations based on your areas of operation and seek out "true" global 3PLs that know the lay of the land.

—Richard Armstrong, Armstrong and Associates

A SPECIAL SUPPLEMENT TO:
SUPPLYCHAIN MANAGEMENT REVIEW



Supply Chain Certification: It's not a "one and done" exercise

BY **BRIDGET McCREA**, CONTRIBUTING EDITOR

A SPECIAL SUPPLEMENT TO:
SUPPLYCHAIN
MANAGEMENT REVIEW

Here are six supply chain certification trends to watch in 2017…and beyond.

Chris Caplice remembers a time when supply chain professionals got the necessary credentials and then proceeded to enjoy their careers without needing much additional education or training. "Those days are gone," says Caplice, executive director of the MIT Center for Transportation and Logistics. "Credentials are no longer a 'one stop and done' kind of thing, like degrees have historically been. Now it's a continual, lifelong learning journey."

As part of that lifelong journey, supply chain professionals are earning certifications, getting credentialed, earning degrees, and taking online courses that help them stay current on specific topics and applications. As the supply chain industry becomes more complex—and as technology, data, analytics and the Internet of Things (IoT) continue to have an impact on the space—that coursework is getting more and more specific.

"The education that's coming out now is smaller, more focused and easier to digest," says Caplice. "Professionals can handle the education at their own pace; you no longer have to devote two to four years to getting credentialed." This is particularly useful for existing professionals who need to get up to speed on modern technologies, applications, processes and strategies. "A lot of people who have been in the field awhile may be bit rusty," says Caplice, "or they may have missed the boat on certain things that have [since] changed."

To help fill those gaps, supply chain certification extends the educational experience beyond traditional college degrees and gives individuals a way to achieve new levels of specialization and expertise. Offered by groups like APICS ("CPIM"), CSCMP ("SCPro") and ISM ("CPSM"), along with most leading academic institutions, certifications provide coursework in areas like internal manufacturing operations, end-to-end supply chains, logistics, transportation and distribution, among others.

Whether they are developing customized

"The education that's coming out now is smaller, more focused and easier to digest, professionals can handle the education at their own pace; you no longer have to devote two to four years to getting credentialed."

programs, tailoring those programs for government use, integrating mobile options into their course offerings or helping existing professionals fill in their knowledge gaps, certifications are playing an increasingly important role in the supply chain education field. Here are six key certification trends that are taking place right now:

1 Turnkey programs that think "out of the box." Working with CSCMP, Broward College in Fort Lauderdale recently launched a Center for Supply Chain Education. A "turnkey" certification program that colleges, universities and businesses can use to train and certify supply chain professionals, this program extends beyond the typical boundaries of the certification process and essentially "thinks out of the box," according to Leslie Backus, national project director. "This is sort of a 'supply chain in a box' program," says Backus, "that allows schools and businesses to take the developed content and adapt it to their own programs and/or their own needs." If, for example, a firm's supply chain training is already strong in an area like warehousing and inventory management, but is weak on the procurement and demand planning fronts, then the program will pick up where the company has left off. "It can be adapted to the needs of the individual student or employee," Backus adds. "This level of flexibility works well for schools and for individual firms that want to offer an adaptable and relevant supply chain certification."

2 Certification that targets existing professionals. When MIT launched its MicroMasters in SCM, it intentionally targeted existing professionals who already possessed undergraduate or graduate degrees, but who needed more professional-level coursework. Officially launched in 2015, the MITx MicroMasters in SCM is offered 100% online and can be completed in roughly 18 months. Zhang Yao, senior manager at online grocer RedMart.com, says one of his organization's biggest challenges is finding talented engineers and analysts who have the "right skills and mindsets," and then training them to design and build the company's supply chain facilities, processes, and systems. "After finishing all the SCx classes, I found that the program provides a broad coverage and helps students see the bigger picture of supply chain management," says Yao. "It [serves] as a perfect foundational course for further development in the supply chain and operations management domain." Yao himself is now responsible for designing and managing RedMart's industrial engineering graduate program, a 12-month in-house program to rotate fresh university graduates through all major areas of the RedMart supply chain process. "I am happy to report that our first batch of rigorously selected applicants will start their training in July," he says, "and selected SCx classes will be an important part of their training program."

3 Programs that morph to meet user needs. Since its inception in 2002, The University of Alabama in Huntsville's supply chain program has seen a significant uptick in interest. In many cases, that interest comes from the many different government and industrial entities situated near the college, which offers a graduate degree in supply chain management along with various credit and non-credit supply chain certifications. Jatinder Gupta says the program has been well received by the U.S. Army. "Much of the industry in this region is defense-related, so we've also included those needs and viewpoints into our overall program in order to accommodate that demand," says Gupta, president of the Decision Sciences Institute, director of the Integrated Enterprise Lab, and an Eminent Scholar of Technology at the university's College of Business Administration. Updated regularly to meet the needs of government and industry, the program now includes a business analytics track that addresses big data, enterprise resource planning (ERP), and IoT. Going forward, Gupta sees supply chain security, governance and disruption as topics that can be addressed through certification. "Other topics that we are looking at, and that aren't currently being addressed, include supply chains related to situations that are not the usual manufacturing or services (e.g., space exploration and education)," says Gupta, "and living supply chains connected with bio-systems and people."

4 Education that helps professionals stay relevant and current. In a society that places much emphasis on education, and where many professionals hold a bachelor's degree (or higher), the question: "Why should I take the time to earn a supply chain certification?" tends to come up a lot. Someone who already holds an MBA or a supply chain degree, for example, hasn't always understood the value of putting a new acronym after his or her name. But Nora Neibergall, SVP of certifications at ISM, says that sentiment is changing as supply chain certifications continue to morph and evolve. "Professionals need to stay current," Neibergall says, "and they need to be able to show that they care enough about their career paths to set themselves apart." Certification not only helps establish that baseline, but most of the offerings also give professionals access to a third party, independently validated certification process. That certification can then be transported from industry to industry, and from country to country, says Neibergall, "to demonstrate the broad spectrum of competencies that one needs to master as a supply chain management professional." She adds that ISM's continuing education requirements also denote that a student has taken the responsibility to learn and grow within his or her job. "Certifications remain relevant in today's world," Neibergall concludes, "because they show that someone is keeping current and staying on top of what they do as professionals."

5 Certification is paying off. Certifications help professionals "fill in" their skillset and knowledge gaps while also helping them keep current and up-to-date on the latest and greatest supply chain trends and applications. But do they pay off when it comes to salaries, promotions and job opportunities? According to APICS' most recent data, the answer to that question is a resounding "yes." Of those surveyed, 44% held CPIM designations and 33% have CSCP designations. Individuals holding the CPIM designation received an average of approximately 10% higher compensation compared to those without the designation, according to APICS, and experienced a 77% favorable hiring decision impact (over those job candidates without the certification). Similarly, individuals with a CSCP designation received on average approximately 12% higher compensation than those without CSCP certification and a 76% favorable hiring impact.

6 Coming soon: Courses made for mobile consumption. Staying "connected" without being tethered to a desk, chair or couch has become a way of life for all professionals, and supply chain specialists are no exception to the rule. Knowing this, nearly all of the certification providers interviewed for this article say that they're working to include more mobile options into their coursework. At APICS, for example, Dean Martinez, EVP and COO, says mobile is becoming an increasingly important aspect of the organization's educational delivery. "We're all looking at how to incorporate mobile technology as part of the training and certification process," he notes. Focused on learning how its educational products are "consumed," the organization recently learned that more than 53% of students are using mobile devices to access and interact with the course content—up from 23% in December of 2016. "That's a 100% increase of use in a six-month period. That's significant," says Martinez, who expects those percentages to continue rising. To accommodate that shift, he says providers will need to start going beyond "mobile friendly" and actually creating content designed for mobile devices. "It sounds like splitting hairs," says Martinez, "but it's a significantly different approach than what we're all used to."

"We're all looking at how to incorporate mobile technology as part of the training and certification process. That's a 100% increase of use in a six-month period. That's significant."

Supply Chain Management

certifications offered by professional organizations and universities

There are more offerings than ever for supply chain professionals looking to improve their skills and further their careers.

BY MALINI NATARAJARATHINAM & PRAHARSHA SUNKARA

Every company that delivers a product or service has a supply chain management department. With the increase in the complexity of supply chains, all companies are looking for people who can be good managers and lead the supply chain with minimal issues. Certifications in SCM can be a great boost for anyone who aspires to a career in this field. The aim of this article is to expand upon the available recognized SCM certifications in the United States and to aid budding supply chain executives in their efforts to keep abreast of this rapidly changing area.

Indeed, many professional institutions, universities, colleges and even companies are expanding their education programs, including certifications, in the area of supply chain management. The focus of these courses is not just on traditional supply chain disciplines, such as inventory management and the fundamentals of procurement, but also to address collaboration skills, strategic planning, work culture and information technology, to name a few.

Given the number of options, choosing a certification is highly dependent on the expectations of the individual, his or her experience and career expectations. For instance, for someone with a global perspective, the APICS certifications are recognized across the globe, while university-offered certifications are better recognized in the United States compared to other parts of the world.

In the following pages, we present details on the certifications offered by professional organizations such as APICS, CSCMP and ISM, along with certificate programs available at more than 40 universities and academic institutions. The aim is to provide a basic understanding of the type of certifications available as well as information the eligibility requirements, expectations and requirements for completion of the certificate program. Please keep in mind that information on certification programs is subject to change. We highly recommend that readers check the respective certification program Websites before making a final decision.

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A more complete description of these certifications is available on scmr.com.

Issuing Institute	Certification Name	Eligibility Requirements	Duration for completion	Type of Teaching
Manufacturing Skills Standards Council	Logistics Certification (CLA + CLT)	10th Grade	70 hours	Classroom
Air Force Institute of Technology	Graduate Certificate in Supply Chain Management	Bachelor's Degree Holders	1 year	Classroom/ Online
American Public University	Graduate Certificate in Logistics Management	Open for All	1 Year	Classroom
APICS	APICS Certified in Production and Inventory Management (CPIM) program	Open for All	No duration	Online
APICS	APICS Certified Supply Chain Professional (CSCP) Certification Program	Supply Chain Professionals	No duration	Online
Arizona State University	Supply Chain Management Certificate	Supply Chain Professionals	No duration	Online
California State University at Dominguez Hills	Online Certificate in Purchasing Education and Training	Open for All	No duration	Online
California State University at Dominguez Hills	Online Certificate in Supply Chain Management	Open for All	No duration	Online
California State University at Fullerton	Supply Chain Management	Supply Chain Professionals	1 Year	Classroom
California State University at Long Beach	Global Logistics Specialist Online Professional Designation Program	Supply Chain Professionals	2 Years	Classroom/ Online
Columbus State Community College	Supply Chain Management Certificate	Bachelor's Degree Holders	1 Year	Online
Council of Supply Chain Management Professionals	SCProTM Supply Chain Management Certification Program	Bachelor's Degree Holders	No duration	Classroom
DePaul University	Logistics and Supply Chain Management Certificate Program	Bachelor's Degree Holders	17 Weeks	Classroom
Eastern Michigan University	Graduate Certificate in Supply Chain Mgmt	Bachelor's Degree Holders	1 Year	Classroom
Ferris State University	Advanced Studies in Global Logistics	Open for All	1 year	Classroom
Fontbonne University	Certificate in Supply Chain Management	Open for All	1 Year	Classroom
Georgia Institute of Technology	Distribution Operations Analysis and Design Certificate	Distribution Operations Professionals	6 Years	Classroom
Georgia Institute of Technology	Health and Humanitarian Supply Chain Management Certificate	Government and members of Humanitarian Activities	6 Years	Classroom
Georgia Institute of Technology	Lean Supply Chain Professional Certificate	Supply Chain Professionals	6 Years	Classroom
Georgia Institute of Technology	Strategic Sourcing and Supply Management Certificate	Supply Chain Professionals	6 Years	Classroom

Issuing Institute	Certification Name	Eligibility Requirements	Duration for completion	Type of Teaching
Georgia Institute of Technology	Supply and Demand Planning Certificate	Bachelor's Degree Holders	6 Years	Classroom
Georgia Institute of Technology	Supply Chain Management Certificate	Bachelor's Degree Holders	6 Years	Classroom
Golden Gate University	UG certificate in Operations and Supply Chain Management	Bachelor's Degree Holders	No duration	Classroom
Golden Gate University	Graduate Certificate in Supply Chain Management	Bachelor's Degree Holders	No duration	Classroom
Leheigh University	Supply Chain Management Certificate	Open for All	1 year	Online
Lonestar College System	First Line Logistics Leader Certificate	Bachelor's Degree Holders	1 Semester	Classroom
Loyola University	Essentials of Logistics and SCM	Key Employees and Engineers	1 year	Classroom
Michigan State University	Master Certificate in Supply Chain Management and Operations	Open for All	24 Weeks	Online
MIT Sloan	Executive Certificate in Technology, Operations, and Value Chain Management	Sr. Managers and above	2 Days	Classroom
Next Level Purchasing Association	SPSM Certifications	Open to NLPA members	1 Year	Online
Northeastern University	Supply Chain Management Graduate Certificate	Bachelor's Degree Holders	1 Year	Classroom
Pennsylvania State University	Graduate Certificate in Supply Chain Management	Bachelor's Degree Holders	12 Months	Classroom
Portland State University	Graduate Global Supply Chain Management Certificate	Current MBA and Masters of Business Management Students	Up to 7 Years. Can be com-pleted in as little as 6 months	Online
Portland State University	Certificate in Supply Chain Management	Supply Chain Professionals	3 years	Classroom
Rutgers State University	Supply Chain Management Certificate	Sr. Managers and above	4 Days	Classroom
Shippensburg University	Advanced Supply Chain and Logistics Certificate	Open for All	1 year	Classroom
Sourcing Industry Group (SIG University)	SIG University Certification	Certified Sourcing Professional	12 Weeks	Online
Southern New Hampshire University	Operations and Supply Chain Management Graduate Certificate	Open for All	1 Year	Online
Southern Polytechnic State University	Industrial Engineering Technology Department Certificate of Logistics	Bachelor's Degree Holders	3 years	Classroom/ Online
St. Louis University	Integrated Supply Chain Management Program	Supply Chain Professionals	18 Months	Classroom

Issuing Institute	Certification Name	Eligibility Requirements	Duration for completion	Type of Teaching
Stevens Institute of Technology	Logistics and Supply Chain Analysis Graduate Certificate	Bachelor's Degree Holders	1 Year	Classroom
Syracuse University	Executive Certificate in Supply Chain Management	Key Employees and Engineers	10 Weeks/ course	Online
Towson University	Supply Chain Management Post Baccalaureate Certificate	Open for All	1 year	Classroom
University of Alaska at Anchorage	Undergraduate Certificate in Logistics and Supply Chain Operations	Open for All	2 Years	Classroom
University of California at Los Angeles	Supply Chain Management certificate	Open for All	5 Years	Classroom
University of California at Riverside	Professional Certificate in Purchasing, Logistics and Supply Chain Management	Bachelor's Degree Holders	1 year	Classroom
University of California at San Diego	Certificate in Purchasing and Supply Management	Supply Chain Professionals	No duration	Classroom/ Online
University of Houston at Clear Lake	Purchasing and Supply Chain Management Certificate	Open for All	2 Years	Classroom
University of Indianapolis	Global Supply Chain Management Graduate Certificate	Master's Degree	1 Year	Classroom
University of Michigan - Ann Arbor	Lean Supply Chain and Warehouse Management Certificate	Bachelor's Degree Holders	2 Weeks	Classroom
University of Missouri at St. Louis	Graduate Certificate in Logistics and SCM	Open for All	1 Year	Classroom
University of North Carolina - Greensboro	Supply Chain, Logistics and Transportation Management	Bachelor's Degree Holders	6 months	Online
University of North Florida	Certification in Transportation and Logistics	Supply Chain Professionals	5 Days	Classroom
University of San Francisco	Advanced Professional Supply Chain Management Certificate	Bachelor's Degree Holders	No duration	Online
University of San Francisco	Advanced Professional Sustainable Supply Chain Management Certificate	Bachelor's Degree Holders	No duration	Online
University of Texas at Dallas	Supply Chain Management Certificate	Bachelor's Degree Holders	12 Days	Classroom
Walden University	Global Supply Chain Management Certificate	Open for All	1 Year	Classroom
Washington University at St. Louis	Supply Chain Management Certificate	Open for All	5 Days	Classroom
Institute of Supply Management	Certified Professional in Supply Management (CSMP) Program	Supply Chain Professionals	No Duration	Online
Institute of Supply Management	Certified Professional in Supplier Diversity (CPSD) Program	Supply Chain Professionals	No Duration	Online