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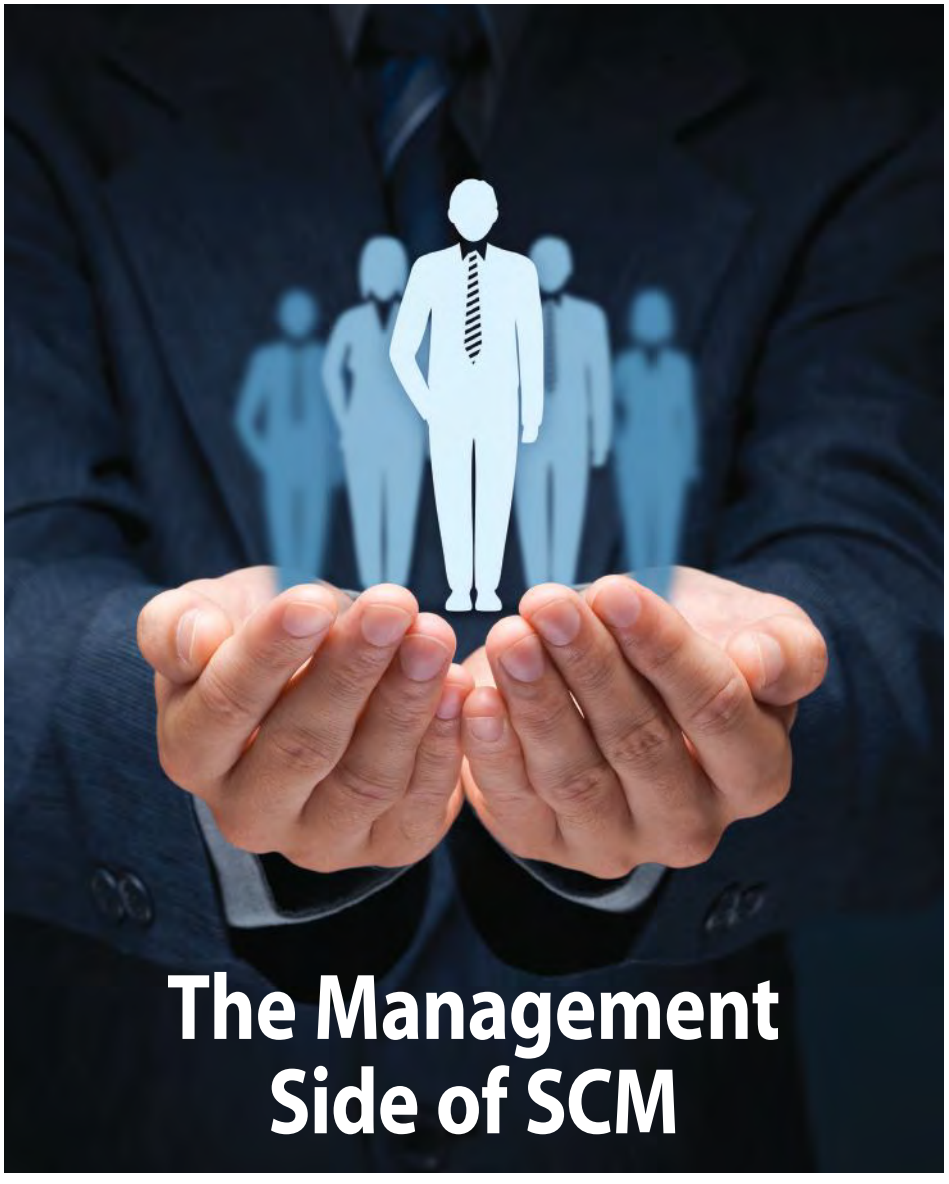

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What's your talent strategy?

At *Supply Chain Management Review*, we've been writing about the talent crisis in our profession since at least 2012 when our MIT contributors were publishing a column on talent strategies. Last winter, the topic touched home when I picked up my local newspaper one Saturday morning. One of the lead stories was about two initiatives launched by C&S Wholesale Grocers with two local academic institutions: Keene State College and Franklin Pierce University.

C&S is not only the largest food distribution supply chain company in the United States, but it also happens to be the largest employer in Keene, N.H., my home town. Should the company ever pull up stakes and move its corporate headquarters to Boston or Hartford, Conn., two cities where it also has a presence, it would be a real blow to Keene. Yet, like lots of great companies located in rural cities or the rust belt, C&S has been challenged with retaining its young hires, often from elite schools, who get a year or two worth of experience under their belts and then move on to bigger cities with more to offer Millennials. I get it: My 20-something daughter and her friends couldn't wait to go to college in places like New York, Washington, Boston or Chicago, where my kid landed. She has never looked back.

What to do? C&S had an idea that is the subject of this issue's How They Did it. Why not partner with two academic institutions in its backyard to build a talent pipeline. The theory is that students who get an education in the region may be interested in building a career here as well. While the jury is still out, I think the C&S approach could also serve as a blueprint for other companies in similar straits.

Bob Trebilcock, Editorial Director
btrebilcock@peerlessmedia.com

Also in this issue, we take a look at strategies for developing a talent portfolio in the gig economy and whether procurement is walking the talk when it comes to hiring for innovation and creativity—two attributes we hear are in demand. We round out the issue with research from MAPI on the impact of the opioid crisis on manufacturing and an excerpt from a new book by Robert Handfield and Tom Linton on Flex's new approach to supply chain management, called the Living Supply Chain.

Finally, we've updated last year's listing of the supply chain certification programs offered by academic institutions and professional associations in North America. Like last year, we are publishing the full program description as a PDF online. It remains one of the most read articles year after year.

As always, I look forward to hearing from you with any comments or suggestions for future stories in *SCMR*.

Bob Trebilcock

SUPPLY CHAIN MANAGEMENT REVIEW

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SUPPLY CHAIN MANAGEMENT REVIEW

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Future factories now playing in 3D

I have been a member of the Manufacturing Leadership Council's Board of Governors since 2010. Last September the council asked if I would be willing to do a phone interview for research it was conducting for a factories of the future study* sponsored by two of its manufacturing company members: GE and Intel. I agreed. I'm always happy to give an opinion about the future of supply chains since having launched the MIT Supply Chain 2020 Project in 2004, and often think 10 years to 15 years into the future.

The first topic I discussed with the researchers dealt with the future state of factories and plants over the next 10 years: How will they be organized and operated? I told them that my perspective is based on "Small Is Beautiful," a thought-provoking book by the economist Ernst F. Schumacher that I read more than 40 years ago.**

"Small is Beautiful" for the earth

My main takeaway from the book is that the ideal future manufacturing model has to be natural-resource efficient. That is one in which goods ought to be sourced and made as close as possible to end-consumers. Back in the day, our "modern manufacturing model" encompassed building large plants to service large swaths of the earth in order to get manufacturing economies of scale. Huge efforts were required to build them and then source them with commodities from distant locations. In addition, the so-called "last-mile" delivery of finished goods to end consumers too often meant the "last thousand miles" or more.

In addition to the book, my view was also significantly influenced by the work of a research group called the Club of Rome. In the late 1960s and early 1970s, this group took on the modeling of complex interactions of the world economy, population and ecology."*** In 1972, the group published the book "Limits to Growth" that "portended a few scary future scenarios involving limited resources to support an unlimited growth in the world's population."

The book's premise was that the world's growing population will eventually deplete the natural resources needed to sustain the current Western-based economic model on a worldwide basis. Further, our current "modern" manufacturing and supply chain models are inefficient in their use of nature resources. For example, carbon-based fuels are used too heavily in sourcing, making and delivering goods to consumers. While the worst outcome scenarios have not materialized, there is still a concern that they may eventually arrive in the future if we continue business as usual.

Some 40 years ago, the author of "Small is Beautiful" argued (according to Wikipedia): "the modern economy is unsustainable. Natural resources (like fossil fuels), are treated as expendable income, when in fact they should be treated as capital, since they are not renewable, and thus subject to eventual depletion. He further argues that nature's resistance to pollution is limited as well. He concludes that government effort must be concentrated on sustainable development, because relatively minor improvements, such as the transfer of technology to Third World countries, will not solve the underlying problem of an unsustainable economy."

The Uberization of manufacturing

Another of the things I discussed with the researchers was a highly distributed global manufacturing model, with a multitude of small local plants rather than a few large global and regional plants to supply goods on a world-wide basis. They published the following summary:****

"From a manufacturing perspective, I think we have to move toward making, sourcing and delivering much closer to where consumption takes place. It's a highly distributed model, supported by the kinds of intelligent machines that are now available. I can still design centrally and coordinate sourcing centrally, but then I need to bring

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it to a place that is much closer to the point of consumption. The previous model of manufacturing was to build a big plant, bring materials and components to it, produce something and then distribute it. I might have one plant around the world, or I might have three or four, but it's a big model. First, it's not environmentally friendly because it involves a lot of transportation to get things to and fro from sourcing, to manufacturing, to delivery. Second, with an ageing population that needs local goods and services, and rapidly expanding urban centers where the majority of people live, distributed manufacturing closer to the point of consumption makes the most sense. It's much more efficient. So when I look at the future of manufacturing, it might be a global manufacturer, but it will have multiple manufacturing sites. It will be distributed, not the 'one big plant' model.

We can still centrally control the whole flow of everything, with some computer system sitting somewhere coordinating things. It's kind of like an Uber model for world production. You could have a computer system that brings in all of the inputs of information that you need to know, when the customer wants something and how to coordinate it to make it happen. But it's all going to happen with a decentralized approach. So think of it as central control, decentralized execution. That is the fulfillment model of the future. It really does look like Uberizing almost everything."

Will 3D printing enable the distributed model?

More than 100 years ago Henry Ford built the Ford River Rouge plant. The conception was of a whole supply chain in an (albeit) very large box. According to the online magazine The Old Motor, "Henry Ford started out in 1915 by buying 2,000 acres along the Rouge River west of Detroit, intending to use the site only to make coke, smelt iron and build tractors. His plans changed and by the late 1920s Ford had built the complex up to the point where it included virtually every element needed to produce a car: a blast furnace, an open hearth mill, a steel rolling mill, a glass plant, a huge power plant and an assembly line that was first used during 1927, the last year the Model T was produced." Thus he had built a plant that converted raw materials into finished vehicles at a single location.

Today we can buy a 3D printer that takes in raw materials—in liquid and powdered form—and "prints" a 3D image that could be either a component part or a finished product. In effect, a 3D printer is a miniaturized River Rouge plant! Thus, this envisions a future global manufacturing network for a product being comprised of an unlimited number of local and regional 3D printing plants. The network would be coordinated from a central computer system that sources the raw materials and the 3D designs that a plant needs to make and assemble component parts and finished products. Companies like the contract manufacturer Jabil are already building out these kinds of networks.

Project-based enterprises also possible

After giving my thoughts about future global manufacturing networks, the researchers delved into business models that might make product innovation better and faster. Their summary of my thinking was also published as follows:

"What makes a manufacturing company? Basically, it's a group of entities that have expertise, that are getting together for the purpose of a mission, which is to make and deliver a physical product. It may have existed for 100 years or more, but it's really a project to produce a certain thing, whatever it's successful in, or to try to develop and make new things. But the model I think will emerge in the future for manufacturing is more like making a movie. There's a producer and he brings on people who don't work for the company; they work for a project called "the movie." Or look at the Uber guys. They're all contractors too. So I think we're getting closer to everybody becoming contractors and where the business becomes much more project-based and connected through real-time technology. If I decide I'm going to make a product, I get a group of contractors together. One of those may be the guy or woman who runs the plant—or a group of people running multiple plants. Now we've got a design issue. So we need people to design the software, design the hardware, and they're all contract-based as well. So I'm putting together this thing for a product, it needs software, it needs hardware, we need to design everything, we need the right modules. So we're really bringing a supply chain together for this product. We may only do that for five years if the product doesn't work out. We'll disband after that. But if the product works out, hey, we'll be together and doing this for a long time. I think this is closer to the project-based model of the future for manufacturing. It's an on-demand approach. The whole concept of a manufacturing company will then be different and the organizational chart won't look the same anymore."

Some of my more far-fetched thinking about future distributed manufacturing networks might seem far away today. However, I believe 3D printing is the Holy Grail and is the link that will enable this reality much sooner.

*"Vision 2030: The Factory of the Future," Frost and Sullivan White Paper, 2018

**"Small is Beautiful: Economics as if People Mattered." E. F. Schumacher. Harper Perennial: A division of HarperCollins Publishers. 1973. (updated 1989.)

*** "Oil Prices Will Rise Eventually," Larry Lapide. *Supply Chain Management Review*, Jan/Feb 2017

**** "Factories of the Future: Five Expert Perspectives." Paul Tate. *Manufacturing Leadership Journal*, February 2018

Rushing to adopt AI? Watch out for speed bumps

Rushing to adopt AI? Watch out for speed bumps

By Ken Cottrill

Artificial intelligence (AI) along with the AI application known as machine learning have captured the imaginations of supply chain professionals, and many companies are pursuing AI projects.

While the technology is starting to make its mark in the supply chain domain, practitioners should not underestimate the amount of preparatory work that needs to be done to provide a strong foundation for AI applications that can yield real value.

Ken Cottrill is the global communications consultant for the MIT Center for Transportation & Logistics. He can be reached at kencott@mit.edu

Varied applications

Definitions of AI refer to the technology as a branch of computer science that focuses on the use of machines that mimic or simulate human intelligence. Machine learning is essentially the process by which machines learn by analyzing data and spotting patterns and relationships.

Applications of these technologies are being developed in many areas of supply chain management. Here are some highlighted at the MIT Center for Transportation & Logistics' 2018 Crossroads conference, which took place on April 17th, 2018.

CTL's Megacity Logistics Lab piloted a project in collaboration with a German company to use machine learning for demand forecasts. In the past, the company used historical sales data to estimate seasonality and trends for forecasting. The project improved upon this approach by bringing in additional variables such as web search data, weather data and internal corporate data. Instead of requiring an expert to build a careful and consistent model, the company used deep learning (a subfield of machine learning that uses neural computing to analyze unstructured data) to automatically find predictive patterns that enabled better two-week forecasting. The company is now better able to preposition inventory and reduce the order cycle times.

The MIT Megacity Logistics Lab also has used AI to predict driving and delivery service times on last-mile delivery routes. Service times vary significantly depending on the type of customers; a residential home delivery versus delivering to a high-rise office, for example. In one application that involved unsupervised learning (see "Smarter solutions" section), different delivery routes were clustered by type. Different routes are subject to factors that affect logistics performance such as route location, how delivery stops are spaced, the availability of parking spaces and delivery density. Clustering routes with similar properties enabled the researchers to assess the performance of the clusters in relation to their distinct properties.

A leading third-party logistics (3PL) provider is using machine learning to automatically extract relevant details from customer emails related to bookings. The system can translate free-form text into a standardized format that the company can use with carriers.

The 3PL is also using machine learning in combination with data sources such as social media, news and messages from ports to detect signs of delays or disruptions. The company wants to use the technology to analyze the nature of disruptions and associated recovery strategies. The overall goal is to give better visibility to customers on the status of their shipments. Another AI project aims to predict cargo arrival times before cargo is shipped. Data on the outbound port, carriers and inbound port can be used to predict passage times and dwell times at both ends. The system will help the 3PL give customers better arrival estimates and predict problems in ports that might delay delivery.

An electronics manufacturer is using the

technology to gather intelligence about its supply base. The company is using machine learning to scan web text data and analyze potential new suppliers found online. By segmenting potential suppliers and comparing them to incumbents, the company can find more suppliers to consider as candidates for alternative sourcing arrangements.

In another project, the company explored the use of AI to automatically detect disruptions in the supply base by reviewing online chatter and other web data. The system determines the type of disruption such as a natural disaster, a corporate social responsibility issue or financial troubles. Analyzing the sentiment of the online communications to determine whether a disruption is negative (e.g., factory damage) or has positive implications (e.g., a surge in orders that is creating shortages), enabled the company to evaluate each situation. The project goal was to help commodity managers and suppliers manage their responses to disruptions. This type of data also can help companies to consider public sentiment and how their reactions might be viewed by the public when responding to disruptions.

The company also developed a proof-of-concept to automate supply chain operations. It looked at automating the handling of exceptions in procurement. For example, if there is a change in the demand forecast, there needs to be corresponding changes in related purchase orders. Taking the application of AI even further, the company is experimenting with the use of machine learning to capture best practices, measure execution and understand why supply chain managers choose not to adopt certain actions.

Risks ahead

As these examples show, potential AI applications in the supply chain are wide-ranging and the scope of these solutions will no doubt increase as companies gain more experience and the technology matures.

However, there are some challenges that need to be considered before companies embark on the AI journey. Following are some notable examples.

Is you organization set up to implement AI? It's one thing to reach for the promise of AI, but quite another to put the technology into practice.

One approach is to incorporate AI development projects in a centralized team—such as a center of excellence—that is driving digitization generally. A leading electronics component manufacturer has a centralized team working on new technologies on a three- to five-year time horizon, for instance. The team presents new technologies to each of the supply chain organizations for consideration and development of use cases. A global logistics company has an innovation team based in corporate headquarters that works on projects given to them by supply chain units to ensure that projects are aligned with customer needs.

Do you have the right data? The basic transactional data that you want to mine for intelligent insights into a problem may or may not be adequate for the goals you have set. Widening the types of data used—something that is becoming easier thanks to the growth of Internet of Things technology—will enrich the data set but also will introduce more complexity. Also, data sets must be organized in a certain way for machine learning model building which takes time.

Which model should you use? There are numerous machine learning models and choosing the right one for the application you have in mind can be a challenge. Fortunately, this process is becoming more streamlined. For example, the MIT Lab for Information and Decision Systems is developing ways to automate machine learning model building and has already achieved some notable successes. Moreover, the research aims to make it easier for mere mortals in operational functions to understand and participate in the process.

Does your team trust the results? When a new-fangled and much-hyped technology such as AI spits out results, there is no guarantee that practitioners will believe and act on the findings—especially if they are counter-intuitive. Some companies pursue relatively small, straightforward machine learning projects first to create trust and credibility. Pairing data scientists with supply chain professionals can help to break down perceptual barriers.

What about customers and suppliers? You might have to do some work to convince trading partners to join the party. On the other hand, some companies report that their suppliers initially drove the pursuit of AI solutions in the supply chain. Either way, AI projects bring opportunities for collaboration in key areas such as data collection.

Be aware of emerging challenges. The security of machine learning systems and processes is likely to become more important. For instance, criminals might attempt to mis-train systems for illicit purposes. The robustness of the technology is another issue, especially in safety-critical applications such as autonomous vehicle operation.

Smarter solutions

As AI technology continues to evolve, more potential applications—and challenges—will come to light.

One development to watch out for is the growth of unsupervised learning, which was discussed at the Crossroads conference. Unsupervised learning is where an AI algorithm basically learns from unclassified, unlabeled data and can act on the information with minimal guidance. The algorithms can handle more complex processing tasks than other types of AI.

Unsupervised learning is expected to develop rapidly, bringing opportunities to generate insights in situations where experts don't know the answers. Such advances coupled with the increasing accessibility of AI—the basic building blocks are becoming available to a wider community of users—will drive more creative applications of the technology over the next five years.

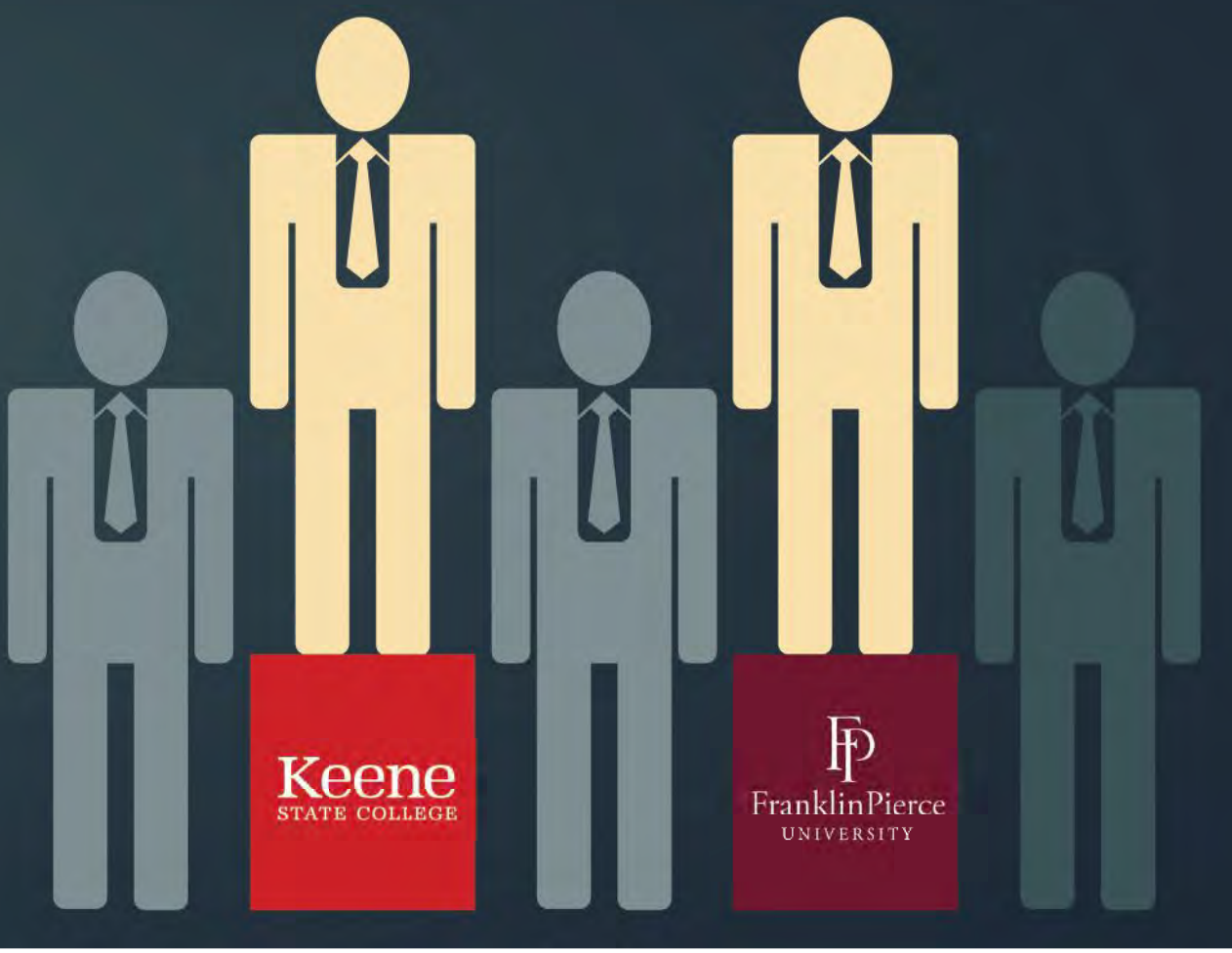
How They Did it: The C&S college connection

BY BOB TREBILCOCK

On an early spring day last March, a small group gathered in a conference room on the campus of Keene State College, a liberal arts state school with around 4,000 students located in Keene, a city of about 23,000 people located in southwestern New Hampshire. The meeting was led by Daniel Henderson, a one-time corporate executive who now serves as the director of corporate partnerships and strategic initiatives at Keene State. Joining him were Keene State faculty members; Gabreille Miele, a Keene State senior who was completing an internship at C&S Wholesale Grocers, the city's largest employer, and executives from C&S, a 100-year-old family-owned company with more than $27 billion in sales and 17,000 associates nationwide.

Bob Trebilcock is the editorial director of **Supply Chain Management Review.** ***He lives in Keene, NH.***

It was a freewheeling session, with lots of ideas on ways that the college and C&S might work more closely together in the coming academic year. Topics ranged from how to further a budding internship program to how to get faculty on-board with working more closely with C&S to whether the company might consider a student loan repayment program or student reimbursement for employees who go on to get a master's degree ("that decision is way above me," one of the C&S executives said). Henderson briefly discussed his idea for a core curriculum of three to six classes that would prepare a student, regardless of major, for an entry level position at C&S. "We have a lot of big and great ideas," notes Melissa Binder, C&S's learning development supervisor and a member of the task force. "The challenge is figuring out how to make something sustainable for both parties."



Monthly meetings like this one have been taking place for a year and a half and have already resulted in a number of interns and new hires from Keene State. Although it is still in the early stages of development, and not yet a formal initiative, the Keene State effort is one of two programs designed to generate a talent pipeline that C&S has launched with local academic institutions in the last two years. The other is with Franklin Pierce University, a liberal arts institution with just under 2,000 undergraduate and graduate students located about 20 miles away in Rindge, New Hampshire. There, C&S and the university have launched the C&S Scholars Program to provide internships and co-operative opportunities to a select group of Franklin Pierce business majors.

The stakes are high: Across the country, small academic institutions are going out of business or merging with other schools to keep afloat while corporations like GE are abandoning their out-of-the-way locations and moving to urban areas where tomorrow's talent wants to live.

It's a different way for academia to work with business, but Henderson argues that it is "fulfilling our responsibility as a state institution of higher education to prepare students for life after college." And, frankly, at the end of the day, C&S and the two schools are trying to address the same issue: How, in a state where nearly 60% of college bound students leave the state, to entice them to get an education locally and stay and develop careers with companies like C&S—a supply chain organization at its core—when their peers are drawn to the siren songs of urban areas like Boston, New York and Chicago. What's that old song: "How Ya Gonna Keep 'em Down on the Farm (After They've Seen Paree)?"

The stakes are high: Across the country, small academic institutions are going out of business or merging with other schools to keep afloat while corporations like GE are abandoning their out-of-the-way locations and moving to urban areas where tomorrow's talent wants to live. The concept is not without precedent in Keene, where not so long ago a large insurance company moved its corporate headquarters to Florida. Still others are embracing their small town roots and partnering with local academic institutions to get at the head of the line to recruit their top students. After all, students who go to school in the area, might be enticed to stick around and develop their careers there. That, at least, is the theory. (For more on this topic, see Walgreen's Talent Strategy in the July 2016 issue of *SCMR*.)

That experiment is now underway at C&S. This is the story of how the nation's largest wholesale grocery distribution company and one of its largest privately-held companies is trying to tap the talent in its own backyard to keep its edge as the food industry's leading supply chain company. Whether C&S can keep its new hires down on the farm may not be known for several years. But the initiative is potentially a road map for other supply chain organizations operating in similar regions.

First steps

The war for supply chain talent has been a topic of discussion at conferences for at least the past five years. Now, with the unemployment rate at record lows, it is more acute—and more in the news—than ever. In recent months the American Trucking Association reported that driver turnover rose 5% in the third quarter of 2017, to 95% per year, "despite offering signing bonuses as high as $10,000 to drivers who, nonetheless, stay on the job for a year before moving on," according to the *Wall Street Journal*.

Other news reports in the *Journal* have noted that the job market is so tight that some cities in rural areas are offering bonuses to individuals willing to relocate to work for their labor-strapped employers. Examples include Hamilton, Ohio, which is offering $5,000 toward student loans to people in engineering, technology, science or the arts, if they agree to live for two years in Hamilton, and North Platte, Neb., home to Union Pacific's largest train yard, where the town leaders are offering up to $10,000 for those willing to move for a job, $20,000 for train crew employees and a $25,000 bonus for diesel electricians.

C&S is certainly grappling with a tight labor market in the 50 facilities it operates around the country. But the challenge of minimizing turnover is not unique to operations. For C&S, turnover is also a challenge at its corporate headquarters in Keene, where the company employs some 1,200. As such, the two new initiatives represent a different approach to recruiting, according to Andrew Connell, vice president of procurement. "In the past, we did all the normal recruiting techniques, like posting online, LinkedIn and social media," he says. "But we weren't strategically utilizing some of the local colleges that could be a great source of talent. We didn't start the process until the need arose, so we didn't have a strong pipeline we could draw upon." And getting

people, especially young people starting their careers, to live in a small town in New Hampshire was an issue. Connell's own experience is a case study. Historically, C&S recruited from top tier schools in the Northeast like Dartmouth, Middlebury and Cornell, where Connell was a student. In 2006, he was offered a summer internship at C&S, in the procurement department. Following his graduation the next year, he joined the executive leadership program at the company headquarters in Keene.

His peers in the program, which allows new hires to rotate through the various departments to find their niche in the company, had similarly been recruited from top tier schools. What set Connell apart is that he chose to put down roots and develop his career in New Hampshire. "One of the biggest challenges we have had is finding people who are not from the area who want to build a life and career here," Connell says. "After two or three years, many new hires want to move closer to Boston or another big city."

The catalyst for a new approach to recruitment originated in 2016 in the finance department, where Mark Fryberger is the vice president of finance. At the time, the company needed more staff accountants following the acquisition of several competitors. "We had hired everyone we could hire locally, so we were hiring from Manchester and Concord," Fryberger remembers. "There was a lot of work, and with an hour commute one way, people were not staying for long."

The company explored opening a satellite office in Boston, where its sister robotics company Symbotic is headquartered, or Hartford, Conn., where C&S has an office. The challenge: Employees in the home office were reluctant to move their departments away from the action. Moreover, Symbotic's controller warned that while Boston might have more schools to draw from, there were also 1,000 companies competing for the same pool of talent. Employees jumped from job to job. In the summer of 2016, Fryberger did a dive into the demographics of the finance organization. What he discovered is that while about 80% of new hires came from outside of southwestern New Hampshire, nearly 60% of those with five years or more seniority—those who had stuck around—had connections to the area. Maybe recruiting from top tier schools wasn't the answer. "We had some great people come through the leadership program, but the retention levels were low," Fryberger says. "We decided to embrace who we are and see what Keene has to offer."

The initial outreach was to Franklin Pierce University, which had a strong accounting program, something Keene State lacked. In December 2016, Cole Mills, then a senior member of the C&S financial team, and Fryberger met with university president Kim Mooney and Lynn Rozanski, who was then the acting provost. "At that first meeting we didn't know where we were going," says Fryberger, "But we realized we had a common need, and we agreed that we should have regular meetings to explore how we can work together."

The two teams met again in early 2017. C&S asked how the company might engage with students, by acting as guest lecturers, providing case studies or providing internships. Rozanski wanted to think bigger: What about creating a C&S Scholars Program? The concept could potentially provide a meaningful work experience for Franklin Pierce students; develop a pipeline of potential new hires for C&S; and result in a program that Franklin Pierce could market to the parents of incoming freshmen. "We realized we needed to get corporate buy in from our CFO and general counsel," Fryberger recalls. "Once we had that, we agreed to move forward with monthly meetings to define the program." It was still a handshake agreement rather than a contractual obligation, says Fryberger. "We have made personal commitments, but if it fails, neither side has made a serious financial commitment."

Meetings continued through the winter and spring, and by the end of the 2017 school year, a framework was in place to launch the C&S Scholars Progam the next fall.

The backyard

Similar discussions were underway with Keene State College. In early 2017, C&S hosted an event for the local Chamber of Commerce and the NH Sectors Partnership Initiative, described as "a collaborative, industry-led program that provides funding, training expertise and other resources to help companies within a growing industry sector collaborate on workforce development needs together." The topic of the meeting was the workforce needs of local businesses and attendees included business leaders, representatives from local governments and a group from Keene State, Henderson among them. "When I heard Mark Fryberger talk about C&S's needs, I thought the door opened for us," Henderson recalls.

Following the event, Henderson arranged a February meeting on campus. "Even though they are the biggest employer in town, it was clear that not many Keene State kids had heard of C&S, knew what they do or realized that there are a lot of job opportunities there," Henderson recalls. C&S asked how it could increase its engagement with students and offered to set up some part-time internships.

Following that February meeting, a task force was formed that began meeting on a monthly basis. And, indeed, C&S

took on a few interns. While the discussions were on an ad hoc basis, the relationship got a boost in May 2017, when C&S's procurement department launched a data cleansing initiative to aid its planning, pricing and promotions programs. It involved having individuals go through old super market circulars, identify the prices at which items sold at different times of the year and then manually enter that information into spreadsheets. It was the kind of work that lent itself to interns or temps. Aware of what the finance team was doing with Franklin Pierce, the procurement team reached out to Henderson. "We didn't have a master plan, but we knew there was this resource in town," says Connell. "We met with Daniel and asked if we could partner in a meaningful way." By the end of May, C&S had hired six summer interns and brought onboard four recent graduates.

How they work

The Franklin Pierce and Keene State initiatives aren't the only relationships C&S has built with academic institutions, according to Melissa Farmer, the program manager for college relations. The company has relationships with other universities near its facilities and offices, including Sacramento State University, Pennsylvania State University, Rutgers, Western New England University, University of Massachusetts Amherst and Lehigh University. But none are on the same scale as the two in New Hampshire. Still evolving, here's how they work for now.

Both programs were launched following a series of monthly task force meetings that included representatives from both organizations who created a framework for moving forward. And in both instances, those groups continue to meet on a monthly basis.

Both initiatives include paid internships. Typically, these are part-time during the school year and full-time during the summer. In addition to their work duties, Melissa Farmer, the program manager for college relations, creates lunch and learns where the interns can learn about the different departments within C&S, and arranges tours of nearby distribution centers. When time permits, interns are given the opportunity to shadow team members to learn more about how the business works. And, some interns have done multiple internships across departments. Finally, to help develop soft skills, interns give a final presentation about what they accomplished during the internships to team members and leadership when they are available.

C&S associates are available to visit classrooms or participate in campus events. In the last year, for example, a

Academia's new take

If you think about it, academia and business have historically had different roles. Often, the two were at loggerheads. "The point of friction was that business would prescribe what it wanted and academic institutions would prescribe what they were willing to provide," says Melinda Treadwell, Keene State College's interim president. Maybe that old model is broken, or, at the least, needs some serious tweaking, especially if smaller schools are going to remain competitive in their war for students.

"I do think the academic paradigm has shifted," says Ed French, the dean of Franklin Pierce's business school. "There are fewer high school graduates and more competition. The challenge for small universities like Franklin Pierce is how do we resonate in the marketplace? We have to realize that tuition is an investment in the future, and we need to ensure that there is a return on that investment. We have to be in the market with companies like C&S to make that happen."

Being in the market is very much a part of the business program at Franklin Pierce, where 27% of the student body are business majors in a program that emphasizes experiential learning. While the C&S initiative is the first of its kind, French envisions forming similar partnerships with other New England businesses. "What we're doing with C&S may not work for someone else, but the fact that we have developed a formal program with a strong, vibrant company tells us we can do this with other companies," he says.

Those thoughts are echoed by Treadwell. In Keene, she says, the college is working not only with area businesses, but local government and the Chamber of Commerce to "build road maps into the business community."

Like Henderson, Treadwell envisions creating micro-certificates with core curriculums, multiple minors or dual majors that would prepare students for participating companies looking to Keene State as a talent pipeline. At the same time, she believes that in return, business needs to make a commitment to institutions like Keene State. "I'd like to see formal agreements that hold everyone accountable, and perhaps that if a student makes a commitment to a company, they can help with student loan forgiveness," she says.

finance associate gave a presentation at Franklin Pierce about what happens in an internal audit and members of the IT department visited a Keene State software engineering class. Last winter, executives participated in a mock interview event at Keene State as part of a career speaker series. Beyond those common elements, the programs have some distinct differences.

C&S Scholars program at Franklin Pierce University. Launched at the end of the 2017 academic year, the C&S Scholars program guarantees students who are accepted into the program a three credit paid internship during the fall or spring semester of their junior year, and, the possibility of a nine credit full semester paid co-operative during their senior year. Ultimately, a C&S Scholar may be offered a full-time position upon graduation.

The program is advertised to incoming freshman at open houses and campus visits to build awareness. Candidates apply for acceptance into the program in their sophomore year. In the 2017/2018 academic year—the first for the program—nine students applied and eight were given the opportunity to compete for an internship. Following their acceptance into the competition, C&S held a recognition dinner for the eight applicants.

The first competition was held at C&S's corporate headquarters last February. The day opened with a breakfast and networking event and was followed by a team building activity. "We wanted to see how they worked together as a group," says Farmer. The students also had a chance to meet C&S's CEO.

Each of the eight candidates then gave a brief presentation on a personal passion. Topics ranged from the environment to sports and fashion to the Rotary Club. Following the presentations, each candidate had a one-on-one interview with C&S senior managers and executives. A member of the Franklin Pierce faculty was on hand to give each student feedback on their presentation and interview skills. C&S extended offers for the 2018/2019 academic year to six of the students, notifying most within two days. Some of those interns will be offered a full-time one semester co-op opportunity during their senior year.

Keene State College. The intern recruiting process with Keene State is less structured and driven more by the needs of specific departments. Potential interns are recommended to Melissa Farmer by Keene State professors who are working with C&S. She, in turn, filters the resumes to Melissa Binder, the learning and development supervisor and one of the C&S representatives on the Keene State task force.

Resumes are reviewed by Farmer, who then schedules phone interviews that are conducted by managers and supervisors from the teams looking for an intern. The best candidates are then offered a full- or part-time internship, depending upon the time of year. Summer internships are 40 hours a week for 10 weeks while internships during the school year are part-time, depending on the intern's class schedule. "I've had interns do multiple internships on the same project, and this past winter I kept on two interns who were graduating in December and who were ultimately hired for full-time positions in procurement and transportation," Binder says.

At the start of an internship, Binder asks the student to set goals they can work toward. An example might be to improve their Excel skills. Repeat interns might be given the opportunity to develop leadership skills by training and mentoring new interns. "We want to make it as much of a real-world experience as we can," Binder says.

Measuring success

In the short term, these newfound relationships are bearing fruit. C&S has taken on at least 20 interns from Keene State and hired 10 of them in full-time positions; in addition to the Franklin Pierce interns over the past two years, including four recent hires, the first six C&S Scholars will become interns in the fall of 2018. What's more, C&S feels as if it is now getting to the head of the recruiting line, and gaining access to the cream of the crop of Keene State and Franklin Pierce graduates.

But the ultimate goal of the two initiatives is to change the retention dynamic, with new hires who stay in Keene for more than just two or three years. "My personal measure of success will be how many employees in the finance areas four or five years from now came through this program," says Mark Fryberger, who was one of the architects of the two initiatives. He adds, "We won't know that for four or five years."

For Keene State and Franklin Pierce, the C&S initiatives represent a new way of interacting with the business community. "Academia has to change, and I think what we're doing here represents that change," says Keene State's Henderson. "For me, the next step is moving from an ad hoc approach to formalizing what we're doing. The question is how do we build a system that we can scale and replicate with other companies? The answer is that you start with the people who know you best, and that's C&S."

Redefining TALENT

for the new world of work

In the future world of work, a dizzying mix of robotics, artificial intelligence, freelance workers and full-time employees will all be essential to achieving objectives. To thrive in this new environment, organizations need a portfolio-based talent strategy designed to align its people, processes and technology and demonstrate agility by being focused, fast and flexible.

BY NICHOLAS HORNEY, GEORGE HALLENBECK AND STEPHEN BATEMAN

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Exponential change is at our doorstep. The World Economic Forum states that we are on the brink of experiencing a Fourth Industrial Revolution. Some predict that we will undergo changes in multiple aspects of our lives in the next five years on a scale comparable to what we experienced in the previous 50 years.

There are good reasons to for supply chain managers to pay attention to these changes. According to research by McKinsey, companies with more agile supply-chain practices had service levels that were seven percentage points higher, and inventory levels that were 23 days lower, than their less agile peers did. One of the key findings reflected the importance of workforce agility and labor flexibility in achieving these results.

We're already beginning to see the early signs of the unprecedented velocity, scope and impact of these changes on the workplace. In all likelihood, in just a few short years, the talent landscape will look completely different for all functions within a company. While the specifics may vary by industry, no organization is immune to some of the major shifts that are already underway.

This article focuses on the effect that these rapid, unpredictable, paradoxical and tangled changes—what we're calling RUPT—will have on the talent landscape. It explores how organizations and individual leaders can adapt to—and leverage—them to turn an otherwise overwhelming experience into an opportunity to thrive amidst the turbulence. By getting a better grasp of what's coming, we contend that an organization can ride the wave to a more agile and prosperous future instead of being pulled under by the current.

Everything is changing

Talent in the digital era is changing in the five overarching ways outlined below:

1. How the work gets done. The work we do on a daily basis is becoming more team-based, project-based and multi-disciplinary.

2. When and where the work gets done. Work is increasingly global, virtual and can happen at any time and any place. We're also seeing a rise in temporary teams, coming together for a specific goal and then dispersing; this is sometimes referred to as the "Hollywood model" of teamwork because it resembles how a film production team comes together.

3. Who does the work. Projects are more often staffed with a mix of internal and external talent that is increasingly diverse in age and experience.

4. What does the work. Within the next five years, technology could be performing as much as 30% of tasks commonly performed by people in today's workplace.

5. Tools for managing the talent. Big data, predictive analytics and the rise of talent platforms such as Seek and Upwork put powerful tools in the hands of managers—if used properly.

For this article, we will focus primarily on No. 3: who does the work. And we'll advise on how our thinking should shift when it comes to talent portfolios.

In all likelihood, in just a few short years, the talent landscape will look completely different for all functions within a company.

The rise of the "gig economy"

The gig economy is also known as contingent work, sharing economy, agile talent, non-traditional work relationships or alternate forms of employment. Today, there are nearly 41 million independent workers in the United States alone, according to the latest State of Independence Report from MBO Partners. That's more than 30% of the nation's private workforce. A recent report from Randstad predicts that by 2019, up to half of workers in the U.S. will be working in a contract, temporary, consultant or freelance capacity. What's more, they predict that by 2025, up to 70% of people could be part of this gig economy. And while Uber and Airbnb have received most of the attention from the press, other "digital disruptors" of the status quo include Lyft (ride sharing), UpCounsel (legal experts), Instacart (shopping and delivery) and TaskRabbit (odd jobs), to name just a few.

Of course, it's not just a U.S. phenomenon. In our interconnected, globalized world, the Gig Economy is a widespread phenomenon that promises to touch every corner of the globe. Part of this seismic shift is spurred by employers (Figure 1). Randstad found that nearly half of employers express a greater commitment to building and utilizing an agile workforce, which is a 155% increase over the last four years. But the shift is also being driven by employees opting to become independent workers. According to MBO Partners, more than 75% of independents say they are happier working on their own, and almost half of independent workers report feeling more secure than in a traditional employment relationship. McKinsey found that as many as one in six people in traditional jobs would like to switch to being primarily independent.

And that could be a conservative estimate—we surveyed more than 200 CCL program alumni and found that one in five aspire to full-time independent work. A whopping 56% of people we surveyed expressed interest in eventually working independently. The majority of them hoped to pursue part-time independent work, but almost 40% said they would like to make it a full-time arrangement.

Why? Here are the top three reasons people told us they are interested in freelance work:

- pursuing their interests;
- freedom and independence; and
- flexibility.

These independents are not the "temp" workers of previous decades. They can be found in every level of the organization—from unskilled positions to C-suite roles. The trend has shifted strongly toward individuals pursuing independent careers by choice, not necessity.

The search for greater freedom, flexibility and fulfillment leads some independents to describe their work as more of a calling than a career. This scenario appeals to an increasingly diverse set of ages and experience levels: Freshly minted graduates bypassing corporate life altogether to establish themselves as solopreneurs, mid-career professionals ready to call their own shots and pursue their passions, and individuals approaching retirement looking to give something back with their accumulated wisdom and experience.

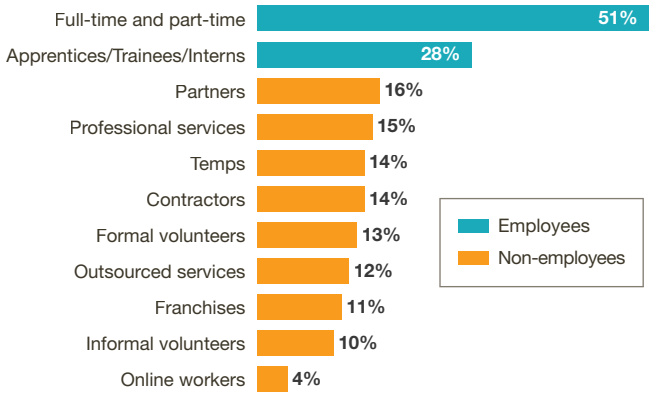
And, it's some of the best, brightest and highest-paid talent trending into this line of work. MBO Partners annual survey sees sharp growth in independent workers taking in more than six-figures in revenue. A recent IBM study found independent workers to be both highly innovative and more engaged than most full-time employees.

Even if only a fraction of current employees actually make the jump to being independent, most organizations aren't ready for such a sizeable disruption, especially if it affects their top talent. Despite a growing desire to work independently, most organizations aren't thinking about how to retain existing employees who are considering independent work,

FIGURE 1

Are organizations ready?

(% of organizations making very big or big effort to motivate and/or engage workers, by type)



Source: Towards Total Talent Management, May 7, 2015, jointly by Crain Communications Inc. and ERE Media, Inc.

and few are putting any effort into motivating and engaging existing or future freelance workers.

Instead, most companies are operating in a decades-old paradigm when it comes to talent. New ways of thinking about—and managing—talent are desperately needed to compete in the digital era. Organizations who can successfully engage and integrate the diverse motivations, skills and experiences of the growing talent base in the gig economy can tap into more of what it has to offer and gain a talent advantage over their competitors.

One emerging area to explore is technology-enabled talent platforms such as Tongal, Topcoder and Mechanical Turk (which the authors have used). These are accelerating the disruption of the status quo for supply chain managers and creating a new era of business turbulence, which we characterize using the acronym RUPT for rapid, unpredictable, paradoxical change. They enable people to have more control over how they work—whether that's a better balance between work and home, choosing passion-driven projects or being their own boss. The gig economy makes all of those things possible on a scale like never before. The question supply chain managers must ask is whether they will leverage these and other talent platforms to successfully manage their entire talent portfolio, or leave that responsibility to the hiring departments or procurement?

Beyond the Band-Aid

If you think about short-term talent at all, chances are you think of it as a Band-Aid to address an immediate need. Using independent workers to cover a brief talent gap or when an occasional, specialized skill is required might make sense, but this limited approach can leave a lot on the table. There's much more to be gained by taking a longer-term perspective on short-term talent.

Following are five ways your organization could take a wider view of short-term or independent talent.

1. Experts in residence: Having a "secret weapon" for strategically important work or using outside talent to raise a team's collective capabilities could be a significant asset to your organization.

2. Mentors for hire: Consider finding someone who could nurture the skills of less experienced employees to prepare them for bigger responsibilities.

3. Brand ambassadors: Successful freelancers form strong networks with others in their industry and/or profession, and if one of them has a positive experience with your organization, it could help you tap into a whole pool of people that could dramatically enhance your current capabilities. Of course, the opposite can also occur.

4. Cultural catalysts: Finding someone who can bring an innovative mindset or exemplify a particular set of values might help you make an important cultural shift.

5. Transitional talent: The Rent-a-CXO concept is trending. An independent worker could be the right move if your organization needs to grow rapidly without derailing or needs to weather an unexpected transition.

This list isn't exhaustive and only touches on some of the possibilities for tapping into an often-underutilized source of talent. We encourage you to further imagine—and experiment with—new approaches to getting the most out of your short-term talent.

Building and managing a talent portfolio

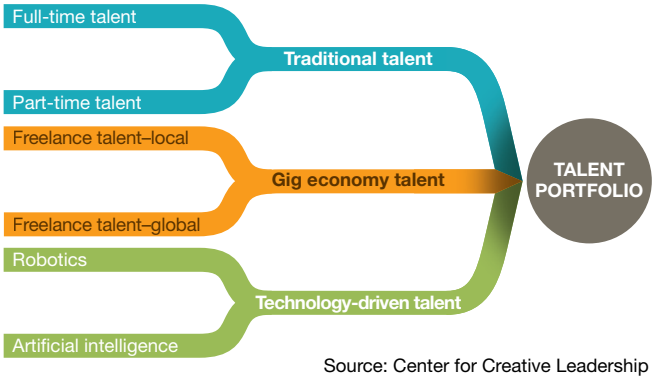
The need for new ways of thinking about talent goes beyond the gig economy. To position your organization and its talent for optimal success in a RUPT world, we recommend that you take a strategic approach that we call "Talent Portfolio Agility," a term we have trademarked.

We define Talent Portfolio Agility as the organizational capability and mindset of accomplishing work through a portfolio of talent enabled by agile talent processes. This has both a "what" and a "how" component.

For the "what" of Talent Portfolio Agility, we suggest thinking about your overall talent equation as part of a three-pronged portfolio, each with two subsets (Figure 2).

FIGURE 2

The talent portfolio



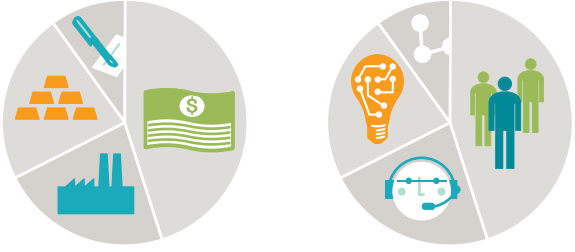
Source: Center for Creative Leadership

The first prong is traditional talent—your current full-time and part-time workforce, which likely makes up the bulk of your existing portfolio. The second prong is gig economy talent, including freelance talent, both locally and globally. And the third—which could be the subject of its own article—is technology-driven talent, including robotics and artificial intelligence.

Just like diversifying and creating an agile financial portfolio, there are important reasons to consider creating a diverse talent portfolio that is sustained by its agile mindset, processes and technology (Figure 3).

FIGURE 3

Creating a diverse portfolio



Financial portfolio **Talent portfolio**

Just as a balanced financial portfolio meets your short and long-term financial goals, it's important that your talent portfolio matches your organization's strategic needs rather than perpetuating what might be an outmoded approach out of habit.

Source: Center for Creative Leadership

Before venturing further, ask the following questions about your talent that you might also consider with regards to your finances:

- What are we trying to accomplish?
- What is our risk tolerance?
- What is the right mix of assets?
- How do we anticipate and adjust to changes in the market?
- How do we measure our performance, and the performance of our various talent?

As you figure out what works best for your organization, also consider questions such as:

- What are the technical and legal issues we should consider?
- What cultural and structural issues might affect our approach?
- Are there issues/opportunities unique to our industry to take into account?

Figuring out the right mix of talent assets for your organization will take time and effort. But by carefully considering the questions we've outlined, thinking about how to better engage current employees and independent workers and exploring how to integrate human talent with technology-driven talent, you can create the needed change in your talent portfolio.

These shifts might sound intimidating, or even overwhelming. In order to succeed, you'll need to also consider the "how" of Talent Portfolio Agility, Specifically, investing in five core capabilities associated with organizational agility will enable your organization to nimbly adapt and adjust to these new realities.

As an individual and an organization, ask yourself how well you:

- anticipate change;
- generate confidence;
- initiate action;
- liberate thinking; and
- evaluate results

Identify the biggest gaps between where you are and where you need to be. Ask yourself which elements you should prioritize and then figure out what makes sense to tackle first. Our Talent Portfolio Agility Index can provide you with an initial assessment of your organization's baseline measurements in each area of capability.

The TPA Index captures a snapshot of how agile the talent management processes, policies and practices are within organizations you have served or are currently involved with now. A deeper audit of these capabilities can pinpoint specific areas for intervention and the systems, tools and processes required for sustainable change in your organization's talent strategy and practices.

From talent management to talent portfolio management

The gig economy is demanding a fundamental shift in the typical talent management philosophy that historically focused on full-time employees to talent portfolio management, which represents both internal and external talent. How an organization manages the internal-external partnership has a lot to do with the successful

management of the HR processes, policies and philosophies supporting an entire Talent Portfolio. Some organizations have problems because they have treated contingent workers as totally separate and not "equal" to internal employees. The culture of most organizations would never allow treating free-agent talent like internal employee talent. Supply chain management leaders need to develop their managers to fundamentally change how they think about and manage the entire talent portfolio.

The gig economy is demanding a fundamental shift in the typical talent management philosophy that historically focused on full-time employees to talent portfolio management, which represents both internal and external talent.

In many organizations, procurement is often responsible for negotiating the contract with contingent workers, with the focus primarily on cost control and limited focus on the talent portfolio value that the contingent works bring to the organization. Hiring managers are expected to manage the relationship with gigsters as part of their talent portfolio. The challenge for procurement is to work with HR and hiring managers on a more collaborative approach to acquiring talent in the gig economy. Talent platforms like Tongal will likely require procurement, marketing and human resources to work together to access and coordinate a new talent portfolio which includes on-demand talent markets and crowdsourced competitions and more traditional in-house teams and outside advertising and creative agencies.

Winning in the gig economy

The world of work is changing. Like it or not, we're destined for a more complicated and complex future. Most organizations don't fully grasp the massive shifts already underway and aren't doing enough to adjust. Instead, they're functioning in a state of complacency or are paralyzed with inaction by the immensity of change they see coming. The window of opportunity is closing quickly.

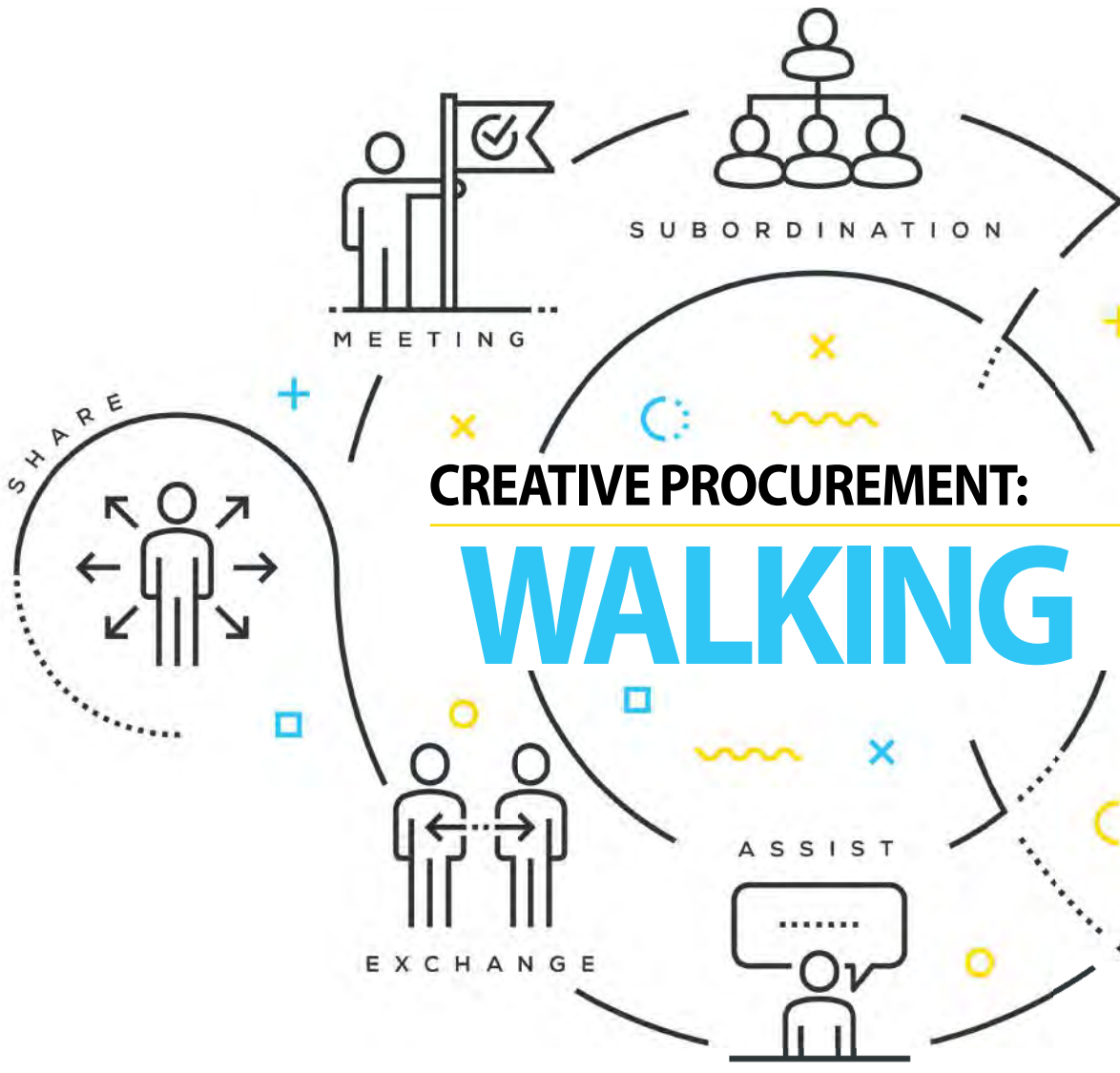
Supply chain managers have the opportunity to drive the agility and rapid innovation necessary to compete in the gig economy, and even demonstrate the change readiness that affects the entire organization. Yet, transformations like this are by no means easy to achieve, even if most executives know they must act. Organizations that figure out the right mix of talent, align their processes or policies to reinforce a talent portfolio agility mindset and then manage that talent in an agile manner, will likely gain a competitive advantage. The frameworks proposed in this article help to guide the choices that supply chain managers must make to help transform their organizations in the face of the gig economy challenges.

You can start by exploring some of the questions we've raised in this article. Share them with your colleagues and consider the appropriate short- and long-term approaches to take. Understand the motivations of current and future independent workers, evaluate how you can work better and more wisely with them and think about how you can integrate a longer-term perspective with multiple types of short-term talent—including technology-driven talent.

By understanding the gig economy and re-thinking how to best attract, engage and retain short-term talent, you can break away from old, outdated methods.

Talent portfolio agility can help organizations that want to adapt and thrive in a new world of work by reducing vulnerability to shifts in the market and maximizing all forms of talent, unlike traditional models of talent management. Achieving talent portfolio agility is a long and challenging journey, but the head-in-the-sand alternative will leave you behind your competitors.

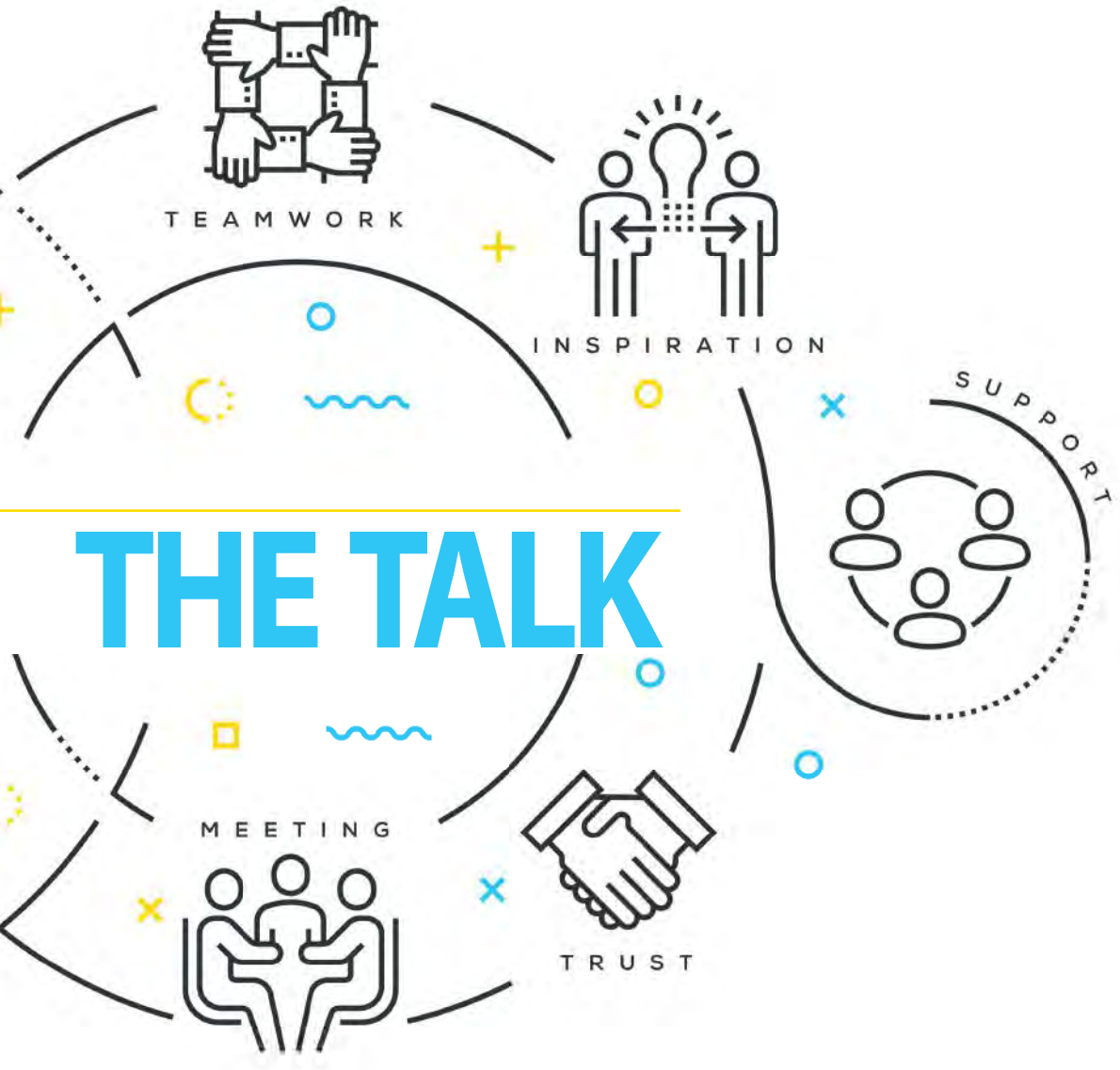
By understanding the gig economy and re-thinking how to best attract, engage and retain short-term talent, you can break away from old, outdated methods. Creating a more agile and adaptive workforce doesn't have to mean a dramatic organizational overhaul. It will take time, and will vary by industry, location, organization and function—but it can be done.



CREATIVE PROCUREMENT: WALKING

Procurement is changing from a focus on cost savings to creativity and innovation in a talent rich supply chain. That's the talk. The question is whether organizations are walking the talk when they recruit, and, if not, how do we recruit for creativity.

BY SRIRAM NARAYANAN, CARLOS MENA AND RIYAJ GILANI



THE TALK

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As a profession, procurement is experiencing a dramatic change in philosophy. In "Charting the course: Why procurement must transform itself by 2020," the consulting firm Deloitte noted significant shifts already underway. From savings and strategic sourcing (called yesterday's paradigms), to category leadership and managing procurement systems in a global environment (called today's paradigm), to a radical approach to thinking about procurement as a creative endeavor, generating new ideas and innovating in a talent rich supply chain (called future paradigm).

In our interactions, senior procurement leaders often emphasize "out of the box thinking" in their supply chains. That shift is certainly on the agenda of supply chain conferences and publications. But we wondered: When it comes to recruiting new hires in their procurement departments, are companies "walking the talk" with reference to recruiting for innovation and creativity? Or are they stuck in "yesterday's paradigm?" That question motivated this article.

Procurement professionals are problem solvers. First, the level at which they solve problems and the issues are likely different across strategic, managerial and tactical hierarchies. What are these issues? Do they have any bearing on innovation? Second, what are the dominant thinking approaches that firms stress in hiring for procurement positions? These dominant thinking approaches have a bearing on the person they are likely to hire and consequent activities.

When it comes to recruiting new hires in their procurement departments, are companies walking the talk with reference to recruiting for innovation and creativity? Or are they stuck in yesterday's paradigm?

To answer those questions, we drew from a popular education planning tool called Bloom's Taxonomy that focuses on the structure of the cognitive process. These processes are classified as follows in increasing order of cognitive intensity: *remember, understand, apply, analyze, evaluate* and *create*. To *remember*, one needs to recall or recognize situations; to *understand*, one needs to interpret, infer, summarize and explain; to *apply,* one needs to implement/execute; to *analyze*, one needs to differentiate, organize and attribute cause and effect; to *evaluate,* one needs to check and critique; and to *create*, one needs to produce, plan and generate ideas; this is to innovate.

To explore whether firms put an emphasis on innovation we went to the first step in the process of hiring procurement professionals—job advertisements. We analyzed the text of job advertisements across more than 150 procurement openings that were categorized at tactical (buyer, senior buyer); managerial (commodity manager, category manager); and strategic (director, vice president, and higher, including CPO) looking for patterns for more creative companies. (For more, see About our research).

Our text analysis was comprised of two stages. First, we examined the emergent topics in these advertisements. Those allowed us to focus on the activities that procurement professionals were engaged in. Next, we focused on the type of cognitive skills demanded from these managers by focusing on specific words that the job advertisements used, that is, what skills companies told the market they were looking for. To do this, we compiled a "word dictionary" across the different levels of Bloom's taxonomy.

We identified the core topics that form the domain of procurement—the problems that procurement managers solve. In studying the topics, we divided our firms into those that have been recognized as innovative in top supply chain rankings (called *innovative firms*), and those that were not ranked as leading innovators (*mainstream firms*). Rather than discuss company names, we will focus on the key findings and learning points that emerged from our investigation.

First, we found that a number of skills and activities were emphasized by both innovative and mainstream firms, including: communication skills, understanding of market dynamics, monitoring compliance, category management, cost analysis, contract management and negotiation. However, there were some notable differences. For one, our analysis suggests that innovative firms require procurement professionals to engage in planning, visioning and a forward-focused thinking—elements that were absent among mainstream firms. In contrast, mainstream firms emphasize control, gate keeping and firefighting. Do planning, visioning and forward thinking lead to innovative procurement departments? Common sense suggests the answer is: Yes, it is likely. Does this mean that in innovative procurement groups managers don't control, gate-keep and firefight? Common sense suggests the answer is: No. It is only practical that managers do both in every firm. It is the relative emphasis across levels that is likely to make the key difference.

Second, our results on the type of cognitive thinking process sought among procurement professionals suggests that the dominant thinking sought is *apply*, followed by *create* and *evaluate*. Surprisingly, hiring advertisements place much lower emphasis on *analyze*. Presumably *applying* subsumes *analysis*. An alternative explanation could be that the emphasis on action and creation without solid analysis underpinning it could

perpetuate a fire fighting culture that struggles to move beyond urgent day-to-day problems.

Finally, *remembering* and *understanding processes* also had low emphasis, and deservedly so. While we expected the relative emphasis on the "thinking process" to vary across the different managerial levels, surprisingly, our analysis revealed that the distribution of keywords across the six thinking processes was very similar across the different hierarchical levels of procurement – tactical, managerial and strategic. We believe this is encouraging, given that high-level activities within procurement are broadly similar across different firms. This also leads to an important question: If procurement wants to emphasize creativity in hiring, should it be using terms that reflect the need for creativity and creative skills in job advertisements?

Of interest is that in none of these job announcements did we see corporations asking for creative individuals who focused on out-of-the box solutions, even though certain keywords were being picked up. Clearly, this shows that despite the talk, procurement is not dominated by creative endeavors. Yet, the focus on issues that emphasize creative endeavors needs better definition and alignment. Should one even ask for them? Is this a reflection on what is happening in procurement departments across firms? While these are provocative questions, we believe that it is important to reflect on these issues to move us to a domain of superior creativity in problem solving. We now detail our results. The approach is relegated to the Appendix for interested readers.

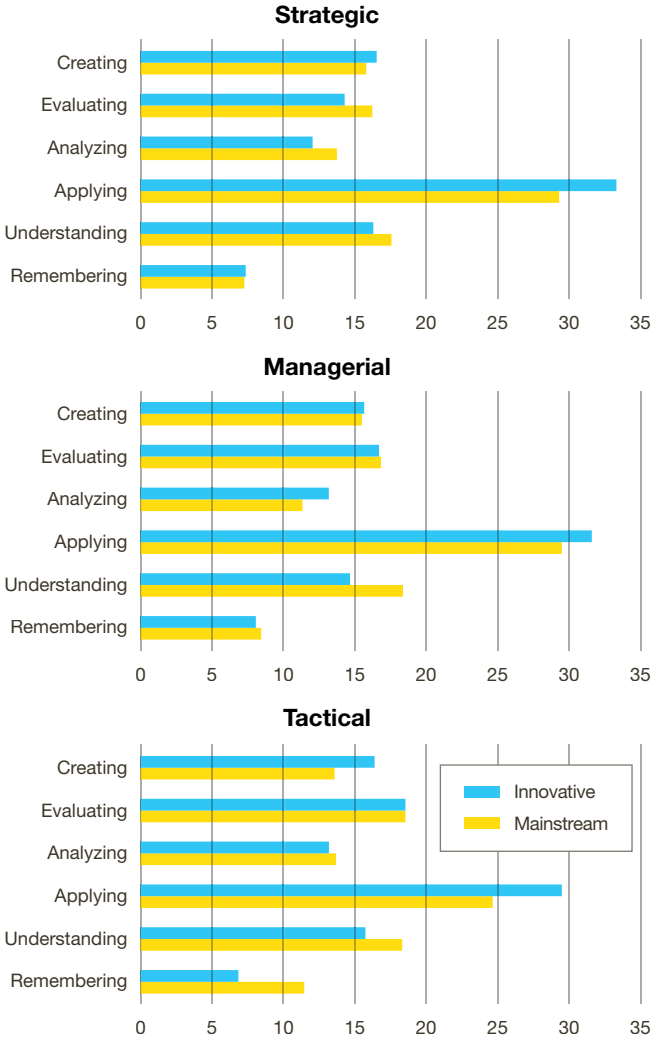
Key takeaways

Let's first look at the results of our word count analysis. These are summarized for innovative and mainstream firms in Figure 1. The percentage of words in the creating category is slightly higher among innovative companies compared to mainstream firms at tactical and strategic levels. It is almost the same in the managerial level. Firms in the mainstream category appear to place more value on evaluation and understanding compared to firms in the innovative category. Of interest is that the firms that we derived from the innovative category appear to have a substantial tilt toward application.

What we found most interesting is that the highest stress is not on *analysis*, *evaluation*, or *creating*—rather it is on *application*. Clearly, this lines up well with our anecdotal observation that procurement professionals often tend to apply policy decisions. Of greater interest is the fact that the distribution of keywords is quite similar across the levels of the organization. Two key questions are relevant here. First, do managers have the onus to be creative as they grow within the organization? At the corporate level what leeway do procurement organizations have to be creative? If organizations spend 50% to 70% of their revenues on

FIGURE 1

Keywords found across different types of cognitive processes under Bloom's taxonomy



Notes: Table based on order of cognitive intensity from first row to last row based on Bloom's taxonomy. Certain words used spanned across multiple cognitive processes in our dictionary, and we let them be counted on both processes for clarity.

Source: Authors

suppliers, this appears to be an imperative question based on our analysis.

We now move to the discussion of the key activities that procurement managers engage in. These activities are presented in Table 1. The results come from a topic analysis of all of the procurement activities that emerged from our text data of job advertisements. We translated the topics from our text analysis into activities for procurement managers. At face value, the activities appear reasonably comprehensive. While the list itself has some value, we are more interested in the scope activities that are different across innovative and mainstream firms.

Table 1 shows that the activities across strategic, managerial and tactical levels are different. Specifically, we show the order of responsibility of the different positions on that activity. For example, "Influencing, managing and executing change" was a category that was found in the innovative firms but not among the mainstream firms. Focusing on the innovative firms, the activity was more prominent among strategic and managerial procurement professionals in that order and least prominent among tactical procurement professionals. Similarly, other activities can be interpreted across innovative and mainstream firms.

What then are the key takeaways from this table of activities? First, we focus on activities that are common across both innovative and mainstream firms:

- "relationship management" is important in both, but there appears to be more strategic involvement in the innovative companies compared to the mainstream group in this activity;
- both type of firms emphasize "understanding market dynamics," however, this aspect is more dominant in strategic positions in innovative companies as compared to managerial positions in mainstream companies;
- in both cases "managing quality and delivery," "managing P/O," "compliance and standards" and "relationship management" is relegated to tactical positions and to some extent managerial, as one would expect;
- "category management" is key at the strategic level for mainstream firms, but at the managerial level for the innovative firms; and
- focus on "cost analysis and management" is higher at the tactical level for innovative firms, but at the managerial level for mainstream firms.

There are some activities that only appear in innovative firms, and not in the topic analysis of mainstream firms. These firms look for:

- people who are influencers and change managers;
- initiative taking;
- generating recommendations based on analytics;
- product life-cycle approach to procurement; and
- strategic portfolio management.

It is interesting that in each of these activities there is a dominant component of senior

TABLE 1

Key activities executed by procurement professionals

ACTIVITY	EMPHASIS ON LEVEL	
	Innovative	Mainstream
Influencing, managing and executing change	S M	N/A
Initiative taking	M S	N/A
Strategic portfolio management	S M	N/A
Generating recommendations based on analytics	T S	N/A
Setting, monitoring and managing targets	N/A	S M
Efficiency and resources management	N/A	S M
Problem solving	N/A	T
Setting policies and procedures	N/A	S M
Managing purchase orders	N/A	T
Relationship management	M T	M T
Managing quality and delivery	T M	T M
Understanding market dynamics	S M	M T
Contract management	S M	M T
Managing product life-cycle	M S	N/A
Compliance and standards	T S	S M
Category management	S M	S M
Cost analysis and management	T M	M T

S Strategic M Managerial T Tactical N/A Activity was not emphasized by a group of companies

Source: Authors

About our research

We first collected job postings from several websites including LinkedIn, Monster and Indeed. The job titles drawn from the openings were then categorized into strategic (director, senior director, vice president, CPO); managerial (procurement/sourcing manager, category manager, sourcing senior manager); and tactical (buyer, senior buyer). We then prepared a comprehensive data dictionary for each thinking type of Bloom's taxonomy that covered all of the keywords related to the different thinking types. This was done by identifying all possible synonyms for keywords within the Bloom's taxonomy keywords by generating more than 1000 words across all the Blooms taxonomy keywords. Using this data dictionary, we focused on building a count of the keywords that appeared across categories for both innovative and mainstream firms. Some of our keywords spanned across all of the cognitive categories, and we counted them for every category they fell into (this is a caveat that required judicious judgment). We then used the collective set of advertisements to delineate the key topics that emerged in these postings to extract our insights. In general, we divided the mainstream company positions into 30 advertisements across each level. For innovative companies, we had 25 each in tactical and managerial positions and only 12 in strategic positions. This recognizes the limitation of having to pull advertisements for a targeted set of firms that were identified as innovative in supply chain.

procurement leadership involvement. Furthermore, these also require a significant degree of creativity-based skills in addition to application and evaluation. Finally, mainstream firms also had areas of emphasis that are intuitive, yet not found in our topic analysis of innovative firms. These are:

- target setting, monitoring and management emphasized at the strategic level;
- issue resolution and problem solving is dominant at the tactical level;
- policy setting and procedures; and
- emphasis on managing P/O.

In these settings, it appears that problem solving and transaction management get more emphasis. Clearly, individuals performing these activities are more focused in a "getting the job done" approach and the level of creativity involved in these jobs is debatable.

It is important to note that we do not believe that organizations pursue one activity to the exclusion of others. A caveat to keep in mind is that each of these activities can be pursued by any procurement organization in varying degrees depending on the "priority" that an organization assigns to these activities. We remind the readers that these are job advertisements, and NOT "real" activities. However, job requirements are often the contract for what an employee ends up doing when they step into the unit.

The choice

So, are procurement organizations walking the talk? Our analysis points to the fact that while procurement requires more innovation, control and cost efficiency continue to be the bread and butter for mainstream organizations. Managers have a choice depending on their context. We believe that procurement professionals can be "planners, visionaries and forward thinkers" or they can be "controllers, gate keepers and firefighters." While one element requires creativity through managing change, pushing initiatives at the corporate level and taking a strategic view of the firm, the second requires them to focus on controlling their supply chain. Ideally, organization should balance the two approaches—our bias is not toward one or the other.

Finally, while we are all for creativity in procurement, control is a key dimension of the profession that is critical to have in place. These need to be carefully balanced. Large-scale creative change initiatives may well require significant corporate backing that many CPOs may not necessarily have. It is perhaps the reason that recruitment efforts are not likely to emphasize creativity and innovation. However, if firms expect innovation from their procurement function, they must take action to attract and retain innovation-oriented talent.

A CRISIS

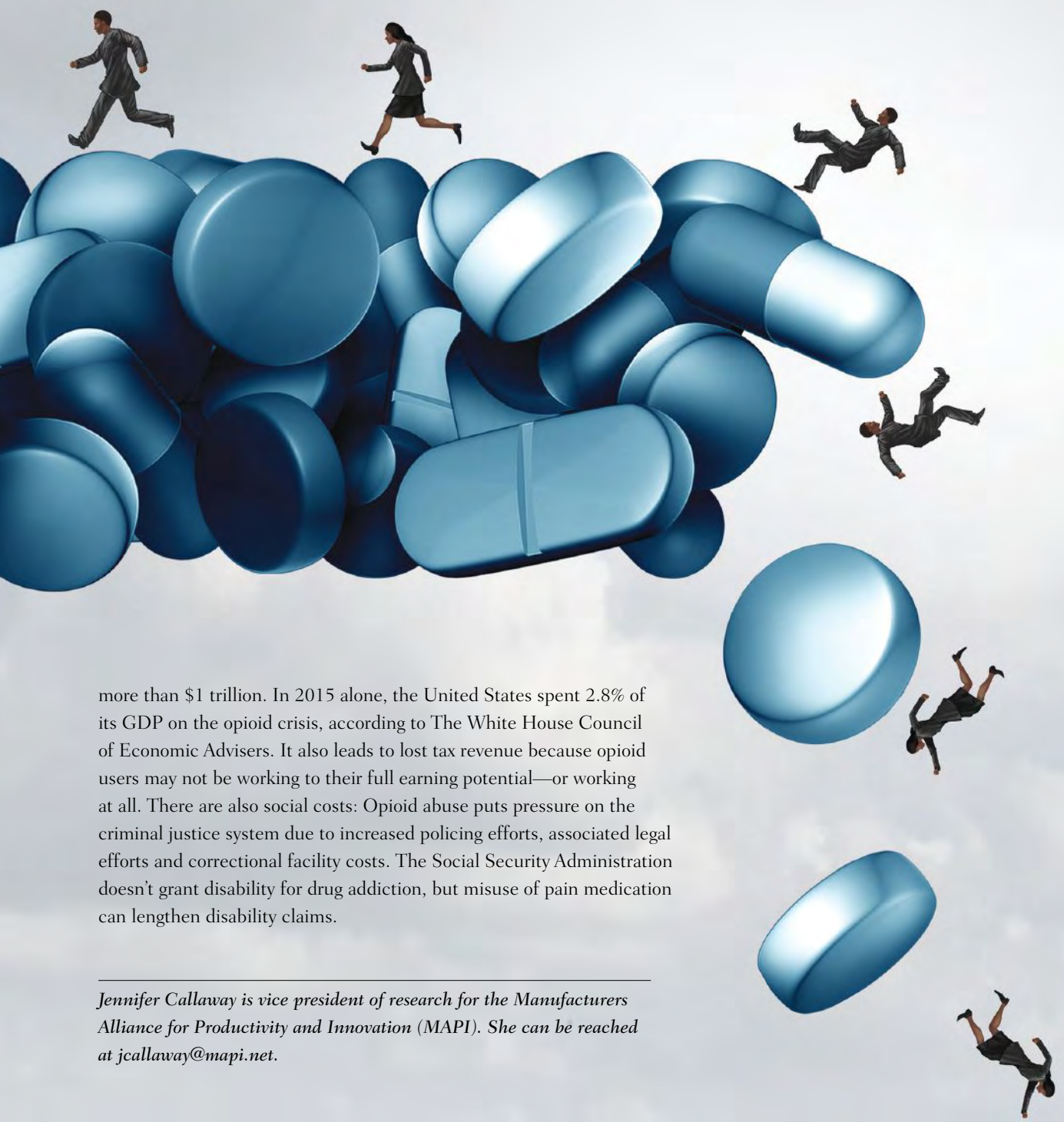
The intersection of the opioid crisis and manufacturing is poised to be a drag on U.S. competitiveness

BY JENNIFER CALLAWAY

The United States is in the midst of its third drug crisis in the last 50 years. The statistics are bleak: In 2016, drug overdose deaths from opioids increased fivefold compared to 1999. Drugs are now more fatal than car accidents were at their peak in 1972, than guns at their peak in 1993 and AIDS at its peak in 1995. Drug overdoses also killed more people in 2016 than the total number of U.S. soldiers who died during the entire Vietnam War. But here is a sobering statistic particularly relevant to manufacturers and supply chain managers: Drugs are now the leading cause of death for prime working age Americans, those who might otherwise be manning our assembly lines, warehouses and logistics departments.

The culprit is the opioid crisis; two-thirds of drug overdose deaths in 2016 involved a prescription or illicit opioid. The economic and societal implications of this crisis are broad and deep. Altarum, a nonprofit health research and consulting institute, estimates the total cost to the country since 2001 at

AHEAD



more than $1 trillion. In 2015 alone, the United States spent 2.8% of its GDP on the opioid crisis, according to The White House Council of Economic Advisers. It also leads to lost tax revenue because opioid users may not be working to their full earning potential—or working at all. There are also social costs: Opioid abuse puts pressure on the criminal justice system due to increased policing efforts, associated legal efforts and correctional facility costs. The Social Security Administration doesn't grant disability for drug addiction, but misuse of pain medication can lengthen disability claims.

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FIGURE 1

Drugs and manufacturing: A growing problem

(Percentage of counties with the most drug overdose deaths and highest share of manufacturing employment)

Source: MAPI Foundation

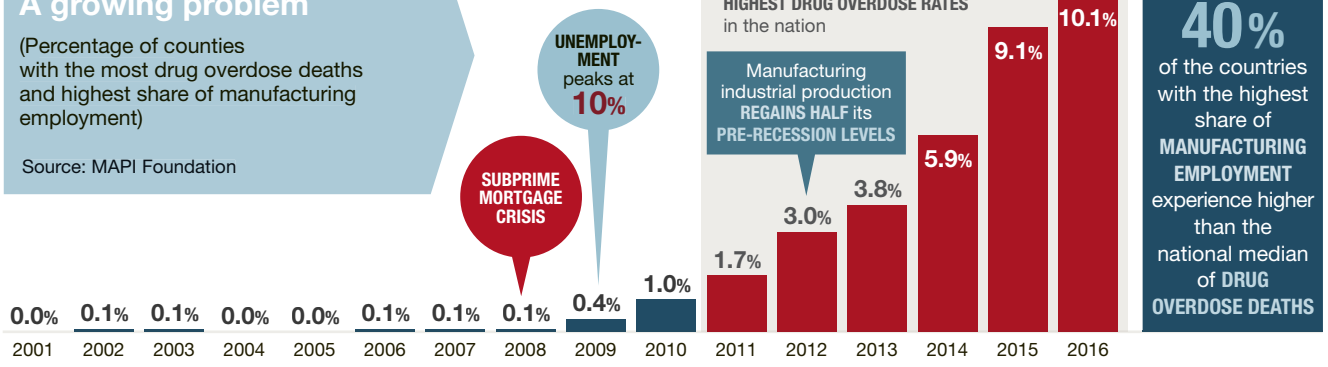


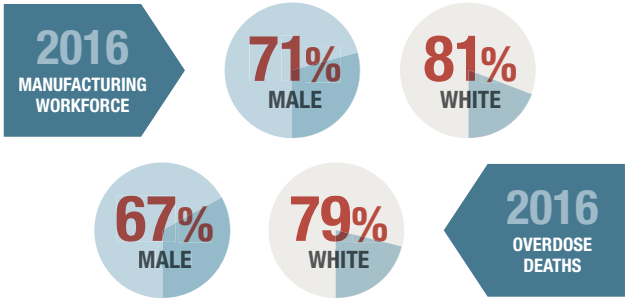
FIGURE 2

How drug overdoses impact manufacturing

Source: "Ignorance Isn't Bliss. The Impact of Opioids on Manufacturing"

FIGURE 3

Drug user or manufacturing worker?



Source: Bureau of Labor Statistics and Kaiser Family Foundation

While statistics like those might be familiar to anyone who has followed the opioid crisis in the news, on the campaign trail or in their communities, lost in the discussion is the impact of the current drug crisis on the workforce and productivity in general and its threat to manufacturing.

A few studies have attempted to put it in perspective. A report from the Office of National Drug Control Policy during the Obama administration noted that "full-time workers who reported current illicit drug use were more than twice as likely as those reporting no current illicit drug use to report they had worked for three or more employers in the past year" and that "full-time workers who were current drug users were more likely to report missing two or more workdays in the past month due to illness or injury, when compared with workers who were not current users." Another study by the Brookings Institute found that nearly half of prime working age men not in the labor force are taking daily doses of prescription pain medications.

Other studies have demonstrated that the rate of opioid prescriptions and labor participation are intertwined. Areas with higher prescription opioid rates have lower labor force participation rates. For some injured workers, a prescription can be a gateway to substance abuse and their eventual exit from the workforce. For others, who may have already left the labor force, abusing a prescription opioid might help numb the emotional pain of the deteriorating economic conditions of their family and community. In addition to the potential risks of losing a worker and workplace safety issues, drug addiction leads to medically-related absenteeism, disability costs for the users and caregiver-related absenteeism that adds to productivity loss for companies. In fact, a 2014 study published by the Workers' Compensation Research Institute found that on average three-quarters of injured workers receive prescription opioids for pain relief after a workplace injury, but few receive services to help them navigate chronic opioid management. These factors are costly to families and individual companies, and they should be studied at an industry level.

Unchecked this drug crisis will erode the health of the U.S. economy. This is particularly troublesome as, until

recently, the recovery of the economy from the Great Recession has been slow and unspectacular. Two key components of the U.S. economy are the performance of U.S. multinationals and foreign multinationals operating in the United States. Together they account for a significant portion of the output, productivity, employment and exports. The manufacturing sector contributes disproportionately to these key economic indicators, and the recent rallying cry for a manufacturing renaissance shows that many Americans want to see it remain a critical driver of the economy in the future. The importance of manufacturing to the U.S. economy is so crucial that many optimists are forecasting its return to global dominance. But we shouldn't be too quick to predict the sector's return to its 1950s and 1960s glory. The optimists are ignoring the obvious—the impact of the drug crisis on the manufacturing industry. It's a classic example of inattentional blindness.

The MAPI Foundation analyzed the intersection of the current drug crisis and manufacturing to understand the risk it poses to the sector's long-term health. Our analysis compares manufacturing employment from the U.S. Bureau of Economic Analysis and drug overdose deaths from the Centers for Disease Control and Prevention to identify the U.S. counties with the highest share of manufacturing employment and most drug overdose deaths. Our findings illustrate the velocity with which the drug crisis has grown in manufacturing-centric counties, what it means for the industry today and in the future and why manufacturers need to be vigilant and proactive.

High drug-related deaths and manufacturing

Conversations about the current drug crisis with manufacturing executives usually follow one of three paths: "I'm not worried," "not a problem yet, but I'm monitoring the situation," or "it's really bad, can you help?" The exasperation in the voice of an executive talking about how drug use is complicating hiring or how prescription opioids can lead to functioning addicts in the workplace is palpable. Stories range from as many as 40% of new hires failing their pre-employment drug test to knowing about prescription abuse in the workforce (sometimes enabled by pill mill doctors).

Executives who know that drugs are affecting their businesses typically operate in counties plagued by high drug overdose rates. But the crisis has direct and indirect impacts on the manufacturing workforce in every state in the union. Companies operating in counties that are featured in articles with headlines like "this is an issue of rural prosperity" and "these maps show where the 'deaths of despair' are most likely" shouldn't ignore the accelerating overdose death rate. The crisis is already at their door.

According to the National Safety Council (NSC), one in four people in the United States are either addicted to opioids or know someone who is. Some manufacturing companies have a feel for how much the drug crisis affects their operations, but few fully understand the scale of the problem or can quantify the impact.

Part of that may be because the crisis initially unfolded slowly. In 2001, the intersection of drug overdose deaths and manufacturing was an annoyance but not a crisis. From 2001 to 2009, the drug crisis made only a small impact on counties with the highest share of manufacturing employment. During this time, less than 1% of these counties also saw the highest rates of drug overdose deaths. Based on our analysis, something changed in earnest in 2009, as some individual counties started to see big jumps in year-over-year overdose deaths.

As the crisis festered from 2011-2016, an average of 44% more manufacturing-centric counties joined the list each year. Because many of these counties were isolated from each other, they remained under the state-level radar until 2014. However, by the end of 2016, 70 counties in the 20 states that rely the most on manufacturing employment were grappling with deadly addiction. All told that year, 25 states saw statistically significant increases in drug overdose deaths. Eleven of these states are reflected in our analysis, including:

1. Illinois;
2. Indiana;
3. Kentucky;
4. Michigan;
5. North Carolina;
6. Ohio;
7. Oklahoma;
8. Tennessee;
9. Texas;
10. Virginia; and
11. West Virginia.

Each year that this number creeps up illustrates that policy interventions have yet to stem the tide of this public health crisis.

You can also see first-hand what the rapid increase in drug use, specifically opioids, has done to the city of Huntington in Cabell County, West Virginia, in the Netflix documentary Heroin(e). Dubbed "the overdose capital of the country," with 10 times the national average of opioid overdoses, the annual costs of the drug crisis are on pace to bankrupt the county according to Huntington Fire Chief Jan Rader, a central character in the documentary. It is also

a locale where manufacturing employment is still strong, accounting for nearly 10% of the local workforce, despite a 10% reduction of manufacturing jobs since 2008. A recent search of jobs posted on employment search engines returned open positions with manufacturers in both Cabell County and adjacent counties.

Manufacturing GDP is at risk

In 2016, the 11 states in our analysis with troubling increases in drug overdose deaths generated 41% of manufacturing GDP. Take Ohio. With 687,400 manufacturing workers and $108 billion in total manufacturing output in 2016, Ohio's ranks third after California and Texas with total manufacturing output representing 4.9% of the total U.S. manufacturing output. Ohio is also home to four of the counties that sport both the highest drug overdose deaths and the highest share of manufacturing employment, where well-known manufacturers like General Mills and General Motors operate.

We should not underestimate the risk the drug crisis in Ohio poses to total manufacturing output. Other states have more manufacturing-centric counties in crisis than Ohio, but they generate far less manufacturing output. The crisis in Tennessee, for instance, spans 19 manufacturing-centric counties, representing 20% of its administrative divisions. But Tennessee contributes half the amount of manufacturing output to the U.S. total as Ohio.

The long-term impact of the crisis requires the support of national and state-level leaders. Yet, according to the NSC, only 13 states, including Ohio but not Tennessee, are adequately addressing the six key actions required to eliminate preventable opioid deaths:

1. mandating prescriber education;
2. implementing opioid prescribing guidelines;
3. integrating prescription drug monitoring;
4. improving data collection and sharing;
5. treating opioid overdose; and
6. increasing availability of opioid use disorder treatment.

It may be tempting to dismiss 70 counties across the country as a small number in crisis. Yet, there are another 201 counties that have the highest share of manufacturing employment and are seeing more than the national median of drug overdose deaths as well. Put another way, 40% of the country's manufacturing-centric counties are experiencing the worst of the drug crisis. The acceleration and penetration of this crisis have followed a consistent path across the country, and each year it has gotten worse. There's no evidence of it slowing down yet. For those reasons, it is safe to say that in the next few years, a number of these 201 counties will find themselves deeper in crisis. And with few adequate actions coming from elected officials to adequately address the crisis, manufacturing leaders may be waiting for support longer than they can afford.

U.S. manufacturing's future is at stake

Some experts are predicting U.S. manufacturing's return to its position as the global leader in the near future. Based on MAPI's analysis, this optimism should be tempered with realism about some of the on the ground challenges the industry is facing. Prime among those is the need for the next generation manufacturing worker. After all, the manufacturing workforce has been aging for some years, with many skilled workers on the verge of retirement. In 2016, the median age of the U.S. manufacturing worker was 44.5. Yet, it's no secret that manufacturing has an employment branding problem when it comes to attracting young people into its ranks. Many parents have discouraged their children from pursuing careers in manufacturing, and today's college graduate is more interested in Silicon Valley than the Rust Belt. The Great Recession had a disastrous effect on many industries, and since 2009, manufacturers have been battling back from low share prices, falling commodity prices, low capacity utilization and labor turnover. To that list, let's add the impact of the drug crisis on the next generation manufacturing workforce.

We noted earlier that this is the third drug crisis in the past 50 years. But earlier crisis, while no less tragic, were different from a supply chain perspective. The crack cocaine crisis of the 1980s, for instance, was an inner-city scourge experienced largely by communities of color after manufacturing had already left those areas. By contrast, today's typical drug user is more often than not male, white and of prime working age—a profile that is eerily similar to the profile of the typical manufacturing worker, of whom 71% are male and 81% are white. In Ohio, drug overdose deaths were 68% male and 89% white. Moreover, drug overdose deaths have bifurcated into two age-related groups—those in their middle age and, more importantly to the future of manufacturing, those in their 20s to 30s.

Any loss of life is tragic, but the lost future productivity from the premature death of prime working age adults has an economic impact on their communities and compounds

year-over-year. In an industry where the workforce closely resembles the demographics of drug overdose deaths, the consequences are painful today, and the effects will persist into the future as well, with fewer young people available to join the work force.

While drugs aren't a uniquely American issue, the problem is more acute within the U.S. labor force than other top manufacturing countries. In 2014, the World Health Organization reported the U.S. drug-related death rate was five times higher than Germany, 16 times higher than Japan, 19 times higher than China and 29 times higher than South Korea. It's undeniable that drugs are more of a drag on the U.S. economy than they are in the other top manufacturing countries. Every country has its own economic and workforce challenges, but our analysis has found that in the U.S. the drug crisis is accelerating in communities with large manufacturing workforces. If this trend continues unchecked, it will have profound effects on manufacturing in the future.

What should manufacturing executives do?

Although each addict and overdose death is one less available adult in the labor market, the undermining power of the drug crisis is that it also hits manufacturing's existing workforce. Nearly one in 20 employees will misuse a prescription opioid in some way this year, and this makes them susceptible to addiction. What's more, addiction often begins innocently enough with an injury—perhaps at work—followed by a prescription for pain medication. The over-prescription of pain medication makes uninformed patients particularly vulnerable to an accidental dependency. The legitimacy of a medical prescription not only lulls a patient into thinking they are safe following their doctor's orders, but it also makes removing impaired workers from the workplace a delicate process—especially if the underlying injury began at work. Addressing any level of impairment in the workplace is critical to workplace safety and should be a priority.

If you are a manufacturing leader, following are four things you can do to take action now to address this issue in your business.

1. Acknowledge that this problem has already arrived at your door. Unlike past drug crises, the opioid crisis is partially caused by the over-prescription of a legitimate pain medication making all prescribed individuals susceptible to an unintentional dependency. Employees who work in counties with lower prescription rates are not immune. Ignoring the intersection of the drug crisis and manufacturing will not change the reality of the situation. You can self-assess the risk to your manufacturing footprint using the MAPI Foundation's national drug overdose map.

2. Raise awareness of the drug crisis with your employees. Many prescription opioid addictions are unintentional. Enhance your wellness program with educational programs to raise the awareness of the risks of prescription opioids and how to use pain medication safely. August 31st is International Overdose Awareness Day.

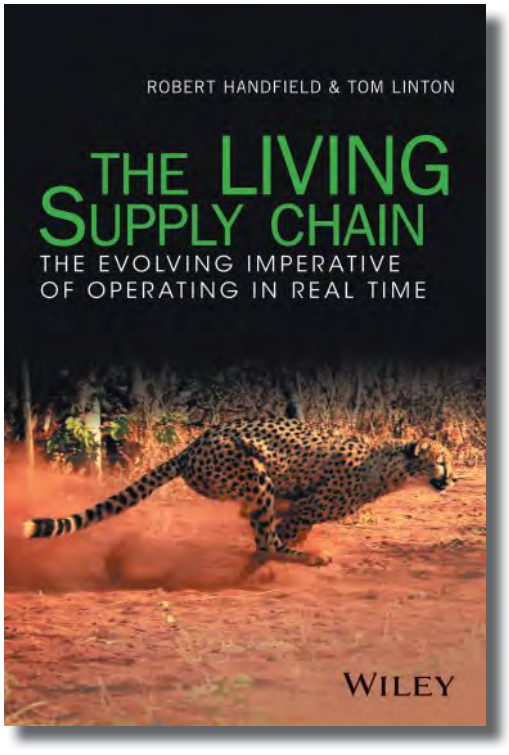
3. Learn the signs of opioid abuse. An employee taking the proper dose of a prescription opioid is not a problem, but those taking more than the recommended dosage will cycle between some level of impairment and withdrawal while at work. Human resource professionals and managers should all learn the signs to identify employees who are posing a risk to workplace safety to themselves and others. The NSC estimates that only one in five people are "very confident" they can spot the signs of opioid abuse; it is likely less because most people tend to overestimate their abilities.

4. Be more flexible with employee hiring and employment practices. It is no secret most manufacturers struggle to hire and retain skilled talent. The opioid crisis doesn't need to put an extra burden on hiring and employment practices. In counties hardest hit by drug addiction, retraining and apprenticeship programs are good investments to access a broader pool of candidates. Companies across the country are also exploring other options to their zero-tolerance drug policies. In some cases, they are going as far as to hire applicants who fail a drug test if they complete a substance abuse programs. Addicts are less likely to relapse after treatment with the support of their employers than if they only have the support of family and friends. Creating a culture of compassion toward behavior that introduces serious risk to a company is counter-intuitive to many executives, but it's also the flexibility society needs to address the crisis effectively.

The opioid crisis is a tragedy, and it is no longer only a governmental or social issue, but also a business issue that threatens our productivity. To that end, it's time for manufacturing and supply chain managers to play a role. After all, our future productivity may be at stake.

***For more information visit mapifoundation.org/opioidmap and overdoseday.com.*

The LIVING Supply Chain



A new book argues that supply chain ecosystems adjust and evolve in ways similar to how the natural world behaves.

BY ROBERT HANDFIELD AND TOM LINTON

Robert Handfield, Ph.D., is the Bank of America University Distinguished Professor of Supply Chain Management at North Carolina State University, and executive director of the Supply Chain Resource Cooperative. He can be reached at robert_handfield@ncsu.edu. Tom Linton is chief supply chain officer at Flex. He can be reached at tom.linton@flex.com.

The story behind the book

On a wet morning in January 2016, I sat next to a cozy fire in a Portland coffee shop, with a warm cup of coffee and an open laptop. I thought about what I had seen the day before on a tour of the Flex Pulse Center in Milpitas California, and the discussion I had with Flex's chief supply chain officer, Tom Linton.

I've known Tom for more than a decade. But what he had shown me the day before was entirely different from anything we had previously discussed. Flex was deploying an experiment of sorts, one that took everything we ever knew about supply chains, tossed it out the window and started from scratch. I had left Tom with a parting comment: "I think we need to write a book about what you're doing here." Tom smiled and nodded.

—Rob Handfield

Our book, "The LIVING Supply Chain: The Evolving Imperative of Operating in Real Time," is about re-imagining what supply chain is, and what it's becoming.

The premise is that supply chains are ecosystems that adjust and evolve in ways similar to the ways the natural world behaves. We have used our creative imagination to envision how supply chains will evolve and adapt to the emerging complex new business environment of the future.

This book also introduces the topic of balance to supply chains, not in the classic context of supply and demand. Instead, as it relates to the values companies increasingly are placing on healthy, honest and transparent supply chains.

The central argument is that balanced supply chains will win and selfish supply chains will lose. I hope "The LIVING Supply Chain" becomes a starting point for a new wave of innovative conversations about what supply chain is versus what it does.

—Tom Linton

Contract manufacturing was the original business of Flextronics. That was during the boom years of the 1990s and the early Internet days. The company largely manufactured PCs for big names like HP, Dell and others.

Contract manufacturing was a volume business with razor thin margins, and relied on the ability to scale up a new product assembly line anywhere in the world. By 2015, Flextronics was no longer a contract manufacturer in the traditional sense, and changed its name to Flex.

"We are in full transition to become a company, that when I think about it, hasn't ever existed before," explained Tom Linton, chief supply chain officer. During a tour of the company's Milpitas, Calif. facility, he continued: "In each of the organizations I've worked in, I liked to experiment with organizational models—and this is the biggest experiment of them all. And I believe we are achieving an essential alignment of procurement and the supply chain organization that is unique. We are influencing and shaping Flex's corporate strategy, but we are also totally supporting it."

Tom went on to say: "we are a capability supply chain company. Supply chain is our business. But it is supply chain on steroids."

The company has 230,000 employees and 5,000 customers in 18 different industries. It produces at least $1billion of product in each of 12 verticals. Flex makes cell phones, the Kindle, Go-Pro cameras, Microsoft X-boxes, Fitbits and much more. But the Flex name never appears on any of those products.

"We are one of the biggest companies nobody has ever heard of," explained Tom. "And we are involved in the downstream supply and manufacturing side, as well as the upstream quoting to our customers when they come to us for a new product."

In short, Flex manages all manner of supply chain risk from complexity to disruptions for its customers. And as a manufacturer across so many of the largest global industries, Flex has the power of global insight.

As a result, Flex triangulates across operations strategies, geographic strategies and product strategies like no other company. The company is in a position to predict how technologies, consumer behavior, supply chain innovations and or digitalization in one sector (say consumer products) may appear in automotive or medical products tomorrow. For example, who ever thought people would play music from their portable phones in automobiles?

As chief supply chain officer, Tom runs an end-to-end supply chain. And end-to-end here truly means end-

to-end. It includes customer-facing flows, supplier and material-facing flows as well as all the sourcing and logistics in between.

Linton elaborated: "Flex's supply chain organization controls sourcing on direct and indirect procurement as it manages all of our materials at over 120 global site locations. This includes all the intellectual property, inventory, cash cycle, days sales outstanding, days payable outstanding and the entire financial workflow of the organization." When Tom presents to leadership, he is effectively talking to them about managing the balance sheet and the income statement, as well as supporting incoming revenue.

The intelligent piece of the real-time supply chain needs to be combined with a number of other cultural values within the organization.

This level of oversight allows Tom to align organizational capabilities and financial outcomes with procurement and supply chain strategy. In so many supply chains, the different pieces of the supply chain are often mis-aligned. Information systems have for years tried to "integrate" these disparate pieces. However, this often results in mis-alignment of decisions, primarily because of political reasons.

Every function has its own agenda, its own performance measures, and its own culture as it operates in a silo. Putting in an ERP system to integrate these parts does little to address the true disparities that exist.

Tom put it this way: "All of the pieces, for the first time in my career, are fully aligned. It is like a big chiropractic alignment, and when it happens, it is truly the secret sauce of successful organizations. We have true visibility to all financial flows, which ensures that we are profitable."

When you look at companies like Cisco, Microsoft, Apple, or others, these companies all have a huge market cap, but have no manufacturing or development activities to speak of. Flex manages all of these activities for them, which means it has to run a top-notch end-to-end supply chain.

So even though you won't see a "Made by Flex" label on these companies' products, Flex is in the background ensuring that it all comes together. This is one reason that Flex and other contract manufacturers are emerging as the fabric of the emerging trend towards the intelligence of things.

The other interesting anomaly is that top 25 lists of the best supply chains at Gartner often list these very same companies. "We manufacture for many of these companies, and actually hold a lot of their assets for them," said Linton. So when Gartner measures the top supply chains, one of the criteria they use is the ratio of the company's revenues to its assets. All these companies are asset-light—because Flex is holding their inventory for them."

Now that really piqued Rob's interest as an academic. If Flex, and others like them, hold all of the inventory and material and shipping flows for these big companies—how does that work? How can one company manage so many manufacturing processes and so many customers?

Rules of LIVING supply chains

The Flex supply chain structure is part of a massive change and evolution that is occurring in today's supply chain world. These changes will occur sometimes quickly, sometimes slowly, but will undoubtedly come into being in the next decade.

The changes we are writing about in the book "The LIVING Supply Chain" are not just about technology—they are about true evolution in a biological sense. In fact, many of the changes have been captured in a set of statements we have called the "Rules of LIVING Supply Chains."

This was the thinking that led us to begin this book. We want to determine how digitization can be exploited to drive competitive value. We have come to the conclusion that the intelligent piece of the real-time supply chain needs to be combined with a number of other cultural values within the organization. From there, it extends upstream and downstream in the supply chain network.

A good acronym that captures these concepts is "LIVING," and is the basis for this book.

Live. Do you have a real-time (LIVE) view of your information?

Intelligent. Are you able to connect the essential leverage points in your network through Cloud, mobile and other mediums that provides a platform for analytics? Can you track the DNA of your supply chain at a part number level globally? Can the system evolve to link to the objects in your supply chain?

Velocity. Is your entire enterprise and network focused

on moving assets faster than ever before in its history?

Interactive. Is there a common governance structure that defines how observations are translated into issues, monitored, validated and translated into specific actions and responses?

Networked. Is your multi-enterprise supply chain networked in such a manner that a common and aligned view of business priorities and actions is aligned with trusting relationships common to everyone?

Good. Is your network truly good, with a common cultural understanding that transcends borders and seeks to establish good relationships as long-term assets that drive growth and transparency anywhere in the world?

These new rules are aligned with many of the rules that dictate how species, humans and genetics have evolved. They represent a natural evolution rather than a radical one. They are occurring because the world of global trade has reached the limits of its growth without re-shaping the way it operates. Welcome to the LIVING supply chain that operates in real time.

Moving past world-class supply chains

For many years, there has been a drive toward a world-class supply chain organization. In fact, you probably use those words in your company.

Unfortunately, world class still emphasizes distinctions in the organization. Purchasing, operations and logistics are still viewed as disparate functions, and arguments break out over which area has dominance over the others. The three functions were lumped together as supply chain, but have not stopped working independently of one another. Technology integration was supposed to bring them together but didn't most of the time.

In the end, there are some real problems with the world class view of the supply chain. We need a new view. That's where the LIVING supply chain enters the fray.

To begin, it is important to emphasize that managing supply chains is no longer just about cost optimization. It is also about a deep understanding of the components of customer value, not to mention making decisions quickly in response to sudden shifts in customers' requirements.

While cost optimization may certainly be one element of this equation, value has many differential meanings. Managing the supply chain first and foremost requires that managers act as internal consultants who spend most of their day listening closely. They must listen not just to the explicit needs of internal customers for materials, information, services, knowledge and capability, but also to the intangible elements customers need.

In the end, there are some real problems with the world class view of the supply chain. We need a new view. That's where the LIVING supply chain enters the fray.

In a sense, real-time supply chains involve understanding and predicting what internal users and customers will need even before they themselves recognize the need. Velocity and speed are integral capabilities that require quick response to customer needs to create the right capability.

Velocity and speed are promulgated by evolutionary economics. Biologists emphasize that organisms and creatures that are quick to respond will evolve more quickly and will survive. Those that don't will die out.

One of the best books to cover this concept is "The Serengeti Rules," written by biologist Sean Carroll. We have applied them to enterprises and their supply chain ecosystems. We propose the idea of a LIVING supply chain as one of a set of networked enterprises that are subject to the same rules as biology.

These observations comprise the elements of the first Serengeti Rule.

Serengeti rule No. 1: Not all species are equal. This rule proposes that some species exert effects on the stability and diversity of their community that are disproportionate to their numbers or biomass. These are termed keystone species based on the magnitude of their influence on the food chain.

We have applied this biological rule to create a rule for the emerging supply chain network ecosystem.

New supply chain rule No.1: Not all enterprises are equal. Firms that respond to changes in their environment more quickly by embracing *velocity, real-time transparency and rapid response* to change will adapt more quickly and will survive. Those that do not adopt these principles will become extinct.

It starts with a simple concept: Speed and velocity are more important than everything else.

Speed drives business value and inventory turns, reduces working capital, produces cash (monetizes) assets and makes customers happy, which in turn further drives

top line revenue. Supply chain optimization typically involves turning the knobs on a supply chain design that is broken. But creation of real-time supply chains provides a means for creating value that the customer cares about. In today's fast-paced environment, velocity is something customers value.

Companies that have speed enabled by real-time visibility will experience improved customer satisfaction. What customer doesn't want to have the product they ordered online to arrive more quickly? This also has the effect of reducing costs, as agility and nimbleness allows companies to move quickly to address situations that may end up costing them a lot of money.

Velocity is the ability of an organization to flow working capital rapidly through its end-to-end supply chain. Working capital is generally in the form of inventory, which is an asset that doesn't produce any revenue or cash.

Speed also reduces inventory as working capital moves more quickly, and reduces obsolescence along with excess inventory. Inventory is a substitute for lead time. As lead time shrinks, so does inventory. Finally, speed frees cash flow by operations. Companies with more cash flow can re-invest in the business, acquire another company or buy their stock.

All of these outcomes make the company stronger, and more able to withstand the challenges of the global ecosystem. As predicted by Rule No.1, enterprises with higher velocity are stronger, more nimble, in better financial health and capable of growing by leaps and bounds. Slower firms will slowly go out of existence.

Visibility drives velocity

There is more evidence than ever that the old rules of strategic supply chain management are fading away. Transparency is the new law and collective innovation of enterprises in the global network is the driver for growth. Quite simply, visibility drives velocity.

This requires an ability to think strategically in terms of the entire supply chain, including supply chain partners. It also requires a close working relationship with these partners to drive collective growth and profitability. This approach is equivalent to another law of the Serengeti desert.

Serengeti rule No.2: Some species mediate strong indirect effects through trophic cascades. Specifically, some members of food webs have disproportionately strong (top-down) effects that ripple through communities and indirectly affect species at lower trophic levels. An example is the wildebeest, which impacts grass populations, predator populations and populations of other herbivores like giraffes and hippos.

The equivalent rule in supply chain terms is as follows:

New supply chain rule No.2: Enterprises that mediate indirect effects upstream and downstream in the supply chain through aligned strategies will thrive. Those that do not will slow and become extinct.

We propose that in a supply chain some companies mediate strong direct and indirect effects. Those companies that do so rely on transparency and rapid response to events in the supply chain. By promulgating the ability to rapidly adapt to uncertainty and change in the ecosystem, companies will ensure that other enterprises (creatures) that they depend on, and which depend on them, will mutually benefit and thrive. Those that continue to operate in a silo (and fail to view the supply chain as an ecosystem) will slow down and not be able to adapt.

Organizations that have adopted an approach focused on velocity, visibility, real-time response and digitization have seen rapid growth in a flat economy. Amazon, Apple and Facebook are leading examples. So is Flex.

Two key concepts—velocity and visibility—reflect the core elements of real time in supply chains.

Velocity is the ability of an organization to flow working capital rapidly through its end-to-end supply chain. Working capital is generally in the form of inventory, which is an asset that doesn't produce any revenue or cash. Thus, the object of the real-time supply chain is to achieve velocity in every aspect of how companies run their businesses.

Visibility enables velocity through the relative transparency of events, material, and flows to all key decision-makers in the extended supply chain. Visibility allows individuals to see what is going on, empowering them to interpret information and rapidly make decisions in response to data.

These principles are not new. Many of the concepts around lean production systems have emphasized flow and

visibility. However, in the context of the digitization of the supply chain, these concepts have a new meaning and impact.

The drive behind LIVING supply chains

The focus on speed is an element that is essential to the real-time supply chain. Every action should be focused on driving increased velocity of materials through the system.

Tom explained: "I tell my people, if you wake up and go to work, and are confused as to what you should focus on that day—focus on speed. Speed will drive all other financial benefits that we need to be paying attention to. It will drive up customer satisfaction, as customers get their products sooner, and get new innovations that come to market sooner. It will drive out excess inventory and improve our balance sheet. And it will speed up our cash to cash cycle, which makes our shareholders happy."

There are some important issues that follow from this principle of velocity.

1.The first is that the centralized control tower is giving way to a new layer of capabilities. This is not the current control tower of internal historical data managed by senior supply chain executives guessing what is coming next. Instead, supply chains are becoming more vertical virtually. That means as we become more reliant on our partners, we need to create a virtual form of vertical integration through greater connectivity.

2. The second big change is Cloud computing. Probably the single, most important component of running a global supply chain, Cloud computing allows something very special to happen—business process convergence. In the past, we automated separate business processes, each operating with one another based on commercial invoices, purchase orders and transactional documents. As these automated processes now start to link with one another in the Cloud, these traditional transactional documents become obsolete.

3. The third big change is that labor arbitrage will no longer be a relevant strategy. Global labor costs are quickly becoming regionalized just as manufacturing will increasingly become regionalized.

4. The fourth big change is that unpredictability is entirely predictable, which means that we need to be more influenced by the use of tools to be better able to respond to unpredictability.

5. The final big change is to change our entire cultural and psychological mindset when it comes to the supply chain. The book "Non-Zero" by Robert Wright starts with a premise that the world is not moving to a zero-sum game, but to a non-zero sum outcome.

Look for instance at the Inuit people. When they killed a whale for food, they shared it with all of the other tribes. All of the tribes were trying to survive, so they formed alliances and states. By working together, they were able to move ahead collectively. That same approach can work in the supply chain if you partner with those who you respect and trust the most.

Big changes coming

There is an increasingly common set of discussions that are also evolving around the digitization and active tracking of product and materials in the network, and not just in the boardroom at Flex. We have had several other conversations with executives at other companies around the increasing focus on the digitization of supply chains that were moving towards becoming live, fast and intelligent.

But what does this mean exactly for the impact of multi-enterprise networks of organizations working in the supply chain?

The idea of a LIVING network is a powerful metaphor for what is going on at Flex. Flex recognizes that the Intelligence of Things is the key driver for change in the new era, not the Internet of Things. The Internet is just the utility that keeps data flowing in the system.

The emergence of more automation, 3-D printing, hyper regionalization and omni-channel customer service will be explicitly considered within an organization's technology roadmap. Our implicit assumption is that these technologies will be coming to fruition in the next two years to five years

The idea of a LIVING network is a powerful metaphor for what is going on at Flex. Flex recognizes that the Intelligence of Things is the key driver for change in the new era, not the Internet of Things. The Internet is just the utility that keeps data flowing in the system.

That said, the emergence of organic, LIVING supply chains suggests that today's supply chain will live, change and evolve differently than in the past. You don't want to lose sight of velocity and visibility as the key for supply chain survival in the Serengeti.

Unlocking blockchain's potential in your supply chain

Beneath the hype, blockchain is s a maturing technology that offers great promise.

By Suketu Gandhi, Adrish Majumdar and Sean Monahan

Blockchain has recently gained notoriety as the underlying technology behind the rise of bitcoin and other cryptocurrencies. However, its true value is far greater, with the potential to fundamentally change the nature of any transaction that requires trust and verification in industries from retail, banking/finance and government to healthcare, transportation and oil and gas. Proponents say blockchain will lower costs, improve planning and strengthen brand reputations. Opponents say the technology is overhyped and not as efficient as traditional processes. A.T. Kearney's view? We see blockchain as a nascent technology that is still maturing but offers great promise in driving efficiencies in your supply chain.

Suketu Gandhi is a partner at A.T. Kearney, based in Chicago. Adrish Majumdar is a principal at A.T. Kearney, based in New York. Sean Monahan is a partner and global practice leader of A.T. Kearney's Operations & Performance Transformation practice, based in New York. They can be reached at suketu.gandhi@atkearney.com, adrish.majumdar@atkearney.com and sean.monahan@atkearney.com.

A ledger innovation

Ledgers have been at the heart of every economic transaction since ancient times. From the first clay tablet that recorded characteristics of contracts, deeds and purchases to today's high-speed computers, companies rely on accurate, secure and reliable data. Blockchain is a ledger innovation that can make your data more robust, secure and error proof.

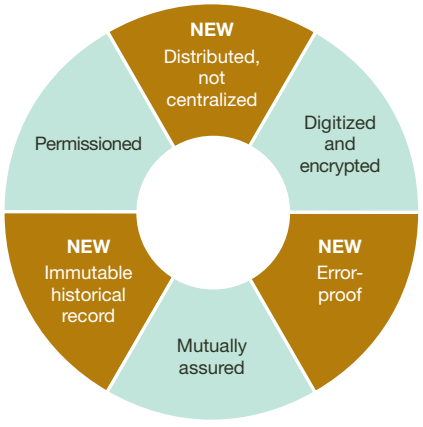
At its core, blockchain technology is a "distributed ledger," with each ledger representing a "chain of blocks" containing data from multiple transactions, such as asset characteristics, price, date and parties involved. Blocks are continuously linked to each other forming a chain that is a complete historical list of all transactions. This ledger is continually shared and reconciled by all members. Because the records are stored by many keepers and available for all authorized users to see, it is auditable and verifiable.

Figure 1 highlights how blockchain enhances the characteristics of any current database system. The red blocks indicate the features common to all databases:

- ***permissioned access*** that can be restricted based on need;
- ***digitized information*** with heavy-duty encryption and highly secure technology; and
- ***mutually assured trust*** and validation to ensure security and accuracy of data.

FIGURE 1

Blockchain adds three important new elements



Source: A.T. Kearney analysis

Blockchain adds three important new elements, shown here as blue blocks:

- ***distributed, not centralized***—there is no single point of failure or ownership;
- ***error-proof***; the ability to encode "smart contracts" prevents accidental and/or intentional entry of transactions that violate contract terms; and

• ***an immutable historical record*** of every transaction that has ever occurred—the entries are permanent; therefore, changes are easier to track.

The result is a digitized recordkeeping platform that is auditable, decentralized, unchangeable and secure. Redundant systems are reduced and end-to-end information visibility allows for faster and more systematic root cause analysis. The elimination of third parties can provide tremendous cost savings and complexity reduction opportunities. The transparent record of information can reduce fraud and security risk, and the decentralized storage of data makes it more secure. While centralized ledgers are prone to cyber-attack, distributed ledgers are inherently harder to breach because all the distributed copies need to be attacked simultaneously for success. Further, these records are resistant to malicious changes by a single party.

Blockchain can transform industries

Blockchain is capable of transforming current supply chain models while reducing costs. Its four archetypal uses include existence, ownership, tracking and storage.

Relevant use cases in supply chains have been piloted in food, apparel and luxury goods, notably around traceability and tracking.

Walmart's success tracing food sources using blockchain has sparked commitment from other major players. Food fraud and food-borne illnesses are major risks in the supply chain. IBM's blockchain technology was piloted to track Mexican mangoes and Chinese pork. This trial involved farms, packing houses, brokers, warehouses and processing facilities and has greatly increased ingredient source tracking. Time to trace a source was reduced from days to minutes. As a result, Unilever, Nestlé and Dole are committing to blockchain food source tracing for products including chicken, chocolate and bananas. In addition, Walmart is seeking to apply blockchain technology to other areas of its business including package delivery.

Carrefour is using blockchain to trace the source of poultry with the goal to expand to other perishables including eggs, cheese, oranges and salmon. For poultry, data is captured at each step from the hatchery, producer and processor and gives consumers full product journey information. Consumers scan the QR code at retail to access product information. Not only does this enhance traceability from a food safety standpoint, it can enable retailers to tell much richer "farm-to-fork" stories to their customers.

Everledger has created a decentralized ledger used to track the origin and ownership of diamonds. Its purpose is to provide supply chain users (diamond manufacturers, primary and secondary retailers, consumers, insurance agencies and law enforcement) proof of origin and confidence in the provenance of conflict-free diamonds.

In addition, companies are exploring blockchain advantages in facilitating payments, post purchase engagement and enhancing luxury ownership. Blockchain solutions will continue to gain traction in industries where they can successfully drive cost and efficiencies; deliver quality and service; and delight and empower consumers.

Understanding supply chain's potential

With the tremendous hype around blockchain, it's difficult to know if it is right for your organization. Do you need blockchain to create high ROI wins or allow you to remain competitive? Or, do you want to embrace blockchain to elevate your customers' experiences to gain a competitive advantage? Actuating blockchain technology within your supply chain requires an enterprise commitment to assess your current business needs, design the appropriate solution and implement this new technology.

FIGURE 2

Blockchain makes data more robust, secure, and error-proof

Archetypal uses	What blockchain can provide	Industry examples
Existence	Proof that a product existed at a certain point in time (for example, land titles or server log files)	**Banking, finance**
Ownership	Proof that an asset was owned by a specific user at a certain point in time. Proof that ownership transferred to another party (IP/copyrights, certifications, mortgage titles, escrow accounts)	**Banking, finance, legal, government**
Tracking	Visibility that product ownership transitioned from A to B to C over time (quality/safety recall management, inventory visibility, tracking, and provenance)	**Retail, transportation, oil and gas**
Storage	Ability to store encrypted data that can be retrieved but not altered or deleted (health records, identity management)	**Healthcare, legal, government**

Source: A.T. Kearney analysis

In the assessment phase, supply chain management must first identify a valid need for a blockchain solution such as: new paradigms for consumer lifecycle engagement or new models for 1:1 marketing; upgrades in speed, cost and quality and a more frictionless engagement with vendors; or, improvements in data storage and transaction processing or improved record keeping. Blockchain technology is being applied in various industries at different speeds. For example, Walmart's participation in the Blockchain Food Safety Alliance is a strong signal to other food and apparel manufacturers and retailers to build business cases for this technology.

Once the opportunities have been identified, internal capabilities need to be assessed prior to design and implementation. A partnership with a current blockchain provider may provide the enabling technologies to build a digital platform and implement a pilot. A pilot program can validate the business case and the ROI for expansion, while identifying any additional barriers to success. Combining blockchain technology with AI and IoT capabilities can provide exponentially greater benefit by reducing the possibility of error in data capture, and by accelerating decision-making based on transaction information.

"Combining blockchain technology with AI and IoT capabilities can provide exponentially greater benefit by reducing the possibility of error in data capture, and by accelerating decision-making based on transaction information."

In certain industries where the landscape is evolving quickly and blockchain is already having an impact, supply chain management will need to explore this technology to remain competitive. In other industries where the costs and risks currently outweigh the benefits, adopting a wait and see attitude may be appropriate. But, a wait-and-see attitude does not mean doing nothing.

Supply chain professionals need to stay informed and gain first-mover advantage by evaluating the benefits of blockchain especially across enterprises where there is an exponential value of real time data, multiple handoffs, and a need for flexibility. This can be particularly valuable in industries with risk laden products including pharmaceuticals, defense or safety. Early engagement and understanding the value of blockchain is the key to unlocking the full potential of this new technology.

SUPPLY CHAIN MANAGEMENT REVIEW

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A SPECIAL SUPPLEMENT TO:
SUPPLY CHAIN MANAGEMENT REVIEW

TOP 50 3PLS

COLLABORATION NOW PARAMOUNT

As the e-commerce juggernaut creates more complexity for today's logistics managers, finding the right mix of 3PLs with the essential integrated services has never been more important. Experts agree that this is a shared journey with new rules of engagement.

BY **PATRICK BURNSON,** EXECUTIVE EDITOR

Industry insiders coming to grips with the dynamic changes shaping both the domestic and global third-party logistics (3PL) marketplace have come to similar conclusions about the future.

Armstrong & Associates Top 50 U.S. 3PLs (April 2018)

2017 Rank	Third-party Logistics Provider (3PL)	2017 Gross Logistics Revenue (USD Millions)*
1	C.H. Robinson	14,869
2	XPO Logistics	9,506
3	UPS Supply Chain Solutions	7,981
4	Expeditors	6,921
5	J.B. Hunt (JBI, DCS & ICS)	6,828
6	Kuehne + Nagel (The Americas)	5,541
7	DHL Supply Chain North America	4,390
8	Hub Group	4,035
9	Burris Logistics	3,396
10	Ryder Supply Chain Solutions	3,066
11	FedEx Trade Networks/Supply Chain/SupplyChain Systems	3,014
12	Total Quality Logistics	2,934
13	DB Schenker (The Americas)	2,915
14	Panalpina (The Americas)	2,381
15	Coyote Logistics	2,360
16	CEVA Logistics (The Americas)	2,331
17	Schneider Logistics & Dedicated	2,330
18	Transplace	2,181
19	DSV (The Americas)	2,094
20	Transportation Insight	1,947
21	Echo Global Logistics	1,943
22	Landstar	1,940
23	NFI	1,910
24	Penske Logistics	1,700
25	Americold	1,536
26	Worldwide Express/Unishippers Global Logistics	1,400
27	BDP International	1,300
28	GEODIS North America	1,297
29	Werner Enterprises Dedicated & Logistics	1,211
30	OIA Global	1,200
31	Radial	1,082
32	Mode Transportation	1,029
33	APL Logistics Americas	1,010
34	syncreon	1,000
35	Universal Logistics Holdings	933
36	SunteckTTS	920
37	TransGroup Global Logistics	905
38	Lineage Logistics	900
39	Yusen Logistics (Americas)	855
40	GlobalTranz Enterprises	854
41	Ruan	836
42	Ingram Micro Commerce & Lifecycle Services	800
43	Cardinal Logistics Management	792
44	Nippon Express (The Americas)	790
45	Radiant Logistics	788
46	Damco (The Americas)	773
47	Neovia Logistics Services	763
48	Crane Worldwide Logistics	740
49	ArcBest	707
50	U.S. Xpress	661

*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.

Armstrong & Associates Top 50 Global 3PLs (April 2018)		
2017 Rank	**Third-party Logistics Provider (3PL)**	**2017 Gross Logistics Revenue (USD Millions)***
1	DHL Supply Chain & Global Forwarding	27,598
2	Kuehne + Nagel	22,574
3	DB Schenker	18,560
4	Nippon Express	16,720
5	C.H. Robinson	14,869
6	DSV	11,374
7	XPO Logistics	9,506
8	UPS Supply Chain Solutions	7,981
9	Sinotrans	7,046
10	CEVA Logistics	6,994
11	Expeditors	6,921
12	DACHSER	6,834
13	J.B. Hunt (JBI, DCS & ICS)	6,828
14	GEODIS	6,255
15	Hitachi Transport System	5,935
16	Panalpina	5,621
17	Bolloré Logistics	5,012
18	GEFCO	4,740
Hi	Toll Group	4,660
20	CJ Logistics	4,454
21	Kintetsu World Express	4,227
22	Hub Group	4,035
23	Kerry Logistics	3,951
24	Yusen Logistics	3,914
25	Imperial Logistics	3,896
26	Agility	3,500
27	Burris Logistics	3,396
28	Hellmann Worldwide Logistics	3,305
29	Ryder Supply Chain Solutions	3,066
30	FedEx Trade Networks/Supply Chain/SupplyChain Systems	3,014
31	Total Quality Logistics	2,934
32	Damco	2,700
33	Sankyu	2,548
34	Coyote Logistics	2,360
35	Schneider Logistics & Dedicated	2,330
36	Transplace	2,181
37	Transportation Insight	1,947
38	Echo Global Logistics	1,943
39	Landstar	1,940
40	NFI	1,910
41	Groupe CAT	1,864
42	NNR Global Logistics	1,735
43	Penske Logistics	1,700
44	Fiege	1,638
45	APL Logistics	1,632
46	Mainfreight	1,627
47	Wincanton	1,565
48	Americold	1,536
49	ID Logistics Group	1,501
50	Worldwide Express/Unishippers Global Logistics	1,400

**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.

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E-commerce continues to be the driving force for the Top 50 industry leaders, according the consultancy Armstrong & Associates. Meanwhile, merger and acquisition activity in the sector has been quieter than in recent years, but remains an attractive option for providers seeking to capitalize on synergies. For today's logistics managers, finding the right mix of 3PLs offering the full gamut of integrated services to tackle e-commerce demands has never been more urgent, add market analysts.

"The biggest news on the integrated services front recently has been the explosive growth registered by the 3PL powerhouse XPO Logistics, which announced double-digit increases in its revenue this past spring," notes Dick Armstrong, the consultancy's chairman. He adds that it has left him a bit "chagrined" because he had been among the chief skeptics about the company's aggressive strategy in the past.

"In retrospect, XPO was making the right moves all along," says Armstrong. "They identified synergies that we had missed, and acquired 17 companies over the past six years."

Indeed, spotting new trends in the 3PL arena both domestically and globally may yet become more challenging. Consider the ever-changing regulatory climate in the Asia Pacific, along with the gathering e-commerce storm breaking all over the world, one may only wonder how shippers will select the right partners in the future. Here's a closer look at some of these key factors shaping today's market and advice for navigating this complex new landscape.

The Asia factor

For Evan Armstrong, the consultancy's president, one of the chief takeaways from the firm's most recent Top 50 global 3PL research was the dynamic role played by the Asia Pacific (APAC) in the global arena. "Absent any new trade wars or regulatory upheaval, we believe APAC will continue to generate revenue and create opportunity for expansion in worldwide 3PL markets," he says.

Should there be a sudden change in trade policies between the United States and major Asian partners, Armstrong feels that 3PLs will come to rely more on air cargo than ocean carriers for more agile adaptation. "With air cargo, a shipper can turn on a dime, whereas ocean carriage poses more supply chain complications," he says. "In any case, we advise shippers to work with multiple providers, or at the very least, to rely on one with integrated services."

Such advice may be of special interest to shippers in the reverse logistics and cold chain niches, adds Armstrong, since business models are especially vulnerable to sudden shifts in trade compliance. "However, it really comes down to e-commerce," he says. "That's the game-changer in APAC and everywhere else."

The e-commerce factor

Just before Armstrong & Associates and the Global Supply Chain Council staged their annual "3PL Value Creation Asia Summit" in Hong Kong last month, the consultancy produced an exhaustive report titled "E-Commerce Logistics in the United States." Taking a deep dive into the impact of e-commerce, the report examines domestic and international transportation, warehousing and fulfillment, last-mile delivery and reverse logistics.

"The well-traveled path from distribution center to store location is being replaced by a much more complex series of moves," says Evan Armstrong. "Newly configured supply chains link distribution centers to

"The biggest news on the integrated services front recently has been the explosive growth registered by the 3PL powerhouse XPO Logistics, which announced double-digit increases in its revenue this past spring."

— Dick Armstrong, Armstrong & Associates

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fulfillment centers to parcel hubs and sortation centers to last-mile delivery providers for residential delivery. And as logistically complex product categories make the shift to e commerce, the extra mile is only becoming more cumbersome and costly."

The e-commerce revolution has hardly escaped the attention of leading private equity firms as well. In a move perhaps signaling a new wave of merger and acquisition activity in the 3PL sector, the firm of Welsh, Carson, Anderson & Stowe recently formed a strategic partnership with a prominent industry veteran to spot candidates for purchase.

According to Randall Curran, the former CEO of Ozburn-Hessey Logistics (OHL) and a consulting partner, this new venture shows exceptional promise. "Given the current environment of extreme volatility, the stakes have never been higher for 3PLs," says Curran. "The volume of SKUs can be overwhelming, and the complexity has become much more pronounced."

Curran led OHL through several years of sustained growth culminating in the sale of the company to Geodis in 2015. At the time of the sale, OHL had 120 value-added distribution centers in North America with more than 36 million square feet of warehouse space, along with 8,000 employees.

"There are quite a few very well run logistics companies that may wish to become part of a larger group," says Curran, who adds that the partnership's goal will be to leverage what makes each company successful while offering the market a more extensive "value proposition."

A shipper's "journey"

A new case study undertaken by Gartner and McDonald's Corp. reveals that having "skin in the game" is essential for future collaboration. "A Shipper's Journey to Achieve the 3PL Partnership Panacea," presented at the recently concluded "Supply Chain Executive Conference" in Phoenix, provided a compelling argument for improved, dynamic partnerships.

"Establishing cultural alignment between shipper and 3PL is a major challenge...If you have that, the risk of 'over-collaboration' is reduced, and the shipper is more empowered."

— David Gonzalez, Gartner

According to David Gonzalez, a Gartner analyst, the investment in functional technology has always been important for both shippers and their 3PLs, but "value-added" technology is becoming increasingly vital. For example, shippers should expect daily forecasts with 99% reliability with shipments of perishables.

"Both shippers and their 3PLs need to invest in continual improvement while adhering to the time-benefit-maturity models," says Gonzalez. "We view Kuhne + Nagle as one player that does not regard this kind of partnership as a theoretical exercise. They are moving beyond their assets to deliver their promises."

Sue Fangmann, U.S. supply chain services director at McDonald's, says that having a solid relationship with several 3PLs can help avoid a catastrophe similar to that of KFC in England earlier this year. "This is particularly true in the European Union where the pressure for land and warehouse utilization is far greater," she says. Furthermore, she advises shippers to define the relationship from the outset and have an exit strategy if things don't work out.

"Establishing cultural alignment between shipper and 3PL is a major

Continued on page 52

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Avoiding supply chain breakdowns: Learning from the KFC debacle

What went wrong, and how can organizations prevent themselves from falling into the same trap?

The breakdown of Kentucky Fried Chicken's supply chain in the United Kingdom in February 2018 provides a cautionary tale about hidden vulnerabilities in supply chains that all organizations should note.

Two-thirds of KFC's nearly 900 UK locations were affected by the breakdown, which led to shortages of chicken, gravy, and many other supplies. Two months after the initial crisis, less than half of the locations were serving a full menu, according to HuffPost UK.

The situation has been more than just a PR and logistics nightmare for company executives. KFC's parent company, Yum Brands, reported on May 2 that the supply chain problems would negatively affect earnings.

What went wrong, and how can organizations prevent themselves from falling into the same trap?

The key breakdown in the KFC supply chain centered around the food chain's recent switch from a specialty food distributor to a mega-freight forwarder, which, like many third-party logistics (3PL) companies, owns very few physical assets. These 3PL companies rely on a complex patchwork of individual trucking companies and other carriers to deliver their service.

Organizations should take specific measures for creating visibility in the vendor supply chain when it is dependent on 3PL providers.

Companies should work with their 3PL partners to keep track of which carriers will be used for their shipments and ensure that their quality and security requirements are cascaded down to subcontractors in contractual language with the 3PL.

Companies should clearly define key performance indicators with the 3PL partner and minimum standards for carriers that they use.

Logistics buyers should conduct in-person checks of at least a slice of the 3PL partner's subcontractors to directly check out their quality, business continuity, and security practices.

In addition, companies should work to identify where their supply chains run through regions that are vulnerable to disruptive local events and build in redundancy there to circumvent disruption or supply chain bottlenecks. Localized low-impact, high-likelihood events pose risks to supply chains around the world without making international news and can create "cascading risk" in which disruptions in one part of the supply chain create additional problems downstream.

Companies should speak with vendors about how local events affect them and what contingency plans they have in place, as well as engage with external geopolitical risk experts who can offer unbiased analysis and context.

Communication and cooperation between the teams examining the supply chain—business continuity, procurement, logistics, and so on—is essential to reduce silos and mitigate overall risk. While many organizations seek to simplify and streamline their supply chains to maximize efficiency and profitability, reducing redundancy can also introduce risk, fragility, and an increased potential for disruption.

Complex supply chains can hide diamond-shaped chains, in which most or all vendors source a component from a small group of suppliers. For example, dye pigments used in many manufacturing industries are only made by a few factories in one region of Japan. A natural disaster in that region that halted production would disrupt all industries that use that pigment.

Having one company coordinate all activity can lead to an onion-like structure of contracting and subcontracting that reduces visibility into who is actually carrying a company's cargo at any point in time. This increases the difficulty of ensuring quality and security through the distribution chain.

In some cases, it may be more sustainable in the long term to work with a roster of several approved logistics companies, granting delivery lanes to each one depending on where their networks are the most dense and robust. Companies can then compare performance across lanes and re-allocate them as the better performing providers rise to the top.

Working with multiple logistics providers serves as a sort of insurance policy. In case there is a business continuity issue with one of them, one (or several) of the others may be able to fill in.

If you take basic precautions to protect the integrity of your supply chain today, your organization will be more likely to operate uninterrupted—preventing future headaches and negative headlines in the future.

—Tony Pelli, BSI Supply Chain Solutions

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challenge," adds Gonzalez. "If you have that, the risk of 'over-collaboration' is reduced, and the shipper is more empowered."

3PLs as business intelligence leaders

At the same time, other industry analysts and trade associations are making a case for 3PLs to take on more of a leadership role in capturing market intelligence.

According on Chris Burroughs, senior director of government affairs for the Transportation Intermediaries Association (TIA), 3PLs are digging deeper into data and analytics to help logistics managers keep pace with today's volatile marketplace. "Simultaneously, 3PLs may find themselves shouldering a greater responsibility to spot and suggest opportunities for overall operational changes—even outside the supply chain—that benefit shippers," he says.

Coinciding with TIA's annual conference held in Palm Desert, Calif., last April was the release of its "2018 Freight Visibility Report." Drawn from interviews with the largest 3PLs, as well as smaller technology leaders, the report goes into some detail on how and why increased freight visibility may be creating significant value in today's disruptive business landscape.

"We were interested to hear from both shippers and 3PLs about the constantly evolving process that depends heavily on the technology," says Burroughs. "Leadership in this arena makes sense because 3PLs are in a position to provide the specific data unique to any one shipper."

Noël Perry, transportation economist and principal with the consultancy Transport Futures, agrees, noting that the real potential for "transport visibility" in supply chain design is becoming more complicated. "Now transport largely conforms to the other elements," he says. "As they find out how much they affect cost and service, 3PLs will increasingly adapt."

Perry adds that significant advances in visibility technologies have created a wide range of perceptions and expectations among shippers—including some that are inaccurate.

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Rafael Duarte Alcoba and Kenneth W. Ohlund, graduate students at the MIT Center for Transportation & Logistics, come to many of the same conclusions as Perry in their recent study titled "Capturing the Value of Predictive Modeling in Logistics."

The research team recently developed a logistics "regression model" for a 3PL based on a historical data set it provides and then indicates which loads are likely to be delayed. They state that "by tracking only loads dictated by the model, the company can achieve significant resource reduction."

In the past, a lack of data and inadequate processing power rendered predictive analytics infeasible, the study contends. But as technology and innovation drive forward, methods facilitating the use of mathematical tools for predictions improve: "Data collection and computing power are two key areas where improvements are changing the landscape of predictive applications. The Internet of Things (IoT) and Cloud storage have transformed data collection and storage capacity."

The move to Cloud-based technology is also making supply chain platforms more accessible for smaller 3PLs, says Jon Slangerup, CEO of American Global Logistics (AGL). He adds that modest-sized 3PLs like AGL are often naturally more agile than their enterprise counterparts, and still have the right tools to provide the shipper with a competitive edge against the big guys.

"A partner with a wide logistics network who understands your workflows makes all the difference if you need to find capacity quickly or navigate a Customs issue," says Slangerup. "And with new technologies like AI and blockchain getting enormous buzz, a provider should be able to separate the real from the hype and guide them on what's relevant for their own management of logistics."

Patrick Burnson is executive editor of Supply Chain Management Review

A SPECIAL SUPPLEMENT TO:
SUPPLY CHAIN MANAGEMENT REVIEW

Making the Case for

CUSTOM EXECUTIVE EDUCATION

Under pressure to perform at unprecedented velocities in a tight labor market, more companies are exploring custom executive education options as a way to bring their supply chain leaders up to speed (and keep them there).

BY **BRIDGET McCREA**,
CONTRIBUTING EDITOR

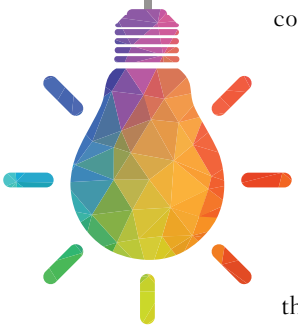
Campbell's Soup did it to improve the agility of its worldwide supply chain. Coca-Cola used it to enhance its supply chain leadership and provide better end-to-end global supply chain integration. Johnson & Johnson leveraged it to develop a network of professionals focused on continuous improvement. These are just three examples of how organizations have used custom executive education programs to improve their C-suite and senior-level executives' knowledge, skill sets and expertise in the rapidly-evolving supply chain industry.

Learning experiences that are tailored to a specific organization's needs, custom executive education is proliferating in supply chain, where many leaders and managers came up through the ranks of their firms without any formal education in the discipline. Combine these realities with the many changes taking place on the e-commerce and omni-channel fronts, and the need for a customized educational approach becomes that much greater.

"The term 'supply chain' only dates back about 20 years, with the first graduates with formal degrees in the field emerging around 2002 from a handful of schools," points out Steve Tracey, executive director for Penn State Executive Programs and the Center for Supply Chain Research, points out. "And while more schools have popped up since then, supply chain as a profession remains a fairly recent phenomenon."

Once the domain of large companies with very specific supply chain education needs, custom or

"tailored" options have come of age and are now applicable for a wider swath of organizations. In most cases, these high-impact learning experiences involve just one company's executives, last from eight weeks to 12 weeks, and include a mix of offline and online curriculum—the latter of which is coming of age in today's digitized world.



"For some of these organizations, that could mean taking tens, hundreds or even thousands of people globally from functional to strategic thinking."

What does it look like?

According to Tracey, customized educational programs help fill a gap that's opening up as supply chain continues its progression from a back-office function to one that creates both strategic and operational value for companies of all sizes. "There are still many firms that, regardless of whether they're centralized or decentralized, have the different supply chain functions separated from one another from a governance standpoint," Tracey says.

The more progressive private and public organizations, on the other hand, recognize that supply chain is an end-to-end function that requires extended coordination across suppliers, customers and the company itself. As more of those wake-up calls happen, a growing number of firms are turning to custom executive education to bring their leaders and managers up to speed on the most relevant, company-centric points.

At least part of this trend is being driven by a lack of recent college graduates holding supply chain and logistics degrees. "There aren't enough existing professionals or new graduates to be able to fulfill all of those needs at this point," says Tracey. "Because it's going to remain that way for the foreseeable future, we're seeing strong demand for training and education that's unique to individual firms; that's where custom programs come in."

Delivery methods

In many cases, custom executive education is delivered at the company's site, although more online coursework is being added in order to create a more hybrid approach that doesn't require professionals to sit in a classroom all day. Customized to a specific company's needs, the education takes on different faces, depending on the firm in question. For example, one organization may want to move its supply chain from being a functional/tactical application to a more streamlined, strategic entity.

"For some of these organizations, that could mean taking tens, hundreds or even thousands of people globally from functional to strategic thinking," Tracey explains. To achieve that goal, those myriad employees would have to think more collaboratively, work from the same playbook, and figure out the answers to questions like: How does my role in demand fulfillment, physical warehousing, or forecasting impact the company's overall customer service and cash-to-cash cycle?

"To answer questions like this you need a common base of training and education, so that everyone—and particularly, professionals who have no formal education in supply chain management—understands the holistic picture," says Tracey, who adds that a transportation expert may have his or her own department "locked down," but may not necessarily know what the inventory department is doing. "They're entrenched in what they're doing and what they know, but they're not always familiar with the other areas of the company."

That's where custom executive education comes in. By combining supply chain curriculum with a company's specific needs, it helps organizations bring their senior and C-level executives up to speed in a fast-and-focused manner. At CorpU, CEO Alan Todd says this tailored approach typically encompasses an 18-module, online curriculum that's "plugged together to solve different problems," and to help supply chain leaders drive some type of change effort.

"It could be transformational change, as in the case of Campbell Soup, which wanted to improve its agility," says Todd, "or like Coca-Cola, which was intent on providing end-to-end supply chain integration across the world." For these and other firms, CorpU starts with the 18-module approach and then tweaks and tunes that coursework to meet the company's specific needs. In some cases, the educational provider will also "blend

in" some program work from sources like the University of Michigan or West Point.

The end result is a tailored executive education offering that helps fulfill the modern-day company's need to be more agile, flexible, and fast. "We hear that from just about every customer in supply chain right now," says Todd, "and it's really forcing them to go digital at speed and scale. Ultimately, they've got to squeeze cost out of those supply chain networks, and they've got to get them operating faster."

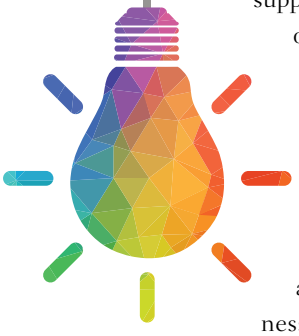
"We want to train our employees"

Rather than sitting around hoping that a seasoned, knowledgeable supply chain professional will come walking through the door, organizations are taking a proactive approach to training and educating their current executives and leaders on the fine points of the digital supply chain. To get this done in the most economical, efficient manner possible, more of those firms are turning to outside providers for help in developing their customized supply chain education.

"We hear from firms that would normally train their rising executives in-house, or at their own special facilities, but just can't afford that approach anymore," says James B. Rice, Jr., deputy director at MIT's Center for Transportation and Logistics (CTL). "So, they decide to do everything online and they come to us for help." From the Center, those companies can get a 12-week program that's customized to their needs.

In another example, Rice worked with an organization that wanted to send its executives to CTL for a hands-on experience, but also wanted to deliver some of the education online. "In our experience," he says, "there's a big benefit that comes when these companies do a bit of 'mixing,' with their custom education." That "mixing" has gained in popularity over the last 2-3 years as more companies started asking for it, and as organizations like CTL started creating a large amount of online educational content for the supply chain arena.

Today, CTL has five full courses that equate to a single semester, with executives earning MicroMasters credentials. "We're happy to take any combination of about 500 different online videos and use it to create a custom program," says Rice. "It can be very technically-oriented (e.g., demand periods in the retail business), or we can pull out the technical content and develop a platform that includes engaging practice problems. We let companies pick and choose from among those options."



"We hear from firms that would normally train their rising executives in-house, or at their own special facilities, but just can't afford that approach anymore."

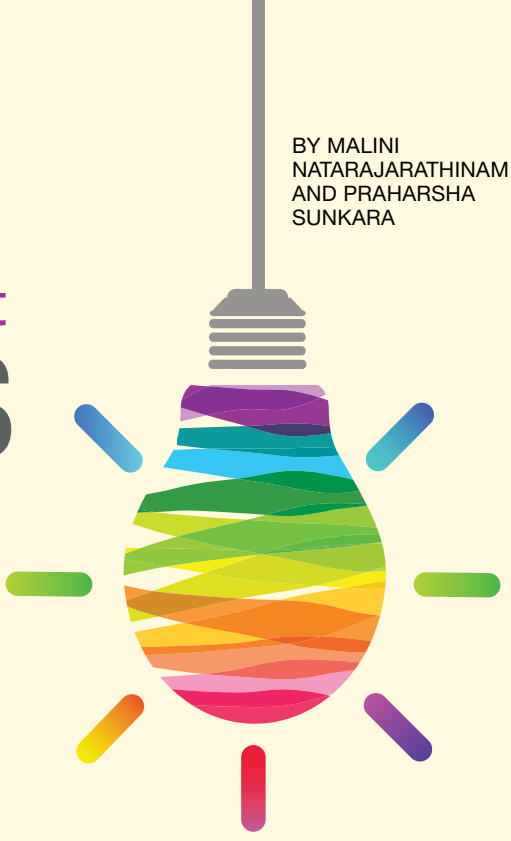
At APICS, executive vice president Peter Bolstorff is also seeing strong demand for custom executive education programs. Tailored to both executives who oversee the end-to-end supply chain (vice presidents of supply chain); functional leaders who oversee one or more processes (director of logistics); and "gold collar" leaders (who oversee S&OP or process governance), this executive education centers on a simple question: What is keeping supply chain leaders up at night?

Last year, for example, an APICS survey found that most of those leaders are concerned about agility, responsiveness, innovation and data security. They're also worried about changing, the proliferation of consumer-centric business models and the ongoing need to find and grow supply chain talent in the gig economy. To help companies address these pain points, APICs has developed tailored coursework centered on achieving operational excellence; implementing supply chain improvements; and building an effective and efficient supply chain organization, among others.

Speaking to companies that want to use custom executive education with their supply chain leaders, Bolstorff says the most successful initiatives are usually top-down and performance-focused. They center on specific problems (i.e., what are we attempting to solve through this learning?), and take a collaborative approach to improving skillsets, introducing new topics, providing practical examples, and then using key metrics to measure the program's success. "The most important thing to have is a burning platform focused on moving the performance needle," says Bolstorff "with that particular learning experience."

BY MALINI NATARAJARATHINAM AND PRAHARSHA SUNKARA

Supply Chain Management CERTIFICATIONS *offered by* Professional Organizations & Universities



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

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.

Malini Natarajarathinam, Ph.D., is an associate professor in the Department of Engineering Technology and Industrial Distribution, Texas A&M University.

Praharsha Sunkara is a former graduate student in the Department of Industrial and Systems Engineering, Texas A&M University and is now an engineer, production control at Global Foundries.

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

Issuing Institute	Certification Name	Eligibility Requirements	Duration for Completion	Type of Teaching
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
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
The Hackett Institute	Certified Enterprise Analytics Professionals	Open for All	No duration	Online
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 completed 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

Addressing people challenges that affect efficiency

More comprehensive training for managers can help the supply chain ease employee frustrations.

By Becky Partida, APQC

Effectively managing employees within the supply chain can be difficult due to the frequently changing nature of the business. Meeting day-to-day needs often takes higher priority than people management. In its research on organizational processes and performance, APQC recognized that people within an organization play an important role in the effectiveness of their fellow employees. APQC therefore conducted a research study on "People Challenges at Work" that identified the top people issues experienced at organizations today. Management development practices adopted by organizations across industries can provide valuable insight into how supply chain organizations can develop the skills of their managers to both address common people challenges and increase organizational efficiency.

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

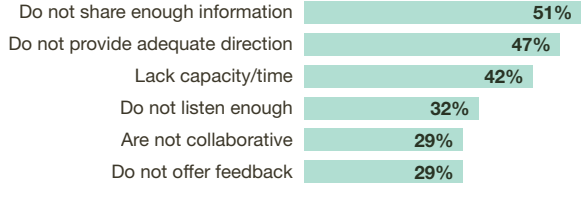
Top people challenges

As part of its "People Challenges at Work" research, APQC conducted a survey of professionals from a variety of organizations to find out the types of people challenges that they encounter. Respondents came from different generations and job levels. For its research, APQC defined people challenges as instances in which the action or inaction of other employees makes it more difficult for an individual to achieve his or her goals. Results from the survey indicate that challenges can be categorized into three groups: communication, planning and interpersonal skills.

As shown in Figure 1, the top two challenges employees face regarding their managers are: the sharing of information and giving direction. Just over half of the individuals responding to APQC's survey indicated that their manager does not share enough information, which makes it difficult for employees to do their jobs well. Nearly as many individuals feel that their manager does not provide adequate direction regarding their work.

FIGURE 1

"Top challenges I have with my manager"



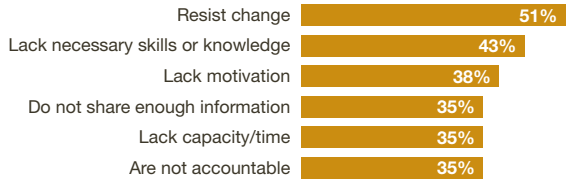
Source: APQC

Managers responding to APQC's survey indicated that they face challenges regarding their direct reports sharing information as well (Figure 2). However, the top two people challenges reported by managers are that their direct reports are resistant to change and that direct reports lack the necessary skills or knowledge needed to do their jobs well.

Organizational leaders can take steps to address immediate needs related to the top

FIGURE 2

"Top challenges I have with my direct reports"



Source: APQC

people challenges faced by both managers and employees. They can develop plans to encourage employees to embrace change, promote training opportunities to direct reports and make better communication with employees a priority.

However, to enact lasting change that reduces staff frustration and drives organizational efficiency, more comprehensive solutions are needed. It is clear from the top challenges that additional development opportunities are needed for managers and leadership. Ideally, this would encompass people skills needed to manage employees, as well as training on more complex capabilities such as change management and communication planning.

Management training opportunities

To understand the types of development offered to managers by organizations, APQC analyzed data on how organizations approach training and development. The results show that organizations rely heavily on traditional avenues for managers to gain skills. As shown in Figure 3, a majority of organizations rely on experience acquired on the job to develop their managers. This is followed closely by feedback given during performance appraisals.

Although on-the-job experience can be helpful for managers, it does not provide these individuals with the tools needed to work with specific types of employees or address complex situations. Rather, this type of development leaves managers to figure out situations on their own, which may result in employees feeling frustrated by a lack of communication or a lack of direction. Performance appraisal feedback can help managers identify broad opportunities for improvement, but does not help managers determine the best course of action for a specific situation as the situation occurs.

Just over half of the organizations surveyed by APQC offer training in people skills to their managers, which can help address some of the top people challenges. Developing people skills can help a manager give clearer directions to employees and improve employee perceptions about whether managers adequately share information and listen to concerns. However, development programs that are more tailored, such as mentoring, peer feedback or one-to-one coaching, are less prevalent among organizations.

Overall, the development opportunities offered by many organizations for their managers rely heavily on managers learning how to approach situations simply through exposure. Although there is no replacement for real-world experience, organizations can do their managers and employees a service by exposing leaders to more formal management training. APQC's research has found that there are organizations across industries that are already offering such programs.

Schneider Electric SE

Schneider Electric SE is an international organization based in France that specializes in energy management and automation hardware, software and services. Schneider Electric promotes a philosophy that talent management supports all 144,000 of its employees in 100 countries, regardless of level within the company. Employees across the organization therefore have equal access to development opportunities.

The organization provides training for high potential employees identified through an annual global talent review campaign that considers performance over time as well as the potential to advance within the organization. Employees selected for this development program represent about 20% to 25% of the Schneider Electric workforce, including about 15,000 managers. These employees gain access to training programs, stretch assignments, special projects and exposure to senior leaders.

FIGURE 3

Approaches used to develop managers

Source: APQC

All managers and leaders participate in Schneider Electric's leadership academy, which provides training on management and leadership fundamentals, such as emotional intelligence. Managers are also required to complete training on performance coaching and hidden or unconscious bias. The training offered by Schneider Electric addresses leadership from a variety of perspectives and combines training modules with both on-the-job experience and projects simulating real-world situations. The comprehensive training provided by Schneider Electric better prepares managers and leaders for situations that may arise when working with direct reports.

An additional benefit of the training offered to managers is that it bolsters the organization's succession planning efforts. As many supply chain organizations well understand, retirements can cause talent gaps in key areas. Having formal manager and leadership training gives Schneider Electric insight into employees who are strong candidates to take on roles being vacated by the departure of long-time employees.

Organizations can support managers by offering training on people skills as well as mentoring opportunities and tools to help identify areas for development.

BAE Systems, Inc.

BAE Systems, Inc. is a U.S. subsidiary of London-based BAE Systems plc, a global aerospace and security solutions organization. This subsidiary has 32,000 employees globally. To get its new people managers thinking about how they can best lead their teams, BAE sends an automatic communication that includes a video outlining the organization's expectations for people managers. The notification also directs these managers to both an online and live version of a course called Essentials of People Management offered by BAE. The organization also sends its new managers a link to its "People Manager Blog" created to assist managers in understanding how they should lead people and in identifying areas for development.

Building a development program

APQC's cross-industry research indicates that managers are in need of a more comprehensive development program that emphasizes people skills as well as strategy and business acumen. This includes managers within supply chain functions, who must balance effective people management with the day-to-day requirements of the business. It is not enough to simply oversee processes; to ensure that their direct reports have the information and support they need to do their jobs well, managers must also take on the role of career mentor, change agent and communications expert.

Organizations can support managers by offering training on people skills as well as mentoring opportunities and tools to help identify areas for development. Both Schneider Electric and BAE provide concrete examples of organizations that take this multifaceted approach to the development of managers. However, APQC recognizes that not every organization can immediately develop a full training curriculum. For these organizations, APQC recommends implementing a training program on a smaller scale, at least initially. This means identifying the areas in which managers need immediate training and then adding on training over time. Whether starting with mentoring, one-on-one coaching, or training on people skills, organizations should keep in mind the important role managers play in creating or addressing people challenges. When identifying areas for development, organizations should consider how manager capabilities can ultimately affect organizational efficiency.

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