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SUPPLY CHAIN MANAGEMENT REVIEW

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Fulfillment

Bob Trebilcock, Editorial Director
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Last month, I was in Atlanta at the Modex trade show. In one sense, it is a tribute to the automation technologies managing today's distribution networks. And, I'm not only talking about automated materials handling systems, but also the software and NextGen technologies such as robotics, wearable technologies, including smart glasses and augmented reality solutions and sensors enabling the Internet of Things.

In another sense, all of these solutions are coming together to drive fulfillment. With the increase in e-commerce, getting the right product to the right customer at the right time has never been more important. As Bryan Jensen, a consultant at St. Onge, once said to me: If you're shipping a carton of blue and green shirts to a retail store and ship one too many green or one too many blue shirts, it's wrong, but no real harm is done. If you're shipping one blue shirt to a customer who planned to wear it out to dinner on Friday night, and you send the green one, you've probably lost a customer. The same holds true if the delivery is delayed until Saturday. What's that old saying? You don't get a second chance to make a first impression.

In the May/June issue of *Supply Chain Management Review*, we're exploring the many facets of fulfillment. We begin with an article on strategies for last-mile delivery—one of the most vexing challenges in order fulfillment today—from MIT's Matthias Winkenbach. And because fulfillment is no longer a one-way street, we are offering research conducted by *SCMR*, the Reverse Logistics Association and the Warehousing Education Research Council (WERC) on best practices in reverse logistics.

Just as last-mile delivery has taken on a new urgency, so too has the packaging utilized for e-commerce fulfillment. According to Kyle Ous, manager of the Packaging Optimization practice for Chainalytics, too many companies are behind the times when it comes to developing an integrated strategy for their e-commerce orders.

Anyone who has looked at the financials of publicly traded retailers or Amazon, the e-commerce behemoth, knows that right now it's hard to meet demanding customer service levels and still turn a profit. So, what happens if e-commerce continues on its projected growth path? That's a question that frequent *SCMR* contributor Robert Lieb sets out to answer. Finally, we round out the issue with a different take on fulfillment, asking about the true cost of outsourcing. Is it enough, as is often the case, to just look at the differential between labor and transportation costs? Or, are there other factors that ought be considered?

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

SUPPLY CHAIN MANAGEMENT REVIEW

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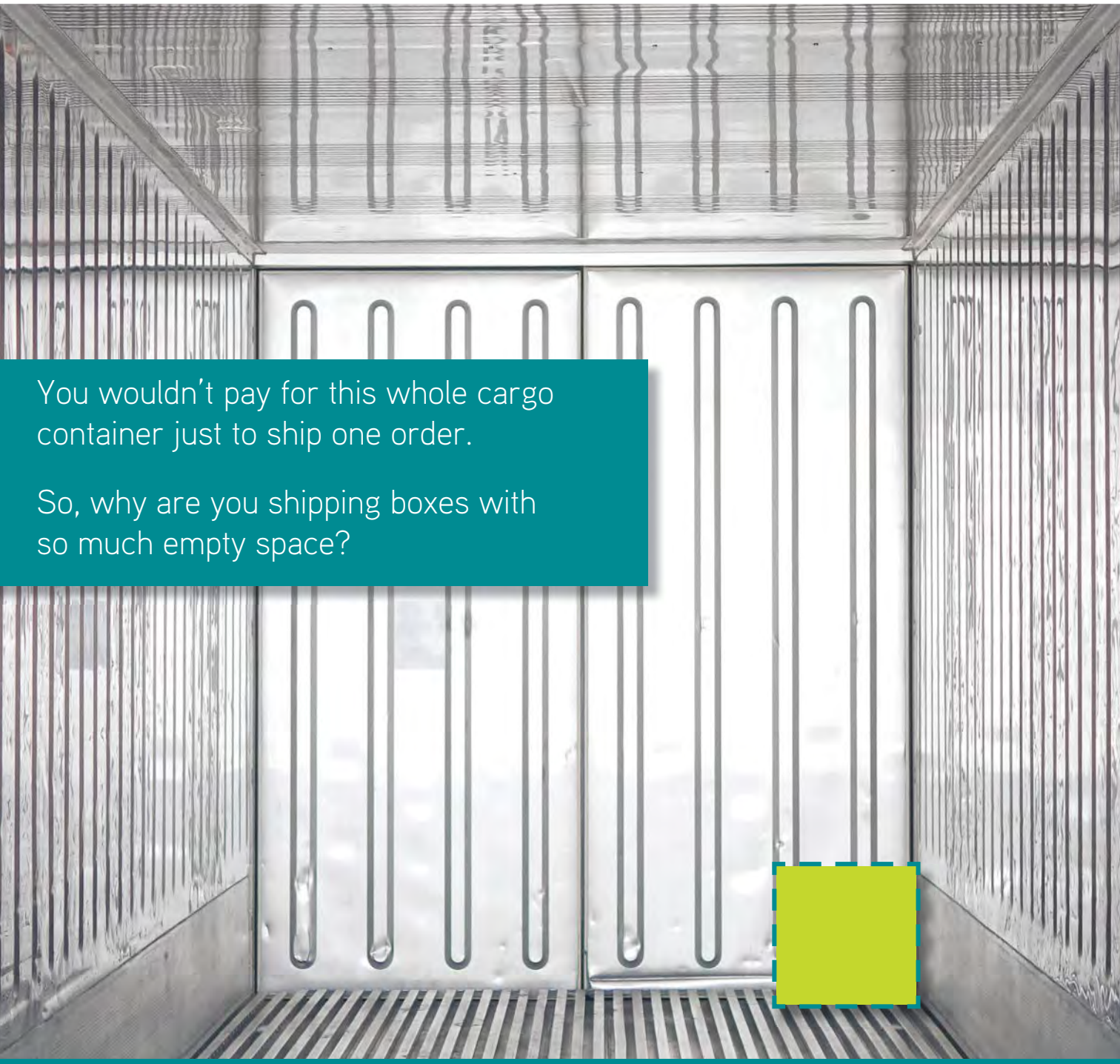

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How data, analytics and connectivity change the way companies manage—and visualize—the most complex part of a global supply chain.

22 The circular supply chain
The boom in e-commerce has led to a record number of returns. How is that affecting supply chains and what are the best practices amongst industry leaders? To find out, SCMR partnered with the Reverse Logistics Association and WERC to survey our readers and their members.

30 Packaging's new role in e-fulfillment
The challenges facing e-commerce shipments don't begin and end with last-mile delivery and reverse logistics. Anyone fulfilling e-commerce orders also has to grapple with the high cost of parcel shipping and consumers who want to minimize the amount of packaging they have to contend with. It's time for a packaging strategy.

36 Many e-tail questions, few answers
Online retailing is changing how consumers shop and how supply chains fill their orders. What that all means for the future is anyone's guess.

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Assessing production costs incompletely was the demise of an already efficient manufacturing plant in Sweden. Here's how total cost of ownership and other key data points could have saved not only the plant's production but also important manufacturing jobs.

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Industrial products forecasting needs sales input

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

The lion's share of demand forecasting publications deal with consumer products and therefore focus more on forecasting demand impacts from the promotional and new product activities of marketing organizations, with less focus on those of the sales organization. In contrast, sales organizations of industrial product companies typically play the most important role in creating and shaping demand—because customers are largely businesses to which they directly sell. I must admit that most of my forecasting publications have been consumer products oriented. Yet, my first major project at a product company, Data General (DG), led to the development of a model to forecast computer revenues based on sales force size and other characteristics.

Sales forecasting at a computer manufacturer

I joined DG, a Fortune 500 industrial products manufacturer of minicomputers, in the early 1980s as a management science analyst in an internal consulting group. The group did in-house analytical projects for various departments within the company. I looked to do my first project with the commercial side of the company, in one of the sales or marketing organizations. A sales support director was my first client at DG, and he was interested in analyzing sales force productivity.

We started the project by collecting data on sales reps and how much they sold each fiscal quarter, as well as other information about them. After much data crunching, we uncovered a correlation between the amount of time a sales rep was with the company and his/her sales performance—a "learning curve" per se. For example, we found that newly hired sales reps sold very little in their first six months at the company. It turned out there was a steep learning curve to selling computers. As a rapidly growing high-tech company with significant sales rep turnover, many of our reps in our "hot" sales markets were fairly new to the company.

The vice president of sales bought into the learning curve concept and agreed that the "correlation" between employment time and a rep's selling performance over time was indeed "causal." Based on his agreement, our project team used the empirical learning curve as the basis for the development of a computerized sales simulation model. The vice president of sales used it to make decisions about hiring and the size of the sales force that was needed to achieve sales targets. The learning curve relationship was updated each quarter and then used as the basis for forecasting computer sales. Future sales rep hiring plans, in conjunction with the employment time of current sales reps, were the major inputs to the model. The model "aged" sales reps with respect to their time with the company over the forecasting horizon. This created a profile of the number of reps in each age category over time, which was then used with the learning curve to forecast quarterly sales.

The model was not only successful, it also became the vice president's decision-support tool for evaluating hiring plans. Later on, the model had its greatest success when it was used to advocate for hiring more sales reps than the company's executive team thought would be necessary to meet sales targets.

Industrial products selling

Most industrial products are highly engineered and sold on the merits of their technical specifications and features. Often these are specified in a request for proposal (RFP) sent out by the customer. At DG, we sold our computers via a direct sales force because it was a technical sell. Our products were not commodities, as many consumer products are, and therefore needed a sales team with product knowledge. Generally little advertising, distribution or promotional activities are required to market industrial products.

At many industrial product companies, the engineering types rule the roost. Executive teams believe that if one designs and builds a great product, customers will flock to their doors to buy them. They feel that there is little need for sophisticated marketing and sales programs. Sales reps are viewed as order-takers not order-makers.

While these executive beliefs may or may not be true, order-taking sales reps do help drive when and in what quantities customers purchase industrial products. So, while they might not create much demand, they certainly help to shape it. The sales rep has to configure the requisite equipment and place a sales order that is accurately configured to meet a customer's RFP-based specifications.

Thus, sales activities need to be seriously considered when forecasting industrial product customer demand, of course, in the context of other considerations. Throughout my career, I've noted a few anecdotes that reinforce this point:

1. I once met a consultant who had an extensive consulting engagement with a large high-tech company's sales organization for whom he had developed a standalone sales forecasting system. And like the one we developed at DG, it evolved to become an important decision-support tool for making sales management decisions. It turned out to be so successful in forecasting that the company's supply chain group decided to incorporate it into its operational forecasting models.

2. I was once briefed by a supply chain manager from Alcatel-Lucent, a telecommunications equipment manufacturer that markets business systems. The manager was responsible for demand forecasting and inventory management in the company. Organizationally, he originally had his forecasters and inventory analysts co-located in the corporate office. After noting that his forecasters were underperforming, he distributed them so as to be co-located in key regional sales offices. He found that when they worked among the sales reps they gained visibility into future sale opportunities that they needed to produce more accurate forecasts. As he said to me (paraphrasing): "I increased my forecasters' salaries, had them live day-to-day with the sales force and only then were they able to provide us with more accurate forecasts."

3. A vice president of supply chain at IBM had gone through a successful major overhaul of its supply chain operations, including the order management function. As he was initially evaluating the function, he found sales reps complaining that they were spending inordinate amounts of time entering orders for integrated computer systems. It was taking too long to put orders into the system that would definitely pass the "system integration" phase when the order was filled. To fix this problem—and enable sales reps to spend more time selling to customers—the vice president implemented an improved order management system and support team. It was such an important element of the major overhaul, that sales rep productivity was one of the targeted goals in his annual performance review.

A sales forecast needs to be developed, not assigned

Typically, when a sales organization produces a so-called sales forecast, it is really what they plan to sell, not forecast to sell. A typical approach to developing a sales plan is to start with an annual national sales target (in dollars), and then portion it out among sales regions. Each region then assigns portions of it to individual sales reps in the region. The resulting numbers are then used to set each rep's annual sales target, upon which his/her commission will be determined. Thus, the real intent of the so-called sales forecast is to align a national sales target by assigning it to sales reps in the regions—not to forecast sales.

Executive teams believe that if one designs and builds a great product, customers will flock to their doors to buy them. They feel that there is little need for sophisticated marketing and sales programs. Sales reps are viewed as order-takers not order-makers.

The problem with these types of sales forecasts is that they are developed based on "gut feelings," rather than on established scientific forecasting methods and principles. Like the DG model, sales forecasting models ought to incorporate the quantitative impacts to sales of various factors about sales force activities, as well as the status of the future sales opportunities (i.e., the sales pipeline) of prospective customers. Generally, historical sales data, which is drawn from transactional order management systems, is critical in consumer products demand forecasting. Meanwhile, in industrial-product forecasting, future prospective customer information drawn from customer relationship management [CRM] systems (such as Salesforce.com) is most critical.

Generally, many business forecasters are skeptical of forecasts produced by a sales organization, mainly because they are not professionally developed. Forecasters who feel this way, especially in industrial-product industries, should not just disregard the sales forecasts. Instead, they should roll up their sleeves and work more closely with sales managers to develop credible sales forecasting models. This will produce more accurate demand forecasts, as well as provide sales management with decision-support tools to help them be more productive.

**Larry Lapide, "Sales Organizations Shape Industrial Product Demand,"* Journal of Business Forecasting, *Spring 2018.*

Is blockchain the missing link in the Halal supply chain?

By Albert Tan, Doan Thanh Xuan, and Ken Cottrill

Occasionally, an innovation arrives that appears to be a tailor-made solution for a long-standing supply chain problem. A current example is the emergence of blockchain technology as a means of improving the traceability of food products, and the urgent need for improved traceability in the Halal food supply chain.

It's a highly complex supply chain that requires trading partners to adhere to rigorous product segregation practices. All too often, however, these practices are not rigorous enough, causing failures that have eroded consumer trust.

Enter blockchain: a technology designed to engender trust with an immutable, tamper-proof database of product flows. The technology does indeed offer much promise as a solution to Halal traceability issues—providing a number of potential pitfalls can be overcome.

Growing market

Halal food is critical to Muslim society. Muslims are required to restrict their diets to the consumption of Halal foods, which comply with the requirements of Shariah law.

These requirements impose strict controls on supply chains. For example, pork and pork-related products must be avoided at all costs, and stringent quality and hygiene rules require Halal products to be carefully segregated from non-Halal products.

Complying with these strictures is no easy task, but there is considerable commercial incentive to develop the requisite practices and systems. The Halal food industry is experiencing dramatic growth in line with the rising Muslim population. According to Pew Research, the number of Muslims is expected to increase by 70%—from 1.8 billion in 2015 to nearly 3 billion in 2060. It is estimated that the Halal food supply chain currently accounts for 16% of the global food market.

Trust issues

The basic structure of the Halal food supply chain starts with slaughterhouses and processing plants. The raw material is shipped to production/manufacturing sites, where the products are made and issued a Halal certificate. From there the food products are transported to a storage facility. Next, they enter the distribution channel and are transported to wholesalers/retailers. Product from different manufacturers is tracked using basic barcoding technology because RFID is expensive to deploy. Thus, there is no way to track back product origins after the items have been delivered to wholesalers/retailers.

Each of these stages must meet strict quality and separation requirements. If there are failures in any one segment, the products are no longer classified as Halal.

There are no standard methods for meeting these track and trace requirements and practices vary from country to country.

For example, in Malaysia, a leading producer of Halal foods, the traceability system is manual, with no real-time tracking and tracing capability. One of the accepted systems involves a trademark logo that is issued by Islamic authorities. Companies that meet the required standards are issued a Halal certificate and can affix the logo to their products.

However, the system is not widely trusted. In one study, 78% of users doubted the authenticity of the Halal certificate and 66% of users were concerned

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about the veracity of the logo. The study showed that users were not confident in the track and trace system used by manufacturers.

Incidents involving Halal product have not helped. For example, in 2014 the Malaysia Ministry of Health discovered that local candy products made by a well-known international brand contained pig DNA. The candy company insisted that its products were Halal-certified, but this certification was subsequently canceled.

Clearly, better track and trace methods are needed, and blockchain technology appears to be an ideal candidate.

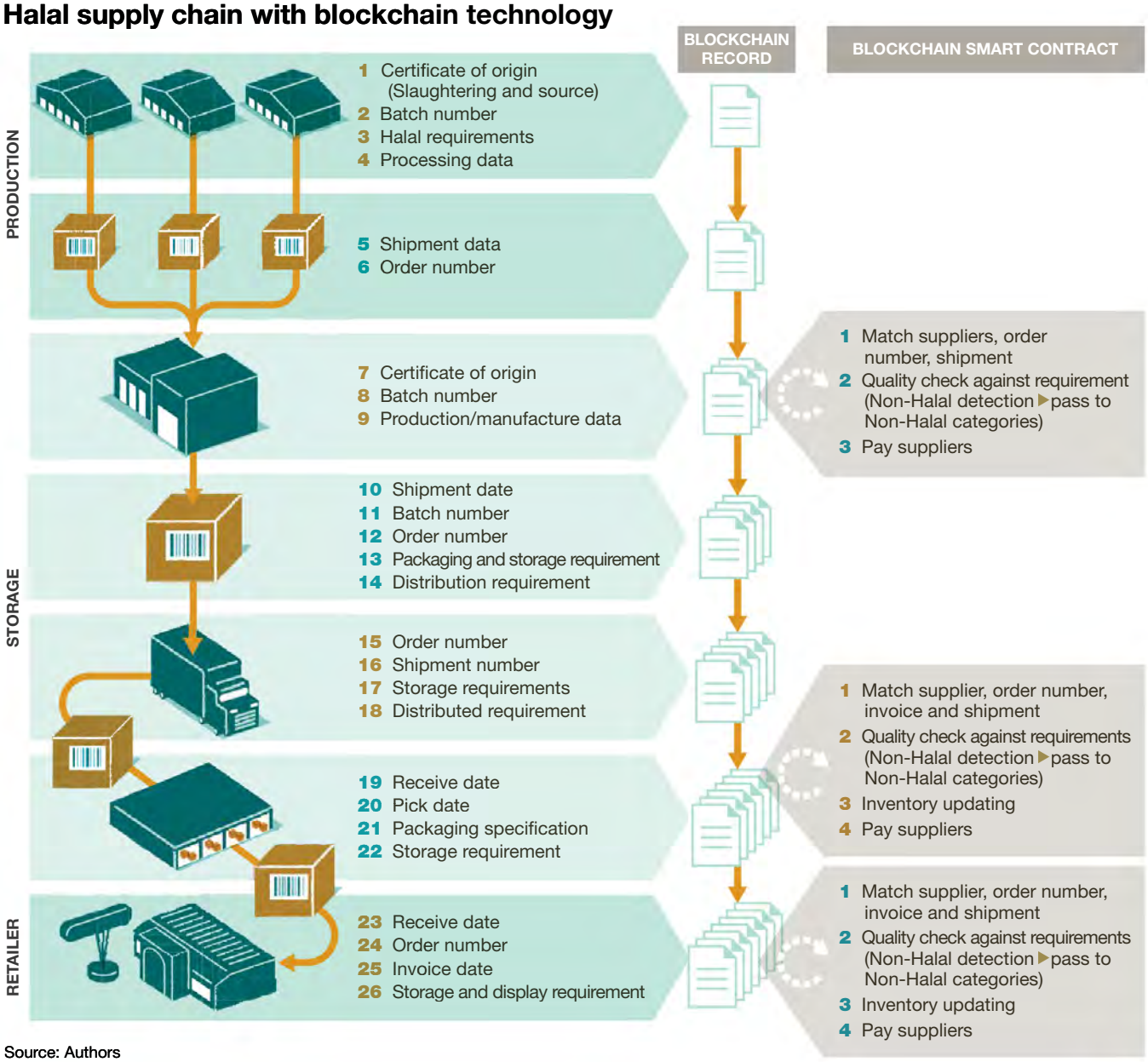
Blockchain benefits

A blockchain-based traceability system in Malaysia could use smart contracts to ensure that Halal products are verified at key points in the supply chain (see Figure 1).

First, Halal information and contractual terms and conditions are encrypted and transferred as a blockchain block. The smart contract is then distributed and replicated by all the nodes in the system. Once an order for Halal product has been received and the contract implemented, the smart contract automatically checks

FIGURE 1

Halal supply chain with blockchain technology



Source: Authors

that the contractual terms are being met.

In all, at least three smart contract checkpoints could be used: at the production, storage, and retailer stages of the supply chain. These three stages are critically important to ensuring traceability. The first stage, production, sets the quality standard, and detecting problems here is generally less complicated and costly than in later stages. Storage is prone to mistakes owing to the risk of cross-contamination. Retail outlets represent the interface with the consumer. An effective check point here could avoid costly recalls and reputational damage.

In all, at least three smart contract checkpoints could be used: at the production, storage, and retailer stages of the supply chain. These three stages are critically important to ensuring traceability.

In addition, blockchain could deliver some significant operational benefits. For example, it eliminates the need for intermediaries to verify sources of foods and ingredients. Also, because the technology provides an immutable record of how much food—beef, for example—is in a product, it is much more difficult to infiltrate non-Halal foods such as pork into the supply chain. Such benefits would build trust.

Recording video of the various supply chain processes and posting it on the blockchain would also reinforce the credibility of the product. Continuous tracking would provide a reliable record of temperatures and other critical parameters.

Challenges

Given these advantages, blockchain is a highly promising solution to Halal traceability problems—with some important riders.

The cost of implementing a system based on the use of smart contracts could be prohibitive. This is especially the case for low-margin, low-price items.

Another issue is that Halal supply chains remain fragmented. For a blockchain system to be effective, the information must be error-free and authentic. Given the supply chain's complexity, the number of actors involved—especially on a global level—and the number of documents that are exchanged, ensuring that these information flows take place is not easy. Moreover, because blockchains are deemed immutable, correcting inaccurate or fraudulent data can be onerous. Consultant firm Accenture recently recommended an "editable blockchain" to overcome this limitation. This is something new that could possibly correct honest mistakes made along the supply chain.

Another consideration is that many of the parties involved are small businesses that will require time and significant investments to migrate to a blockchain system. One possible solution is for a country's Islamic authority to fund the blockchain infrastructure and provide a Cloud-based system that small businesses could subscribe to.

Blockchain is an extremely promising innovation that could transform the Halal supply chain, as well as other highly regulated supply chains. However, several key drawbacks must be addressed before the technology can be applied.

This article is based on research carried out by Doan Thanh Xuan for her master's thesis at MISI and supervised by Dr. Albert Tan. She is currently a procurement officer at a leading food manufacturer in Vietnam. Ongoing research on the Halal supply chain is being conducted at the MISI Center for Sustainable Value Networks. For more information contact Dr. Albert Tan.

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New studies measure the benefits of the circular economy

The concept is conceived as a continuous positive development cycle that preserves and enhances natural capital, optimizes resource yields and minimizes system risks by managing finite stocks and renewable flows.

Two reports from prominent global think tanks bring into question some past "best practices" of supply chain management, which may soon be regarded as not only antiquated, but wasteful as well.

Researchers from the Ellen MacArthur Foundation maintain that the linear "take, make, dispose" model—the dominant economic template of our time—relies on large quantities of easily accessible resources and energy, and therefore is increasingly unfit for today's complex global trade networks.

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

Unfortunately, researchers add, working toward efficiency by reducing the resources and fossil energy consumed per unit of economic output will not alter the finite nature of their stocks—but can only "delay the inevitable."

They conclude that a more fundamental change of the operating system is necessary because the concept of the circular economy has been gaining traction for a variety of obvious reasons. According to the Ellen MacArthur Foundation, the circular economy is characterized (more than defined) as "an economy that is restorative and regenerative by design and which aims to keep products, components and materials at their highest utility and value at all times."

EU model

The study Growth Within: A Circular Economy Vision for a Competitive Europe estimated that a shift to the circular economy development path in three core industry sectors—mobility, food and built environment—would allow Europe to increase resource productivity by up to 3% annually.

In addition, it would generate EUR 1.2 trillion in non-resource and externality benefits, bringing the annual total benefits for Europe to around EUR 1.8 trillion versus the current development scenario.

On a global scale—using different methodologies and performed across different sectorial and geographical scopes—researchers have consistently "monetized" the positive impacts of the circular economy: growing GDP by 0.8%–7%, adding 0.2%–3.0% jobs and reducing carbon emissions by 8%–70%.

Circularity as a "rethinking device" has proved powerful, capable of sparking creative solutions and stimulating innovation. An academic meta-study of the relationship between employment and the circular economy, conducted in the Growth Within report, found a positive effect on jobs in scenarios where the circular economy is implemented.

Researchers admit, however, that despite the repeated demonstration of the benefits of the circular economy, the introduction of some of its core practices—such as performance models—has to date been slower than expected.

The study concludes by asking two provocative questions:

- Could the onset of intelligent assets perhaps provide the missing link to make a step change in the uptake of circular business models—removing barriers that prevent sharing, leasing and performance models from becoming "the new normal?"
- Could the digital revolution offer a blueprint of the infrastructure needed to keep materials in circulation—or could the infrastructure in fact even be fully virtualized?

Digital transformation

A second study seems to indeed suggest the match between the digital development and the circular economy is promising. Intelligent Assets: Unlocking the Circular Economy Potential is a product of Project MainStream, an initiative that leverages the convening power of the World Economic Forum, the circular economy innovation capabilities of the Ellen MacArthur Foundation and the analytical capabilities of McKinsey & Company.

Here, researchers observe that the rapid increase in the number of intelligent assets is reshaping the economy, and this development will create significant value. The number of connected devices is expected to grow to between 25 billion and 50 billion by 2020—up from around 10 billion today.

A growing body of research indicates that this Internet of Things (IoT) offers a trillion- dollar opportunity, brought about by improved production and distribution processes and, perhaps more importantly, a significant shift in the way products are utilized.

Businesses are already exploiting the interactions between the circular economy framework and intelligent assets today, across several sectors, and with a focal point in cities.

By breaking down structural barriers established over time between production and consumption or use, an IoT-enabled circular economy offers considerable opportunities for a multitude of sectors including manufacturing, energy and utilities, built environment and infrastructure, logistics and waste management, and agriculture and fishing.

Both large incumbents and disruptive innovators are rethinking their models and value chains, indicating that the digital revolution is not a niche market, but instead the underpinning of a new economy. With over 80% of global GDP generated in urban areas and multiple opportunities to optimize materials flows, cities are at the forefront of the upcoming transformation.

What is at stake is not incremental change or a gradual digitization of the system as we know it, but a "reboot:" pervasive connectivity rolled out at scale has the power to redefine value generation, while helping emerging economies bypass heavy up front investments and material-intensive solutions.

For example, an ecosystem of intelligent asset-enabled services could jointly open widespread access to reliable, grid-free renewable energy. Solar panels could be provided as a service to individuals and businesses without access to the capital to buy solar panels themselves, through weekly online payments. Battery health monitoring, predictive maintenance of panels, automated management of distribution systems and other IoT-enabled services could complement this model to avoid the massive investment in capital and resources needed to develop a centralized grid infrastructure.

Such a promising horizon entails redefined collaborative mechanisms between technology and the framework within which it operates.

What is at stake is not incremental change or a gradual digitization of the system as we know it, but a "reboot:" pervasive connectivity rolled out at scale has the power to redefine value generation, while helping emerging economies bypass heavy up front investments and material-intensive solutions.

At the confines of innovation and regulation, creativity needs to be called upon in order to manage the complex questions raised by data circulation and capture, compatibility of systems and intellectual property.

Several experts consulted have remarked that companies need to shift away from a protective approach and closed innovation, towards more open-source, collaborative data platforms. At the same time, the proliferation of sensing equipment in society raises important questions about data security and privacy. Addressing these challenges requires new rules of the game that will allow the fast-moving technology and market trends to evolve.

The report concludes by noting that companies and policy makers would need a "multi-stakeholder" approach to create such conditions. Should this strategy prove if successful it could lay the groundwork for solving several of the core challenges for designing an economy that is truly restorative and regenerative.

Higher oil and fuel prices, increased volatility on tap for rest of 2018

Derik Andreoli is the director of economic analysis and forecasting at Mercator International, LLC. He welcomes comments or questions and can be contacted at dandreoli@mercatorintl.com.

As expected, oil markets continued to tighten over the course of the first quarter, and there is every reason to expect that markets will remain tight through the rest of the year. Consequently, oil prices will continue to face upward pressure, and—perhaps even more importantly—oil prices will become even more sensitive to geopolitical disruptions.

Strong global demand

Strong global demand has underpinned the nearly 60% oil price increase that has occurred since last summer. Over the course of last year, global oil consumption grew by 1.8%, and demand was 2.1% higher in the first quarter of 2018 than it was in the first quarter of 2017.

A continued strengthening of the global economy should correlate to a slight acceleration in global oil consumption through the end of the year. While world GDP grew by a healthy rate of 3.7% in 2017, the consensus outlook among 10a investment banks is for the world economy to grow by 4.0% this year.

"Production statistics suggest that OPEC may not be capable of bringing enough new oil to the market to account for growing global demand in light of Venezuela's production crisis."

Over the first quarter, we have already seen strong economic growth in the U.S., China and Japan, which are the top three oil-consuming economies. Through the rest of the year, oil consumption should continue to be strong, with year-over-year growth between 1.6% and 1.8%. With global oil liquids consumption at just under 100 million barrels per day, this equates to an increase of between 1.6 million barrels and 1.8 million barrels per day.

Global supply: The glut is gone

In May 2017, OECD stocks hovered around 275 million barrels above the five-year average. By press time, this surplus will most likely have disappeared all together as the glut has been contracting at a rate of around 800 thousand barrels per day. Not coincidentally, oil production from the "OPEC 14" is down by approximately 750,000 barrels per day over this period.

What remains to be seen is whether OPEC can lift production to the degree necessary to ease upward pressure once they decide to uncork the taps. Production statistics suggest that OPEC may not be capable of bringing enough new oil to the market to account for growing global demand in light of Venezuela's production crisis.

While Saudi Arabia has led the way with production cuts, Saudi volumes produced in April are only around 500,000 barrels per day lower than the kingdom's maximum sustainable production rate. While they remain the world's pivot producer, it does not appear that they alone could stem the stock withdrawals.

The UAE could most likely add another 100,000 barrels per day to OPEC production, but increasing to this level would bring them to a production level above which they were only able to maintain for a brief period once before.

Other than Saudi Arabia and the UAE, the only other OPEC country that appears capable of lifting output to a meaningful degree is Kuwait, which appears poised to add an additional 100,000 barrels per day to the cartel's total output. Together, these three countries appear capable of bringing an additional 700,000 barrels per day to the system.

A whole host of other OPEC producers have encountered production challenges over the last

six months. Libya and Nigeria are both exempt from OPEC production cut quotas, but production from both countries has plateaued since the summer of 2017.

Similarly, while Iraq is bound to production quotas, it appears that the country is producing at a maximum rate. It might be possible for Iraq to lift production, but

"While the possibility of Iran lifting oil production appears to be remote, the risk that oil sanctions will be re-imposed is not. The nuclear deal that eliminated sanctions is set to sunset in May, so unless a new agreement is hammered out in the next few weeks we should expect production to fall to some degree."

we should not count on Iraq being able to add more than 50,000 barrels per day to OPEC production at this point. Adding Iraq's potential contribution to Saudi Arabia, the UAE, and Kuwait brings the total OPEC potential increase up to 750,000 barrels per day.

Under the OPEC quotas, Iran could produce more than 4 million barrels per day and still not violate the OPEC production quota. The problem is that Iran's oil production has been flat for the last 12 months. This is especially telling considering that the country is in desperate need of petrodollars to ease a recent run on the rial, which has lost half of its value in recent months.

While the possibility of Iran lifting oil production appears to be remote, the risk that oil sanctions will be re-imposed is not. The nuclear deal that eliminated sanctions is set to sunset in May, so unless a new agreement is hammered out in the next few weeks we should expect production to fall to some degree.

Russia could probably lift production by as much as 150,000 barrels per day, and adding this to the 750,000 barrels per day from OPEC, we might expect the volume that could be brought back online is around 900,000 barrels per day.

This would be more than sufficient to cover the current stock draw of 800,000 barrels per day, but from this volume we need to back out some amount to account for Venezuela's production crisis. Over the last year, Venezuelan production has fallen by 500,000 barrels per day, and 400,000 of the loss has come in the last six months alone. Even if Venezuela is able to significantly arrest this slide, it wouldn't take much to erase the 100,000 barrel per day cushion.

While the outlook for U.S. oil production remains quite bright, we must recognize that OECD stocks were drawn down over the last 12 months despite U.S. production increasing by 1.6 million barrels per day. In short, if U.S. production continues to surge, it could be sufficient to cover the expected increase in global demand.

If the United states covers the incremental new oil demand, we are left with the problem that stocks have been drawn down at a rate of 800,000 barrels per day, and it doesn't appear that OPEC and Russia combined can lift production by that amount unless the decline in Venezuelan production is arrested.

Tight markets: Rising prices and increased volatility

Oil prices have been climbing in a more-or-less steady state since last summer, and while recent geopolitical events have certainly had an impact on prices, it would be wrong to conclude that oil prices are being overinflated by a risk premium. The fact remains that oil supply has fallen well short of demand, and the analysis

above suggests that this will remain the case.

At the end of last year when formulating an oil and fuel price outlook for an annual rate outlook, I explained that the fundamentals supported a continuation of the upward trend in prices. At the time, a barrel of oil would fetch around $58, and I predicted that by the end of the first half, prices would rise 20% to just under $70. At the time of writing, WTI is trading at $68 per barrel.

If the global economy yields to the consensus forecast, oil prices will continue to climb through the third and fourth quarter, and we may see $80 oil by the end of the year.

The analytics revolution in LAST-MILE *Delivery*

How data, analytics and connectivity change the way companies manage—and visualize—the most complex part of a global supply chain.

BY MATTHIAS WINKENBACH

Urbanization is progressing at a rapid pace. The United Nations projects that by 2030 the number of so-called megacities of over 10 million inhabitants will rise to well above 40. About two-thirds of the global population is expected to reside in cities by 2050. Without a doubt, cities represent the epicenters of future global economic growth as well as the social, technological and cultural advancement of humanity.

The supply chain implications of these trends are profound. To remain competitive, companies across all sectors, industries and markets need to succeed at serving urban customers and consumers. This is particularly true in retail, where the battle over future consumer markets is largely a battle over who excels at managing the urban last mile of physical distribution.

Strategies for change

As urban populations grow, cities are becoming an increasingly complex and uncertain operational environment. The key driver of this complexity is a rapid increase in urban density. The potential of any city to grow in geographical size is naturally bounded. At some point, cities find that to keep growing they must build upwards to accommodate more people, businesses and activities.

However, these growth strategies also lead to rising levels of congestion across the urban transportation infrastructure and an increased likelihood of accidents and other random disruptions to urban mobility. Planning efficient and reliable

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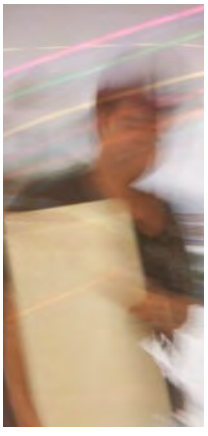
last-mile delivery operations is thus becoming more challenging and requires higher levels of operational flexibility and redundancy from urban distribution systems.

At the same time, the retail industry is facing a continuing boom in e-commerce together with rapidly rising customer expectations regarding the speed, timeliness, flexibility and customization of last-mile delivery services.

Heavily cross-subsidized premium delivery services offered by some of the major e-commerce platforms are gradually educating consumers to further postpone their purchase decisions, as they can rely on the availability of affordable, fast-track delivery at all times. This trend toward "on-demand consumerism" renders the last-mile performance of a company's logistics operations a critical competitive factor.

However, it also leads to a massive increase in the spatial and temporal fragmentation of urban deliveries, making it increasingly difficult for logistics service providers to consolidate shipments into efficient delivery routes.



Driven by significant advances in sensor technology, mobile computing, mobile data and vehicle connectivity, real-time visibility is no longer limited to aggregate information on stationary items at distribution and warehousing facilities.

These trends could render the provision of delivery services to urban markets increasingly unsustainable, unless companies fundamentally rethink their approach to last-mile logistics. Without substantial paradigm shifts in the design, planning and operation of last-mile logistics, urban goods distribution will become—and remain—economically unprofitable. Moreover, delivery operations will burden urban environments with more traffic congestion and associated noise and emissions pollution.

One way in which companies can redefine last-mile logistics is by adopting anticipatory planning and flexible operations that allow for dynamic and pro-active adjustments to rapidly changing operational conditions and market requirements. Another strategy is to build multi-echelon network architectures and multi-modal delivery models, integrating connected and potentially autonomous technologies into smart cyber-physical systems. Both of these options require companies to deploy advanced analytics, powered by diverse sources of high-resolution data and supported by highly connected and sensor-equipped operations.

Mobile data and connectivity as key enablers

A number of companies, especially in the fast-moving consumer goods industry and in e-commerce, have realized that they need to challenge traditional last-mile delivery solutions in light of recent advances in data analytics and technology. Supported by state-of-the-art research from MIT, some enterprises are leveraging their existing data sources. They are using transactional records, delivery data from individual routes, high-resolution telemetry and movement data on the level of individual vehicles to develop a more precise picture of their last-mile logistics operations.

Similarly, publicly available data sources are becoming increasingly relevant for the optimal design and planning of last-mile delivery systems and processes. These data sources provide insights into the operational and commercial environment—from road infrastructure characteristics to traffic and congestion dynamics to socio-demographic profiles of the customer base.

These are important advances—but they have certain limitations. Most of these data sources describe urban markets in retrospect; many are even static in nature. This information is valuable in discovering and understanding systematic patterns in how urban markets and the associated logistics services function and perform historically, and in predicting how they may evolve in the future. However, the information is limited in its potential to improve the way companies dynamically react and proactively adapt to short-term fluctuations in the marketplace and the operational environment on tactical and operational levels.

With the rise of Internet of Things (IoT) sensor networks, companies are now able to obtain reliable, high-resolution and real-time visibility into their transportation networks. Moreover, this visibility is not limited to the status and location of shipments, or to the inventory levels of individual storage locations. It is now possible to obtain system-wide insights into the number, status, location and expected trajectory of products and shipments along their entire journey from their upstream source or vendor to the

final recipient. Driven by significant advances in sensor technology, mobile computing, mobile data and vehicle connectivity, real-time visibility is no longer limited to aggregate information on stationary items at distribution and warehousing facilities. It is now possible to achieve real-time visibility for in-transit volumes down to the level of individual items or shipments.

This new level of detail and dynamism enables companies to substantially reduce the number of blind spots in their distribution networks. Previously, these blind spots prevented them from dynamically adjusting their last-mile distribution approach to changing market dynamics, or to proactively mitigate the effects of disruptions to their last-mile operations.

The data analytics revolution

Another key development is the availability of advanced analytics. The recent methodological advances in this field will have a major impact on last-mile logistics on three levels.

First, advanced analytics—and in particular a group of tools commonly known as machine learning—can help companies to better understand urban markets, customers and operational environments. This is particularly relevant when serving a large and highly fragmented customer base. Such tools can provide substantial business value by revealing customer-specific insights that would have otherwise remained hidden or too costly to identify.

More companies across sectors, industries and geographies are reaching out to academic partners to develop prescriptive decision support tools based on high-performance optimization and simulation techniques.

For instance, a leading global brewing company recently partnered with researchers from the MIT Megacity Logistics Lab to use data to improve the operational efficiency of its global last-mile delivery operations. Based on historic route plans and delivery records, machine learning tools helped identify customer-specific delivery constraints in a pool of hundreds of thousands of customers around the world—from big box retailers in the U.S. to single-owner operated nanostores in emerging markets. The analyses helped to identify those customers that are most disruptive to the efficient operation of that company's delivery operations due to their hidden delivery constraints. The company was then able to address these issues by re-incorporating the information into its route planning algorithms, or by reconfiguring distribution services for certain customers.

Similarly, machine learning can help reveal and exploit the local knowledge and expertise of a company's distribution workforce. For instance, the analysis of high-resolution GPS traces in conjunction with telemetry data and transactional records can provide relevant insights on the availability and suitability of local infrastructure such as roads and parking bays for last-mile delivery. The data can reveal behavioral patterns of drivers and delivery crews that have local knowledge about their route territory and know better than any algorithm or data source where to park, which shortcut to take, or which congestion hotspot to avoid. Extracting this knowledge without having to disrupt crew member workflows can achieve significant improvements in route planning and more effective delivery instructions. Companies also can maximize service levels and minimize cost inefficiencies due to inaccurate planning.

Large-scale optimization models informed by descriptive and predictive analyses of both historic and real-time data can provide answers to these and other questions.

Second, state-of-the-art analytics of the increasing amounts of readily available, high-resolution data can help predict last-mile operations at much higher levels of detail and accuracy.

In light of rapidly increasing customer expectations regarding delivery speed and responsiveness, detailed and accurate spatio-temporal demand forecasts—i.e. understanding what, where and when customers will order—are becoming indispensable. At the same time, shorter delivery lead times give companies limited leeway to compensate for short-term fluctuations in traffic conditions or the availability and pricing of (potentially crowd-sourced) carrier capacities.

Advanced analytics can also be used to develop reliable near-term predictions of traffic dynamics and resource availabilities, taking into account historic patterns as well as real-time information on influencing factors such as weather or other relevant events. Such capabilities are crucially important to guaranteeing high

levels of service to increasingly demanding customers.

Lastly, advanced analytics can inform a new generation of prescriptive analyses, helping companies make the right trade-offs and decisions during the strategic design, tactical planning and day-to-day operations of fast, reliable and responsive last-mile distribution systems. More companies across sectors, industries and geographies are reaching out to academic partners to develop prescriptive decision support tools based on high-performance optimization and simulation techniques.

Questions and answers

To gain an understanding of how analytics can be deployed to improve last-mile logistics, it's helpful to look at specific questions that the technology can address.

Changing urban environments and customer needs require new approaches to the design of urban distribution networks. They also raise several questions for supply chain managers and logisticians. For instance, how can a company transition from a traditional, static, single-tiered, uni-modal urban distribution approach that is built around various dimensions of operational flexibility? Especially when such a network must also allow for dynamic changes in the company's distribution approach in response to dynamically unfolding customer requirements and operational conditions such as traffic or weather. And, how can enterprises design, plan and operate a distribution network that is built on a combination of various vehicle technologies, delivery models and supporting distribution facilities?

To avoid being blindsided by the analytics revolution in last-mile logistics, many companies need to build internal capabilities and collaborate with external knowledge centers such as academic institutions.

Large-scale optimization models informed by descriptive and predictive analyses of both historic and real-time data can provide answers to these and other questions.

Faster, more responsive last-mile delivery services can also have major implications on inventory management—raising more questions. How, where and in what quantities should a company allocate its inventory so that it can quickly respond to customer requests at various service levels? What is the impact of decentralizing inventory in a network of hyper-local storage locations in order to move closer to the urban customer? Can service levels be improved and cost reduced by sharing inventories across a network of fulfillment locations, or by making them mobile?

Simulation and analytical approximation methods can provide insights to these questions, based on an in-depth understanding of the spatio-temporal dynamics of urban demand obtained from advanced analytics of last-mile Big Data.

At the operational level, more flexible delivery models require more sophisticated route planning capabilities. Logisticians must ask: How should delivery vehicles be dynamically routed in response to unfolding uncertainty of demand and operational conditions? How can multi-tiered and multi-modal delivery models that rely on multiple vehicle systems that work hand-in-hand be perfectly synchronized into an efficient and reliable service? How will the introduction of (partially) autonomous technology and unmanned aerial or terrestrial vehicles affect the design, planning and operation of such systems?

These and other questions can only be answered by smartly combining large-scale optimization, high-resolution simulation, and detailed near-term prediction of market dynamics, environmental conditions and delivery operations.

Communicating about data

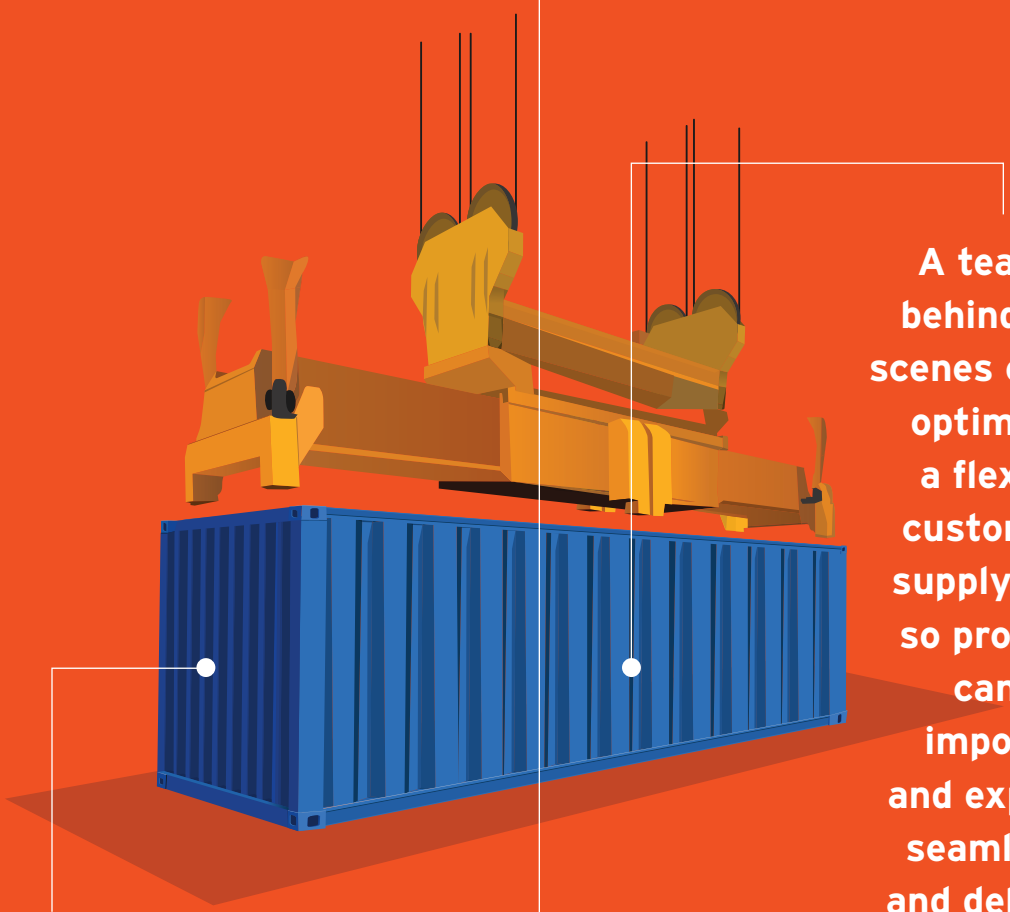
In an increasingly customer-centric and service-oriented market environment, companies need to take a leap of faith to embrace these new methods of leveraging data and analytics for their strategic, tactical and operational decision making. To many companies this appears particularly challenging because the use of data and analytics is not ingrained in their corporate culture. What's more, many lack the internal capabilities to develop such tools on their own.

To avoid being blindsided by the analytics revolution in last-mile logistics, many companies need to build internal capabilities and collaborate with external knowledge centers such as academic institutions. Moreover, they need to initiate a cultural change that enables them to develop and apply advanced analytics and quantitative methods both tactically and strategically.

For example, some companies—even in traditional industries—are turning advanced analytical methods from black boxes into trusted toolsets by building advanced analytics teams and centers of excellence that operate outside of their day-to-day business operations. These

MOST SEE

WE SEE



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teams identify issues that benefit the most from analytical approaches to problem solving, and provide the expertise that business units and, ultimately, the whole organization, need to put these solutions into practice.

Turning advanced analytics into actionable insights, however, requires a second group of people that is often neglected in companies' efforts to build analytics expertise—the data translators. Data translators bridge the gap between advanced analytics experts (usually referred to as data scientists) and domain experts who run the business on a daily basis.

Educational institutions such as MIT should develop graduate and professional programs that educate supply chain and logistics professionals to become data translators. Industry needs to engage with academia to align research agendas and academic curricula with the real-world challenges faced by practitioners in making the next generation of last-mile distribution systems become a reality.

Visualization has a key role to play in achieving these goals. Current display standards as well as rapidly emerging technologies such as augmented and virtual reality allow for rich, high-fidelity visual representations of complex datasets along with the mechanics and results of advanced analytical methods that are built on top of these datasets. These visual representations are a powerful tool that enables domain experts to understand, validate and trust the data and the outcomes of sophisticated analyses. Individuals can interact with these representations and conduct what-if analyses, or move from high-level, aggregate views of supply chains to arbitrarily granular views. As technology evolves, interactive visualization will become an indispensable decision-making tool.

To support the logistics industry in embracing this development, the MIT Center for Transportation and Logistics has partnered with leading companies to conduct research and develop tools at the intersection of last-mile logistics, advanced data science, and interactive information visualization within the newly created Computational and Visual Education (CAVE) Lab.

Benefits from sharing data on a system level

Aside from promoting the use of data and analytics within individual companies, a huge untapped potential to improve the efficiency and long-term sustainability of urban last-mile delivery operation lies in cross-vendor collaboration and data sharing.

Already, some of the major express logistics and parcel delivery services are investing heavily in the analysis and commercialization of data that their vehicle and courier fleets can collect in cities around the world, every day of the year.

Today's last-mile operations are highly fragmented across multiple carriers and logistics service providers, leading to suboptimal asset utilization. Hundreds of thousands of unnecessary miles and hours traveled are expended within already congested and polluted urban centers. There is fierce competition for the increasingly scarce resource of urban transport infrastructure capacity.

Attempts by policy makers and legislators around the world to force vendors to collaborate, coordinate and consolidate urban shipments have largely failed. The solution to the problem may, once again, be technology.

Technological advances are enabling increasingly seamless, low-cost and platform-independent connectivity between vehicles, distribution facilities, infrastructure components, shippers, carriers and customers. The transaction cost, risk, and operational friction caused by sharing information and assets across players will reduce substantially over the coming years. This trend may be reinforced by technologies such as blockchain that reduce the effort, risk and cost of validating information, executing contractual agreements and processing transactions of money, goods and services further.

With regards to system-level connectivity and data sharing, there are four major directions in which urban last-mile delivery operations will experience transformational shifts driven by new levels of connectivity in the near future:

- Vendor-to-vendor, carrier-to-carrier, and vendor-to-carrier connectivity will finally enable the safe, efficient and mutually beneficial sharing of transportation infrastructure, facilities and fleets; a tight coordination and consolidation of shipments across vendors and carriers; and an efficient integration of downstream last-mile delivery operations, upstream

first-mile pick-up operations, and reverse logistics flows.

- Vehicle-to-infrastructure connectivity will allow for a paradigm shift away from individual-vehicle route optimization toward a system-level optimization of overall urban mobility by jointly optimizing vehicle flows and sharing information about traffic, accidents, the availability of parking spaces and other relevant operational constraints to last-mile delivery.
- Machine-to-machine connectivity will enable more streamlined and efficient interactions between multiple vehicle systems (e.g., trucks and cargo cycles or bike couriers) in multi-modal delivery models. It is also a crucial prerequisite for the large-scale deployment of autonomous vehicle systems for last-mile delivery.
- Carrier-to-cloud or crowd-to-cloud connectivity will encourage the massive sharing of (potentially crowd-sourced) historic and real-time information on road and traffic conditions, customer-specific delivery requirements and other defining actors of last-mile efficiency.

The latter trend will also enable new commercialization models for last-mile data and analytics as a service. Already, some of the major express logistics and parcel delivery services are investing heavily in the analysis and commercialization of data that their vehicle and courier fleets can collect in cities around the world, every day of the year.

Future challenges

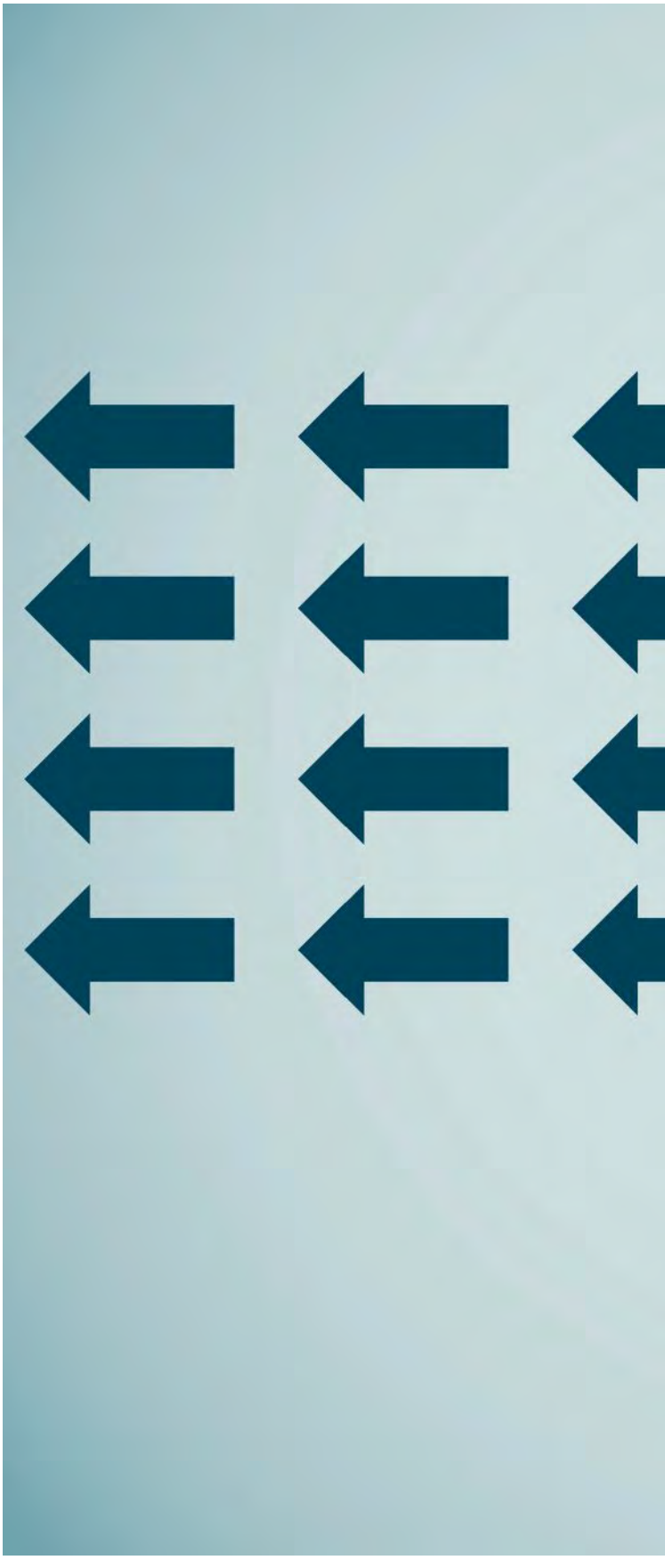
Rising demand from consumers, who are increasingly intolerant of service failures, coupled with urbanization and more intense competition is forcing companies to rethink their last-mile delivery supply chains.

Developments in data analytics will play a key role in meeting these challenges. But first, companies must build capabilities that allow them to use analytics creatively, and, crucially, to have the confidence to implement solutions based on these analyses.

THE CIRCULAR SUPPLY CHAIN

The boom in e-commerce has led to a record number of returns. How is that affecting supply chains and what are the best practices amongst industry leaders? To find out, *SCMR* partnered with the Reverse Logistics Association and WERC to survey our readers and their members.

BY JUDD ASCHENBRAND, MICHAEL MIKITKA, TONY SCIARROTTA AND BOB TREBILCOCK



It's a law of gravity that what goes up must come down. The corollary for e-commerce is that much of what goes out will come back—think of it as a circular supply chain. Or, as the *Wall Street Journal* put it last February: "Retailers still celebrating their strongest holiday sales in years now face the less-pleasant task of disposing of billions of dollars in returned merchandise."

In the same article, Zac Rogers, an operations and supply chain professor at Colorado State University, estimated that post-retail sales, which includes returns and over-stock

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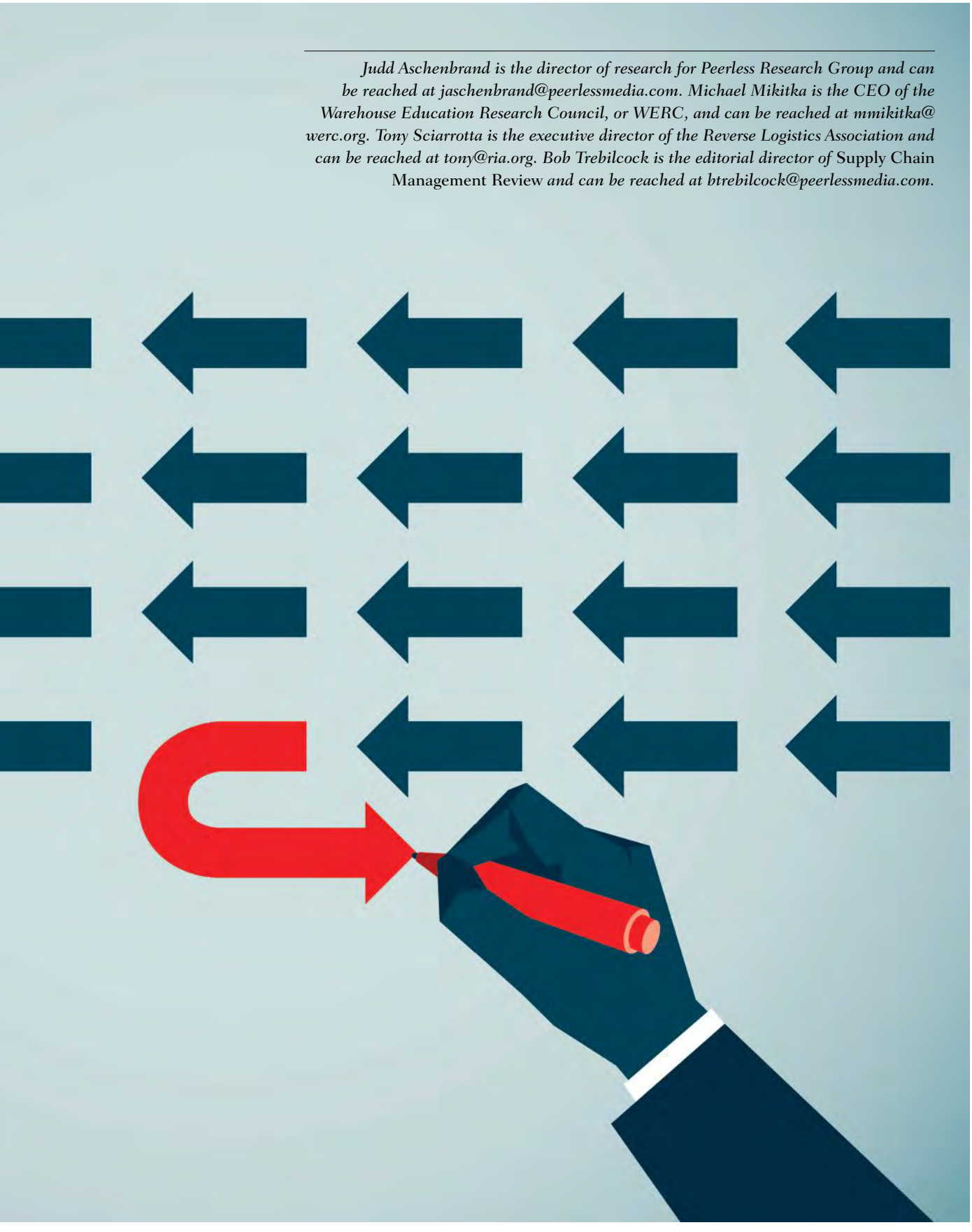


items, is growing at an estimated 7.5% a year. Meanwhile, Optoro, a third-party logistics provider, estimated that roughly 13%, or $90 billion, of this year's holiday sales, would pass through the reverse supply chain by the end of February.

While that estimate includes all verticals, in some fashion categories, such as shoes, the returns rate is estimated to be as high as 70%. Amy Augustine, the senior manager of reverse logistics for U.S. Cellular, estimates that her organization handled nearly 550,000 returned electronic devices and accessories in 2017 (see sidebar). Those devices all had to be shipped, received, inspected and resold or disposed of in a way that delivers value to the organization.

At U.S. Cellular, reverse logistics is a mature operation. Augustine has been in her role for five years, with clear lines of responsibility. Not only does she have a team reporting directly to her, there is a line of command to the C suite. "Our leadership is aware that there is a cost associated with reverse logistics," says Augustine. "They want to understand the holistic picture from soup to nuts." Augustine points out that reverse logistics was cash flow positive last year.

But is U.S. Cellular the exception or the rule? Do most organizations have an executive who owns the reverse logistics process? Have most organizations implemented best practices for handling and disposing of returns in a manner that delivers value? Is the executive suite aware of the costs and potential revenue to be gleaned from returns? And, if not, are organizations preparing for the future or just muddling through?

Those are among the questions the Reverse Logistics Association, *Supply Chain Management Review* and WERC set out to answer in a recent survey of readers and members (see "About our research").

Our bottom line: Organizations like U.S. Cellular that are paying attention to returns are realizing a benefit that either adds to or minimizes the hit to their bottom line. At the same time, the U.S. Cellulars of the world are the exceptions and not the rule as too few organizations are devoting sufficient resources to their reverse logistics processes.

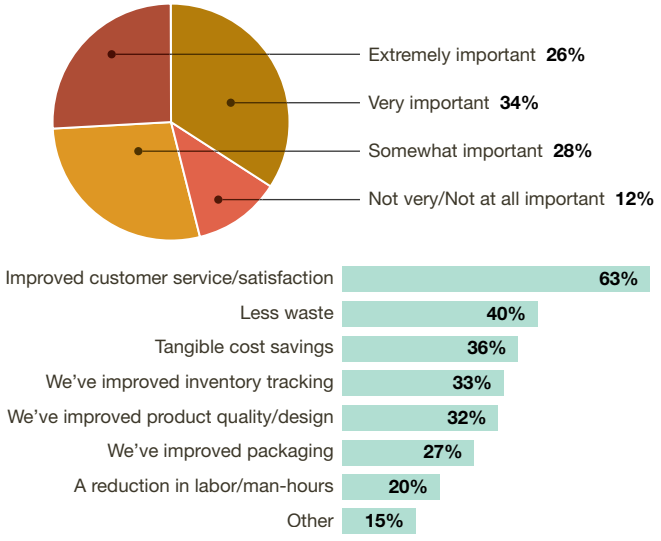
The who's who of reverse logistics

One of the truisms of business, attributed to management guru Peter Drucker, is that what gets measured gets managed. Now, truth be told, Drucker went on to add that the practice is true "even when it's pointless to measure and manage it …" We would argue that when it comes to the sheer volume of returns coupled with the growth of e-commerce, failing to measure the logistics, labor and revenue associated with reverse logistics is far from pointless—it's no longer an option.

Survey respondents do recognize that when done right, reverse logistics delivers value to the organization. Nearly two-thirds, for instance, cited improved customer service and satisfaction as a benefit of their reverse logistics processes, followed by less waste (40%) and tangible cost savings (36%) At the same time, just 60% said that reverse logistics was extremely important (26%) or very important (34%) to their company. You have to wonder why.

FIGURE 1

How important is reverse logistics to your organization?



The first step in raising the visibility of returns is having someone responsible for the process. Yet, based on survey responses, in many respects returns and reverse logistics is an orphaned function, with no one clearly claiming parental responsibility. Only 17% reported that they had a department dedicated to reverse logistics and

another 16% responded that reverse logistics was organized under a single group or department—which might have other priorities. The latter ranged from logistics (31%) to distribution (16%) to supply chain (14%) to sales (7%). Nearly 60% responded that reverse logistics is handled across more than one department, ranging from logistics (55%) to sales (30%) to finance (14%) to product marketing (7%).

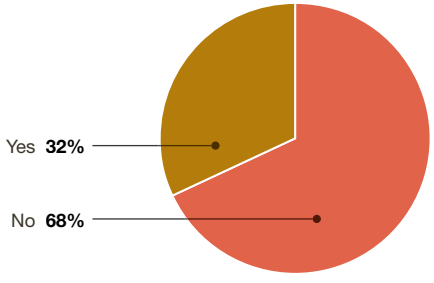
The titles of respondents, which ranged from corporate directors to operations managers to purchasing managers, reflects that diversity. Indeed, only 9% of respondents were managers or directors of reverse logistics. You can read more about the breakdown of respondents in the "About our research" sidebar.

Perhaps the most telling response was that more than two-thirds of respondents (68%) said that no one at the corporate level in their company was responsible for reverse logistics. Nor are senior leaders overseeing the process as a rule: Only 15% of the reverse logistics managers reported to a vice president of operations while only 13% each reported to the CEO or president and only 9% reported to a vice president of supply chain.

Rather, the responsibility for reverse logistics was largely doled out to department managers (44%) or supervisors (13%) in logistics, warehousing, inventory management and other

FIGURE 2

Does your company have someone on a corporate/C-level who is responsible for reverse logistics?



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departments associated with traditional supply chain management functions. Senior leaders at the president/CEO (16%) or vice president (18%) level accounted for just over one-third of respondents. The list of titles to whom the individual in charge of reverse logistics reported was equally diverse, with some 26 titles; the question of who else was involved in reverse logis-

About our research

This research was conducted in January 2018 by Peerless Research Group on behalf of the Reverse Logistics Association, *Supply Chain Management Review* and the Warehousing Education and Research Council. The study was conducted to better understand how organizations are handling their reverse logistics operations. The results are based on 272 qualified respondents and has a margin of error of +/- 6.1%.

Respondents represented a broad range of titles, including corporate/divisional director (11%), VP/general manager (14%), logistics/distribution director/manager (19%), warehouse/DC director/manager (8%), supply chain director/manager (7%), operations director/manager (7%), reverse logistics/returns director/manager (9%) and purchasing director/manager (2%). An additional 23% of respondents listed their title as engineer, inventory control manager, logistics supervisor, owner, product engineer, purchasing and logistics manager, sales or shipping supervisor.

More than one-third of respondents were manufacturers (34%), followed by 3PLs and transportation/warehousing service providers (33%), wholesale distributors (12%), retailers (7%), e-tailers (6%) and consultants (6%). More than one-third (34%) listed their primary business as business-to-business while 11% noted that they primarily sold directly to consumers; the remaining 55% sold into both channels. The average revenue of respondents was $862.7 million, with 27% indicating revenues of more than $1 billion; at the other end of the scale, 37% indicated revenues of less than $50,000.

tics operations produced a list of 50 other titles.

The impression is that while the number of returns continues to grow, reverse logistics is largely in the hands of mid-level managers, with responsibility spread across a multitude of departments and with little oversight at the senior level.

Returns basics

The "make or buy" decision could be one of the most important decisions related to any logistics or distribution function. In the case of reverse logistics, more than two-thirds of respondents (68%) are handling their returns operations in-house and another 2% indicated that they outsource now but plan to pull those tasks back under their control. Meanwhile, 13% responded that they outsource all of their reverse logistics operations and an equal percentage outsource some tasks but keep others in-house. Only 4% of those who currently do it in-house plan to outsource to a 3PL in the future.

Why do it yourself? More than half (54%) said it allows them to keep better control, while 51% said they can be more responsive to customers, 47% have the resources to handle in-house and 45% believe they can do it for less expense.

Of those currently outsourcing, 60% said it is not their core competency and an equal percentage believe it's more cost-effective to outsource. Interestingly, 38% believe that a 3PL can be more responsive to customers, 33% said they just don't have the resources or labor to do it in house, and 25% are limited by space in their facilities.

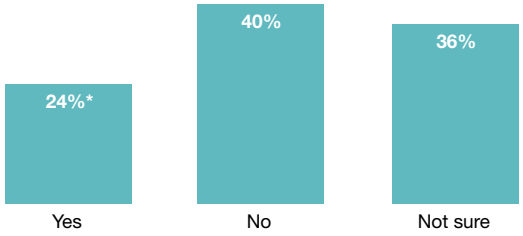
Regardless of who handles returns, a surprising 39% of respondents said they have no visibility into returns—they just show up. A similar number (38%) receive scheduled reports and 32% track point of sale information at their returns center.

More surprising, 40% of respondents couldn't determine how much reverse logistics is saving their company and another 36% aren't sure. Only 24% said they were able to determine how much their reverse logistics operation is saving their company, with an estimated average annual revenue savings of 16.5%.

Some 44% of respondents accept returned items at a fulfillment or returns center, and another 15% of respondents said they were 3PLs who handle reverse logistics tasks for their customers, presumably at the 3PLs distribution center.

FIGURE 3

Are you able to determine how much your reverse logistics operation is saving your company?



* These companies claim their reverse logistics operation is yielding, on average, revenue savings of **16.5%** annually.

Peerless Research Group (PRG)

Three-fourths of respondents don't expect that to change in the next two years.

More than 70% of respondents are collecting information regarding returned items, and another 15% say they sometimes collect information. In fact, only 11% said that they never collect information about returned items. The most common collected data among retailers (R) and manufacturers (M) included who is returning the item (81% - R, 92% - M), the model number (79% - R, 81% - M) and the date sold (60% - R, 64% - M). Retailers were also collecting if the customer is a repeat returner (60%), where the item was purchased (44%) and how the item was purchased (35%), while 57% of manufacturers were also collecting the serial number.

The number one reason for returns, noted by 59% of respondents, was defective merchandise, estimated to account for 16.3% of returns. Forty-two percent of respondents identified buyer's remorse as a reason for returns while 29% noted that the product wasn't what the customers was expecting or that the product had been misrepresented as a reason for returns.

The most common challenges associated with processing returns: Damaged goods (52%), no reason given for a return (40%), missing parts (38%), incorrect or inaccurate manifests (36%), and a reverse logistics process that needs improvement (33%).

Last, respondents are utilizing a multitude of channels for the disposition of returned items that are in re-sellable condition, ranging from putting the item back on the shelf or a liquidation sale (both at 56%), selling to a discount retail chain such as Big Lots (21%), auctioning off inventory (18%) and utilizing a dedicated page on the company web-

site (9%). Other channels mentioned included charitable donations, outlet stores, refurbished and discounted, selling or giving away to employees and destroying.

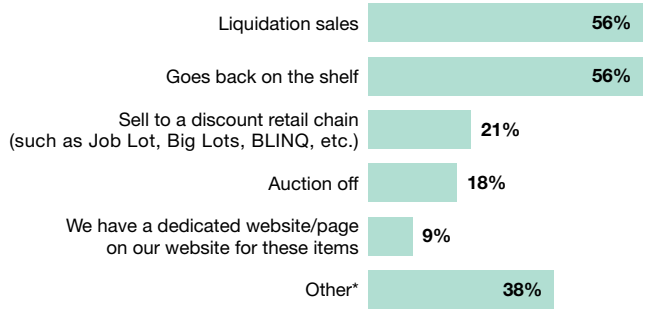
Digital returns

Few of us would challenge the notion that e-commerce is affecting the way we do business and order fulfillment. Given easy return policies, there is certainly the perception that e-commerce is having an impact on reverse logistics processes. That is borne out by the 75% of respondents who said that the number of returns they are dealing with has increased and that e-commerce has affected their ability to manage their reverse logistics operations (39%). Only 28% of respondents indicated that their reverse logistics platform is very prepared to handle a growing e-commerce business, while 53% said they are somewhat prepared.

At the same time, 62% of respondents said that e-commerce is not changing the way they process returns at all or not very much. Another 22% said that it is only changing their processes to some extent. Only 16% said that e-commerce is changing their reverse logistics processes to a great extent.

FIGURE 4

How do you handle refurbished and returned items that are in re-sellable condition?

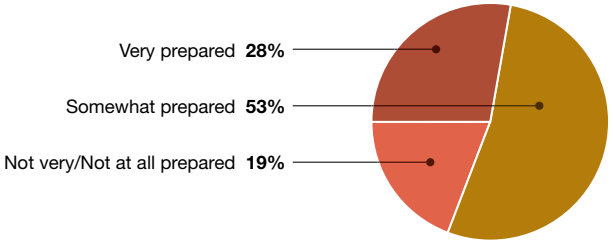


* Charitable donations, clearance/outlet stores, destroy, employee sale/giveaway, refurbished and discounted

Peerless Research Group (PRG)

FIGURE 5

How well prepared is your reverse logistics platform to handle a growing e-commerce business?



Peerless Research Group (PRG)

Of those who believe that e-commerce will affect their overall business operations in the next two years, 57% believe they will improve while only 3% believe they will deteriorate.

Of those respondents making plans to deal with more returns in the future, 26% are increasing their warehouse space, 22% are adding part-time labor and 16% are adding full-time labor, 22% have set up a dedicated department to handle e-commerce returns and 11% are outsourcing the function.

Given that e-commerce fulfillment has had a tremendous impact on order fulfillment and transportation strategies, we believe that it is only a matter of time before reverse logistics organizations will need to rethink their operations.

The Internet of Things (IoT) is also heavy in the supply chain discussion about the future. When it comes to return rates, only 20% of respondents believed that IoT is a driver to a great extent (7%) or to some extent (13%). The vast majority, 70%, said that it is not having much, if any, impact and 10% don't yet have an IoT strategy.

Those who do think that IoT is affecting their business said they are getting more analytics and data about sales, that IoT is providing more transparency and that they are using IoT data to predict and resolve failure events before they become an issue, reducing the need for returns.

Looking forward

Whether your organization is a manufacturer, wholesale distributor, retailer or e-tailer, returns are ingrained in the customer experience. Whether it's the ease of doing a return with Amazon, liberal return policies from fashion and apparel companies or the fact that service on electronics and appliances is often done by third parties, business customers and consumers alike judge the companies they do business with by their returns experience.

Our survey respondents clearly recognize

Delivering value at U.S. Cellular

Over the past five years, returns at U.S. Cellular has evolved from a cost of doing business to a process that gets the most value out of the more than 500,000 devices and accessories coming through the reverse supply chain each year. What changed?

According to Amy Augustine, senior manager of reverse logistics, the catalyst was an internal audit of her operations. "We discovered that my processes down at the DC were rock solid," Augustine says. "We also discovered that any issues we were having were due to upstream processes before the devices came into my custody."

Around that time, U.S. Cellular also hired its first vice president of supply chain and located that process under the CFO. "Now, there was a lens on the process," Augustine says. "So much so that we've developed a suite of reports for leadership. They want to understand from soup to nuts what's reverse logistics, what are the cost impacts and where are the revenue drivers." She adds that in 2017, her organization was cash flow positive.

Once returns had the attention of senior leadership, Augustine says the returns team took several steps to turn the process into a best practice. One was to launch continuous improvement initiatives, such as changes to the returns receiving process with its 3PL provider, and identifying opportunities within the DC that would increase revenues when product was sold on the secondary market. One example: asking stores to remove and dispose of screen protectors prior to returning a device. The team also worked with different groups across U.S. Cellular to develop financial reports that began getting rolled out about a year and a half ago. A third was the creation of a "360 view" of used equipment that is sent to the CFO. The team tracks the inventory acquisition cost, the return freight cost, the labor associated with processing a return, the cost of any parts or return to the OEM for repair and revenue from selling inventory on the secondary market.

Today, Augustine has a team of six individuals who report to her. She, in turn, reports to a director of device logistics who reports to the vice president of supply chain. The whole team is ultimately responsible to the CFO.

From a process standpoint, devices and accessories can come into the supply chain from a myriad of channels. U.S. Cellular has a 24-hour service level agreement with FedEx to return any device received before noon the next day. Devices returned because of a mechanical failure in the first 15 days of a contract are verified and shipped to the OEM. Otherwise, items are received and graded on cosmetic appearance as an A, B, C or D item. Items for which there might be demand are sent to storage. Otherwise, they go to the re-commerce team to resell online. Items are auctioned off to revenue share partners that sell them on-line and share the revenue with U.S. Cellular.

that fact: 75% agreed that reverse logistics is a key component to a streamlined supply chain and only 3% stated that reverse logistics is a waste of time. At the same time, there was a complacency among respondents, where only 24% disagreed with the statement that their reverse logistics process needs to be re-engineered and only 39% disagreed that their process for handling returns lacks focus. Many more were in the middle—they didn't know. In an earlier question, only 33% indicated that their processes needed improvement. Clearly—or maybe not so clearly—it is a mixed bag.

When we asked what had changed in their reverse logistics operations over the last two years, 56% said that they had improved, but 41% said there had been no change at all with the remainder saying they had deteriorated. Driving those changes was a need to improve efficiencies (53%), more demanding customers (44%), the volume of returns (38%), and the volume of sales (23%).

When we asked how their processes will change over the next two years, we received almost identical responses: 57% expect them to improve, through better tools to forecast, track and manage returns. At the same time, 40% expect no change at all, and the rest expect them to deteriorate.

In reviewing the results, we came to two important conclusions. The first is that, as with U.S. Cellular, those respondents with a focus on reverse logistics are realizing benefits that have an impact on their bottom lines. Yet, too many respondents indicate that they aren't paying close enough attention or don't have enough resources. One example: Liquidation was the second most common way of handling returned items in a re-salable condition. While that might be a simple solution, it's leaving money on the table.

Those findings are consistent with the experiences of the two organizations that co-sponsored this research, WERC and the Reverse Logistics Association.

Tony Sciarrotta, the executive director of the Reverse Logistics Association and a former reverse logistics executive at Philips Electronics, was struck that more than two-thirds of respondents (68%) said that no one at the corporate level in their company was responsible for reverse logistics. "During my 15 years at Philips, everyone knew that I was accountable for returns," says Sciarrotta. "If no one knows who is responsible, it doesn't get fixed." He also noted that 42% of respondents said that reverse logistics was somewhat or not very important to their organizations. "What we do matters to your organization's bottom line, and not enough respondents said it was important."

When we asked what had changed in their reverse logistics operations over the last two years, 56% said that they had improved, but 41% said there had been no change at all with the remainder saying they had deteriorated. Driving those changes was a need to improve efficiencies (53%), more demanding customers (44%), the volume of returns (38%), and the volume of sales (23%).

Michael Mikitka, the CEO of the Warehouse Education Research Council, similarly noted the number of respondents that said they lacked resources for their reverse logistics operations. "Those who are paying attention are experiencing a benefit, but not enough organizations are putting resources into their operations," he said. He also noted that 70% of respondents said they were somewhat or not prepared to handle a growing e-commerce channel. Yet, we all know that e-commerce is only going to grow as a sales channel, resulting in even more returns. At the same time, Mikitka saw the glass half full. "When those companies that are doing it right see improvements in key areas that affect their bottom lines, such as reducing costs and waste, those are opportunities," he said.

The second is to repeat the axiom that what gets measured gets managed. When only 27% said they could quantify the impact on annual revenues, that means that most don't understand their end-to-end costs. That makes it difficult to justify investments that can improve operations.

** You can read the complete survey results on scmr.com.*

Packaging's *new* role in e-fulfillment

The challenges facing e-commerce shipments don't begin and end with last-mile delivery and reverse logistics. Anyone fulfilling e-commerce orders also has to grapple with the high cost of parcel shipping and consumers who want to minimize the amount of packaging they have to contend with. It's time for a packaging strategy.

BY KYLE OUS

If you purchased the new release of a Stephen King novel from Amazon back in the late 90s, in all likelihood you paid for shipping and waited a week or more for the book to arrive on your porch in an over-sized box filled with air pillows. As you read the pages of King's latest thriller, you probably didn't stop to think that you might have been at the front end of a fundamental disruption in the way consumers shop, retailers sell to their customers and supply chain operations fill an order. You just wanted the convenience of having a book delivered to your door.

Now, let's fast forward 20 years and think about the way things have changed. Order that same book today, and you probably expect it to arrive on your doorstep in two days or less—and if you live in an urban area, perhaps in a matter of hours. In many cases, the delivery is free. And, in the best-case scenario—and we want to emphasize best case—the packaging has been optimized for the book, minimizing the amount of waste you, the customer, send to the landfill.

The logistics associated with that 21st century e-fulfillment supply chain are astounding; what's more, the pressure for organizations to keep up with a whirlwind of changes and customer expectations is greater than ever. And, it's only going to get worse. While e-commerce makes up just 10% of global retail purchases, sales are steadily rising and organizations across the globe are scrambling to fulfill orders in geographical regions they previously haven't served. As a result, retailers are forced to carefully manage their customers' buying experiences in the fight to earn their loyalty. That is resulting in faster click-to-ship order processing times, constant communication with the customer and speedier delivery. Additionally, the omni-channel supply chain has transformed last mile strategies and added new levels of complexity when serving customers.

Given the increasing volume of orders being handled, and pricing methodologies like dimensional rating from parcel carriers, you would think that packaging would command a starring role in an e-commerce distribution strategy. After all, today's customer no longer wants to dispose of an over-sized box stuffed with excessive packing material. Yet, the reality is that many companies

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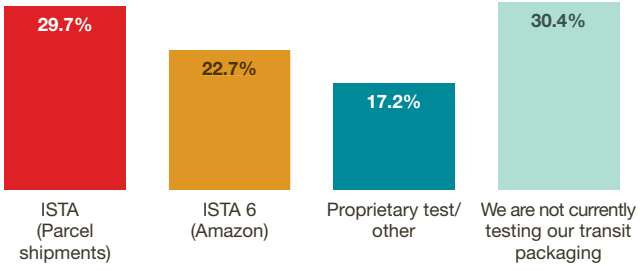
FIGURE 1

Leveraging packaging testing

What standard do you use to ensure your transit packaging will perform as required for ecommerce shipping?



Source: Packaging Digest Ecommerce Packaging webinar, July 2017

have yet to implement any real methodology for omni-channel packaging. That's because the operational complexity inherent in designing a dedicated packaging strategy is so daunting. In the eyes of C-level leadership, some companies may not have the sales volume to justify a dedicated packaging strategy or a support staff capable of doing so. The costs associated with e-commerce optimization may still appear too high for companies whose brick-and-mortar sales dwarf their e-commerce channel.

Those organizations may just be fooling themselves—or postponing the inevitable. For companies positioning themselves for increased e-commerce operations, analyzing shipment data can help determine what packaging solution is needed by distribution channel. In fact, the most advanced shippers are continuously reviewing their sales volume by delivery channel and developing strategies at the product category level to put them one step ahead of the competition. These companies are paying attention to e-commerce sale trends, such as seasonal and holiday spikes or product demographics, to determine where operating line strategies can shift as online orders increase.

Maintaining consumer satisfaction and loyalty in a cost-effective manner proves increasingly challenging as companies weigh the effects of packaging, dimensional weight adjustments, slack fill reduction, damage control and steadily rising parcel rates. With the increasing share of e-commerce sales, a variety of end users, last-mile delivery challenges, rapid response expectations and more, savvy retailers, e-tailers and even manufacturers shipping directly to their customers need to reevaluate and optimize their packaging strategy to meet the needs of the future supply chain.

New distribution challenges

Without question, the omni-channel supply chain has created network challenges as organizations try to position inventory and fulfillment operations closer to the customer. It is also creating new packaging challenges to determine the optimal distribution strategy for a given product. Indeed, a product's size, weight, function and origin alone may no longer dictate a predetermined distribution channel utilized for last mile delivery.

These challenges are not limited to traditional retailers playing in the e-commerce space. It is also creating a significant packaging challenge for manufacturers and wholesalers who are now selling directly to the consumer or drop shipping for their retail partners. They are now forced to find a happy medium between the traditional shelf-ready packaging they create for stores and the transport packaging for full pallet shipments going into distribution centers. Neither works for e-commerce fulfillment.

That was the lesson learned by a health and beauty products manufacturer when it agreed to stock its products for direct to consumer shipments in the distribution centers of a leading e-commerce retailer. The manufacturer went with the packaging strategy it knew best, which was to ship full pallets of product in shelf-ready packaging to the DCs. Problem solved. Unfortunately, that packaging wasn't suitable for an e-commerce distribution environment. To rectify the situation, the e-tailer re-packaged the products prior to filling an order—at the manufacturer's expense. Once the manufacturer realized the high cost of this over-pack service, it created a special operation in its own facility for e-commerce ready packaging, eliminating the additional charges from its e-commerce partner.

In another example, the commercial team of an automotive parts supplier agreed to drop ship its products to the customers of the same e-tailer. However, the commercial team failed to inform its operations team, whose processes were designed to ship full pallets of product to retail and wholesale distribution centers, not to pick, pack and ship individual orders directly to consumers. To rectify the problem, the supplier was forced to reorganize its warehouse, implement a new piece pick and pack area, and develop packaging for parcel shipments.

Examples like these will become more common as manufacturers and wholesalers expand their footprint in omni-channel marketplaces to capture some of the e-commerce

sales channel. Constant evaluation of consumer purchase data and product handling hazards will drive the evolution of an organization's packaging strategy as it seeks to avoid costly situations such as high damage rates or e-commerce repackaging charges.

Performance standard challenges

For retailers, the first step in that evolution is to adopt a performance standard for packaging and to then educate their manufacturers and suppliers about those standards. That's because the shift from traditional full pallet shipping to each shipping in e-commerce often triples the number of times a package is touched between receipt in the warehouse and delivery to the customer and doubles the total distance that package will travel. Well thought out guidelines can influence the design of the package to improve service levels and minimize labor that can be allocated to other areas of the operation.

Minimizing waste is also an increasingly important consideration. That's a result of new government regulation as well as consumers who don't want to be burdened with disposing of more packaging than they have to. As a result, manufacturers and retailers are now tasked with reducing the amount of packing materials utilized but without compromising the integrity of the package to minimize damage. Moreover, sustainability initiatives are shifting the responsibility of reducing the environmental impact of packaging back on to the manufacturer, who in many locales are now tasked with managing the life-cycle of their products from cradle to grave. That can include new, end-of-life costs such as taking the product back from the consumer, recycling and final disposal of the product and its packaging. There are even potential penalties for non-compliance, especially in markets in EMEA and APAC. Employing packaging solutions that meet both sustainability initiatives and damage reduction requirements needs to be a consideration.

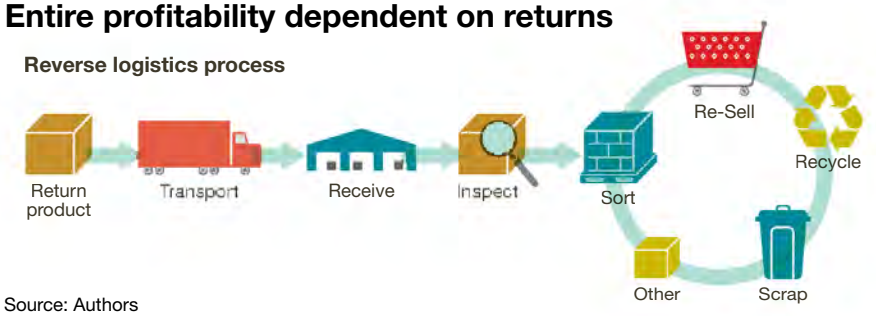
The importance of testing protocols

Creating sustainable packaging and minimizing damage may seem difficult to achieve. Doing so requires advanced packaging solutions that are currently lacking in many companies supply chain operations. Further, organizations must realize that damage isn't simply limited to product appearance and functionality. The costs associated with damage are palpable and varied. They include markdowns, additional tasks, higher waste percentages, negative process operations, returns and lower customer satisfaction levels. Damage creates complexity in the supply chain and can impact a brand's reputation. Addressing it is increasingly difficult due to the number of times an individual package is touched from the time it arrives in a distribution center until its delivered to the end customer.

We have identified seven hazards of e-commerce distribution that include: manual handling; mechanical handling; warehouse stacking; loose load vibration; vehicle vibration; horizontal impact; and environmental conditions.

FIGURE 2

Maximize recovery: Entire profitability dependent on returns



Source: Authors

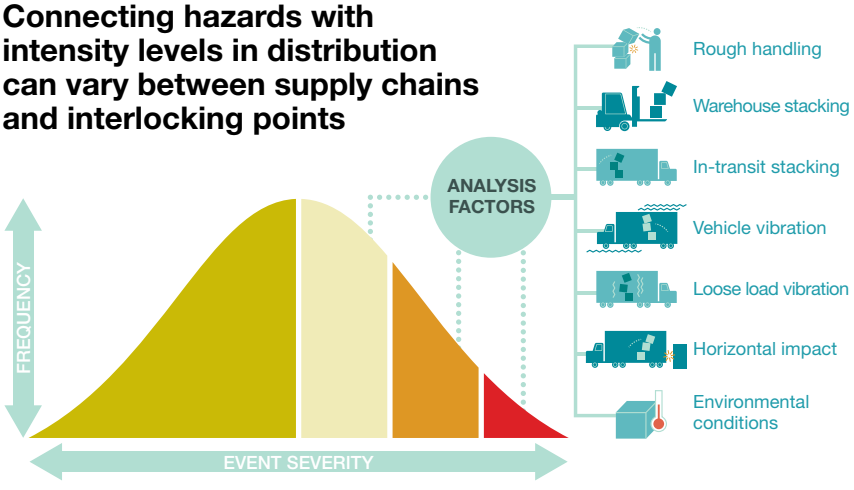
To better prepare products for these potential hazards, supply chain professionals should implement packaging solutions designed to protect goods across the entire journey.

Recent industry surveys have suggested as many as 30% of companies do not currently test their transit packaging. A good resource here is the International Safe Transit Association (ISTA)—a pioneer in packaging testing. By leveraging industry partners, ISTA has outlined several package testing protocols that replicate different distribution channels. These test protocols serve as a technical resource and set the standards that are followed by many leading retailers and manufacturers worldwide.

A successful implementation of proper test methods is often a great way to keep costs down and consumers happy. For example, a manufacturer of large and heavy sporting goods recently began selling its products through e-commerce with direct delivery to households. As is often the case, the company saw rising damage rates followed by increased packaging costs in its scramble to launch a new product feature on an existing product. Realizing that the

FIGURE 1

Connecting hazards with intensity levels in distribution can vary between supply chains and interlocking points



Source: Chainalytics

damage signaled by customer complaints was a result of new hazards encountered in e-commerce distribution, the company assembled a custom test protocol for its products. It then designed an intelligent packaging system to account for e-commerce distribution hazards. This process of protocol implementation and design allowed the company to bring damage rates down and avoid a 20% cost associated with the initial haphazard e-commerce packaging. That kind of example is one reason that utilizing resources provided by ISTA is an excellent starting point for those who are in need of packaging proper protocol but don't have the time or knowhow to build custom protocol.

More sales equals more returns

Order fulfillment no longer takes place in one direction. The increase in e-commerce fulfillment has resulted in more packages being returned to a fulfillment or returns processing center rather than a customer just dropping a package off at the store where it was purchased. This means products are subjected to even more time in the torturous LTL environment. Smart companies must account for parcel returns with thoughtful packaging solutions. A good return policy is a critical first step, not an afterthought, for any organization looking to increase its e-commerce presence.

Ensuring that the package can facilitate the return logistics is not just an operational issue, it is part of the overall customer experience and a customer satisfaction imperative. In some cases, such as when the cost of a return is higher than the product's overall value, a refund may be granted without the customer needing to return the product to the manufacturer or vendor. For those items that are going to travel back through the supply chain, the packaging must be designed to support reverse transport, receiving, inspection, sorting and re-purposing. Packaging that enables your product to re-enter the supply chain can be a critical way to improve profitability by limiting product damage. Having a strong reverse logistics strategy up front also helps organizations streamline the returned products back to the appropriate point, whether it be repair, recovery or salvaging. As e-commerce sales continue to increase, e-returns will continue to grow as well.

Future pack

For the first time in history, e-commerce sales surpassed traditional brick-and-mortar sales during the 2017 holiday season. Creating e-commerce packaging for products with growth potential in this sales channel can deliver huge impacts in future online sales and drive profitability. Exploring where an organization can implement "seasonal flex" strategies inside the operation may add significant value in forward and reverse logistics across the supply chain as well. Employing a scientific approach developed by experienced packaging engineers will give organizations the tools they need for the evolving marketplace now and into the future.

As e-commerce sales grow, manufacturers should expect increases in overpacking situations that allow a product to safely enter the various distribution channels necessary for meeting customer needs. Online retailers and omni-channel distribution models have revolutionized the industry and now require organizations to rethink their entire supply chain strategy. To do so, organizations must establish methods that allow them to utilize their data more efficiently in order to determine where and when a specific packaging solution should be employed. Organizations that adopt a proactive mindset by periodically reevaluating their packaging strategy and perform supply chain hazard assessments will find themselves better positioned to meet the challenges and complexity of today's marketplace.

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Many e-tail questions, *few answers*

Online retailing is changing how consumers shop and how supply chains fill their orders. What that all means for the future is anyone's guess.

BY ROBERT C. LIEB

Given the number of deliveries each of us receives from Amazon, it's hard to remember that between 2000 and 2002, the first wave of online retailing crashed as the dot.com bubble burst. Many of the failed online retailers suffered from a lack of basic logistics knowledge that contributed to their demise.

What was taking place in the online retail marketplace at that time? For starters, early online retailers were typically funded by readily available investment capital and supported by financial markets that rewarded rapid growth over sound business plans and profitability.

As online sales exploded, many misguided investments were made in transportation and warehousing assets. Price competition between online retailers was brutal, and free shipping and returns crept into the marketplace as online

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sellers looked for ways to differentiate themselves from their competitors. As this was happening, traditional brick-and-mortar retailers were developing their own strategies to cope with the new competitive environment. The fulfillment space became increasingly crowded.

With business booming, large third party logistics providers (3PLs) viewed online retail as their most important market opportunity. Many went so far as to create separate business units focused solely on dot.com businesses. At the same time, parcel delivery carriers experienced rapid growth from this new business sector.

Does any of that sound familiar? I believe it does. And while everyone knows that forecasting can be a fool's errand, I believe that a second wave of online retail failures is quite possible. However, if that happens again, the scale, scope, geographic coverage and economic impact of the second wave will be dramatically greater and the casualties will not only include small start-ups, but also large-global retailers. Those adversely affected may also include the transportation and logistics service providers that continue to make substantial investments in assets to support those clients. In fact, over the past several years, those service providers have become increasingly dependent upon online retailers as a revenue source.

Let's take a look at a number of questions about the possible vulnerability of online retailing and related businesses to another crash and explore the supply chain management elements of that vulnerability.

1. How long will the investment community fund scale over profitability?

During the dot.com revolution, the common pitch was to establish scale before focusing on profitability. Initially supportive, venture capitalists later soured on the concept as many of the new ventures showed no likelihood of ever turning a profit, regardless of scale. When the bubble burst (pets.com anyone?), online retailers who lacked viable business plans failed as venture capital companies pulled the plug. Unfortunately, some online retailers that appeared to have real potential also went out of business when they too were denied a second round of funding.

It's rather amazing that large online retailers, including Amazon, are still selling the same scale versus profitability story nearly twenty years after the crash. What's more amazing is that the financial marketplace is still buying. As the stock prices of those companies continue to set record highs, the dominant online retailers keep piling on debt to finance domestic and global expansion.

In most cases, these online retailers would be very unprofitable without cross subsidies from other internal business units. For example, Amazon's web services business (AWS), accounts for just 10% of Amazon's revenues but typically generates more than 80% of Amazon's slim profitability. Amazon also gets profits from its ventures into film and other industries. These cross subsidies have more than offset the marginal or non-existent profits of the company's mainstay retail business. However, how will Wall Street react if those other businesses are faced with more aggressive competition and their profits fall? Will global financial markets continue to accept the prospect of retail profitability in some undefined future or demand at least moderate retail profitability?

There have been recent signs that some of those pressures are emerging within Amazon. In February 2018, the company announced modest employment cuts in its retail operations. At the same time, company executives granted its AWS and Alexa software development groups permission to hire during the year.

2. Is there any such thing as free shipping or free returns?

No, there isn't. The first generation of online retailers competed on the basis of the speed and ease with which customers could navigate their websites, their chosen retail niche, their product assortment, their fulfillment speed and price. Not only did they charge for shipping, some viewed shipping as a profit center. That all changed as competition intensified and margins disappeared. To differentiate themselves, online-retailers began to offer "free shipping" followed closely by "free returns." At that point, the online retail industry officially entered fantasy land and all hell broke loose. Some online-retailers experienced return rates of as much as 70%. While free shipping and returns certainly fostered the growth of online retailing they also wreaked further havoc on margins, thus playing a major role in the collapse of the first wave of online retailing. As I said at the time, and I'll say it again now, "there is no such thing as free shipping and free returns!" Ultimately someone has to absorb those costs. If it isn't the customer, it has to be the online retailers, their suppliers or their logistics providers.

Today, free shipping and returns are back with a vengeance. The transportation cost burden continues to rise dramatically as competitors steadily increase the time sensitive

It's rather amazing that large online retailers, including Amazon, are still selling the same scale versus profitability story nearly twenty years after the crash. What's more amazing is that the financial marketplace is still buying.

service levels being offered to customers. That forces retailers to expedite more deliveries to meet those service level targets, while also adding substantially to the amount of market-positioned inventory that must be maintained to deliver items in increasingly narrower time-windows. While Amazon contends that Prime customers, who pay an annual fee, buy nearly three times as much as non-Prime customers, it's unclear if the additional transportation cost burden of those shipments significantly improves company margins or not.

The same is true for free returns in an industry that averages an approximately 30% return rate. Retailers offering free returns typically have to absorb return transportation costs, receiving costs, inspection costs and the costs of returning items to stock or disposing of items that can't be resold. Such free return policies invite many forms of abuse by customers, particularly in the apparel space. But now, returns are being expanded into the fastest growing segment of online retailing, larger goods such as furniture and appliances. The impact on retailers of these policies was illustrated by L.L. Bean's recent announcement that it is changing a long-standing, liberal returns policy because abuses have led to a doubling of returns in the last five years.

Some large retailers, including Walmart, are taking steps to address this by promoting returns to their stores, thereby reducing their return transportation costs and creating the possibility of up-selling when customers bring items ordered online back to a retail store. However, there are significant costs associated with promoting in-store returns related to reconfiguring existing retail space to handle those returns. Others have introduced restocking fees, or are providing lower prices on items with no-return privileges. Until online retailers establish more realistic returns policies that "discipline" the online customer base and educate them on the true cost of returns this will continue to be a massive drag on online retail profitability.

3. Are service level offerings sustainable?

For decades marketing literature has focused on the concept of market segmentation. The idea is that not all customers are created equal, and companies should not provide the same level of service to all customers, especially if they don't require it. That concept appears to be lost on online retailers. Intense competition has not only led to price competition, but also to aggressive service level competition that is increasingly expensive to support. Customers now expect to receive customer service levels they don't need without bearing their true costs. That raises questions about online retailers creating "needs" in their customer community. If you offer a two-hour delivery window on cat food or toilet tissue, customers will take it, but do they really need it? The shipping charges for such deliveries are quite low compared to the cost of making them, and the amount of inventory that has to be pre-positioned to provide those service levels is expensive. Fostering unrealistic service levels while undercharging for those services is just not sustainable.

4. What happens if interest rates and oil prices rise?

Free shipping and returns programs were rolled out during a time when interest rates and oil prices were at historic lows, leading to lower than normal transportation and inventory carrying costs. But, what happens if oil prices and interest rates rise significantly? If prices are not increased accordingly, online retail profitability will be further eroded; and if prices rise, how will consumers weigh the convenience of shopping online against a significantly higher price structure? In the alternative, will online retailers continue to attract investments, or even have the cash to survive?

5. What is the impact of the continuing diversification and globalization of online retailing?

From all appearances, Jeff Bezos, Amazon's CEO, has yet to discover an industry or geography he doesn't want to conquer. While diversification offers some benefits, one has to wonder whether the scope and span of Amazon's ambitions is in the long-term interest of the company, its customers and the financial community? If not, what does it portend for the future of online retailing? As noted earlier, Amazon successfully moved into web services, film and other industries in the past. Now, it is moving into grocery stores and delivery, convenience stores and

even bookstores. Recently, it announced a plan to compete directly with UPS and FedEx. Some of these moves are of questionable wisdom. For instance, so far, no one has convincingly made money in the grocery delivery business with its historically low margins. And, if Amazon is really serious about becoming a major player in the parcel delivery business, it will not only be required to make major capital investments, it will face intense competition from the incumbents in that space. Does anyone remember what happened when DHL decided to make a similar move into the U.S. market?

As Amazon becomes more of a conglomerate, it may face headwinds associated with size and complexity similar to those of Litton Industries, Gulf and Western, the Penn Central and other conglomerates in the late 1960s. With few exceptions, they failed miserably. Today, GE is shedding business units to improve its finances. Are there lessons that Amazon should take from those experiences? Absolutely. Success in one industry sector doesn't guarantee success in other, often unrelated, businesses.

Geography presents its own set of challenges. While Amazon continues to expand its global footprint in Europe and Asia, companies like Walmart, China's Alibaba and JD.com and India's Flipkart are not only intensely protective of their home markets, they are also eyeing moves into foreign markets for their future growth. The extent of that global involvement was highlighted by Walmart's announcement in February 2018 that it was considering taking a 40% equity position in Flipkart. Such global ambitions require substantial capital outlays, adjustment to the cultural and regulatory norms of other countries, staffing up to support that expansion and intensive price competition. What's more, longer supply chains are more complex and difficult to manage, particularly with respect to customs clearance and customs duties. The more these companies move into the international arena, the greater the likelihood that the promise of increased profitability will remain just that—a promise.

While Amazon continues to expand its global footprint in Europe and Asia, companies like Walmart, China's Alibaba and JD.com and India's Flipkart are not only intensely protective of their home markets, they are also eyeing moves into foreign markets for their future growth.

6. What is the long-term impact on transportation companies and 3PLs?

In the early days of online retailing, transportation companies and 3PLs rushed to attract online retail customers. Many went so far as to establish separate e-commerce business units with dedicated assets and management. When the bubble burst, those companies were badly burned when many of their e-commerce customers went bankrupt, often owing them substantial sums. A common refrain from the CEOs that I was surveying at the time was: "we won't that mistake again."

But, memories are short. In recent years, companies like UPS, FedEx and the major 3PLs have invested billions to support the future growth of the e-commerce market. A number have bought or leased expensive urban distribution space to support last mile deliveries and have implemented expensive automation technologies to increase throughput speed. Today, it's not uncommon for e-commerce to represent 8% to 10% of the total revenue base of those companies, and it is increasing steadily. While these service providers are increasing their capital and operational commitments, they are also routinely squeezed by large e-commerce clients who threaten to take their business elsewhere or provide last mile services themselves.

At the other end, the last mile delivery market is getting increasingly crowded with countless new entrants that use low prices to attract customers for a niche in the marketplace. These not only include local parcel delivery companies, but also micro fulfillment involving the likes of Uber and Lyft and crowd sourcing orders to any individual with a full tank of gas and free time on her hands. That puts even more pressure on incumbents who have routinely been squeezed by companies like Amazon to reduce delivery times while lowering their prices. Need we point out that this is a repeat of the market dynamics that preceded the collapse of the first round of online retailing?

Now, Amazon's intention to begin providing parcel pickup and delivery services could represent a third pressure point on prices. Typically, Amazon has undercut the prices of incumbents when it enters a new business. While its next steps into the transportation marketplace are likely to be limited to its marketplace retailers, that experience will provide some insight into its long-term

Because major economies around the global are increasingly linked, such a recession will not be localized. At that point, the true value proposition of online retailing will be tested and the casualties will likely be significant.

impact on the transportation and logistics service providers that increasingly depend on online retail business.

I have previously suggested that Amazon might more reasonably expand its logistics services on a retail basis. Given its current infrastructure, its ability to attract capital and its past history of acquiring companies, it's not a stretch to envision the acquisition of several large 3PLs in different geographies to quickly develop a global presence. That would make more sense than Amazon embarking on a large-scale confrontation with UPS and Fedex in the parcel delivery market.

7. At what point will regulators review Amazon's business practices?

The "Amazon effect" is pervasive. In 2017, Amazon was reported to control approximately 44% of online retail sales in the United States. At the same time, the company has a retail pricing structure that not only appears to be non-compensatory, it is also potentially predatory. Its past moves into new verticals have typically been accompanied by major price cuts to build market share. The company's intense price competition, coupled with its constant focus on reducing time to fulfillment, has led to the demise of hundreds, if not thousands, of retailers.

To date, there has been little real public discussion about whether Amazon's business practices may violate federal regulatory policies concerning predatory pricing. If Amazon did not have the internal cross subsidies from its other profitable non-retail operations, its deficits would be stunning. Should there be any limits beyond which the company can go to bankrupt its competitors? Are further acquisitions by the company consistent with the public interest?

There are also new questions about the impact on the environment of the millions of cardboard boxes and related packaging materials that are now flooding landfills and transfer stations. Amazon has pledged to take action to address those issues, but to date it is unclear what those actions might involve. In addition, I would expect to see much greater local, state and federal scrutiny of the impact of online retail fulfillment operations on traffic congestion and air quality, particularly in major metropolitan areas.

8. Is online retailing recession-proof?

Online sales have grown dramatically since the Great Recession began in 2008. We are now in the ninth consecutive year of global economic growth, and that growth is forecast to continue through 2018. However, the business cycle has not been repealed. When the next global recession hits, and it will, buyers with less disposable income will likely become more price sensitive, particularly if prices rise as online retailers struggle to become/remain profitable. Because major economies around the global are increasingly linked, such a recession will not be localized. At that point, the true value proposition of online retailing will be tested and the casualties will likely be significant.

9. Where does the global online retail industry go from here?

Let's face it: The e-commerce genie is out of the bottle. In the short term, e-commerce will continue to set year over year growth records around the globe, with the growth rates in China and India outpacing the rest of the world. Traditional retailers and their omni-channel competitors will continue to fight for market share as the major players in the global marketplace spend billions to build out their infrastructure, much of which will involve the construction of increasingly automated fulfillment centers in or near major population centers. Cross-border online sales will increase dramatically, as will the complexity and costs of managing a global network to support that growth.

Customer service level expectations will continue to rise, as will oil prices and interest rates. It is highly likely that much more government attention will be paid to acquisitions and pricing issues in online retailing and that similar attention will be given to the environmental impact of the industry.

The unanswered question is: At what point will economic realities play a more significant role in determining the scope of online global retailing? While we don't know the answer, I believe that point will not likely be reached until the next major global recession.

To offshore or reshore?

The battle of data points

An incomplete assessment of production costs led to the demise of an already efficient manufacturing plant in Sweden. Here's how total cost of ownership and other key data points could have saved not only the plant's production but also important manufacturing jobs.

BY DAVID ERIKSSON, PER HILLETOFTH, LISA M. ELLRAM AND CINZIA SANSONE

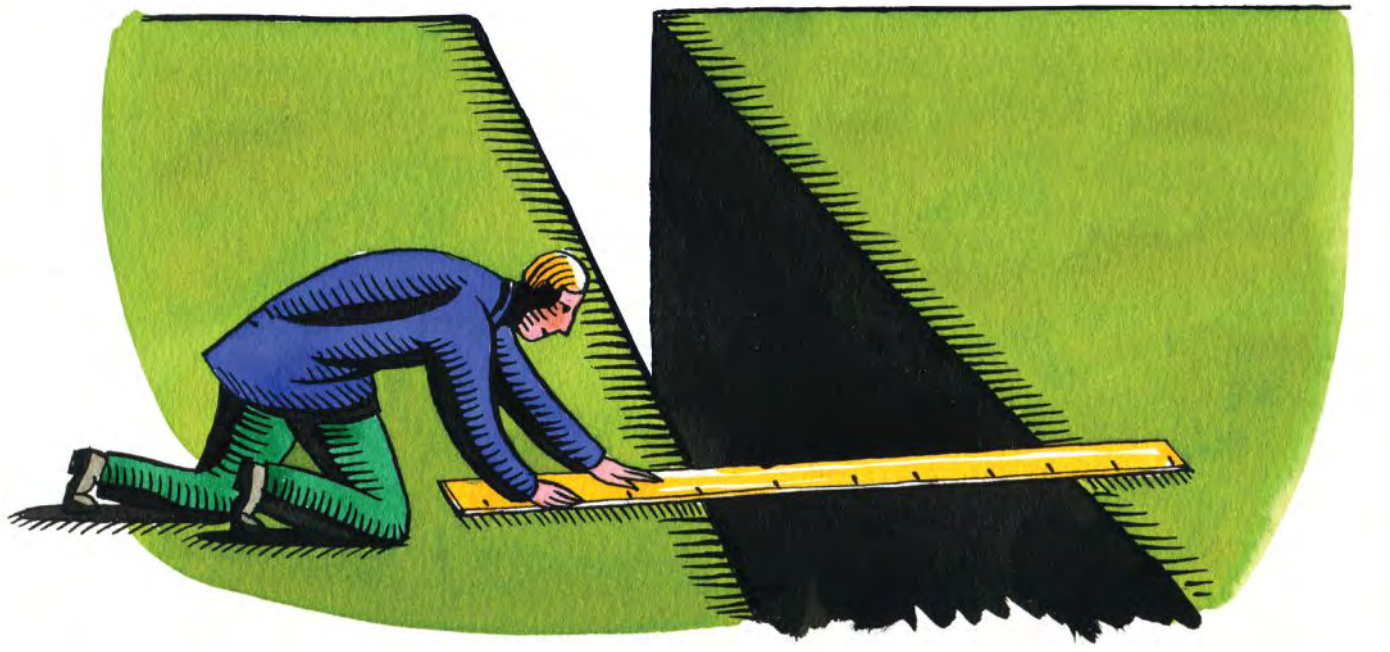
It is said that goldfish have a memory of about four seconds. That's why they never get bored swimming around in a little bowl, rediscovering the same place over and over again. We may scoff at the repetitiveness of their ways, but are we really any better?

For some time now, offshoring has been one of the most important strategic decisions for manufacturing companies. The practice accelerated along with increased globalization and competition. The intent remains maximizing cost efficiency by shifting home-country production to low-cost countries. This sounds good, but the rewards have not always come to fruition. As a result, many companies are now looking at the possibility of reshoring.

There are numerous reasons to consider the shift, just ask the man in the White House. But the movement goes far beyond President Trump.

The American Manufacturers Association offers its own list of reasons to reshore:

- shorter manufacturing lead times;
- a more skilled workforce;
- rising costs of freight;
- local tax incentives;
- responsiveness to consumer demands; and



- offshore wages are rising.

Additional incentives to reshore are often found within the company and in how it manages the supply chain. These include:

- growth of transaction costs;
- centralization of firm activities;
- reactive decisions; and
- overestimation of offshored savings originally.

Despite myriad reasons that offshoring can be a bad business decision, many companies still make the move. In fact, our research shows that not all offshoring decisions are based on the best methods or information.

One common problem is that the decision to build products in another country is generally not based on operating data from manufacturing. Instead, accounting data for one specific product line is used to make the decision. Worse yet, many costs are ignored in the calculation. Stumbling blocks here include:

- no allocation of costs for the vacated space;
- cost of idled equipment; and
- continuing costs not eliminated by offshoring.

In other words, offshoring decisions must assess all of the new total costs of operations and products that the company sells, as well as the costs that persist for discontinued or relocated operations.

Making this happen is not easy. Despite this "common sense" view, we observed that industry often overlooks these data points in their decision making. Worse yet, the same issues surface again and again—just think of the goldfish.

From this viewpoint, we offer our insights from research (see sidebar About the research) into a leading manufacturer of communications products that we'll call TechCo—a real company whose data we were able to analyze but whose identity has been changed for the purposes of publication. As we found, the company's decision to offshore was not grounded in the right data points. As a result, a series of incorrect decisions made offshoring look like a great decision when it was not. In fact, the company's Sweden-based manufacturing was already plenty efficient.

Many of the principles covered here also apply to reshoring. Ultimately, it's a battle of data points. The challenge is to identify and use all the right ones to get to the right decision.

About the research

The data from TechCo, our name for a real but unnamed company, was collected and analyzed by six researchers starting in 2015 through early 2017 and with complementary data being collected in 2018. It includes 15 interviews that have been recorded and transcribed.

Among the researchers, informal contact and smaller collaborations with the company date back almost 20 years. The viewpoint provided here is based on rigorous research and prolonged engagement with the company's Plant A, enabling a deep understanding of both the studied object and its context.

Offshoring at TechCo

TechCo started in the late 1800s in Sweden. Over time, the company assumed a pivotal role in the advancement of communications technologies across the country. Today, TechCo develops nextgen telecommunication standards and infrastructure, and is one of Sweden's best-known global companies.

In 2016, TechCo had two production sites in Sweden, one on each of the country's coasts. The company employed a total of about 15,000 in Sweden, including 800 production employees in Plant A and 400 in the Plant B. Unfortunately, Plant A had numerous cut backs over the years.

Financial challenges was a main reason for these cutbacks, which TechCo tried to fight by cutting costs. In turn, employees expressed to us a fatigue working for a company with, as one employee expressed "a constant threat of termination hanging over your head."

While it is hard to pinpoint the exact beginning of the cutbacks, one respondent to our research said that the potential closure of the plant can be traced to 2010.

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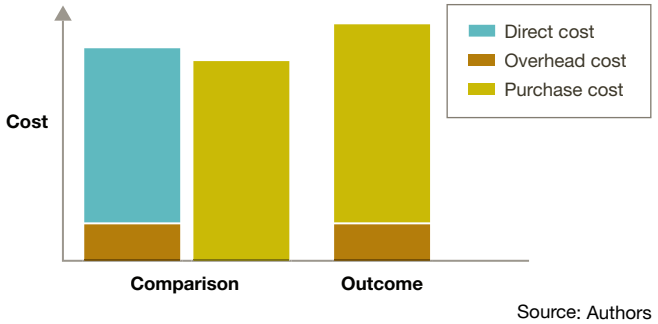
The root cause of the financial problems was initially difficult to understand. Research into the company's performance showed that the plant functioned well. Furthermore, Plant A adopted lean management in 2005, improving production in several ways. The list includes:

- significant cost cutbacks;
- high-quality performance (partly due to diligent work with Six Sigma);
- advanced delivery capabilities (including dependability and speed);
- production flexibility;
- strong customer service;
- agility to adapt to as many as 15 new product introductions a week;
- sharp focus on reducing the plant's environmental impact; and
- an educated workforce.

Furthermore, according to one production development manager: "It was broadly acknowledged that we are good at lean. People from other companies came all the time come to visit us for benchmarking purposes."

FIGURE 1

How make-or-buy decisions are evaluated and actual outcome



Source: Authors

Advanced operating practices didn't stop with lean, either. As one manager said, "We had good development in manufacturing cost-reduction through standardized work and other parts of 5S. … [We had] good projects that combined lean and Six Sigma."

Despite all of this, the decision to offshore some of Plant A's production was looming in the late 2016. Word got out quickly. Many of the employees wasted no time searching for new jobs. As one manager said: "Unfortunately, the ones leaving early were the ones we would like to keep."

In early 2017, about 450 employees were let go in favor of a European manufacturing site. Ultimately, the move came down to a lower cost per piece at the new facility. However, high fixed overhead costs were another contributing factor. As a result, after years of outsourcing, Plant A was still the same size and unable to trim its overhead despite lower production levels.

Is it possible that Plant A was actually more efficient and cost-effective than it was given credit? Our research says yes. Here's what went wrong in the offshoring decision-making process.

Make or buy: Comparing apples and pears

At TechCo, many make-or-buy decisions were evaluated as business cases. However, the cases were often overly simplistic.

Sourcing often compared the purchase price from a factory in a country with lower labor costs with the total cost of manufacturing in the home factory. This results in critical incorrect cost assessments. As one manager said: "Certain costs, like management of external plant contracts, were often overlooked. The need for administration to manage outsourcing wasn't added into costs. Furthermore, initial comparisons were made that did not include fixed costs such as information technology."

For any offshoring decision process, overlooking these and other costs that will persist causes a fundamental problem—the cost of buying appears more favorable than it is. That is what happened with Plant A.

Furthermore, the true internal cost to make a product is not equal to the accounting-determined product cost when production ceases—at Plant A or anywhere else for that matter. The cost used for comparison includes both direct production costs and overhead costs. If the product is no longer produced, the direct costs are saved. However, overhead costs—such as rent, heating and administration—remain. In many cases, purchase price and overhead costs are higher than direct production costs and overhead costs (see Figure 1).

Then the problem compounds itself. Overhead costs not added to the purchased product price were allocated across products still manufactured at the original site. Consequently, all products still produced appear to be more expensive to produce, as they take on higher overhead allocations. This is the start of a vicious cycle where it becomes more and more attractive to buy instead of to make.

There is still another way to deal with remaining

overhead costs after an offshoring decision. Consider the overhead cost as project costs included in the total cost of the offshoring activities. The manufacturing plant then has a set time period to reduce its overhead costs and adjust to the new manufacturing level and dispose of unneeded assets. In addition, the offshored product should receive an overhead allocation that reflects management time, information systems and other resources that it legitimately uses.

The power of total cost of ownership

All of that said, this is where a total cost of ownership (TCO) approach is helpful. It is an approach that goes beyond measuring price to consider all of the associated, and often hidden, costs of doing business with a particular supplier. TCO also takes into account the cost of pursuing various options, such as alternative processes, or insourcing versus outsourcing.

TCO is an effective approach to estimating the financial cost for a product or system. It includes the costs associated with acquiring, operating and maintaining the product or system. When used properly, TCO compares the cost of the existing system to the cost of the alternative. In other words, it compares the two systems rather than comparing the cost of one system to the cost of purchasing the product.

The result is an apples to apples comparison, not the apples to pears used at TechCo. (See sidebar How TCO works.) As straightforward as this appears, we have identified two areas where TCO is not used. One is at the tactical level and the other at the strategic level.

The trouble starts at the tactical level when someone in operations is tasked to minimize costs, often with the lure of a personal incentive system. This comparison is typically based on the cost the company has calculated for producing one unit with the purchase price of one unit.

This usually results in two costs being forgotten or at least overlooked.

First are overhead costs beyond manufacturing costs. These overhead costs remain with the facility if the product is purchased from elsewhere, just as happened at TechCo.

Second are transaction costs related to purchasing. This could be quality control, goods receiving, delays and coordination and information technology, to name a few.

The strategic issue occurs when top management (often at the board of directors level) make strategic decisions without factoring in costs of infrastructure and facilities that remain. Included here are depreciation costs as well as overhead.

In such decisions, the board of directors also fails to understand the implications on financial flows. When manufacturing the product, raw materials are procured at a relatively low price. Value add is typically created by using already incurred costs (investments in machines and facilities).

However, when purchasing parts, the entire purchase cost needs to be settled through a financial transfer to the seller. This results in a larger financial flow to the supplier and requires more committed capital.

It is not certain why we see many examples of the board of directors acting this way. It could be because they are not focusing on the complexities of manufacturing costs; it could also be due to the anticipation of investors' positive reaction to news that offshore production will reduce product prices.

The not-so-simple fix

It is striking how getting the calculations right for offshoring decisions is a problem time and again. TechCo was no exception, and neither are other large multinationals.

One of our researchers worked as a cost accountant in the 1980s and saw this scenario play out frequently. In fact, one product became so expensive to produce internally that it was priced too high and failed in the market while lower-cost competitors thrive today. The culprit, of course, was allocation to the product overhead costs for products no longer manufactured in the plant.

In researching TechCo and other companies, we have come to the following conclusions:

- The purchase price is not the true cost of the purchase. There needs to be room to include additional costs, including cost for delays, quality problems and extra inventory.
- The current production cost is not equal to the potential cost savings. It is important to carefully evaluate how much overhead costs can be reduced when buying instead of making. The costs that will remain need to be included when considering the price of buying.
- It might not be possible to maintain a top-of-the-line manufacturing plant for the remaining products. As less and less is produced, it is harder to recuperate investment costs. If there is a long-term plan to keep production at the facility, it is important to have the required volumes. Overhead cost allocations may have to be adjusted to reflect what products can bear.
- Overhead costs for offshored products can be seen as project costs, which gives the manufacturing plant time to downsize the support and administrative activities or

increase manufacturing of other products.

Fixed or overhead costs that remain after products are eliminated must not be overlooked, or blindly passed on to remaining products. They must be added to the cost of whatever alternatives are under consideration. Otherwise, an incorrect decision may be made, eroding the competitiveness of other aspects of the business.

One production development manager from a large multinational company told the researchers that top management decided to move production abroad to a supplier. The manager could show how it would become more expensive to move production due to remaining overhead costs, but top management would not budge. When such facts are presented and ignored, irrationality cannot be beat by rationality.

Unfortunately, while we are busy living this scenario, we are slowly but surely killing domestic industries that are a critical aspect of advanced economies. Fortunately, we are not goldfish in bowls. We are people with memories who know that the stakes are high.

How TCO works

Total cost of ownership is a technique for estimating the true financial cost for a product or system. Here is a limited but detailed example of how TCO works.

A manufacturing company plates parts at a cost of $59 per 100 parts, or $0.59 per part. It can plate between 1,000 and 5,000 parts at a time.

An outside supplier proposes that it can plate the parts for a lower cost per part in batches of 10,000 to 25,000. The supplier says it can provide comparable quality plating for a price of $0.42 per part, plus delivery. Delivery is estimated at $0.05/part each direction to and from the plating supplier if the company gets shipments of 25,000 parts. Quantities of 5,000 to 25,000 parts would add delivery costs of $0.09/part.

It appears the supplier can reduce the costs. See the details here. Fixed costs will be incurred even if the company stops plating. It will still own the plant and use it for its other operations. Remaining operations will have to absorb an extra $120,000 annually in plant-level depreciation, maintenance and upkeep that will not go away. That cannot be ignored; it is still a cost to the company.

However, the supplier's offer looks like a good alternative at $0.42/part. Even adding the $0.12/part for remaining overhead costs puts the per piece price at $0.54, less than the $0.59 company cost. However, there are more costs that need to be included.

TABLE 1

Cost of production and costs remaining if outsourced

Cost	Annual based on 1,000,000 units/year, $	Cost per unit, $	Cost remaining if outsourced, $
Processing labor	100,000	0.10	0
Variable plant costs	50,000	0.05	0
Materials	320,000	0.32	0
Fixed overhead	120,000	0.12	120,000
Total	**590,000/yr**	**0.59/unit**	**120,000/yr**

Source: Authors

TABLE 2

True purchase cost from supplier

Outsourced costs	Cost per unit, $
Part	0.42
Transport to plater	0.05
Packaging to send product to plater	0.01
Transport from the plater	0.05
Inspection, receiving, putaway	0.015
Total variable costs/unit	**0.545**

Source: Authors

The company makes the part, so it will pay to ship the part to the plater as well as for its return. Delivery is estimated at $0.05/part in each direction. In addition, there are likely some packaging costs associated with shipping the parts as well as unpacking, handling and inspection costs on return.

Let us have a closer look at some of these. The table below brings in these costs: transportation to and from the plater and receiving (including inspection and put away).

At $0.54/part, it still looks cheaper to use the supplier—but no, we have to add on the remaining overhead of $0.12/unit making it more expensive.

And, there are soft costs. The company loses control. It is assumed that there will always be large batches to plate and ship, otherwise the costs go up a lot. The company will have a lot more inventory in its system because it will have in-transit inventory going to and from the plater, plus in process at the plater. That limits the company's flexibility and ties up working capital.

While this is a simple process example, it makes the point of the importance of added costs. TCO helps companies understand these costs and associated issues.

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A crisis is a terrible thing to waste

Sure, the logistics industry is in crisis but leading shippers recognize this as an opportunity to make bolder changes to secure capacity at reliable prices for the future.

By Balika Sonthalia and Michael Zimmerman

There is a crisis brewing between shippers and carriers, one being fueled by a perfect storm of carrier capacity constraints, rate increases, driver shortages and government mandates. Growth in the global economy has converged with capacity crunches in Europe, which is experiencing its highest growth rate since 2010, and North America, where the high demand for full truckload shipments is coupled with a shortage of equipment and drivers. Capacity is now at its lowest level relative to demand in the last 10 years.

Government regulation is having an impact. In North America, the ELD mandate took effect in December 2017, with full implementation of ELD required by April 1, 2018. As of this past March, CarrierLists confirmed compliance among long haul carriers in the high 90s, and smaller fleets in the mid 80s. The mandate was expected to have a productivity impact on fleets, but its parallel impact as a reducer of capacity by curtailing Hours Of Service (HOS) cheating has put further pressure on rates. And while the ELD mandate will increase carrier efficiency, as driver time becomes more valuable in 2018, shippers with inefficient systems will see ongoing capacity issues and increased operating costs.

In Europe, a broad new legislation package introduced in May 2017 proposed new regulations on minimum wage rules, weekly rest requirements, cabatoge restrictions, conversion to distance based tolling systems and measures to reduce transport carbon emissions. This new mobility package is predicted to lead to increased logistics costs for carriers, and by extension, for shippers.

The result of these impacts: A wave of rate increases from carriers and brokers continues with contracted rates up 10% or more while spot market loads are 20% to 30% higher than 2017. Carrier and broker opportunism has been reported as even the strongest relationships are seeing price increases, causing sleepless nights for logistics leadership at most shippers. There is little relief in the near future, as spot rate strength, rising driver wages, electronic logging device (ELD) costs, capacity impacts and carrier eagerness for better profits will sustain maximum pressure. Yes, supply will overshoot demand at some point, but a return to structural advantages for shippers is not in the cards for 2018 unless a recession kicks in, and even that is not expected to fully reverse the capacity crunch.

It's not all doom and gloom. Leading shippers recognize that a crisis creates opportunity to make bold changes to secure capacity at reliable prices for the future. A.T. Kearney encourages logistics leadership to make the case that capacity must be freed up or generated with carriers through improvement initiatives in logistics strategy and operations.

Better capacity at a better price

In tight market conditions, to ensure better capacity at a better price, shippers must become a "shipper of choice" by making their freight more desirable for carriers. To do so, leading companies in retail and manufacturing are aggressively reducing carrier pain points and improving their planning, logistic sourcing, network optimization and site logistics operations. A holistic approach is necessary to embrace trends that include carrier

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collaboration, internal coordination and changing demand. The best practices include the following.

Carrier collaboration balances driver availability while maximizing trucking capacity utilization. Carriers are addressing typical pain points by using optimization analytics to reduce empty miles and increase capacity utilization; testing automation technology to assist driving and increase road safety; and testing AI to connect trucks in platoons to improve safety and fuel utilization while reducing the need for drivers.

Leading shippers are implementing collaborative initiatives such as flexible appointment windows; better drop trailer utilization through better-coordinated drop and hook programs; more efficient live load for carriers; and raised carrier volume commitments. Some shippers are also implementing wait-time measurement technology; 20-hour access to drop/pickup loads; improved invoice on-time payment; extended tender notice lead time (target 48 hours to 72 hours); maximized load configuration (decking); production plan visibility from production to distribution; and advanced forecasts for major volume changes. One large shipper has proposed programs at their largest sites that would enhance the driver experience with simple changes such as improved facilities and more friendly site logistics personnel.

Internal coordination leverages best practices across all supply chain silos. Shippers can implement cross silo teaming between master production scheduling, operations and logistics for planning, forecasting and execution; launch continuous improvement teams comprised of dock/yard management and logistics for sites; and team with inbound and outbound logistics with/without third-party logistics (3PL) or carriers as intermediaries. These initiatives should be promoted to carriers as evidence of efforts underway to be a shipper of choice. Optimized DC performance includes:

- Inbound scheduling and vendor management. Use advanced shipping notification software to communicate with vendors to preplan receiving and increase dock utilization. Standardize requirements like case quantities with vendors to maximize throughput.
- Inbound staging and receiving. Ensure staging layout to provide sufficient buffer room for unloading. Shipments should be staged in one area and inspected in a line to avoid batch processing. This eliminates shipment auditing for DC-to-DC transfers if accurately inspected on outbound.
- Packing and loading. Make outbound shipments fluid where possible to avoid staging and load directly from the packing area. Consider shrinking the size of the outbound staging area to encourage compliance. Reduce re-handling of pallets in packing and perform inspections of pallets while on carts rather than after they are unloaded and on the floor. Include dollies in the packing station to reduce the need for fork lifts.
- Other best practices. Establish KPIs at each facility and visually communicate these to associates. Standardize processes where possible to improve shipment accuracy and better identification of continuous improvement opportunities. Involve associates in creating these processes to ensure knowledge transfer.

Changing demand encourages practices that will address volatility and increase available capacity. To reduce volatility, shippers must evaluate the total cost of ownership including the impacts of end of week/month/quarter shipments and take advantage of enabling technology and capabilities. They can deploy real time network optimization, "design for shipment" and "design for e-commerce" packaging and load optimization initiatives as well as the deployment of a guaranteed capacity exchange provider for critical segments of capacity.

Initiatives that reduce or eliminate the bad experiences and enhance the smooth ones will lead shippers to differentiate themselves in the marketplace, gain preferred status among carriers and benefit from being a shipper of choice, including that elusive good night's sleep for logistics leadership.

A crisis is a terrible thing to waste

Mobilizing a shipper of choice program starts with a rapid assessment of one's current shipper attractiveness, potential issue and opportunity areas, and forming a shipper attractiveness roadmap. This comprehensive roadmap should include shipping efficiency analytics, carrier engagement (usually a targeted survey, but it can start with a few phone calls), a cross functional ideation for improvement initiatives and quick wins for changes identified in the carrier engagement survey. Implementation of high-priority and high-impact initiatives can begin as a pilot program that builds quickly as shipper attractiveness is improved.

Shippers must make a conscious decision to be better at managing their modes and nodes, to partner corroboratively, listen proactively and implement solutions that benefit both parties. Initiatives that reduce or eliminate the bad experiences and enhance the smooth ones will lead shippers to differentiate themselves in the marketplace, gain preferred status among carriers and benefit from being a shipper of choice, including that elusive good night's sleep for logistics leadership.

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SUPPLY CHAIN MANAGEMENT REVIEW

Carriers rev up for a hot freight market

The best of the best are planning big investments and more strategic operations geared to serve shippers in a roaring freight environment—one that's being driven by a booming economy and a tight labor market.

BY **JOHN D. SCHULZ**,
EDITOR AT LARGE

Freight markets come in highly predictable waves. Unfortunately for shippers, the wave they're being hit with now contains a *tsunami* of higher rates, as truckers make up ground lost by the long slog back to normalcy following the Great Recession of 2008-2009.

In fact, this current cycle might as well be called the roaring freight market of 2017-2018. Freight is overflowing, even in the first quarter—traditionally

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SPECIAL REPORT

TOP 50 TRUCKING

TOP 25 LESS-THAN-TRUCKLOAD CARRIERS: 2017 REVENUES

(Including fuel surcharges)

Rank	Carrier name	2016 Revenue ($ million)	2017 Revenue ($ million)	YoY % Change 16-17
1	FedEx Freight	$5,936	$6,341	6.8%
2	XPO Logistics	$3,445	$3,641	5.7%
3	Old Dominion Freight Line	$2,936	$3,304	12.5%
4	YRC Freight	$2,923	$3,033	3.8%
5	UPS Freight	$2,384	$2,596	8.9%
6	Estes Express Lines	$2,157	$2,476	14.8%
7	ABF Freight System	$1,873	$1,948	4.0%
8	R+L Carriers	$1,452	$1,580	8.8%
9	Saia Motor Freight Line	$1,218	$1,379	13.1%
10	Holland	$1,046	$1,132	8.2%
11	Southeastern Freight Lines	$1,043	$1,116	7.0%
12	Averitt Express	$717	$769	7.2%
13	Central Transport	$703	$754	7.2%
14	Dayton Freight Lines	$498	$571	14.5%
15	Pitt Ohio Transportation Group	$519	$556	7.1%
16	AAA Cooper	$518	$554	6.9%
17	Roadrunner Transportation	$462	$447	-3.2%
18	Reddaway	$386	$412	6.8%
19	New England Motor Freight	$398	$402	1.0%
20	A. Duie Pyle	$290	$310	6.9%
21	New Penn Motor Express	$309	$281	-9.1%
22	Central Freight Lines	$202	$263	30.2%
23	Daylight Transport	$195	$229	17.7%
24	Oak Harbor Freight Lines	$198	$208	5.4%
25	Ward Trucking	$153	$166	8.8%
TOTAL TOP 25 LTL CARRIERS		**$31,960**	**$34,468**	**7.8%**

NOTE: REVENUE FOR LTL OPERATIONS ONLY, UNLESS OTHERWISE INDICATED AND INCLUDES CANADIAN OPERATIONS
SOURCE: COMPANY REPORTS AND SJ CONSULTING GROUP ESTIMATES
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**Source: 2017 Mastio & Co. National LTL Carrier Report*

SPECIAL REPORT

TOP 50 TRUCKING

the slowest quarter of the year. Carriers, hampered by a lack of drivers and faced with new time constraints due to mandatory electronic logging devices (ELDs), are increasingly being choosy in picking the best-yielding freight for their bottom lines.

As we disclose in our annual examination of the Top 50 trucking companies, nearly all of the Top 50 carriers are profitable, some with eye-popping efficiency, such as Old Dominion Freight Line's (ODFL) industry-leading 82.5 operating ratio for last year. Keep in mind ODFL is posting that impressive ratio while growing annual revenue 10% to more than $3 billion last year.

It's this combination of growth and profitability that nearly all members of the top 50 strive for in the dog-eat-dog, pennies-on-the-dollar, deregulated trucking environment. Let's examine some moves that the Top 50 are making to maximize profitability and growth in this booming freight environment.

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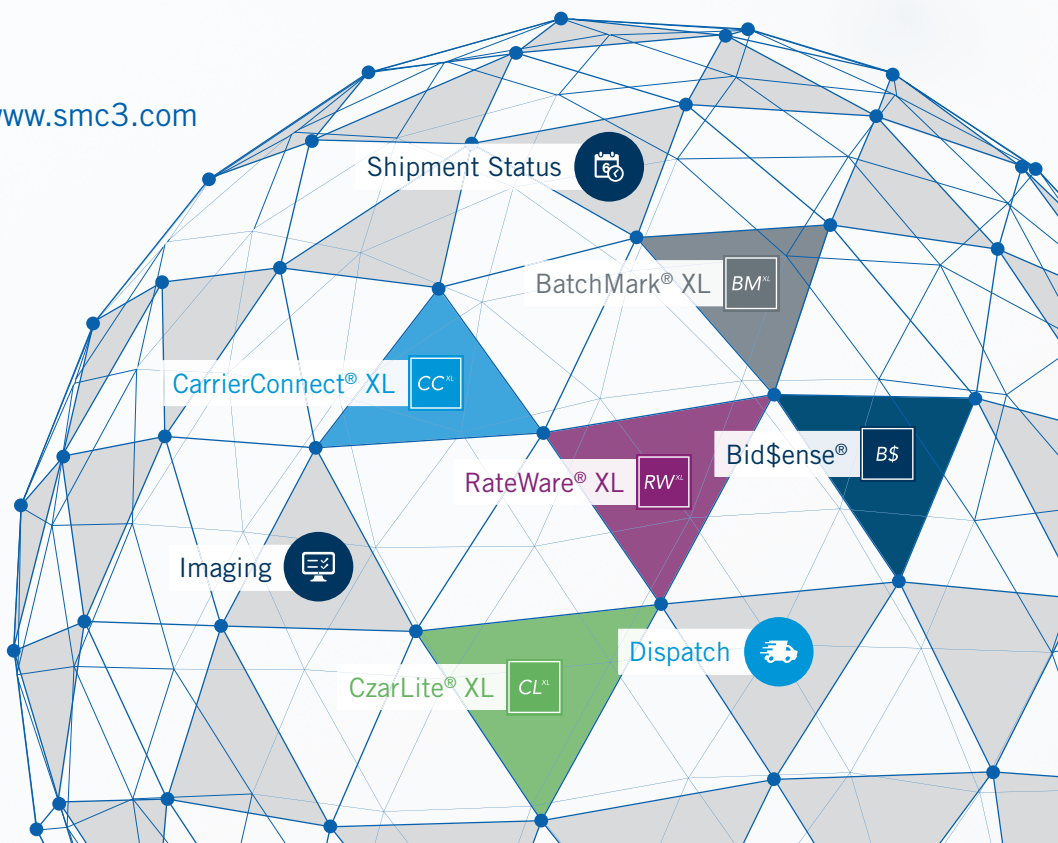

TOP 50 TRUCKING

TOP 25 TRUCKLOAD CARRIERS: 2017 REVENUES

(Including fuel surcharges)

Rank	Carrier name	2016 Revenue ($ million)	2017 Revenue ($ million)	YoY % Change
1	Swift Transportation	$3,361	$3,344	-0.5%
2	Schneider National	$2,298	$2,457	6.9%
3	J.B. Hunt Transport Services	$1,921	$2,097	9.2%
4	Landstar System*	$1,619	$1,836	13.4%
5	Prime	$1,520	$1,638	7.7%
6	Werner Enterprises	$1,512	$1,609	6.5%
7	CRST International	$1,173	$1,448	23.4%
8	U.S. Xpress Enterprises	$1,302	$1,382	6.2%
9	Crete Carrier Corp.	$984	$1,005	2.1%
10	Knight Transportation	$900	$906	0.7%
11	Ryder Systems	$837	$899	7.4%
12	CR England	$855	$895	4.7%
13	Celadon Group**	$892	$856	-4.0%
14	Roadrunner Transportation	$862	$844	-2.0%
15	Ruan Transportation Management Services	$750	$764	1.8%
16	Penske Logistics	$642	$697	8.6%
17	Daseke	$564	$645	14.3%
18	Cardinal Logistics*	$621	$613	-1.3%
19	Heartland Express	$613	$607	-0.9%
20	Stevens Transport	$589	$607	3.0%
21	Anderson Trucking Service	$593	$605	2.0%
22	Covenant Transportation Group	$594	$601	1.2%
23	Western Express	$528	$566	7.3%
24	Marten Transport	$533	$547	2.6%
25	NFI Industries	$490	$520	6.1%
TOTAL TOP 25 TRUCKLOAD CARRIERS		**$26,551**	**$27,988**	**5.4%**

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REVENUES PRIMARILY FOR TRUCKLOAD OPERATIONS AND MAY INCLUDE LESS THAN TEN PERCENT FOR NON-TRUCKLOAD SERVICES
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TOP 50 TRUCKING

All the right moves

After years of delaying capital expenditures or minimizing expansion plans, top trucking companies are loosening their purse strings in what they say is a badly needed recapitalization effort. While they may not be expanding the number of trucks, they're bolstering their networks with newer, more fuel-efficient tractor units, and in some cases adding terminal capacity.

Carrier executives say that the Trump administration's corporate tax cuts taking effect this year, along with a reduction in regulations, have combined to create a bull market in investments by carriers.

Class 8 heavy truck sales rose 43% year over year in December to more than 22,000 units. That was the most of any month last year and the most since July 2018, according to WardsAuto.com. In fact, market leader Freightliner nearly doubled its December Class 8 sales compared with December 2017.

"Overall market fundamentals is the big thing," says Darren Hawkins, president and COO of YRC Worldwide. Hawkins is taking over for YRC Chairman and CEO James Welch, who is retiring July 31. "Market dynamics are driving this."

Overseeing the parent company of YRC Freight and three regional less-than-truckload (LTL) carriers (New Penn, Holland and Reddaway), Hawkins says that the LTL giant is well positioned for 2018's surging demand—and meeting that demand with its youngest fleet in decades. Currently, 68% of YRC Freight's line-haul tractors will be less than three years old, he adds, nearly double what it was as of the end of 2016.

"Upgrading the fleet not only enhances safety, but we also see a noticeable improvement in fuel efficiency, service reliability and a decrease in maintenance expenses compared to the units replaced," says Hawkins.

In addition to prioritizing yield improvement, Hawkins says that 2018 strategic objectives for YRC Freight include safety measures, including in-cab technology that delivers dividends around accident avoidance and is being supplemented by a new investment around employee injury avoidance.

For example, YRC recently re-engineered eight regional distribution centers to prepare for what it expects is a flood of freight this summer, Hawkins disclosed. The result is faster processing, greater density and fewer transfers of customer shipments, he said.

"YRC's multi-year change management and technology investments around line-haul, pickup and delivery operations is now maturing into a 2018 benefit through overall mile reduction, better cube utilization and intended cost reduction," says Hawkins. "These large projects are being implemented in stages, and network benefits should continue to align around each additional install throughout 2018."

YRC is hardly alone. UPS, parent of LTL unit UPS Freight, says it plans to spend $12 billion on investments to expand its logistics network, increase pension funding and position the company to "further enhance" shareowner value. Not to be outdone, FedEx Corp., parent of FedEx Freight, says it's investing $3.2 billion in tax savings. Not all will go to the LTL unit, of course, but it's indicative of the investments carriers are making.

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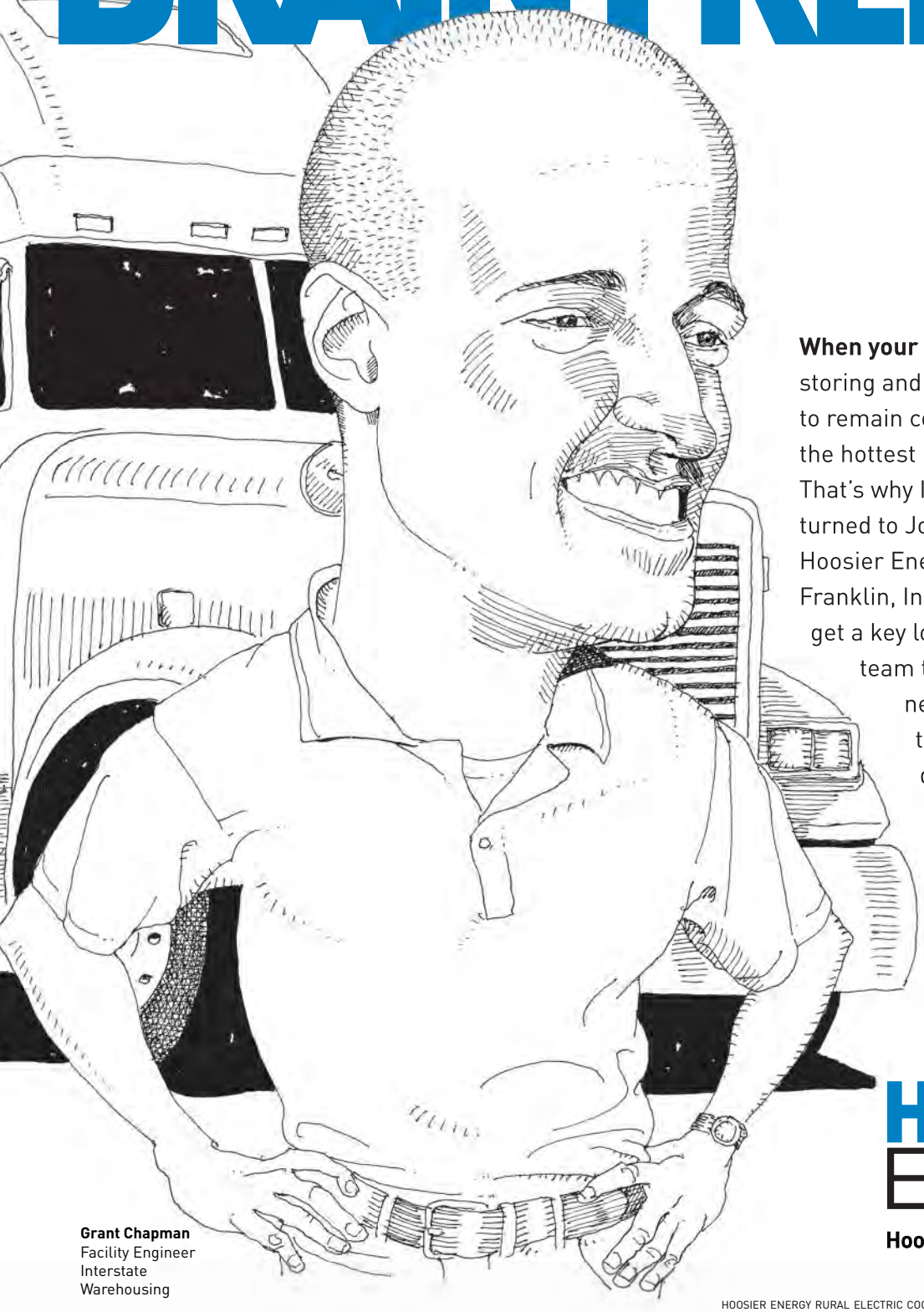

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SPECIAL REPORT

TOP 50 TRUCKING

Carriers with drivers win

Until last year, LTL carriers were largely immune from the driver shortage that's plaguing growth in the truckload (TL) sector. The American Trucking Associations (ATA) estimated that the industry is short about 50,000 drivers right now, with some of those shortages in the LTL sphere.

"It's more so in the truckload space, but it's becoming a problem in LTL as well," says Chuck Hammel, president of Pitt Ohio. "As an industry, we need to start recruiting younger employees and train them as drivers. Each year we lose more and more drivers to retirement, and it's difficult to replace those drivers, let alone grow our driver workforce. Today it seems that most companies replace those drivers by poaching them from other companies, and that's not sustainable."

In the TL sector, sign-on bonuses as high as $10,000 are being offered for drivers who last one year with a company. Even so, driver turnover in the TL sector rose 5 percentage points to 95% turnover in last year's third quarter, according to Bob Costello, chief economist for the ATA.

Fritz Holzgrefe, executive vice president of finance and CFO at Saia Motor Fright Line, says that LTL carriers are seeing some impact from TL market capacity dynamics. "The driver market continues to be challenging," he says. Like a lot of competitors, Saia is offering prospective drivers the favorable LTL lifestyle along with competitive pay, rising benefits, and comparatively new equipment.

After years of retrenchment, a new development at YRC is driver hiring. According to Hawkins, YRC is using technology such as an applicant tracking system that allows for streamlining processes and reducing time to hire. "We've made investments in recruiting personnel to allow for additional driver training instructors throughout the network to

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support our tuition-free driving schools," he says, adding that YRC operates over 80 driving schools throughout the country and continues to focus on promoting the dock-to-driver program to find over-the-road drivers from its most motivated dock workers.

"Carriers are doing a better job capturing accurate dimensional pricing and accessorial charges, and shippers should recognize that this environment isn't temporary and will continue for most of 2018."

—Satish Jindel, SJ Consulting

Hawkins adds that YRC and other unionized LTL operators (UPS Freight and ABF Freight System) should theoretically be in the best positions to attract drivers. But a shortage of workers appears even despite a more favorable work-life balance, more predictable schedules and union protection.

"We're still capable of attracting drivers from other modes as well due to the quality of life around LTL," adds Hawkins. "And our turnover is not near what you see in other segments."

Indeed, carriers seem to be opening the purse strings to attract and retain drivers. The parent of FedEx Freight says that it will spend more than $200 million to increase compensation for its staff at all its operating units, with pay increases taking effect April 1, instead of the usual Oct. 1 date.

Several other carriers have reported that they'll offer pay increases or bonuses this year. Old Dominion recently allocated $500 to all 22,000 employees to be distributed this year, while many carriers are increasing driver and dock pay in an effort to retain employees in a tight labor market.

As Old Dominion CEO David Congdon, who will be stepping down as part of planned executive succession next month, recently wrote in an email to employees: "The president has signed a historic tax reform bill that should reduce our taxes and also generate growth for the U.S. economy. We expect that the anticipated improvement in the economy will create additional opportunities for use to win market share and grow our company more than originally anticipated."

What's the deal with rates?

Carriers have rarely been as bold as they are now in seeking adequate returns. According to Satish Jindel, a leading trucking analyst and principal of SJ Consulting, carriers should be able to get 5% or more in their base freight rates this year.

"However, it's not just the base rate that's rising," says Jindel. "Carriers are doing a better job capturing accurate dimensional pricing and accessorial charges, and shippers should recognize that this environment isn't temporary and will continue for most of 2018."

Carrier executives say that the most sophisticated shippers realize that their rates must rise in this tight capacity market, but some continue to hunt for the best price as they increasingly put more of their freight on the market for open bids.

"Shippers realize that capacity has tightened, but they're still fighting to keep their rates from increasing too much," says Pitt Ohio's Hammel. "Some are putting their

business out for bid, but are receiving rate increases anyway."

Analysts agree. "Pricing remains strong, but what's maybe misleading about the overall yield number was that fuel surcharges were a headwind the past couple of years," says Stifel Inc. trucking analyst David Ross. "As a result, yield declined. However, now fuel surcharges have moved from being neutral to maybe a slight tailwind."

In this environment, Ross is now predicting core LTL price increases in the 3% to 4% range. "That's the least carriers can recover to cover their rising cost of labor," he adds.

According to Wayne Spain, Averitt's president and chief operating officer, the "majority" of shippers realize capacity has tightened, but added that "many have not necessarily experienced it to a strong degree yet." He said Averitt's internal North American supply chain survey showed that nearly 20% of shippers said they've experienced capacity challenges in the past year—an 8% increase over the previous year's results.

Spain and other trucking executives emphasized that shippers and carriers need to work more closely together now more than ever. "We're being hit with double-digit increases in nearly everything—trucks, tires, trailers, healthcare costs and employee wages," says Myron Shevell, chairman of Shevell Group, parent of Northeast LTL carrier New England Motor Freight. "We can't absorb all these costs by ourselves, and if we did we would all be out of business and there would be no one to haul freight in the Northeast. Shippers have to realize this is a new era for pricing, and it's not going away any time soon."

Other executives concur. "Shippers are beginning to understand the dynamics in the current transportation markets," adds Saia's Holzgrefe. "The rate environment remains positive."

John D. Schulz is an editor at large for SCMR

Modex 2018 SHOW WRAP UP

Modex 2018, April 9-12, covered more than 300,000 net square feet of exhibit space on two show floors at Atlanta's Georgia World Congress Center with 900 exhibiting companies. The expo was co-located with the Georgia Logistics Summit. Here's a look at some of the booths that editors visited.

Kardex Remstar launched remote support service

Kardex Remstar launched a Cloud-based Remote Support platform that continuously monitors the status of installed systems and remotely maintains them as needed.

"There are two key features included in the new support platform," said Mark Dunaway, EVP of new business. "Remote Assistance manages diagnostics and allows simple maintenance requests to be performed remotely instead of on site to cut downtime; and Remote Analytics, which gives users access to machine data anywhere with the Internet."

Additionally, the new LR 35 vertical buffer module (VBM) and the Shuttle XP vertical lift module (VLM) are displayed. "The LR 35 is ideal for single-part or small-volume orders," continued Dunaway, who noted the unit includes a shelf system with automatic bin handling, picking stations and logistics software. "It delivers totes of small items to operators with minimal wait time, speeding up order picking and reducing the amount of floor space required to store items."

Chelsea Tarr, marketing communications coordinator, demonstrates Kardex Remstar's Shuttle XP 500, which features new Access Ready light technology.

Also new, Access Ready light technology can now be added to the Shuttle XP VLM, alerting operators to the tray's arrival in the access opening.

Dematic demonstrated versatility of new modular GTP solution

Dematic introduced a modular, turnkey goods-to-person (GTP) solution to provide a fast and scalable order fulfillment engine.

The solution combines the secure, high-density inventory management benefits of Dematic's Multishuttle with the compact, high-speed advantages of patented inter-aisle transfer capability. It includes a high-density buffering and sequencing engine with multi-purpose ergonomic workstations used for picking, packing, replenishment, robotic cells or all of the above.

"Industries with high SKU volumes will especially benefit from our enhanced GTP solution," said Mike Khodl, VP of global solution management. "Its dynamic, compact design manages inventory accurately and delivers items to pickers quickly. This allows our customers to extend order cutoff times, speed up shipping and delivery windows, and even enables them to expand into new service areas."

Scott Watts, EVP for Dematic North America, shows the company's Multishuttle with inter-aisle transfer capability.

Khodl said ROI is typically less than three years. The modular design lowers initial cost, he said, and the solution's scalability improves flexibility.

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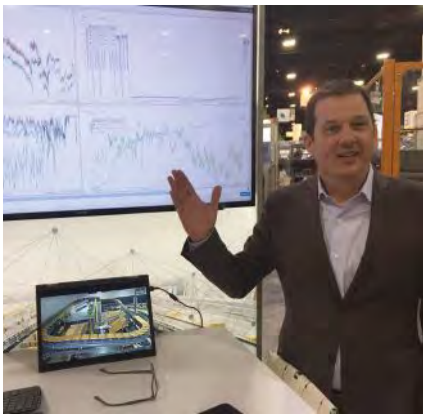
Honeywell Intelligrated's Momentum WES connects orders, automation and labor

Honeywell Intelligrated offered a live demonstration of Momentum, its new software platform for distribution centers that streamlines and simplifies complex e-commerce fulfillment operations.



Pieter Krynauw, president of Honeywell Intelligrated, demonstrates Momentum's real-time metrics with a live feed from a facility demonstration center.

The warehouse execution system (WES) brings together automated equipment, workflows, orders and labor in a unified platform. The system provides e-commerce fulfillment, store replenishment and wholesale distribution center operations with shortened order cycle times, improved order accuracy and faster deliveries.

"Many of today's warehouse execution systems are a patchwork of custom software and control solutions, so we've taken a vastly different, clean-sheet approach that prioritizes stability and simplicity to enable a Connected Distribution Center," said Pieter Krynauw, president of Honeywell Intelligrated.

Krynauw also emphasized improvements to the company's Lifecycle Support Services. Hardware-agnostic cybersecurity and data collection have enabled a new approach to service.

"You can't have an army of people maintaining and fixing such complex systems," Krynauw said. "You need systems that are smart enough to heal themselves."

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New reach truck, VR training simulator at Raymond

Showcasing the interconnectivity between the digital and physical worlds, The Raymond Corp. highlighted its Reach-Fork truck series. The vehicles are now integrated with technologies and scalable telematics to enhance the operator experience and increase productivity.

"With integrated trucks, warehouses and DCs can obtain real-time information—from operator performance to certification tracking to operational efficiencies—helping achieve maximum productivity and visibility," said Michael Field, CEO.

Introduced at Modex, Raymond's new high-capacity Reach-Fork trucks reach an industry-leading 542 inches and lift up to 4,500 pounds for increased productivity and storage utilization.

Also displayed, the Raymond Virtual Reality Simulator has been updated to offer reach truck instructional modules, providing advanced, hands-on instruction to improve operator proficiency and build confidence.

A Raymond representative guides an attendee through a virtual reality training program that uses a standard reach truck.

SSI Schaefer debuted shuttle, highlighted VLM and WMS

SSI Schaefer expanded its shuttle portfolio for small load carriers with the new SSI Flexi Shuttle. The modular single-level shuttle system handles a wide variety of stored goods with a storage capacity of up to 110 pounds.

The unique feature of this system is the adaptability for storage location sizes. This feature works by having flexible positioning within the racking system, which efficiently stores a broad spectrum of load unit dimensions, up to 860 x 680 mm (33.85 x 26.77 inches). The design allows installation at any position throughout the storage aisles and combines automated storage, buffering and sequencing. Moving at speeds up to 4 m/s (13 ft/s), the shuttle also works in deep freezers.

Mark Dickinson, SSI Schaefer's head of IT sales in North America, with the new Flexi shuttle.

"In comparison to conventional applications, the SSI Flexi Shuttle does not rely on fixed-allocation storage positions within the racking system," said Peter Berlik, technical CEO. "Paired with intelligent IT strategies, the rack design allows size-independent, fully automatic, space-optimized storage, and therefore offers operators previously unheard of possibilities."

Mark Wheeler, director of supply chain solutions, with the MC3300 mobile computer.

Zebra displayed latest mobile technology

A leader in rugged mobile computers, bar code scanners and bar code printers enhanced with software and services to enable real-time enterprise visibility, Zebra Technologies demonstrated its latest innovations.

The MC3300 handheld computer series is an Android-based computer fortified with Mobility DNA to help simplify the deployment and application development required to transition from legacy Windows-based mobile investments. Available in multiple form factors, the device provides powerful and easy-to-use advanced data capture features that can scan 1D/2D bar codes in any condition.

Zebra also displayed the LI3608-ER/LI3678-ER 1D Ultra-Rugged Scanner. Designed to capture virtually any 1D bar code from as close as 2 in./5.1 cm to as far as 56 ft./17.1 m away, this versatile device allows workers to capture codes in hand as well as on the top of warehouse racks.

Rite-Hite debuted two new products

Rite-Hite showcased two new products at the show. The Direct Drive HVLS Fan and the Trailer Stabilizer round out the manufacturer's product line.

The HVLS fan comes in five sizes (8 feet to 24 feet) and is powered by a direct drive that requires no oil—a feature that makes it attractive for "clean" warehouse and DC environments, such as food or pharmaceuticals. Users can control up to 24 of the HVLS fans—which will be available for sale in early-July—with a single control box.

Rite-Hite's new Trailer Stabilizer rolls into place and can be raised and lowered with a crank. Featuring two support legs, this stable, mobile product is rated for 80 tons. Rite-Hite also demonstrated the Dok-Commander System and a new graphic user interface (GUI) control panel at its booth.

Walt Swietlik, director of customer relations and sales support for Rite-Hite, with the Trailer Stabilizer.

Knapp introduced new shuttle technology, operational optimization software

A new shuttle AS/RS—the OSR Shuttle Evo—debuted in a press conference led by Kevin Reader, director of marketing and business development at Knapp.

Completely redesigned, the shuttle packs more functions and greater energy efficiency into a smaller size, enabling it to travel faster, increase system density and reduce a facility's carbon footprint.

Heimo Robosch, executive VP of Knapp, explained the benefits of the OSR Shuttle Evo as Kevin Reader, Knapp's director of marketing and business development (right), looked on.

Ideal for either Greenfield or existing buildings, "the shuttle structure now integrates the lifts and conveyor queuing, dramatically increasing its flexibility and adaptability by making it a much simpler process to add on workstations for e-commerce, automated case handling and palletizing, or quality control, Reader said. "It also now travels as high as 130 feet and distances of 650 feet, a 25% improvement over the previous models."

Knapp also showcased its new red-PILOT software that serves as a control panel for senior managers seeking to leverage Big Data, predictive modeling, analytics, Internet of Things (IoT) and artificial intelligence (AI) to optimize warehouse and DC operations.

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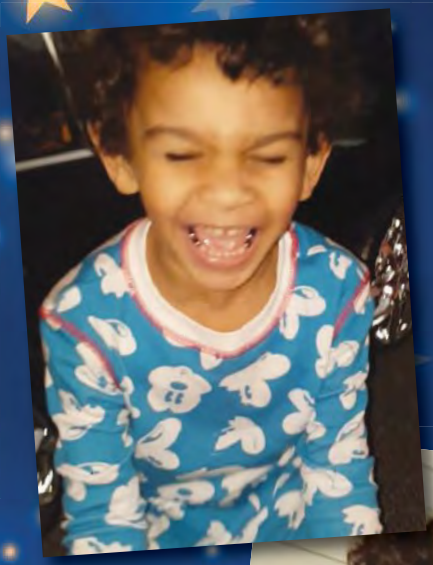

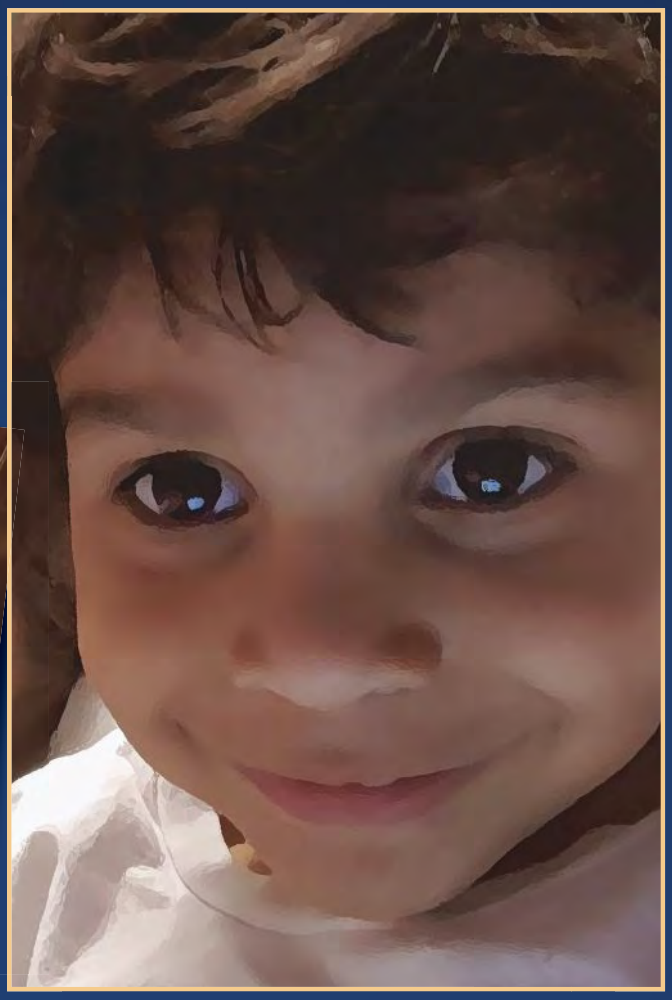

Meet Isaac. Isaac's mom, Amanda, is currently fighting Leukemia. As a single mom, she needed help. The Beauty Foundation stepped in and not only provided a financial grant so that she could pay her mounting bills, but also made sure Isaac received a full Christmas... including some nice wheels to get around.

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Reverse logistics practices and organizational factors

Industry and annual revenue affects the extent to which organizations invest in returns management.

By Becky Partida, APQC

For many organizations, reverse logistics provides a way to quickly and efficiently obtain returned products for repair, disposal, recycling or refurbishment. For that reason, it is in an organization's best interest to conduct reverse logistics as efficiently as possible to keep customers satisfied and occupy minimal resources.

Data from APQC's Open Standards Benchmarking in logistics indicates that a majority of organizations (over 82%) have implemented a returns management process as part of their logistics activities. Nearly half of organizations have implemented formal returns management extensively; what's more, many have determined that it makes more sense to outsource returns management than to execute the process in house.

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Accordingly, APQC has found that most organizations (about 75%) in our survey have implemented the use of third-party logistics (3PL) providers or other external agencies to manage their returns. However, the degree to which organizations use 3PLs varies. About 41% of organizations use 3PLs to some extent, and one-third of organizations use them extensively.

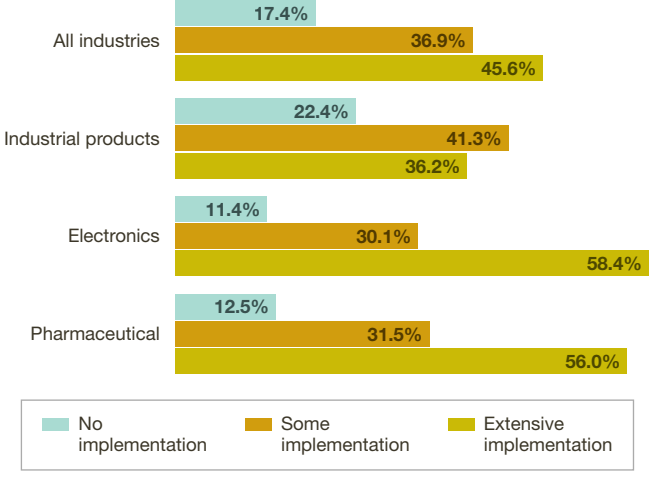
With these factors in mind, APQC further evaluated its data to look at how organizations manage reverse logistics. The data reveals that the use of formal reverse logistics varies by industry and by revenue. When it comes to logistics cost, the greater implementation of a formal returns management process and working with 3PLs for reverse logistics are associated with a higher cost to manage logistics and warehousing.

Industry's impact

An organization's industry can have an impact on the extent to which it implements a returns management program, as well as the extent to which it uses 3PLs to manage returns. Results from the industrial products, electronics and pharmaceutical industries illustrate this point.

FIGURE 1

Industry and implementation of formal returns management



Source: APQC

As shown in Figure 1, the degree of implementation of formal returns management varies among the three industries, especially when compared to a broader group of cross-industry organizations.

Industrial products organizations have more respondents that have not implemented formal returns management at all, although they make up just less than one quarter of the entire group. This industry also has fewer respondents that have implemented formal returns management extensively. This may be due to the types of products manufactured by this industry. These products may not be returned as frequently as products in other industries, thus reducing the need for a formal returns management process. Products from this industry may also be highly customized, leading organizations to handle returns or defective products on a case-by-case basis rather than to establish a formal process.

As Figure 1 also shows, the more specialized electronics and pharmaceutical industries have more respondents that have adopted formal returns management processes extensively when compared with the group of cross-industry organizations. Because of the technical nature of products in the electronics industry, and the highly regulated nature of products in the pharmaceutical industry, these organizations have need for documented, standardized processes for product returns and defective products.

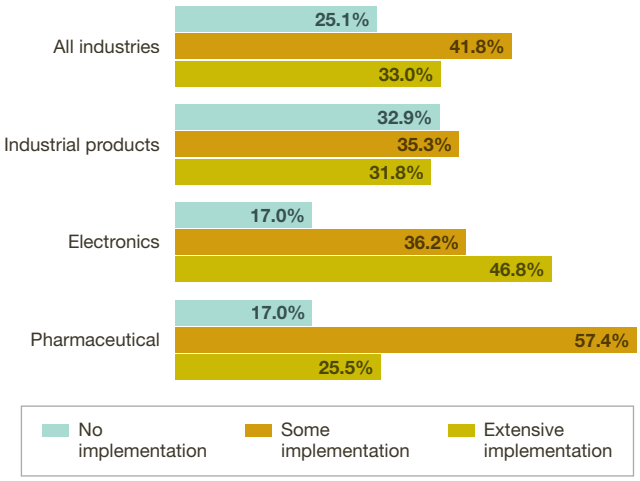
For the pharmaceutical industry, the fact that over 12% of organizations in APQC's data have not implemented any formal returns management processes is concerning. Not only does this indicate that some organizations are struggling to keep up with potential regulations set by government agencies, but it also calls into question these organizations' abilities to track and ensure the safety of products.

In addition to the presence of formal returns management, industry groups also differ in the degree to which they use external agencies or 3PLs for managing returns. As shown in Figure 2, the industrial products industry has more respondents that do not use external agencies or 3PLs to manage their returns. This may be related to the fact that this industry has a higher percentage of organizations without a formal returns management process.

Both the electronics and the pharmaceutical industries have a larger percentage of organizations that use 3PLs extensively to manage their returns. The results for the pharmaceutical industry highlight the need for organizations in this group to adhere to regulations set by governmental organizations. To best meet these requirements, pharmaceutical organizations may outsource the management of returns to service providers who can focus solely on adhering to governmental guidelines. Using external providers also means that pharmaceutical organizations do not have to dedicate resources to managing returns.

FIGURE 2

Industry and use of external agencies/ 3PLs to manage returns



Source: APQC

Revenue's impact

An organization's revenue can also impact the degree to which it has implemented a formal returns management process as well as the extent to which it works with external providers to manage returns. APQC's data shows that as annual revenue increases, the percentage of organizations that have not implemented a formal returns management process decreases. At the same time, the percentage of organizations that have implemented the process extensively increases. Among organizations with less than $100 million in annual revenue, about 14% have not implemented a formal returns management process at all. For organizations with revenue $20 billion or greater, this group is only 10%. A similar difference between the two groups exists among organizations that have implemented returns management to some

extent: 38% of organizations with less than $100 million in annual revenue have implemented to this extent, and 41% of organizations with annual revenue of $20 billion or greater have implemented to this extent.

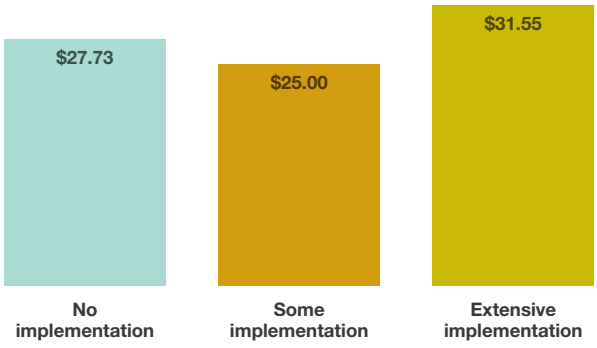
Revenue can also impact the extent an organization uses external agencies or 3PLs to manage returns. Nearly 30% of organizations that have less than $100 million in annual revenue do not use external providers at all, while only 11% of organizations generating $20 billion or more in annual revenue fall into this category. Just over 25% of organizations with the lower annual revenue use 3PLs extensively and 47% of organizations with the higher revenue use 3PLs extensively.

These results indicate that adopting formal returns processes and outsourcing the management of returns requires investment. Organizations with lower revenue cannot afford to implement returns processes or outsource returns. It may also be that they are simply unwilling to spend the money on processes that may not yield an immediate return.

This trend continues when considering the extent to which an organization has adopted an external service provider to manage product returns. Those with extensive implementation spend just over $3.00 more per $1,000 in revenue to manage logistics and warehousing than their counterparts that do not use 3PLs to manage returns.

FIGURE 3

Formal returns management and cost to manage logistics and warehousing



Source: APQC

Consider the cost

Although many organizations have adopted returns management processes and use the expertise of outside groups to manage their returned products, organizations still vary in the extent to which they do so. Variations in adoption are even more prevalent when considering an organization's industry as well as its annual revenue.

It is worth noting that although formal returns management may go a long way to creating efficiency and giving organizations the level of compliance they need for governmental regulations, implementing these processes requires some investment in setting up processes and supporting systems. APQC's data also indicates that organizations with more extensive implementation of formal returns management or the use of 3PLs pay more to manage logistics and warehousing than their counterparts adopting these practices to a lesser extent.

As shown in Figure 3, there is a $3.82 difference per $1,000 in revenue in the cost to manage logistics and warehousing between groups that have not implemented formal returns management and organizations that have implemented this practice extensively.

Organizations should be aware of how industry and revenue can affect whether they adopt formal returns processes, as well as whether they should outsource returns management activities. They should also consider the potential for additional costs associated with the creation and management of these logistics practices. Government regulations may make extensive, in-depth formal returns processes necessary, but the type of product and the amount of funds an organization has available to invest in additional processes may be an influencer on the choice an organization makes.

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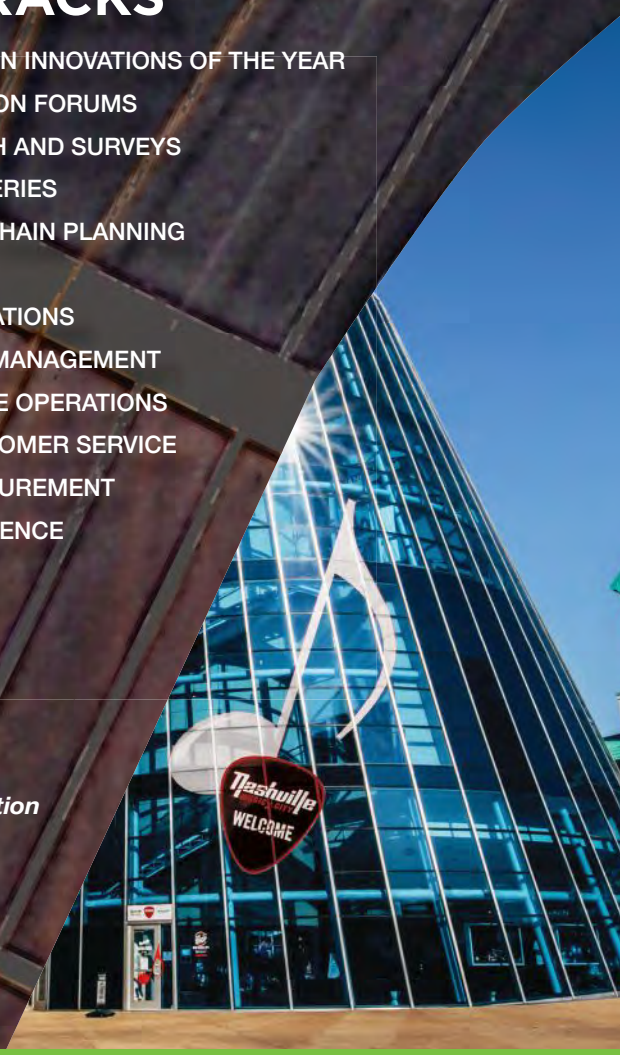

THE SPEAKERS

Joanna Wright
Vice President Enterprise Operations and Services, IBM

David Bozeman
Vice President, Amazon Transportation Services, Amazon.com

Mike Brewer
Vice President, Global Operations and Logistics, Nike

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