

SUPPLY CHAIN

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Heather B, Supply Chain Account Specialist



It's our time to lead

In late May, I attended the Institute for Supply Management's first live conference since 2019. The message from Tom Derry, ISM's CEO, was simple: These are challenging times, but along with the challenges come opportunities for those of us who can step up and lead our organizations into the future.

One area where supply chain will be tasked with stepping up to the plate is going to be ESG, the initialism for environmental, social and governance. It was a major theme of the conference, and while all of the reporting requirements are still being debated, there's little question that supply chain will lead the charge in environmental initiatives as well as areas such as conflict minerals, supplier relations and diversity and inclusion. Just pile those on top of the traditional role of getting stuff out the door and into the hands of customers.

It's going to be a tall order, but as Derry pointed out, therein lies the opportunity to lead.

The July/August issue of SCMR is all about leadership, and touches on ESG. We kick off the issue with an interview with Lynn Torrel, the chief procurement officer and supply chain leader for Flex, one of the world's largest contract manufacturers. Among the topics we touched on were what Torrel learned about leadership through the pandemic.

On the ESG front, you'll want to read "Procurement has a significant role to play in the pursuit of ESG goals," by Elouise Epstein, a Kearney partner and in-demand speaker on procurement. Excerpted from her book *Trade wars, pandemics, and chaos: How digital procurement enables business success in a disordered world*, Epstein spells out the vital role

procurement can play at an organization that aims to lead on ESG.

You'll also want to read this month's Operations Advantage column, also from partners at Kearney, and "Regionalize your supply chain: Closer is better," by frequent contributors Knut Aliche, Kai Hoberg and Julien Mauhourat. Both articles take a long, hard look at the trend toward locating capacity—and a supply base—near demand, which helps with ESG scoring.

Rounding out the issue, Stan Fawcett, Mike Knemeyer and their writing team return with an article on the importance of sharpening your team's sensing abilities. It explains why the kangaroo rat, which has extraordinary sensing capabilities, survives, and also why some organizations that took early warnings about a pandemic in Asia were less disrupted by COVID than their peers. It's a fascinating read.

Last but not least, if you haven't done so already, be sure to register for the NextGen Supply Chain Conference at nextgensupplychainconference.com. This year, we're back in person for our fifth conference at the Chicago Athletic Association, October 17–19, 2022. I expect another great lineup of senior leaders as speakers. As always, I look forward to hearing from you.



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MANAGEMENT REVIEW

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The supply chain leader for one of the world's largest global manufacturing partners discusses the lessons she has learned about leadership during the pandemic as well as her vision for "true demand."

26 Actionable awareness: How to avoid becoming supply chain roadkill

Disruptive events affect us all. But companies with supply chain sensing capabilities can take action to avoid becoming the proverbial deer in the headlights.

34 Regionalize your supply chain: Closer is better

Highly complex, global supply chains might have passed their peak given the accelerating uncertainties in supply and demand. In this article, we illustrate that regional supply chains can be more resilient and need not be more expensive if planned well.

42 Supply chain traceability is key to sustainability—and improved performance

For more than a century, businesses have honed highly efficient, linear supply chains. Raw materials flowed in one direction, were transformed into a product, used and ultimately discarded in a waste heap. That approach now puts a firm's competitiveness at risk.

48 Procurement has a significant role to play in the pursuit of ESG goals

One of the lasting legacies of the post-COVID era will be how ESG jumped to the top of the corporate strategic objectives. In fact, it's such a popular board-level objective, visible in nearly every annual report, that the discussion is less about why to do it and more how to do it.

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By Marisa Brown

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Supply Chain Management Review® (ISSN 1521-9747) is published 7 times per year (Jan/Feb, Mar/Apr, May/Jun, July/Aug, Sept/Oct, Nov, Dec) by Peerless Media LLC, 50 Speen St, Ste 302, Framingham, MA 01701. Annual subscription rates: USA \$199, Canada \$199, Other International \$241. Single copies are available for \$60.00. Send all subscription inquiries to *Supply Chain Management Review*, PO Box 677, Northbrook, IL 60065-0677 USA. Periodicals postage paid at Framingham, MA and additional mailing offices.

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Revisiting Quick Response

Editor's Note: This marks Larry Lapidé's 100th Insights column.

Dr. Lapidé 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 last two years have upended forecasting and planning processes. Some companies and public officials appear to have gotten things right, while others have gotten things wrong. While the current times have been extraordinary, getting forecasting and planning right is always a battle. Throughout my career I've listened to practitioners discuss what they have done that has been successful or not. A couple of interesting talks were from

managers who were brought into their companies to redo demand forecasting and planning processes—such as sales and operations planning (S&OP), similar to what had to be done by many managers during the pandemic.

One discussion that really resonated with me was from a manager who said that she took over management during a chaotic time in her business. As a result, her main strategy was to first install processes to achieve stability goals; that came before she even thought about optimizing processes. The following definitions clarify the differences.

- Chaotic: completely confused or disordered.
- Stability: resistance to change, especially sudden change or deterioration.
- Optimal: the greatest degree or best result obtained or obtainable under specific conditions.

Prior to the pandemic, global supply chains had evolved toward being optimized, largely cost-effective and efficient vis a vis responsiveness. As the virus ravaged throughout the globe, demand was adversely (and unpredictably) affected, and supply chains broke down for lack of labor (during lockdowns), as well as material shortages. A state of chaos arose for the private and public sectors on a global basis. In short: The just-in-time (JIT) violin strings of supply chains were wound too tight, and eventually broke down under the stresses put on them by the virus.

It was chaos because the virus changed everything. While goods and services did not physically change, worldwide consumer behavior and supplier performance did. This meant that the history for every product and supplier was virtually useless for forecasting and planning purposes during the pandemic.

Lessons learned

Three major lessons came out of my research into planning and forecasting. One was that there is a difference between decision-making (DM) and planning under uncertainty vis a vis planning under risk. Under uncertainty, probabilities of future occurrences are unknown, not assumable and inestimable, while not so under risk.

Managers who were not aware of the difference usually assumed all randomness could be modeled by stable probability distributions. Because stable and optimized demand-supply chains have history as a guide, stable distributions can be estimated from a statistical analysis of that history. Meanwhile, chaotic environments emerge from unpredictable, and rarely seen a priori catastrophic events, such as pandemics, hurricanes, tsunamis and earthquakes. Thus, history is virtually useless for assessing and modeling probabilities of future random occurrences that are fraught with uncertainties.

A second major lesson gleaned was that DM strategies for uncertainty versus risk are very different. Making decisions under uncertainty involves balancing optimism versus pessimism to achieve an appropriate risk-reward balance for a company in its industry¹. It's all about the degree of risk one is willing to take. A risk profile that enumerates the probability of each future occurrence cannot be estimated for uncertainties. On the other hand, DM under risk extensively uses risk profiles to make decisions, such as setting buffer stocks, extra production capacities and buffering lead times (by adding extra time to JIT supply chains).

The third lesson involves rapid decision-making, which I had initially termed Quick response (QR)². However, QR under uncertainty vis a vis under risk is different. QR under risk might require rapid response because a highly unlikely event in a stable environment occurred. Such as an outlier that has a

minimal chance of occurring. Statistically-based analyses can help managers make rational QR decisions under risk. Not so under uncertainty, in which managers are begrudgingly forced to make decisions on the spot, unsupported by historical precedence nor sufficient data.

First foray into defining QR

More than four years ago I wrote an Insights column meant to start a dialog of an advanced concept which the Institute of Business Forecasting (IBF) was tentatively calling Quick Response Forecasting (QRF). It was predicated on the premise that in order to take advantage of predictive downstream demand signals, such as from social media, that portend a significant change in demand, current forecasting and planning processes were too slow to both detect and respond to them.

Also, that ad-hoc QR demand-supply teams would need QRF forecasts to capitalize on the revenue opportunities offered when acting on "predictive" demand signals. In the QRF process, monitoring signals on a real-time basis would also be needed to alert teams, as calls to action. I now believe that I should have termed this type of rapid DM: QR under risk. Because in a stable supply chain, there is ample historical demand data for the products affected, as well as of supplier performance.

Another premise was that ad-hoc QR teams, business continuity management (BCM) teams, for example, would need to be put in place in response to the occurrence of catastrophic events that would likely significantly alter demand-supply chains. I now realize that these teams would be facing uncertainty, not risk. Thus, in retrospect, two types of QR processes should have been discussed in that column.

I also asked a colleague of mine, Patrick Bower, to write his own QRF article. In response,

Bower wrote “S&OP, Demand Control, and Quick Response Forecasting”³. His executive summary included the following about QRF:

There has been some discussion of late in IBF circles about Quick Response Forecasting (QRF)...I find myself ... confused by proponents who discuss everything from Big Data, to point of sale data (POS), to “responsive” supply chains—each already having a place and role in supply chain planning... I think otherwise well-meaning folks are trying to define a process that already exists inside the sales and operations planning process. It is referred to as “demand control” (and sometimes SOE: sales and operations execution)...

When I first read Bower’s article, I didn’t fully appreciate his points because, paraphrasing him, demand control/SOE does not “get the

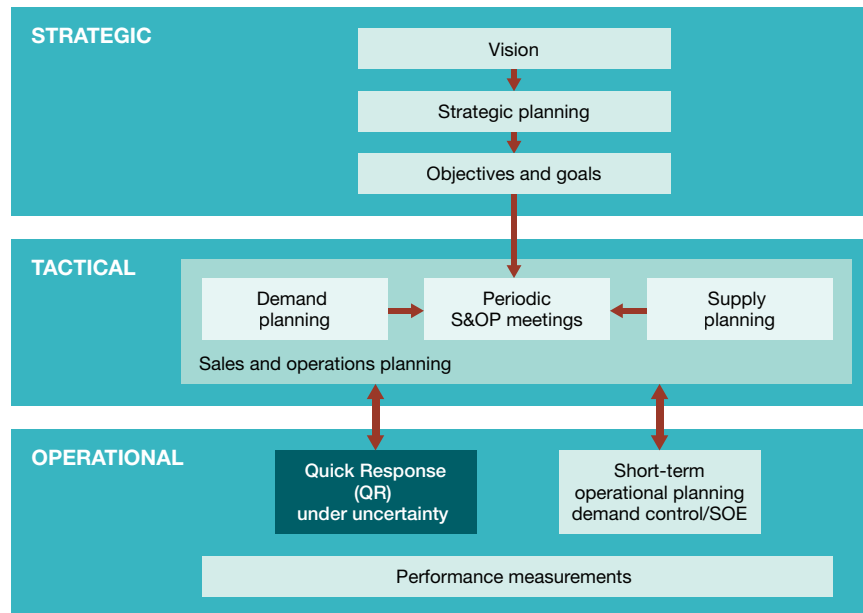
mindshare that other elements of the S&OP process receive—and yet, is the process element that seems to solve most of the problems that QRF aims to solve.” He went on to argue for his views and I encourage managers to read it as a detailed discussion of how demand control/SOE work within S&OP.

However, as I mentioned for QR under risk, S&OP as well as demand control/SOE are also under risk, not uncertainty. I suspect that the severe degree with which global supply chains broke down during the COVID-19 pandemic was the result of companies relying for too long solely on their S&OP processes. I believe that if ad-hoc QR teams had been put in place earlier during the pandemic, the damage might have been less severe and taken less time to fix.

Hierarchical demand-supply planning framework

In “Under uncertainties: Quick Response, not

FIGURE 1
Hierarchy demand-supply planning framework
(Including Quick Response (QR) as a temporary process to evolve from chaos to stability)



Source: Author

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only S&OP”⁴, I proposed a framework that included an ad-hoc process I called “hierarchical planning framework with Quick Response.” It was meant to be an operational planning process that is temporarily in place whenever uncertainties arise in a portion of a global demand-supply chain.

In this framework, an executive-led team of managers would be immediately assembled to do short-term forecasting and planning. The team would exist until enough information and data have been assembled to return that portion’s planning to the S&OP team. That is, when stable probability distributions can be estimated from historical patterns.

Figure 1 represents a revised version of that framework, titled “Hierarchy demand-supply planning framework.” The major difference from that prior hierarchy is that it includes two renamed planning processes. They are: 1) Demand control/SOE; and 2) Quick Response (QR) under uncertainty.

In a recent podcast with SCMR, I was asked to provide advice I’d give to a CEO during uncertain times. In response, I identified three things to do.

1. Recognize that your S&OP team is responsible for tactical planning under risk and is therefore not adequately trained nor chartered to do operational planning under uncertainty. Disciplined S&OP teams are responsible (often monthly) for developing detailed plans for complex demand-supply chains for navigating a company’s way forward. These chains are comprised of an untold number of products, selling countries, sales offices, customers, suppliers, plants and distribution centers.
2. Remind your S&OP team that uncertain times also include significant supply-side risks. While S&OP teams have historically been adept at handling demand-side risks, many teams have been reluctant to assume suppliers might not perform according to a supply plan.

However, since the Japanese tsunami and the rise of piracy reared their ugly heads, only some in the supply chain world had started recognizing that there are significant supply-side risks. The COVID-19 pandemic should now have convinced every supply chain manager of this.

3. Assemble an executive-led QR planning under uncertainty team comprised of your smartest and most resourceful managers. Charter it with recapturing lost demand-supply and revising products and suppliers as necessary. Give the team the responsibility to make rapid risky decisions unencumbered by lengthy executive approval processes. Once the chaotic (under uncertainty) part of the demand-supply chain becomes stable, disband the team.

In contrast, what would I advise managers now? Do not attempt to apply your optimized S&OP forecasting and planning approaches to uncertain portions of your demand-supply chains. Resist any pressure from executives to do so. Instead, advise them to assemble a QR team and, if brave enough, volunteer to be a part of it. It just may boost your career opportunities. ☺☺

1. L. Lapidè, “Decision making under uncertainty: A primer,” *Supply Chain Management Review*, May/June 2022
2. “Are you capturing enough ‘Quick-Response’ revenue?” *Supply Chain Management Review*, Mar/Apr 2018
3. Patrick Bower, “S&OP, Demand Control, and Quick Response Forecasting,” *Journal of Business Forecasting*, Summer 2018
4. L. Lapidè, “Under uncertainties: Quick Response, not only S&OP,” *Supply Chain Management Review*, Mar/Apr 2022
5. L. Lapidè, “Quick Response Forecasting & Planning: Revisited,” *Journal of Business Forecasting*, Summer 2018

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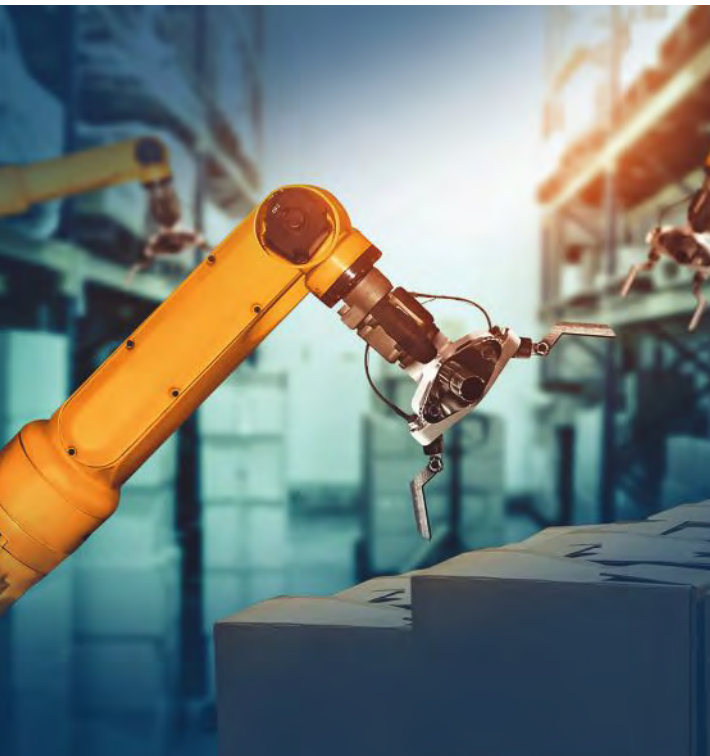
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Four misconceptions are hampering the advancement of digital twins

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By **Özden Tozanli and Maria Jesus Saenz**



Digital twins (DTs)—living digital replicas of physical entities—are used widely in manufacturing to mimic and improve real-world processes and systems. However, there are far fewer applications of the technology in supply chain management. DTs could deliver similar benefits in supply chains if it were not for certain misconceptions that prevent companies from unlocking the technology’s huge potential.

Contrary to these mistaken beliefs, DT technology is accessible and can be implemented in well-defined steps. And as is the case with any new, innovative technology, companies need to understand what they want to achieve before implementing it.

Pioneering projects

Digital twins can deliver efficiency gains

in a wide variety of supply chain functional areas. Here are some illustrative examples.

- The consolidation of shipments in distribution centers.
- Optimizing the size of freight transportation fleets.
- Testing different warehouse layouts.
- Adjusting goods flows and routing, in alignment with demand.

- The tracking of assets in real-time.
- Supporting predictive maintenance programs.

An early adopter of digital twin technology in manufacturing operations, the \$13 billion packaging company Tetra Pak, built a digital version of a warehouse in Southeast Asia together with logistics services provider DHL. A continuous stream of operational data harvested from the physical facility's Internet of Things (IoT) infrastructure feeds the digital model. The warehouse digital twin is used in a variety of ways. It helps Tetra Pak to dynamically adjust stock locations, manage inventory as well as seasonality and shifts in demand, balance workflows and allocate equipment in the physical warehouse. These applications enable the company to optimize storage space utilization and improve both operational efficiency and workplace safety standards.

Amazon uses DTs to maintain service levels in its two-day doorstep delivery services. The technology helps the online retailer to dynamically optimize delivery operations by continuously tracking shipments and streamlining product flows.

Examples of DT applications can also be found in the packaging area. A pharmaceutical company has improved the way it tests the durability of packaging for the distribution of temperature-controlled products with the help of DTs. A home furniture company utilizes DT technology to predict the performance of new materials in packaging designs. The technology enables these companies to test different packaging alternatives in a simulated environment and reduce the cost and duration of testing procedures in distribution processes.

However, such applications tend to be the exception rather than the rule in the supply chain field. A primary reason is a lack of understanding about how DT technology can deliver value. The MIT Digital Supply Chain Transformation Lab has identified four misconceptions that stymie the adoption of DTs in supply chains.

1. What exactly is a digital twin?

There is some confusion over what constitutes a DT. The term digital twin implies that DTs are living entities as they mimic their physical counterparts, and to some extent this is true. But they also are learning entities. Failing to recognize this nuance prevents companies from capturing the technology's full value, and restricts DTs to the role of tactical decision-making tools.

What distinguishes DTs and makes them so powerful is their ability to continuously sense ongoing conditions in the physical (living) environment using streaming data generated by various sources, and to evolve by dynamically learning from this information and its contexts (learning). For example, by embedding AI in simulation scenarios, companies can explore numerous what-if scenarios, identify the long-term outcomes of decisions, study the tradeoffs between efficiency and resiliency and predict the risks associated with supply chain disruptions. Also, DTs are connected to each other, learn from their experiences through feedback loops and enhance each other's knowledge via these networks of DTs.

Perceiving DTs as living, learning entities enables companies to use the technology

as a critical tool for strategic decision-making in complex supply chain settings. DTs inform decisions and hence help organizations to adapt quickly to different operational contexts.

2. A digital twin is a sensor, a simulator or an application of AI technology.

The most common misconception in supply chain circles is that DTs are one of the above applications. This is untrue.

A DT is a combination of enabling technologies and analytics capabilities. The mix depends on the requirements of the application and may, or may not, include one or more of the three enablers listed above. There are many others to choose from such as Cloud computing, edge computing, 3D modeling, visualization and augmented reality.

Confining a DT to the role of a sensor, simulator or AI application hinders its adoption and limits its ability to deliver value. This is a holistic technology composed of component technologies that can grow with the addition of more enablers. Additionally, DT implementation and expansion to its potential requires a digital mindset along the supply chain function and the company, in which data availability, granularity and harmonization have to be guaranteed.

Before selecting which DT building blocks to use, companies need to understand which core supply chain functions they want to mimic, which KPIs need to be improved and which the analytical capabilities and data sources that are currently available.

3. DT technology is largely theoretical and not relevant for our supply chain.

The futuristic nature of DTs leads many companies to mistakenly believe that the technology is not ready for prime time or is the product of hype that belongs in the realm of science fiction. Some companies might accept that the technology is relevant today but primarily in manufacturing—not necessarily in supply chain.

However, the technology’s adoption in manufacturing began in the early 2000s, and the aerospace and defense industries have been using it

for several decades. DT technology has become more accessible and affordable over recent years thanks to advances in digital connectivity, computing, data storage, Big Data processing and analytics and complex modeling.

As the above examples show, DT applications in supply chain management are compelling and deliver value. Enabler technologies are paving the way for faster adoptions in a wide variety of functional areas within supply chains. Also, as implementation costs continue to come down, it takes less time for projects to reach the breakeven point after the initial investment.

4. A DT cannot be built before the physical twin exists.

Contrary to what some supply chain professionals believe, a DT can be created before its equivalent physical asset is built or acquired. The digital entity gives companies the opportunity to start analyzing the asset’s performance whether it be a production line, a new product or a supply chain network. For example, companies can perform cost-benefit analyses before investing in the asset. Such analyses improve long-term decision-making and support prototyping.

However, the physical entity must become a reality at some point otherwise the twin will remain a digital model and its potential will not be realized.

Three-phase implementation plan

Armed with a more accurate picture of what DT technology can achieve in supply chains, companies can approach the creation of a supply chain digital twin in three phases.

1. Observe. In this phase a twin acquires and aggregates data. Hence, data sources and types should be clearly identified. There are five main streams of data to consider: environmental, operational, financial, those pertaining to human interactions and DT-generated feedback loops. Data from simulation models can also be used depending on the context of the DT application. IoT and Cloud platforms are primary facilitators that help teams accomplish this stage.

2. Think. Processing the data described above to learn and perform analytics triggers the Think phase. The DT uses optimization, AI, simulation and other analytical tools in this phase to dynamically assess various what-if scenarios and highlight alternative optimal actions.

3. Communicate and execute. Based on the findings in the previous phase, twins can now generate actionable insights. These insights are communicated to users through various visualization tools such as dashboards and mobile apps. After evaluating users' responses, the DT executes relevant actions and stores the responses as a new data source to be used in future analyses. Storing the actions in this way creates a feedback loop that enables the twin to learn from experience, share it with other DTs, and continuously enhance its ability to learn.

Be clear on your objectives

The definition of a digital twin and what the technology is expected to deliver vary from company to company depending on the supply chain context. Hence, to get the most out of the technology, companies need to identify which business outcomes they want to improve. And, of course, these assessments should not be clouded by the misconceptions described in this article. It is then possible to decide where to start—a critically important step.

Ideally, digital twins should be part of an overarching supply chain digitalization strategy, one that uses DT technology to help orchestrate the strategy. However, this is a broader topic, and companies that have yet to start their supply chain digital transformation journey, or are in its early stages, should not be deterred from using DTs to enhance the efficiency of their supply chains. ∞∞



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Transportation innovation: Oxymoron or trend?

Companies must face the harsh reality that in addition to increasing transportation capabilities, they need innovative, structurally-driven processes to meet increasing customer expectations.

By Deanna M. Rainwater and John F. McMahon

In today's customer-focused culture, supply chain networks are under continuous pressure to remain competitive, deliver quality service and to find innovative ways to optimize their operations. Drawing on our experience, we will focus on the road ahead as companies traverse the historical challenges facing the transportation industry and search for a holistic approach to manage the rocks in the road.

Expanding on the people, process and technology framework, we will explore what components are aligned to the strategic operating model necessary to drive market adaptability to guide organizations in the years ahead.

Keep your eyes on the road ahead

The transportation industry is experiencing unprecedented levels of change accelerating in 2020. Global supply chain disruptions, both intended and unintended, initiated by the pandemic amid economic/geopolitical events, have continued to impede businesses in their quest to perform the basic functions of procuring and delivering goods in a timely fashion. These challenges, along with the increasing demand for more frequent, time-sensitive home deliveries, have created more stress on supply network ecosystems and transportation providers than ever before.

Companies must face the harsh reality that in addition to increasing transportation capabilities and capacity to meet today's substantial challenges, they must now prepare for an era of extraordinary technological advances that will affect daily life in

new and innovative ways. These advances will require innovative, structurally-driven processes to meet further increasing customer expectations.

The structural challenges and future trends detailed in Figure 1 highlight the need for companies to remain nimble in the face of rapidly changing expectations that affect transportation operations. Business capabilities and supporting technologies, as well as operational processes, must constantly evolve to remain current with on-going requirements while keeping an eye on the road, anticipating changes from future trends and innovations affecting the transportation industry. Resilience results from response. Response results from foresight. If companies fail to constantly adapt and evolve their transportation capabilities to adequately meet daily business expectations or adapt to critical industry trends, they will find themselves battling rising costs to deliver products to dwindling consumer bases.

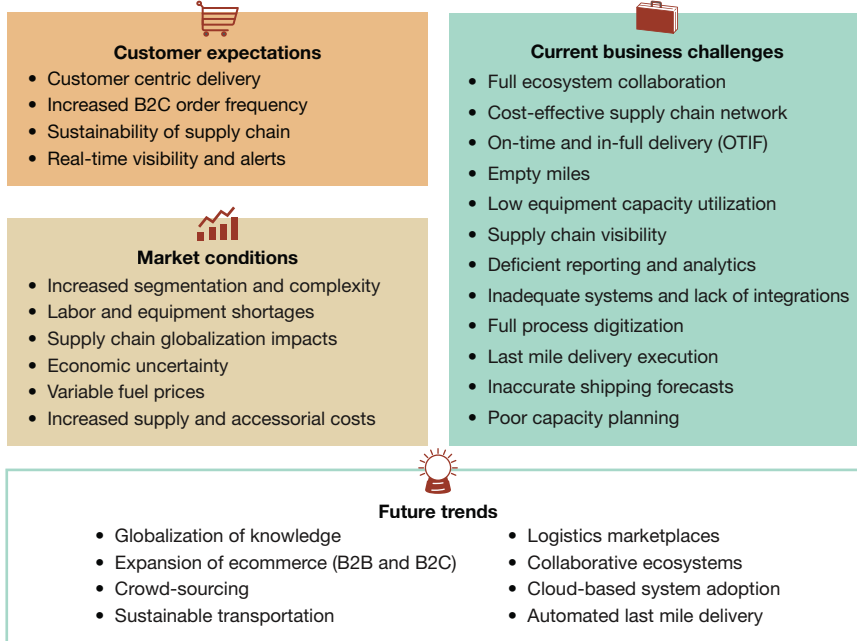
Holistic solution approach

To address current challenges and prepare for future needs, companies can

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FIGURE 1

Key transportation challenges and future trends



Source: Authors

transportation must be employed, requiring total visibility into all transportation movements and associated transactions and data. With today's digital and network connectivity, there should be no need for manual processes or lapses in visibility regardless of shipment mode or carrier used.

To execute at the highest levels, organizations must have the right technology in place to appropriately balance cost versus service decisions for all shipments in accordance with customer preferences and each organizations' financial goals. To ensure that

implement strategies to increase their existing transportation capabilities and supporting infrastructures by adopting a holistic solution. Such an approach facilitates key changes and foundational improvements that will assist companies in meeting current needs, while better preparing for future structural landscape shifts. While companies may already demonstrate certain capabilities related to each of the layers discussed below, all five levels must effectively be orchestrated in concert for companies to fully optimize their transportation function.

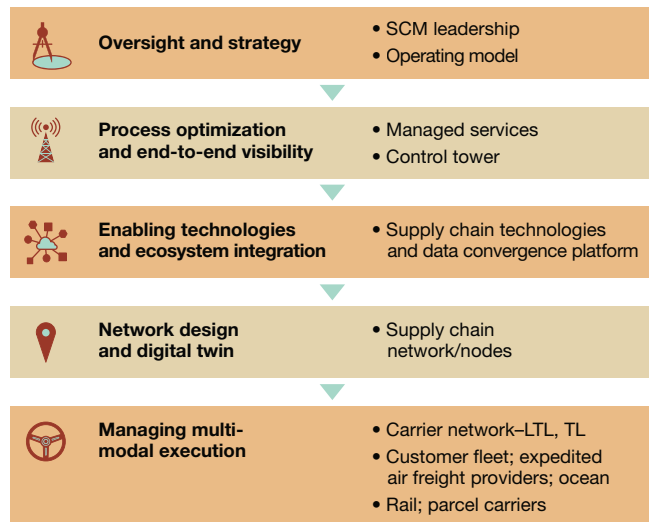
The five multi-dimensional layers comprising this holistic solution model are shown in Figure 2.

Managing multi-modal execution.

Efficient execution of the transportation function should always be a top priority as transportation costs represent a significant (if not the largest) portion of supply chain cost. Depending on the business model, various modes of

FIGURE 2

Holistic approach for optimizing transportation



Source: Authors

this happens, there must be total alignment between a company's overall mission/strategy and their aligned transportation delivery strategy for each product/customer. It is critical that the right emphasis is placed on efficiency, responsiveness and cost so that transportation is planned in the most beneficial manner for the company.

Network design & digital twin. Today's demand-driven supply networks require network design solutions that will help them identify, build and maintain optimized cost-effective supply networks. These solutions must consider an assortment of variables to include supplier ship points, customer delivery locations and required lead/delivery times. These tools must also factor in/forecast all related logistics costs for each identified scenario to include inventory storage/handling costs and any associated transportation costs.

NextGen solutions must also provide robust analytics capabilities to simulate and determine the best ways to optimize cost, service and product flow for multiple sales channels and customers. The NextGen network solutions will proactively ensure that there are optimal flow plans developed for all possible scenarios and volume levels, and will play an active role in helping companies minimize supply chain risk through intelligent network design and inventory deployment strategies.

To remain dynamic in an ever-changing business environment, companies may develop a two-pronged strategy to achieve their network optimization goals to include the development of network-design capability and the deployment of a supply chain digital twin. These two capabilities will help companies answer long-term planning questions to assist in determining optimal deployment of DC locations and resources and allow for the incorporation of real-time data to validate that network strategies remain optimized over time.

The need to conduct a network-design study can no longer be a sporadic task. It must be carefully planned and performed at different levels of

scale. An organic team that employs both tools strategically will be better suited to handle both large-scale decisions, such as redeploying a whole network, and small-scale decisions, such as repositioning products to a new distribution center, necessary to guide daily operational strategy planning.

An organic network-design team with access to a digital twin will allow a company to be more strategic in its design decisions and will enable the company to adapt to frequent changes more rapidly to consumer preferences using its predictive analytics capability. Seamless integration of network-design capability and a supply chain digital twin will promote real-time responses to market changes and will support superior organizational performance.

Enabling technology and ecosystem integrations. Enabling technologies are a cornerstone of a company's ability to rapidly respond and adapt to challenging market conditions. Through the utilization of leading supply chain technologies and data-convergence platforms, companies can increase coordination and decision making across their entire supply network thus improving service levels and reducing costs. Key enabling technologies must also leverage the Internet of Things (IoT), Artificial Intelligence (AI), Machine Learning (ML) and robotic process automation (RPA).

Any systems deployed should also allow companies to participate/form ecosystems with their partners to facilitate end-to-end (E2E) visibility of operations resulting in connecting suppliers, distributors, logistics partners, customers, and soon, competitors to enhance collaboration. By leveraging leading technology and innovative software, organizations can effectively communicate, provide E2E visibility, proactively solve problems and provide the level of service expected, from both partner organizations and customers.

Enabling technologies and ecosystem integration are an integral part of a company's ability to adapt their transportation capabilities to maintain pace with ever-changing demands on their supply networks.

Process optimization & E2E visibility.

When deciding how to manage the transportation function, companies must determine which competencies within transportation will be their core strength. Key strategic questions include: Is it better to manage these capabilities internally or is it better to outsource to a managed service provider that specializes in those areas?

Outsourcing can often be less expensive than using internal resources and usually the provider can be seamlessly integrated into the business operations. Strategic outsourcing should be considered for companies that want to dedicate efforts to other areas of transportation.

Transportation processes that remain in house must be digitized, automated and centralized as much as possible to be efficient. Additionally, companies must have real time end-to-end visibility to the status of an order, shipment, item and more, or any corrective actions required. Enabling E2E visibility requires connecting key internal systems with the full-partner/market ecosystem.

Oversight and strategy. Oversight and strategy are crucial to ensuring all aspects of this holistic transportation approach are appropriately implemented and operating in conjunction with a company's overall mission/strategy. An organizational omnidirectional information flow is required for a company to effectively operate in ecosystem markets. For example:

- 1.) Transportation leadership must implement a coherent and current transportation operating model that is closely aligned with the company strategy and is effectively applied throughout the global organization; and
- 2.) all critical data resulting from transportation operations must be available using a common platform with supporting analytics to provide E2E visibility of order/material/cash flow status and actual performance against


goals to drive continuous improvement

Oversight and strategy are key operational enablers to this innovative holistic approach. Without effective leadership across all levels of an organization, companies will face difficulties managing and executing daily operations as well as adapting to market disruptions, trends and challenges. Companies grow, and as they do, leadership must make sure they have the best transportation operating models, processes and system capabilities in place.

Breaking up the rocks in the road

The road ahead is fraught with rocks, typified by rapidly changing consumer preferences, evolving market conditions and competition. The holistic approach we describe provides transportation organizations with a unique solution to navigate that journey. It considers people, processes and technology influenced by the market's structural drivers, and is led by a well-planned strategic operating model. Adopting this model and methodology will help companies transition their transportation function into a competitive advantage through the following innovations.

- Leveraging digital tools to increase transparency and visibility into key transportation processes.
- Increasing communication across transportation networks through the creation of interconnected ecosystem supply networks and platforms.
- Placing an emphasis on developing the right strategy and tracking the right metrics enabling organizations to minimize costs and improve capability.

The transportation industry will continue to undergo significant structural change, but innovative companies are better prepared to respond with resilience and sustainability by effectively executing at each of the layers discussed to build capable transportation teams and tools. 

MANAGER

SENSING

DESIGN

TRACEABILITY

PROCUREMENT





— *The SCMR Interview:* —
**LYNN TORREL,
FLEX**

The supply chain leader for one of the world's largest diversified manufacturers discusses the lessons she has learned about leadership during the pandemic as well as her vision for "true demand."

BY BOB TREBILCOCK, EDITORIAL DIRECTOR

Gary Forger, SCMR's special projects editor, assisted in the edit.

One of the marks of leadership is how an individual responds to adversity. Lynn Torrel, the chief procurement and supply chain officer for Flex, joined the organization in October of 2019. Three months later, she was managing one of the world's most complex supply chains in the midst of a global pandemic. As everyone knows, those challenges have continued over the past two and a half years. Her portfolio is vast: Her team includes eight direct reports, with an overall team of about 10,000 individuals in the procurement and supply chain organization, and she oversees an annual spend of \$22 billion. The organization is responsible for the supply chains of 1,000 customers and works with 16,000 suppliers and 1 million SKUs. She is responsible for direct and indirect materials, transportation and logistics, business operations, materials management and strategic supply chain management.

We spoke in May 2022, as most organizations were still contending with shortages and disruptions, while now confronting a spike in inflation.

SCMR: Lynn, given that Flex is often behind the scenes, the company may not be a household name to all of our readers. What's your elevator speech for how you describe Flex and what it does?

TORREL: We are a \$26 billion global manufacturer, with more than 160,000 employees across 30 countries, and we manufacture a wide range of products for a diverse set of companies efficiently and effectively using our global scale and scope, as well as our unique capabilities. My team's role within the organization is to make sure we have everything we need in the right place, at the right time, in the right quantity, and at the right cost to enable the successful production of those products.

SCMR: You've had procurement and a supply chain titles. What drives the Flex supply chain?

TORREL: That's a great question because our structure is unique. As a diversified manufacturer it is valuable to have procurement and the broader supply chain functions all in one organization. Because it's not just a matter of negotiating the right price for components, but making sure you have in place all of the inventory and logistics to enable manufacturing as well as focusing on the total cost of ownership.

Our customers are outsourcing their manufacturing to Flex so we work to earn their trust every day. To do that, we have made tremendous investments over the years in our global procurement practices and our digitalized supply chain, which is one of the most advanced in the world.

SCMR: Give us some idea of the scope of your supply chain.

TORREL: We manage supply chains on behalf of 1,000 customers. That alone makes us unique. We also work on a direct basis with 16,000 suppliers, which translates into 1 million SKUs. We work across multiple verticals including industrial products, consumer devices, health care, automotive, communications, enterprise, cloud and lifestyle. We also have strong partnerships with our preferred suppliers and providers. Our digital tools provide end-to-end visibility that

companies need—from design through manufacturing to delivery—when they are looking for a partner to manufacture their products.

SCMR: You just described involvement from conception to grave. Was it always this way?

TORREL: No. Flex started out as an outsourced manufacturer. Then, as we evolved, we developed value-added services such as design capabilities. Customers would bring us their initial design, and we would look at what could be done to make the design more efficient for manufacturing. We could then recommend suppliers with expertise in that final design.

Today, we're also designing our own products and selling black box solutions to our customers to improve their time to market. We're taking all of our learnings to increase the value proposition we offer customers, but still with our core competency being an outsourced manufacturer with a global scale and scope.

SCMR: How do you differentiate between procurement and supply chain?

TORREL: I have strategic supply chain managers who report to me. They're experts in procurement and supply chain. But they're assigned to a customer to help manage the customer's supply chain. By bringing procurement and supply chain together, you have a holistic approach. You also have better control over all of the costs by not having the two groups separated.

SCMR: Since 2020, it seems as if supply chains have been operating according to Murphy's Law, where everything that can go wrong does—and then something else goes wrong. What have the last two years been like for you?

TORREL: Many descriptions come to mind: challenging, frustrating, tiring, but also exhilarating, as well as a sense of pride in what my team has accomplished. Traditionally, supply chains were built around low costs and efficiency. We experienced disruptions like the flood in Taiwan or the tsunami in Japan for instance, but they were more isolated from a geographical impact. Since January 2020, we've experienced one

challenge after another that has led to numerous supply chain disruptions. Like everyone, we had to shut down and reopen all of our facilities as COVID spread across the world. When we reopened, we had to redesign our production floors so that we could maintain social distancing. We sourced and manufactured PPE for all of our employees.

In 2020, the biggest issue was a lack of visibility more than a significant lack of supply. Starting in January 2021, it became a real lack of supply, and it's been a nonstop set of challenges since. We've had to be a lot more tactical than I would have expected. If someone had said at the start of COVID that two and a half years later we would still be in a crisis mode, I wouldn't have believed them.

SCMR: *How do you get tactical with 16,000 suppliers and 1 million SKUs?*

TORREL: Flex has a robust supplier relationship management program and we work closely with our suppliers to ensure they meet our requirements for cost, delivery, quality and ethics. Our global commodity managers are responsible for the overall supplier relationship.

The current market conditions are challenged due to the supply chain disruptions and semiconductor shortages. For example, we can bring in everything needed to manufacture a product, with thousands of parts all with different lead times, and at the last minute get a decommit from a supplier. It could be something as simple, but as essential, as a screw. In fact, it's going to be three additional months until I can get the said "golden screw."

When this happens, the team quickly moves into tactical mode, because we are sitting on all the other inventory for manufacturing a product, but it's not doing anything because we are missing the golden screw. That can lead to shutting down production lines, sending employees home, disappointing our customers and their customers, and disappointing our business unit. Managing through a situation like this can be a challenge.

Because we build other people's products, we naturally

have a sense of urgency. Our customers are trusting us to manage their supply chains and manufacture their product. Nobody wants to hear that they're going to miss their revenue because a part like a screw is missing.

Flex has been transparent with suppliers and customers regarding the shortage situation. And with suppliers, we have to do what we can to help them work as efficiently as possible so that Flex is getting the components it needs. When I joined Flex, right before the pandemic, I would not have expected to spend a lot of time addressing shortages and calls with suppliers like this but it has been a significant focus area.

SCMR: *Along with parts shortages, there's a people side. How are you addressing the labor and talent availability issues?*

TORREL: We have great supply chain talent. What we have tried to do is be very humble and thankful for all of the work that people are doing, especially working from home and putting in long days.

I recognize that we all have other responsibilities and often, those responsibilities have increased in the past two-plus years. So, I tell my team that kids, parents and pets come first. We want to ensure our employees know that we value them and that we want to support them.

In March of 2020, I started a "happy hour" every Monday with my direct staff because I was concerned about stress levels and the amount of hours we were working.

We met every Monday for an hour. We'd play games and have prizes. They would give me a hard time if I talked about work. We'd share what was going on with our lives, our families, our kids and what they were doing. We got to know each other so much better than we did prior to COVID when we would have quarterly in person reviews and dinners. It worked so well that many of my team members started doing the same with their teams.

In fact, when I asked if they wanted to stop this as things returned more to normal, they said no. So now we do our happy hour twice a month on a Monday and talk about our weekend and get ready for our

week. Then, twice a week we have a coffee talk in the morning and I get to talk about work. That's our compromise.

When it comes to the larger global organization, regular communication is very important. We have a weekly newsletter and quarterly town halls. The regular communication includes how we are performing, and what the strategic initiatives and priorities are at Flex. We also want to be personal, so we include questions and answers from the leadership team. We want to communicate regularly with the global team and let them know that we appreciate all that they are doing.

SCMR: *Resiliency, flexibility and agility are keywords I hear at every conference. How are you addressing those at Flex?*

TORREL: Every company would like to have an agile and resilient supply chain. There are costs associated with developing those models in both the design and manufacturing of a product. Typically, there is going to be more cost involved in designing a resilient supply chain.

For example, a company has decided to manufacture in one global location because of the cost benefit. This company is at risk of a supply chain disruption affecting that location. At Flex, we can offer to build that product in three regions to mitigate a geographical risk and offer a range of solutions to our customers depending upon what they want to accomplish. But there has to be an open discussion about what those solutions will cost and what the company is trying to achieve.

SCMR: *So, has the steam gone out of reshoring for those reasons? Or is it still very much a conversation?*

TORREL: I think it's still very much a conversation. However, I think less action has taken place than people might have anticipated. I don't think

it's for lack of desire, I think it's because we are still in a crisis. People want to talk about the long term. However, things have not stabilized enough to be able to achieve that yet.

SCMR: *It sounds like Flex can take many different approaches here. What approaches are predominating?*

TORREL: Yes, we can offer multiple solutions. We have always looked to localize our suppliers. Semiconductors, for the most part, come out of Asia. But if you're looking at plastics, mechanicals or raw materials, we always like to develop suppliers close to our manufacturing facilities. That helps with the cost of freight.

We can move where we make our products, and when we do that, we look at the supply base in the new location. For us, that's not new. It's just a smart way to manage our business. Yet, there are going to be some parts where you don't have options. In those instances, like semiconductors in Asia, you have to look at other ways to buffer risk. And, all parts are not the same. They are not all created equal or treated equal in a procurement environment. So, we develop different strategies depending on the part.

SCMR: *I was not hearing much about sustainability or diversity and inclusion prior to the pandemic when I would speak to supply chain leaders. The focus was operations. Now, it's coming up all the time. What are your customers asking of you about ESG?*

TORREL: We're taking a leadership role in our ESG goals, which are becoming so important to our customers. We want to be a leader in sustainability efforts. To do that, we have come up with some ambitious goals for Flex and we are rolling those goals out to our preferred suppliers. As an example, we're committing to reducing our greenhouse gas emissions by 50% by



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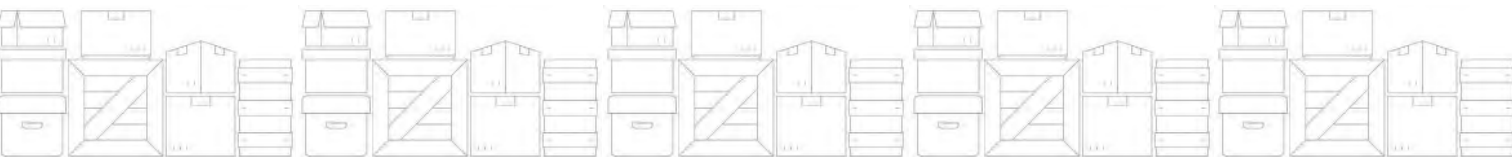
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2025. We want all of our preferred suppliers to do the same. And we have tools and processes that can help. We're looking at how we can evolve our organization to attract more customers who want to work with a company that has ambitious ESG goals for itself. We also want to be sure that as an organization we have put ESG in the right context for younger employees for whom this is so critically important.

SCMR: *What are the technologies that you implemented with the pandemic or are interested in exploring going forward?*

TORREL: Flex has always had supply chain digitalization tools, and we have very good visibility with our Tier 1 suppliers. Now, we want to get better visibility and transparency into the second and third tier of suppliers. We've also been able to create specific dashboards that help us understand the impact of COVID or supply chain shortages on production. All of the governance for that is under my organization.

Another area that I'm excited about is trying to get at something we're calling "true demand." After some initial investigation, I've put together a group of leaders from across the electronics ecosystem that is evaluating how to improve forecasting demand. We are looking at utilizing an independent third party to analyze forecasted demand against industry growth expectations and macro indicators and utilize AI/ML to more accurately predict demand.

SCMR: *This is fascinating. What do you envision as the independent third party?*

TORREL: We've had a couple of meetings so far, and we're looking at some companies that could develop and run the independent third party and would have the required security measures. The way I envision it is that companies put their data in and get out what's

relevant to them. And as an association, we guide the development and ongoing governance of the independent third party. We would all continue to forecast the way we do it today. But this independent third party would provide an additional analysis and make a recommendation.

SCMR: *They say the pandemic accelerated everything. What was going to happen in five years happened in five months. Did the pandemic accelerate the pace of innovation?*

TORREL: That's a great question. In some cases, yes, it did. As an example, Flex had never built ventilators before the pandemic, but we started producing them in three regions of the world in three months. In 2020, Flex alone had produced more ventilators than had been produced the year before across the world. And then the business went away because there were enough ventilators. It will be interesting to see what the future brings for the pace of innovation.

SCMR: *What leadership principles helped you get through the past two years?*

TORREL: One of my leadership principles has always been collaboration. Leadership is the bringing together of the collective genius around you. You bring the experts together and give them a spot to talk through challenges.

Getting through the pandemic for us wasn't a math problem with a right answer. It was a matter of bringing together supply chain professionals making intelligent decisions with limited information. If we could not come to a consensus, I would make the decision and be held accountable. But I'm able to make the best decision when I hear from everyone. The best leadership is driving a collaborative style especially in an end-to-end supply chain where everything is connected. ☺☺

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ACTIONABLE AWARENESS: HOW TO AVOID BECOMING SUPPLY CHAIN ROADKILL

Disruptive events affect us all. But companies with supply chain sensing capabilities can take action to avoid becoming the proverbial deer in the headlights.

BY STANLEY E. FAWCETT, MELANIE HINTERPLATTNER,
A. MICHAEL KNEMEYER AND AMYDEE M. FAWCETT



On March 11, 2020, the World Health Organization (WHO) declared the novel coronavirus (COVID-19) a global pandemic. The WHO was too late. Travel bans and lockdowns followed, but COVID had breached containment. Two-plus years of pain—physical, emotional and economic—ensued, injuring individuals, businesses and economies worldwide.

During COVID's twists and turns, decision makers, including supply chain professionals, acted like deer caught in the headlights: Startled, vulnerable, they froze. So did global supply chains. As if struck by an unyielding force, the global economy staggered. Eventually, COVID became endemic, supply chains thawed and the global economy rebounded. Many inquired: "Why was the COVID response so hard?"

We have another question: After a half dozen infectious-disease events since SARS in 2003, why didn't we see COVID coming? Once spotted, why didn't we sense the nature of COVID's threat earlier? The answer stares us in the face: Our sensing abilities, at all levels, are under-evolved.

Critically, we don't just miss disruptions—large and small—we often fail to get out in front of emerging trends, and we seldom sense and make sense of changing competitive rules. Do you remember Blockbuster, Compaq Computer or PanAm? Each was an industry leader killed off by a disruptive marketplace.

Now, a little good news: The deer-in-the-headlights idiom offers keen insight into how to improve our sensing abilities to achieve actionable awareness. Let's take a closer look.

The origins of the idiom

Have you ever tried to sneak up on a deer in the wild? It's quite the impossible task. Deer possess highly evolved senses. Their eyes, ears and nose keep them fully aware of their setting. The eyes are especially well adapted for survival. You may know that as a prey species, a deer's eyes are widely spaced. They can spot and track movement across a 310° field of view. But do you know the rest of the story?

- As a nocturnal species, deer possess elliptical pupils that dilate to cover the entire width of the orb to allow 10 times more light to reach the retina compared to humans.
- Deer possess a tapetum lucidum, a layer of tissue directly behind the retina that reflects light back through the retina. Deer see well at night because they use the available light twice.
- Deer also have more rods than cones in their retina—about 20 times more. Rods are 1,000 times more sensitive to light than cones and much better motion sensors.
- A deer's eyes lack a UV filter, enhancing the eyes' sensitivity to low-light settings.

As you can see, a deer's eyes are almost perfectly evolved for its natural habitat and habits.

But what happens when the deer is grazing on the side of the road and your car comes along?

Instantly, the deer lifts its head and the light from your car's headlights fills the deer's eyes, literally. The eyes glow as the light reflects off the tapetum. Now you know why a deer's eyes shine brightly when caught in your headlights. So much light, however, blinds the deer, if only for a moment. *The deer doesn't know what to do, so it does nothing.* It freezes as it tries to process the information—a task for which its other senses fail.

Sadly, at 60 miles an hour, your car closes distance quickly. Disoriented, deer often make a fatal mistake, becoming roadkill. To be caught like a deer in the headlights means you, or your company, are so surprised that you freeze. You cannot think or move. The probability of making a mistake goes up, and the likelihood of a winning competitive response goes down.

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Survive and thrive

Not all animals freeze when startled by the unexpected, nor do all companies. What makes the difference? It turns out they are built differently. Consider the kangaroo rat's story. When a rattlesnake strikes, these desert rodents take action within the blink of an eye, literally. You need 150-200 milliseconds to blink. By comparison, from a perfectly still position a rattlesnake can strike its prey in about 100 milliseconds. The kangaroo rat is even faster. Its reaction—a leap out of the strike trajectory—initiates in as little as 50-70 milliseconds. The result: Kangaroo rats survive most rattlesnake ambushes. They are built to survive.

More than that, kangaroo rats are also built to thrive. Like the deer, they have highly adapted eyes and ears. But kangaroo rats have an advantage. They have evolved with huge hollow chambers in their skulls, called tympanic bullae, which act as amplifiers. These built-in “radar receivers” enable kangaroo rats to sense the slightest change in air pressure. When a rattlesnake strikes, *the kangaroo rat doesn't know what to do, so it does something*. It leaps into the air, continuing to sense—and make sense—of the attack. If the snake makes contact, kangaroo rats twist, and ninja-like, kick the snake away, seeking to dislodge the snake's fangs before it can inject its venom. Amazingly, the kangaroo rat lands on its feet, ready for its next move—a quick hop to safety. From strike to flight, it all happens in the blink of an eye. Quick-start, fast-response companies are built with enhanced sensing capabilities; they are built to survive and thrive like kangaroo rats.

Deer freeze and kangaroo rats don't. What should you learn from this comparison? Answer: Today's marketplace is too fast paced, too frenetic for your company to act like a deer caught in the headlights. Even momentary pauses can be deadly. You need the response speed and agility of the kangaroo rat. You need to evolve your sensing skills to build an actionable-awareness capability. Because actionable awareness starts with sensing, so will we.

Sensing for supply chain success

To extend your takeaways, let's explore the kangaroo rat's distinctive morphology. The tympanic bullae—the kangaroo rat's built-in radar—are nestled at the back of the kangaroo rat's skull, causing a bulging appearance. These giant hollow spaces are the middle ear cavity, and depending on the species, range in size from 470 to 1000 mm³. That's 8 times to 16 times larger than the middle ear of the common brown rat (i.e., 61 mm³), a much larger, but distant cousin. By volume, the kangaroo rat's middle ear cavity is larger

than its brain. Nature has invested deeply in the kangaroo rats' sensing ability.

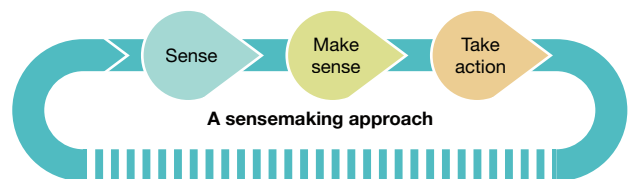
• **Takeaway #1.** If you want to be a quick-start, fast-response company, you must invest in your firm's sensing structures with equal purpose. Most companies do not.

Now, consider this: For years, scientists marveled that kangaroo rats survive rattlesnake ambushes, but they attributed escapes to “random thrashing”—that is, blind luck. Even filmed at 120 frames per second, ambushes appeared as blurs of motion (to see for yourself, search “*Deep Look Kangaroo Rats*”). But at 500 frames per second, a different story emerges. Kangaroo rats move purposely. They sense what the snake is doing and adapt, processing complex information at amazing speeds. They use this insight to instantly initiate a series of appropriate responses. Kangaroo rats model effective sensing in action, a process we call actionable awareness (see Figure 1).

• **Takeaway #2.** Actionable awareness requires you to sense, make sense and act—almost simultaneously—as the world changes around you. Most companies cannot.

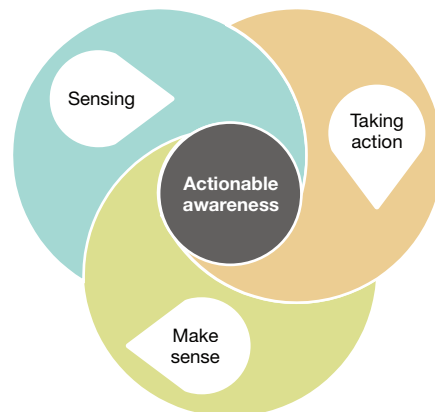
FIGURE 1

Actionable awareness: A “survive and drive” capability



They don't know what to do, so they do **NOTHING**

- Sequential approach to sensing, making sense and taking action
- Often one and done, but it might be iterative



They don't know what to do, so they do **SOMETHING**

- Seemingly simultaneous sensing, making sense, and taking action
- Always fast-cycle iterative

Source: Authors

scmr.com

Let's unpack these takeaways, asking the question: "How are companies investing in their sensing capabilities?" Thirty years of working with supply chain leaders worldwide reveals that many supply chain leaders ignore sensing as a strategic tool. Sadly, they often find themselves caught off guard, staring at change like deer in headlights. The few who do view sensing as a matter of survival share a resonant goal: Achieve operational excellence, retain strategic relevance and thrive as disruptions strike. Their experience highlights sensing's critical dos and don'ts. Attacking the don'ts first, you want to avoid three pitfalls.

Don't settle for superficial sensing. Sensing is important. Intuitively, everyone concedes this. No one wants to be caught like a deer in headlights. It's embarrassing—or worse. Few companies, however, make sensing a strategic priority. Even fewer make it part of their organizational DNA. Managers may keep their eyes open (or not), but they don't sense deeply. The result: Too busy with their day jobs or putting out fires, managers see what everyone else sees. Opportunities and threats go unseen. Sensing structures aren't well developed.

Don't silo your sensing. Most companies—perhaps 90%—pursue sensing locally: Marketing conducts focus studies; R&D runs a skunk works; operations adopts Machine Learning. Or they do it on an ad-hoc basis: Corporate engages in a blue ocean exercise; supply chain undertakes scenario planning. Purposes, processes and data types are different. Managers seldom cross-pollinate insights. The result: Even when the right dots are identified, they are seldom connected. Sticky stories regarding emerging trends, game-changing technologies, shifting competitive rules and vital inflection points go untold. Systematic sensing is homeless.

Don't stop sensing. Some companies, and their leaders, get it. They see sensing as a source of strategic strength. Whether the focus is innovative business model design, cool new products, cutting-edge technology or rapid response to disruptions, they leverage sensing to lead their industries. Then, inexplicably, they stop. The result: Innovation and speed take a hit as sensing skills atrophy. Why do they stop? Some get complacent, some distracted. Sensing is, after all, tedious, back-stage work. Others suffer brain drain as champions leave for bigger roles elsewhere. Sensing is hard to sustain—a love-to-have, but easy-to-lose capability.

For instance, do you remember Dell Computer? Twenty years ago, Dell was a most-admired and most-feared competitor. An insatiable sensor, Dell leveraged sensing to get into the minds of customers, build an unprecedented direct-sales business model and rack up process patents. Dell thrived, achieving negative cash-to-cash cycles and taking profitable market share during 2001's economic downturn. Dell's competitive

ferocity led HP to gobble up Compaq and IBM to exit the PC business. Dell's goal: Stay one step ahead of rivals. Dell's mantra: Celebrate for a nanosecond and then move on. But Dell became lax, lost focus and then relevance. After taking his company private to fix its woes, Michael Dell noted, speaking of tablets: "I didn't completely see that coming." Careless kangaroo rats get eaten.

Now, let's flip our focus and dig into three dos.

Do evolve a portfolio of sensing structures. Although the tympanic bullae gets the attention, kangaroo rats possess a complement of highly adapted senses. Sight, sound and smell all enable survival. Consider this. In one study, 40 ambushes were recorded, but snakes struck only 23 times. In 17 encounters, the kangaroo rat sensed the snake before the strike. In 13 instances, the kangaroo rats taunted the rattlesnakes, drumming their feet, jumping back and forth, or kicking sand at the snake. These "predator deterrent" actions worked. The snakes didn't attack; they slithered away.

Early detection is key to risk mitigation, but the more meaningful takeaway is that if you want to survive and thrive in an increasingly hostile environment you need a range of sensing structures.

How do you evolve the right complement of sensing structures? One step forward is to know what works.

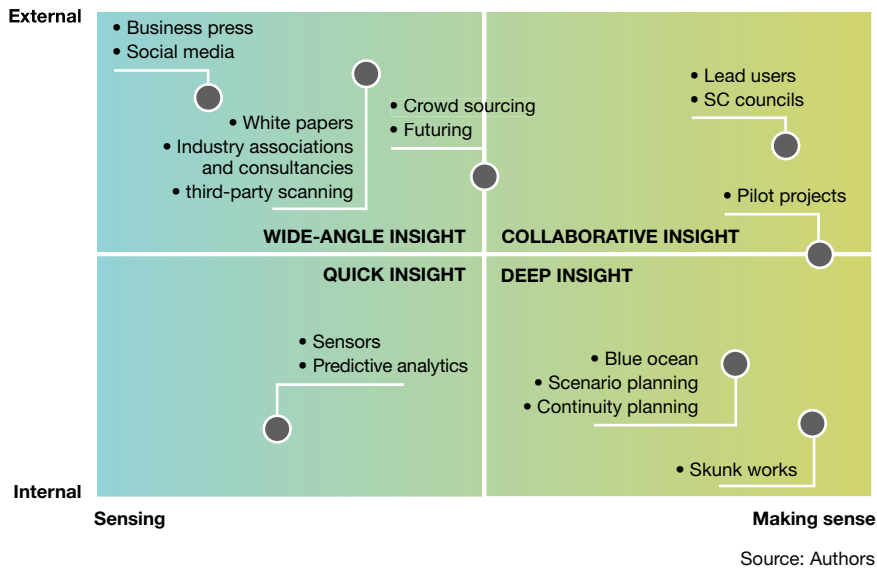
The Sensing Matrix, depicted in Figure 2, maps proven sensing structures across the skills and sources you need to leverage to achieve actionable awareness. We anchor the matrix's horizontal axis along the skill continuum, from sensing to making sense. The vertical axis anchors on the source continuum, from internal to external. We label the resulting quadrants as follows: wide-angle, quick, deep and collaborative insight. Simply put, unevolved sensing (i.e., superficial, siloed, sporadic) may suffice in normal times, but you make decisions in unprecedented times. You need to see things quickly, wherever they happen. But sensing is more than seeing. You need to make sense of a shifting world—and you likely need help to do so.

One more thought: Technology is evolving sensing capabilities. You need to be on the lookout for new, technology-enabled sensing tools (e.g., computer vision, predictive analytics, web scraping). Keeping your sensing portfolio up to date is critical to survival and success, but you dare not overlook tried-and-true, low-tech sensing. Both fit in a quick-start, fast-response sensing portfolio.

Consider the business press, a long-time favorite of trend spotters. It's widely available, low-tech and low-cost. Jack Welch, GE's iconic CEO and an avid fan, argued everyone should read voraciously.

FIGURE 2

The sensing matrix: A “genetic” map of sensing structures



Business is like any game. It has players, a language, a complex history, rules, controversies, and a rhythm. The media covers it all, and from every angle. From my earliest days in plastics, I learned mountains about business just by reading ...

I didn't believe everything I read, of course, and the more I knew, the more I realized some articles were off the mark in their analyses. Regardless, I still believe the business media is such a good teacher that I am always amazed when I meet a young person who doesn't just consume it. Don't let that happen—this mentor is right there for the taking.

Lee Scott, former Walmart CEO, received a daily summary of all press articles that reported on Walmart. His goal: Spot novel ideas, synthesize market and technology trends and see how the outside world perceived Walmart—insight that led Scott to announce Walmart would lead the effort to create a truly green global supply chain.

Computer vision, by contrast, is rather new and high-tech. Primarily used to amp up operating efficiencies, some companies use it (and related digital sensors) to rewrite competitive rules. Consider an example of each.

1. Tyson Foods turned to computer vision-enabled Machine Learning to automate inventory tracking. Inventory accuracy increased 20% to the high-90% range. Product freshness improved and stockouts declined. Detecting foreign objects enhanced food safety.

2. Amazon relied on computer vision and Artificial Intelligence (AI) to develop its Amazon Go cashier-less stores.

Amazon Go stores use computer vision, sensors and AI to track products customers take off shelves, automatically charging their accounts as they walk out the door.

Sensing technologies often go where you can't, giving you a new line of sight. For instance, they enable you to monitor processes remotely. If a glitch occurs, a text invites you to go online to see, and perhaps fix, the problem. You can likewise trace product flow and status from origin to destination or use the data that sensors generate to feed predictive analytics, helping you spot hidden opportunities to improve performance.

Do make sensing part of everyone's job. Each moment foraging brings life-and-death peril to the kangaroo rat. So, it keeps every sense alert to the first sign of danger. You operate in a larger, more diverse, but comparably perilous space. The only way you can spot opportunities and threats with comparable certainty is to tap into what others are sensing. You never know where vital insight may emerge. The good news: Your sources of insight are increasing. Consider two supply chain leaders' quests to keep in touch with an ever-changing world.

A.G. Lafley realized that P&G's sense-it-ourselves model put the company in a perilous position. He resolved to look everywhere for ideas, declaring, "I'm a big believer that we sometimes need help in solving problems. So, I have set a goal to get half of our innovation from outside." To make this BHAG a reality, Lafley made two commitments.

1. To attract great ideas from outside, P&G would earn partners' trust by delivering win-win relationships. Lafley's vision: "To be known as the company that collaborates—inside and out—better than any other company in the world."

2. To make sharing ideas easy, P&G would launch Connect+Develop, a technology-enabled sharing platform. P&G's innovation portal for idea submission was set up in five languages.

The decision to find innovation, not just develop it, helped P&G hit Lafley's 50% goal within five years. Amazingly, P&G's innovation success rate doubled as R&D

TABLE 1

Supply chain sensing structures

SUPPLY CHAIN SENSING STRUCTURES	EXEMPLAR	DESCRIPTION
Business press	General Electric	GE's Jack Welch noted, "The media covers it all, and from every angle." Individuals or organizations can use the media as a low-cost source of up-to-date sensing.
Social media	Marriott	Using geofencing Marriott tracks Facebook, Instagram or Twitter posts sent by guests. Its M Live team reads posts in real time and contacts managers so they can resolve complaints or help guests celebrate special occasions.
Digital sensors	Amazon	Amazon used computer vision, sensors and AI to develop its cashierless Amazon Go stores. More often digital sensors offer a new line of sight, enabling you to monitor operations remotely or trace product flow and status.
Predictive analytics	Bosch	Bosch monitors vehicle systems and component conditions in real time using sensor technology. Predictive analytics enables Bosch to predict failures and schedule preventive maintenance, avoiding expensive vehicle downtime.
White papers	McKinsey	McKinsey conducts a variety of future-looking research that it publishes as white papers (e.g., impact of automation on employment, cost of net-zero transition). McKinsey gain credibility. Readers get a sneak peek at a possible future.
Industry associations	Carnival Cruise Line	Carnival Cruise Line joined the board at the Institute of Supply Management to help shape—and to get an early view of—ISM's research and training. Carnival's leaders also enhance awareness by networking with other SCM leaders.
Third-party scanners	Western Digital	Western Digital used predictive analytics to leverage supply chain disruption alerts from Resiliinc, a 3rd-party visibility provider, to achieve 93% disruption detection accuracy and save \$53 million during COVID's first six months.
Crowd sourcing	Procter & Gamble	P&G launched Connect & Develop to crowdsource product ideas from supply chain partners. Within 10 years, P&G was obtaining almost 50% of its new product ideas externally, up from 10%.
Futuring	Intel	Intel employs a futurist to model what it will feel like to live 10-20 years into the future. Futurists use stories to share best "guesses" derived from social science, technical research, statistical analysis, interviews, and science fiction.
Blue ocean	Nintendo	Nintendo used blue ocean thinking, a method for sensing a new market space and creating value to fill it, for its Wii and Switch gaming consoles. Sensing helps define where you are and imagine where you could be.
Scenario planning	Royal Dutch Shell	Shell translates futurist visions into actionable plans via its Scenarios process, which combines the views of diverse experts to consider "what if" questions and propose likely but varied scenarios that drive discussion and preparation.
Lead user	3M	3M turns to lead users—customers on the innovative edge of market trends—for "what" and "how" insight. 3M's surgical division worked with vets, developing-country doctors and a make-up artist to develop a groundbreaking surgical drape.
SCM councils	Collins Aerospace	Collins developed its customer and supplier partner boards to act as both sources of and sounding boards for new ideas and to partner in pilot projects to prove the best ideas.
Pilot projects	Aldi	Aldi pilots product and process ideas to "make sense" of ideas that emerged via sensing; i.e., to document benefits and define a proven path. Aldi's Backbox pilot showed that an in-store bakery could bring in new customers profitably.
Skunk works	Google	Google runs a skunk works—a secretive lab with a start-up culture—to cultivate "shoot for the stars" ideas. Skunk works come in many forms, but share a goal: Envision, create and accomplish; i.e., make it a business reality ASAP.

Source: Authors

investment dropped by 30%. Profitable products like Swiffer Dusters and Olay Regenerist, the world's top-selling skin cream, emerged from C+D's open innovation. And it's not just product ideas. P&G crowdsources solutions in areas from packaging to processes.

Sam Walton, Walmart's founder, knew the key to success is to outlearn rivals. To do this, Walton believed you need to "listen to everyone in your company and figure out ways to get them talking." Sensing became part of everyone's job, from frontline associates to CEO.

- At a new store opening, an executive invites: "I want you out on the floor talking to customers, finding out what they like, what they don't like and what we don't have that we should have."
- A Walmart associate observes Hispanic customers are asking for calderos, a specific kind of cookware. She shares this insight at the morning meeting. Calderos are soon on the shelf.
- At weekly merchandizing and operations meetings, store managers share what they are seeing in the market, including from rivals. Whatever is working in one store is shared with others.
- Suppliers blend real-time sales data from Walmart's Retail Link with their own insight to develop product and merchandizing plans, which they share with Walmart. Shared sensing makes suppliers partners in growth.

Comprehensive sensing made Walmart a fast-response giant. In the mid-2000s, Wall Street got into Walmart's head. Distracted, Walmart stopped leveraging sensing and started trying to copy rival Target. Seven quarters in a row of declining same-store sales led Walmart to get back to basics, including more actionable listening, especially to suppliers and customers. Then online sales exploded, and Amazon became an existential threat. Walmart put sensing on steroids, launching its own skunk works, Walmart Labs, and buying specialty online retailers, including Jet.com, to acquire talent and assimilate expertise. Next, Walmart built its Intelligent Retail Lab to add AI to its sensing structures. Better sensing drove faster innovation, helping Walmart build out store pickup and home delivery services that let customers shop when, where and how they want to.

Do treat sensing as a must-have strategic process.

Survival for a kangaroo rat hinges on instant action. The instinctive cycle of sensing, making sense and taking action are almost simultaneous—and it's iterative. Companies, by contrast, move much more slowly, hindered by inertia. Your takeaway: Sensing and making sense are necessary but not

sufficient. Actionable awareness requires that you tell a sticky story to motivate movement.

Shell built its sensing portfolio around a storytelling structure: scenario planning. Shell describes its efforts, known as Shell Scenarios, as follows.

We tend to be trapped within the limits of our own experience, which leads to all kinds of problems. That's why, for the last 50 years, Shell has been exploring critical uncertainties through scenarios, asking "what if" questions that encourage leaders to stretch their thinking and consider what you might call "alternative memories of the future."

The process begins by thinking big: What major trends (e.g., demographic changes or technological progress) are beyond Shell's control? Next, the Shell team asks, "How will these influence people's attitudes and behaviors?" Exploring how these might affect the future enables Shell to model specific scenarios.

Shell scenarios look at short-term situations like happenings in the South China Sea as well as far-reaching developments that will affect the global energy system over decades. Shell stimulates collaborative learning by sharing its thinking widely and working with interested parties (e.g., governments, think tanks) to capture outside-in thinking. By helping people grasp diverse perspectives, scenarios begin conversations and challenge assumptions. Scenarios inform how you make decisions now to win as the world evolves.

Collins Aerospace grounded its story development in councils: A supplier, a customer and an executive advisory council. The outward-facing councils consist of internal and external sensors. The supplier advisory council, for instance, included a dozen senior Collins' managers and executives from 16 suppliers of choice. This council served the following four roles.

- 1. Generate ideas.** Council members bring the supplier perspective to Collins; that is, what's working and what's not. They propose new products and ideas for process improvements.
- 2. Provide feedback.** Collins uses the council as a sounding board for its own ideas, ranging from product to process to governance.
- 3. Run pilot projects.** Ideas with potential get developed. If they look promising, Collins pilots them with one or more council members to document successes and define a proven path.
- 4. Share what works.** The council speeds the sharing of technology and best practices among the supply base.

The steering committee, composed of senior executives, helps refine the stories worth telling, deals with turf issues to generate buy-in and obtains resources. The steering committee, simply put, overcomes inertia so members of the council can go to work and get things done.

The bottom line: Do you want to survive and thrive in tomorrow’s marketplace? Your path to safety and success is defined by the dos and don’ts. Your takeaway: As you build your sensing portfolio, you’ll need to draw from all four quadrants of the sensing matrix. It’s worth the investment. Your sensing portfolio will define how you see the world as well as how, and how quickly, you respond to it.

Now, the rest of the story

We mentioned that sensing is the first step in building an actionable-awareness capability. To take a peek at the rest of the story, let’s take another look at the kangaroo rat’s unique morphology.

Earlier, we glossed over two distinct features: The kangaroo rat’s powerful back legs and long, whiplike tail. These structural endowments enable the kangaroo rat’s incredible agility and amazing survivability. Without them, the tympanic bullae would be novel but not noteworthy. We’ve also talked about how instinctive and instantaneous the kangaroo’s first response is—a leap into the air. Besides removing the kangaroo rat out of harm’s way, why is this leap so instinctive?

Perhaps you’re thinking, “The leap buys a flash of time to sense and make sense.” Although true, here’s the more important story: The leap unleashes the morphological adaptations. While in the air, the kangaroo rat uses its whiplike tail to rotate and reorient its body—and those powerful legs. If the rattlesnake makes contact, the legs are in position to kick the snake away. If the snake misses, the kangaroo rat lands feet first, ready to escape. None of this could happen if the kangaroo rat were on the ground.

Your takeaway: You need instinct (i.e., culture) and morphology (i.e., structure) to enable a quick-start, fast-response capability. Here are two hints for adapting your organizational DNA.

1. Invest in trust. Instinctively, kangaroo rats trust their senses. Do your people trust you? Do they trust your organizational processes? If they don’t, sensing won’t conquer inertia. You’ll be aware but unable to act, at least not with the desired speed and agility. Trust emerges from team ego and is embedded by purposeful measurement. Trust makes change safe.

2. Invest in structure. We can’t tell you exactly what structures you’ll need, but we have noticed that few companies have a common sensing repository like ERP’s central database or a consistent coordinating mechanism like S&OP’s cadence process. The good news: Keeping your eyes and your mind open will clue you in to where to make structural investments.

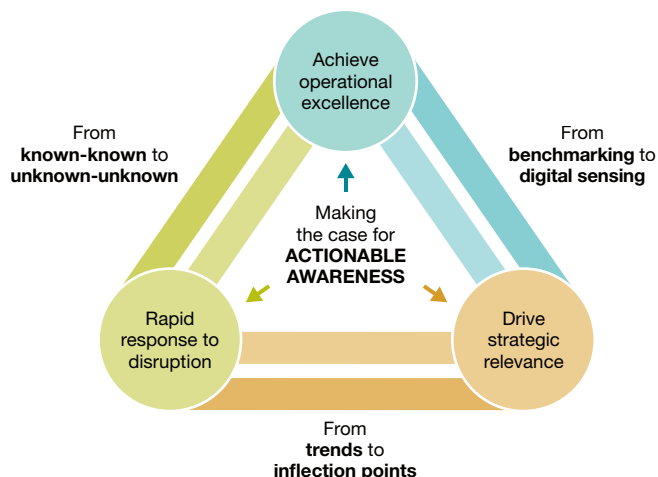
The power of actionable awareness

Adapt or die describes our perilous times. Competition is fierce. Rivals appear out of nowhere. Competitive rules—and technologies—change quickly, often erratically. Geopolitics in our interconnected world can blindside all but the most perceptive.

Actionable awareness can give you the speed and agility to achieve operational excellence, retain strategic relevance and thrive as disruptions strike (Figure 3).

FIGURE 3

The power of actionable awareness



Source: Authors

Two other benefits invite a little genetic modification. First, beyond survivability, actionable awareness increases your value. The fact that you possess deeper insight faster than your partners or rivals makes you indispensable. Second, you’ve heard the phrase, “The early bird gets the worm.” You may also be familiar with the corollary: “The second mouse gets the cheese.” The fact is that you often don’t need the quick-start, fast-response ability that accompanies actionable awareness. The good news: Actionable awareness positions you to make the choice. That is, it enables you to know whether you want to be the early bird or the second mouse—and it gives you the power to execute to that choice. ☺☺

Regionalize your supply chain: Closer is better

Highly complex, global supply chains might have passed their peak given the accelerating uncertainties in supply and demand. In this article, we illustrate that regional supply chains can be more resilient and need not be more expensive if planned well.

BY KNUT ALICKE, KAI HOBERG AND JULIEN MAUHOURET



For the last five years, concepts such as reshoring, nearshoring or China+1 (see sidebar) have been propagating a stronger regionalization of industrial production. Instead of confining global production to Asia, production should take place in (or close to) the market with regional supply chains. The aim for many managers and politicians is resilient local production at low cost with short delivery times and minimum CO₂ emissions.

Overview of relevant shoring concepts	
Offshoring	Transferring manufacturing from HCC to BCC
Reshoring	Transferring manufacturing back from BCC to HCC
Nearshoring	Transferring manufacturing back from BCC to close surrounding of HCC
China+1	Duplicating manufacturing outside China
Regionalization	Duplicating manufacturing in each key region (partial/full value chain)—could happen at country level or at continental level

Note: HCC: high-cost country; BCC: best-cost country

Numerous companies in Europe and North America from very different industries are following this trend: For example, the retail giant Walmart is currently setting up a \$350 billion program over the next decade to produce toys, household appliances or textiles in the United States independently of Asian manufacturers. In the semiconductor industry, major players such as Intel, TSMC,

Texas Instruments and Samsung have announced investments of \$115 billion on fabrication plants in the United States rather than expanding their capacity in Asia. Similarly in Europe, numerous projects around regional battery value chains have been announced, including Northvolt in Sweden, Poland and Germany or ACC in France.

On many levels, these ideas fundamentally contradict the thinking of the past decades, according to which supply chains were essentially planned around the lowest landed cost possible. This cost focus led to a strong concentration of production in Asia in many industries. The resulting supply chains benefited from low wages, material and energy cost advantages, and low transportation costs, while the associated supply networks often span the globe. As a result, complex structures developed with correspondingly long supply chains and long response times, especially for the markets in Europe and North America.

However, events such as the 2011 earthquake in Japan, the COVID-19 pandemic and geopolitical tensions/conflicts have highlighted the limits of these global supply chains. Even small disruptions such as a fire at a supplier somewhere in Asia, a border closure or the brief blocking of the Suez Canal in March 2021 can throw highly complex networks out of sync and can lead to supply problems in other parts of the world. Returning to orderly working networks often takes weeks, if not months. Add to this the increasing focus on CO₂-efficient supply chains that also requires reorientation, supporting the trend

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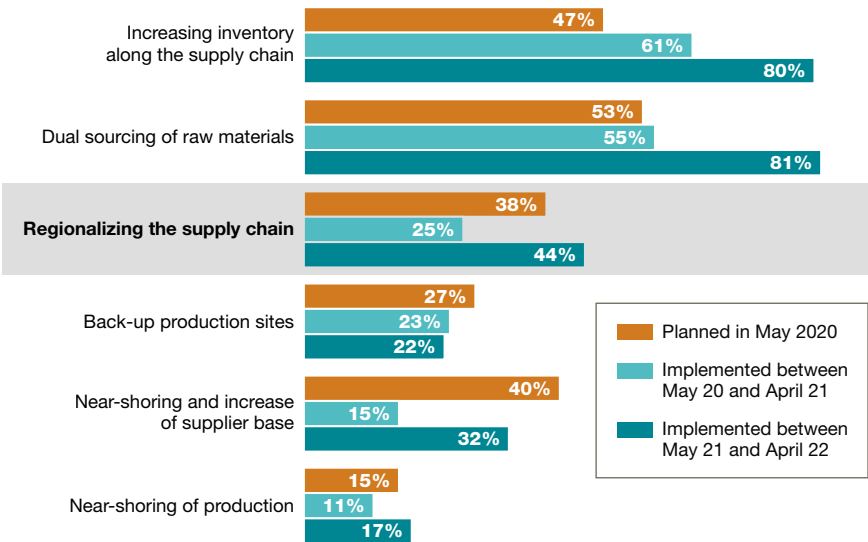
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away from the traditional global export model.

As potential mitigation actions against these more frequent disruptions, supply chain leaders often mention regionalization of supply chain as a key lever (see Figure 1). However, these strategic initiatives are by nature long to implement and require significant investments versus more tactical levers such as inventory increase and dual sourcing of key components that can be more easily implemented in the short term (80% versus 44%). Nonetheless, there is more value in the regionalization of supply chain than just resilience that we aim to highlight in this article.

FIGURE 1
Responses to increase supply chain resilience
 (Planned and implemented actions, % of respondents)



Source: Source: McKinsey survey of global Supply Chain leaders (March 28-April 19, 2022, N=113)

Value drivers and enablers

Regional supply chains can deliver additional value to customers and shareholders, and are being enabled by underlying trends and factors. Figure 2 highlights the differences between global and regional supply chain setups. For a global supply chain, manufacturing is concentrated in one region, where large factories are leveraging economies of scale to compensate for increased transportation cost. For regional supply chains, each market is served from the production assets in/near the region/subregion.

Tesla’s network strategy is a good example of the move toward regional supply chains set-ups. Elon Musk decided to build the fourth Tesla Gigafactory in Grünheide, near

Berlin, with an initial production capacity of 500,000 vehicles per year to serve the fast-growing European electric car market. Instead of importing vehicles from the United States or China, Tesla can reduce delivery times, shorten transport routes, avoid customs duties, use local expertise and respond more quickly to customer requests. To ensure this is sustainable, the Gigafactory will also manufacture key components such as batteries or powertrains, and a large number of component suppliers will be located around the production site.

The value drivers

Since the COVID-19 crisis, secular trends have accelerated and provided some new dimensions of value, beyond the traditional cost/service/capital equation. Typically, resilience, market access, speed to market and sustainability are value drivers supply chain leaders should aim at developing to enable growth (see Table 1).

The outbreak of COVID-19 in March 2020 fundamentally changed the perspective of managers with regard to regional supply chains. In a KLU analysis of the reasons for reshoring after the start of the pandemic, improving supply chain resilience was observed in more than 54% of all cases.



Top managers see the regionalization of supply chains as a crucial

lever to avoid supply bottlenecks: The structure can become clearer and shorter, so there are significantly fewer points of attack for disruptions. That creates value. In addition, the access to regional sales markets is much harder to restrict when manufacturing is done in the region and might even provide marketing value (“made in Europe”).

Speed to market can be another asset if innovation cycles are fast or customization is required. In the extreme, entirely new, agile business models can be created: Ultra-fast textile retailers like Shein or Fashion Nova launch up to 1,000 new styles per week and benefit from regional supply chains that can respond to the latest Instagram trends. In this way, the time from design to prototype to production to sales launch is shortened to as little as three days.

FIGURE 2

Global vs. regional supply chain setups

	GLOBAL SUPPLY CHAIN SETUP	REGIONAL SUPPLY SETUP
Concept		
Production	Production of the final product at the most cost-effective global location (e.g., in China)	Regional production at locations in/near markets (e.g., Poland for Europe, Mexico for Americas)
Suppliers	Global supplier selection with focus on total landed cost to the production site	Regional supplier selection according to the component criticality and cost difference
Transport	Long transport (ocean, air) from the production site to sales markets in Europe and North America	Short transport distances between regional production sites and regional sales markets
Advantages	<ul style="list-style-type: none"> • Significant cost advantages due to factor costs and economies of scale • Established model improved over decades • Centralization and no duplication of investments and structures 	<ul style="list-style-type: none"> • Reduced delivery times due to market proximity • Higher resilience due to potentially lower complexity • CO₂ reduction due to shorter transport distance

Finally, regional supply chains with shorter transport distances are typically more carbon-friendly (they reduce the need for expediting with air transport) enabling companies to achieve their sustainability goals and complying with new regulatory evolutions.

Enablers

Beyond the value drivers, there are key enablers for the set-up of regional supply chains, helping to close the cost gap compared to global set-ups (examples include ease of financing, increased transportation cost and automation—see Table 2).

In many industries, such as pharmaceuticals or semiconductors, politicians use the argument of national security, as demonstrated not least by the “Supply Chain Review” initiated by President Biden in the spring of 2021. As a result, re-shoring efforts for up to a

hundred critical pharmaceuticals, the creation of an end-to-end national supply chain for lithium-ion batteries or grants to expand apprenticeship training were initiated as initial measures. At the same time, other government measures to support local production (such as low-interest loans or subsidies) or foreclosure (tariffs, local content requirements, local standards) will undoubtedly play a stronger role.





This trend is not limited to the United States. In Europe, Indian group REC in Hambach, France is planning to establish photovoltaic production of the latest generation of products, including

Source: McKinsey / KLU

cell production and solar module assembly. Nine million solar modules with an output of 4 gigawatts will be produced annually, whereas the current European annual capacity is 0.65 gigawatts. Other Chinese battery manufacturers are also in the process of building production capacity in Europe.

TABLE 1







Overview of value drivers

EXPLANATION OF VALUE DRIVER	EXAMPLE
 <p>Resilience of supply network, as some level of redundancy with reduced touchpoint/length of network will reduce loss sales linked with disruptions (economical, geophysical)</p>	Increased awareness of need resilience following Japan earthquake in 2011, COVID-19 pandemic in 2020, Ukraine war in 2022
 <p>Access to regional markets, either driven by consumer preference for local production “made in” or by customer/government incentive for local production</p>	U.S. tariff-war against China by president Trump and buy-American campaign
 <p>Speed to market, customization and fast innovation cycle, where a premium price is offered for fast deliveries enabled by regional production</p>	Ultra-fast fashion manufacturer Shein with three day design-to-sales cycle
 <p>Sustainability, where customer behavior is more and more linked with product CO₂ footprint (transport and utilities) and circularity (plastic waste, re-use)</p>	Paris Agreement in 2015 triggers supply chain carbon calculations and corporate carbon reduction targets

Source: McKinsey / KLU

TABLE 2

Overview of enablers

EXPLANATION OF ENABLER	EXAMPLE
 <p>Ease of financing, as investment support from different sources is available (e.g. green funds, public subsidies) and interest rate are (still) low</p>	EU and U.S. funds for battery and semiconductor investments
 <p>Increased transportation cost and lack of transformation capacity with uncertainty to which extend costs will return to pre-pandemic levels</p>	Multiplication of container shipping cost from China to U.S. and China to Europe in few months
 <p>Reduction in labor cost gap between Asia and Europe due to significant salary increases in China and developing countries</p>	Annual increases of labor costs in coastal regions of China by up to 20%
 <p>Less labor content due to new technologies with increased process automation reducing both direct and indirect labor</p>	Highly automated manufacturing assets in bike manufacturing reducing FTE number by 80%
 <p>Increased carbon emission focus that triggers demand for low carbon products and increases cost of carbon emissions (e.g. carbon border tax)</p>	Unilever committed to carbonize supply chain by end of 2030s
 <p>Disruptive technologies in some industries that triggers need for new manufacturing capacities with new technologies</p>	5nm node technology in semiconductor industries requires new assets

Source: McKinsey / KLU

The cost disadvantages—especially vis-à-vis China—are decreasing with the rise of wage levels in Asia and the potential for more automation: Highly automated production lines that get by with few employees make labor costs move to the background. Thanks to flexible industrial robots, the U.S. bicycle manufacturer Kent in South Carolina, for example, can produce with only 12 employees on one line per shift, what would currently require more than 60 employees in a manual process in China.

In addition to the alignment of production costs, transportation costs for long hauls are rising due to higher energy prices and limited freight capacity. Taxes and tariffs make imports even more expensive. Decreasing factor cost advantages are complemented by positive effects from shorter delivery times and reduced distances in operations with the opportunity to respond faster to orders and new customer requirements and reduce CO₂ emissions.

Making regional supply chains work

Defining and setting a regional supply network strategy is a significant and long-term investment. It should consider several key factors: (i) establishing cost and value transparency; (ii) developing regional suppliers; (iii) aligning the product design; and (iv) advancing the SC operating

model. Let’s look at these one at a time.

Establish cost and value transparency

Many manufacturing footprint projects in the past suffered heavily from a lack of cost transparency. Therefore, it is critical to obtain reliable data to model costs in the different scenarios and to have a good vision on how these parameters could evolve in time. Further, a broader definition of the value created through regional supply chains (cost and non-cost factors such as ease of doing business or mitigating disruptions) is essential. Using holistic clean sheet (“target cost”) cost models, managers must assess the advantages and disadvantages of regional supply chains in detail.

The first step is to record the main factor costs such as wages, material costs, equipment (including maintenance), energy, transport costs and customs duties, thus analyzing the positive and negative effects of relocation. Similar models already existed in the outsourcing and offshoring discussions in the 2000s—but often no realistic costs were applied, and their development was not sufficiently considered.

For instance, labor hours should not be transferred 1:1 thanks to higher automation potential, and economies of scale cannot be maintained with lower production and purchasing volumes. In addition to these classic direct costs, expert panels must make realistic estimates for the impact of regionalization on inventories, service and quality costs.

In the cost models, the dynamics must not be underestimated under any circumstances: With annual increases in Chinese labor costs of 10% to 20% for regions close to the coast, wages will likely match those in Eastern Europe or Latin America in the coming decade. Similarly, utilities or raw material costs can suddenly approach the Western levels as soon as these governments introduce the long-discussed carbon border tax, or new trade wars lead to higher tariffs.

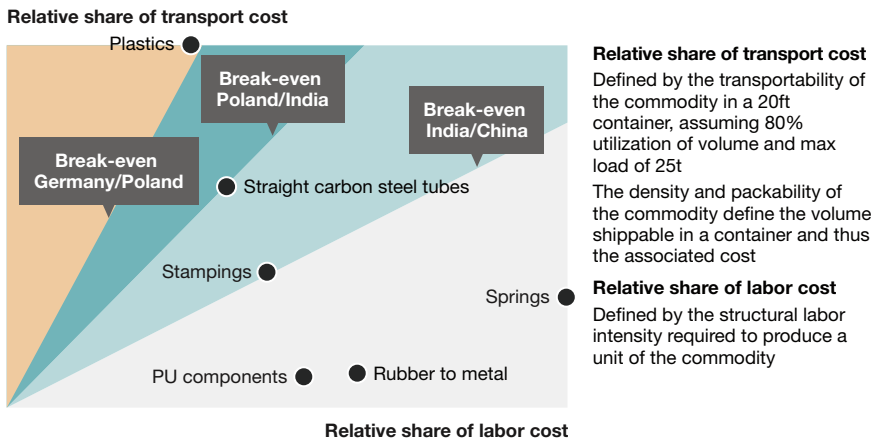
Another example is rising transportation costs, which have been very cheap for years; between January 2019

and January 2022, the cost of shipping a 40-foot container from Shanghai to Rotterdam rose approximately 700%. It is unclear whether the old level can ever be reached again. For this reason, it is important for managers to keep in mind the sensitivity of the location decision to these factors.

The classic total landed cost view can be supplemented by a sensitivity analysis: The economic location advantage can be determined for many products by a few key cost factors. Figure 3, for example, shows the location decision as a function of the relative share of transport costs and labor costs for automotive components to Germany.

FIGURE 3

Economic location by product category



Source: McKinsey analysis

Plastic parts, which are generally characterized by low density and high volume, and therefore incur high transport costs with relatively low labor costs, are more suitable for regional production. This contrasts with springs, which have relatively high labor costs and for which production in markets such as China is therefore more economical. Stamped parts are close to the break-even line in the base case.

Rising labor costs in China or rising transportation costs cause a shift in this break-even line between countries, and a higher degree of automation causes a change in the labor cost share, i.e., a shift of the individual products on the matrix. This sensitivity analysis makes it possible to evaluate different scenarios and illustrate the impact of cost changes. Regular reassessment is essential to track the impact of changing factor costs.

Build realistic cost models that compare costs in alternative supply chains set-ups (e.g., labor, utilities, transport, duties) based on trusted database.

- Consider dynamics and avoid point estimates for

different cost elements (attention: over-optimism bias), potentially using Monte Carlo models to assess uncertainty.

- Run economics for own and external network, with the broader definition of value (e.g., capital, resilience and agility, service, sustainability quality and employee experience) and consciously decide on cost-resilience trade-off.
- Identify benefits and growth opportunities of regional supply chain (e.g., based on shorter lead time, “made in country” effects, customization opportunities).

Develop regional suppliers

Companies must by no means be naïve when it comes to establishing a regional supply chain: Simply setting up final assembly or a plant in Eastern Europe or Mexico is typically not enough.

Companies that continue to rely on distant suppliers with long transportation routes often fail to realize the benefits in terms of agility and resilience. For example, inventories in the form of raw materials or intermediate products can often only partially buffer the high delivery times, and are unpopular with management and investors due to the tying up of

working capital, they are sensitive to forecast accuracy (mix) and lack responsiveness on quality defects. For this reason, it is critical for companies to establish an efficient, regional supply structure and build a regional ecosystem.

The first step is to investigate which components can already be provided regionally by suppliers at reasonable prices and in the right quality. Engineers, purchasers and supply chain managers should keep a particularly close eye on parts that only come from one supplier, are very costly to manufacture or are time-critical. These may need to be sourced at higher prices or higher inventory levels until an additional regional supplier can be developed.

The entire supply chain should be considered: The direct suppliers, but also the 2nd and 3rd tier suppliers with whom a company is often not in direct contact. For a regional pharmaceutical supply chain, for example, it is not enough to simply produce the active ingredients locally and process them into capsules. Rather, it should be ensured that intermediate products, raw materials or excipients are also

produced regionally. This is the only way to ensure self-sufficient production.

Unfortunately, when looking at pharmaceutical supply chains, it often turns out that for many intermediates, one is heavily dependent on manufacturers in China or India and that regional suppliers have to be developed first. Therefore, it can make sense to offer long-term contracts for regional production in order to enable a certain investment security and thus bring Asian suppliers and their knowledge to Europe. State aid—as the pharmaceutical example shows—is critical in motivating partners to invest in markets with low growth rates.

Throughout the process of building and selecting regional suppliers, collaboration between procurement and supply chain teams is particularly important. Companies must move away from pure cost objectives in this process, as regional suppliers have little chance of success if purchasing has the sole objective of minimizing purchase prices. Clear targets must be set jointly with regard to the trade-off between total landed cost, lead times, resilience, and other parameters such as CO₂.

On the one hand, shorter delivery times enable lower warehousing with reduced storage costs and capital commitment and, on the other hand, a faster response to changes, e.g., due to customer requirements. This indirectly enables a higher sales potential.

These effects—often ignored because they are difficult to quantify—should be carefully weighed against potentially higher total landed costs. In addition, the contribution to the company's own carbon footprint and that of its customers must also be taken into account. Many companies already have ambitious CO₂ targets, so regional supply chains can certainly provide interesting selling points. Of course, the exact cost and revenue assessment is not easy as long as there are no CO₂ prices shown in the product or explicit penalties for missing CO₂ targets.

In summary, to increase effectiveness of regionalization beyond owned network, the following actions should be considered.

- Identify potential suppliers with relevant capabilities in the region.
- Develop local capabilities with existing supply base and jointly identify how they can create a regional base.
- When sub-scale, partner with others to build attractive platform for potential suppliers.
- Incentivize sustainability investment in external network to reduce manufacturing carbon footprint (e.g., green

electricity, carbon-free process heat) as most CO₂ content is scope 3 (e.g., purchased goods and services, upstream/downstream transport).

Align product design

Product design levers can further accelerate regionalization of manufacturing networks. So far product design in the context of supply chain was mostly focused on enabling efficient transportation (e.g., with small packages) and offering goods that can be sold in multiple markets (e.g., using multi-language boxes and manuals). To the traditional themes of design simplification around part count reduction, design for new automated manufacturing processes and design to value considering spec and material change, we can now add design that supports resilience, supply chain flexibility and sustainability.

A leading European consumer electronics player has accelerated the concept of dual design with several alternative bills of materials for a given component. This enables the company to select alternative designs to increase the protection against disruptions and improve its supply chain agility. Dual design is enabling “premium protection” on risks not being fully covered by inventory buildup (e.g., quality issues, long disruptions, spike in demand) and can be used to easier identify suitable local suppliers.

In addition, multiple product design-related aspects should be considered for supporting regional supply chains.

- Change design of parts to be sourced from fewer suppliers (and avoid the complex sub-tier structure) and ensure all new products are released with potential component sourcing in multiple regions—both in the design and in the regulatory filling for regulated industries.
 - Design for substitution, to enable replacement of key components in case of disruption and/or allow for late-stage customization in the design to reduce cost of supply chain flexibility.
 - Design for sustainability, taking CO₂ out of the design at raw material stage (e.g., replacing components that have high carbon footprint), conversion stage (e.g., reducing utilities needed to manufacture, reducing structural material waste), and distribution (e.g., transport value density).
 - Allow for circular economy (reuse, repair, redistribute, remake, recycle), which is facilitated by having production capabilities in close proximity of final consumption areas.

Advance SC operating model

The supply chain operating model describes which customers are served by which locations with which products. In many industries, individual sites are often responsible for the production of selected products, which are delivered from there to the whole world. At BMW, for example, the X3 or X5 SUV models are produced solely at the Spartanburg plant in South Carolina, which supplies the markets in Europe and Asia in addition to the strong U.S. market. This supply chain operating model enables significant economies of scale—both in terms of internal production and suppliers. Conversely, vehicles such as 3 Series and 5 Series are imported into the United States from European plants.

Other automakers are working to make their plants more flexible and assemble more models on a single line. Thanks to flexible automation with highly variable production lines, many models could be built in the region in the future, reducing the risks of currency fluctuations, customs embargoes or strikes. To achieve this, however, it is important to manage complexity and develop suppliers to produce smaller batches, instead of a high number of identical axles for a few SUV models, smaller quantities of axles for different small cars, sedans, and SUVs.

New vehicle manufacturers like Arrival are embracing radical new supply chain operating models. Instead of first centralizing manufacturing and only then distributing it further, the BlackRock-funded provider of commercial electric vehicles is directly introducing decentralized micro factories.

In these small highly-automated factories with flexible manufacturing cells, Arrival wants to assemble vehicles with virtually no direct manufacturing staff. Currently, more than 30 of these micro factories are planned, which could also be installed in existing halls, each with a capacity of up to 10,000 vehicles per year. To keep costs low for suppliers despite small batch sizes, new material concepts and manufacturing processes are planned so that, for example, no complex tools are required, and fabric-based composites could replace metals that are difficult to form. In this way, Arrival aims both to produce flexibly on site and to respond quickly to changing customer requirements—and has already been able to win logistics companies such as UPS and Royal Mail for orders worth \$1.2 billion.

Typical actions that could be taken on SC operating model are as follows.

- Deploy automation company-wide to minimize labor dependency on both direct and indirect jobs, enabling lower batch size and avoiding need for tools.
- Implement advanced SC planning models, to dynamically allocate product to plant to customer in a volatile environment (e.g., energy cost, transport cost, duties).
- Create transparency across multi-tier supply base and increase end-to-end collaboration.
- Enable plants to produce many products for regional markets rather than few products that ship globally by drastically reducing viable batch sizes and tooling.

Be realistic

Regional supply chains—if well designed in the right context (e.g., industry, value chain)—can be an interesting alternative to the currently prevailing global supply chains. However, one should be realistic and not be guided by overly positive assumptions.

It is very unlikely that, in the current environment, new supply chains will be, to a high degree, developed locally, such as operations in the U.S. for the U.S. market or in Germany for the German market. For many labor-intensive processes, the labor cost advantages of producing in nearby low-wage areas such as Mexico and Latin America for the United States or Eastern Europe, North Africa or Turkey for Western Europe will continue to be too weighty. The vision of manufacturing in developed regions like the U.S. and western Europe utilizing hyper-flexible, highly automated local production and new technologies such as 3D printing is currently still in its infancy.

With regionalization, companies can realize many benefits if they increase their focus to include agility and resilience. To date, both have been neglected in many companies: Low costs are reign supreme while the benefits of short delivery times and high delivery capabilities are insufficiently valued.

Fortunately, this view is changing, and not just since the COVID-19 pandemic or the geopolitical conflicts. It is important that all functions think holistically and work toward a common goal: Only by combining realistic cost estimates, achieving growth, aligning product designs and setting up new supply chain operating models firms can realize the benefits of regionalization. ☺☺

Supply chain traceability is key to sustainability—and improved performance

BY HERNAN SAENZ AND JOSHUA HINKEL

For more than a century, businesses have honed highly efficient, linear supply chains. Raw materials flowed in one direction, were transformed into a product, used and ultimately discarded in a waste heap. That approach now puts a firm's competitiveness at risk.

To ensure supply in an increasingly volatile business landscape, companies need more resilient networks. Fast-changing consumer preferences and customization require increased flexibility and speed. And investors, consumers and governments expect more sustainable products and processes—with certifications to prove companies' claims. Winning in the coming decade will require a transparent and circular value chain—one that reduces or reuses materials and remanufactures or recycles products—lowering cost and creating less waste.

It is a profound paradigm shift. And the technology is already available to trace each raw material that goes into a product and follow how a product is used and where it is discarded. In fact, digital traceability enables companies to meet and balance a broader set of business objectives, including efficiency, resilience, responsiveness and sustainability. It allows companies to redefine the boundary of operational excellence and set aspirational new goals.

How does it work? Traceability gives companies the ability to follow products and goods as they move along the value chain and to glean exact information about the provenance of inputs, supplier sourcing practices and conversion processes. With that data in hand, companies can make predictions, run scenarios and dynamically optimize operations. Leadership teams can serve customers better, identify unnecessary resource consumption, respond faster to changes



in demand and fulfill orders more efficiently. They are also able to identify strategic value chain opportunities, innovate faster, minimize the impact of internal and external disruptions and certify sustainable processes and products.

These combined benefits will translate into higher revenue growth, lower costs, increased market share, better returns on investment and overall improved stakeholder returns. Traceability leaders will also help shape the standards and regulations in their sector. Firms that do not invest in traceability will be more vulnerable to

supply chain disruptions and allegations about product safety or provenance. For example, the stranded 400-meter cargo ship that blocked the Suez Canal in March 2021 left hundreds of other cargo ships stuck behind it, wreaking havoc on global supply chains. The companies that knew which ships were carrying their cargo were able to quickly reroute shipments to minimize the supply disruption. Those that lacked visibility were hit hardest.

In fact, across most industries and sectors, we are already beginning to see companies with traceable supply chains start to outrun competitors with limited visibility. And traceability technologies are evolving rapidly. In the coming decade, we expect firms to cluster around two different performance curves: a higher-performance curve for companies that invest in traceability and a lower-performing curve for those that lack traceability.

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The key to improved performance

Bain's recent Global State of Traceability survey, a consultation with 150 senior supply chain leaders, shows that 68% of executives view traceability as "very or extremely important." But many leadership teams have found implementation painfully complex. In some ways, the traceability journey is analogous to a digital transformation. The multitude of technology options and application areas is overwhelming. It is relatively easy to set up a simple pilot. But scaling it and amplifying the benefits across different application areas is challenging. Traceability adds a new element of complexity: the need to collaborate closely with a vast ecosystem of value chain partners. While firms are investing to improve traceability, 58% have just begun the journey and only 15% are capturing value at scale (see Figure 1).

Bain's traceability research, conducted in collaboration with the World Economic Forum's working group on the future of advanced manufacturing and value chains, is documented in the white paper: "Digital Traceability: A Framework for More Sustainable and Resilient Value Chains."

Successful companies take a three-pronged approach. First, they explore how traceability technologies can lay the foundation for advanced supply chain performance. Second, often in parallel, they build a community of leaders, enablers and potential partners to learn from. Sharing successes and failures improves performance across the value chain. At the same time, they partner with regulators and policymakers to help inform and shape government proposals that will support and accelerate sustainability.

Focus on value

We are sometimes asked about the connection between sustainability and traceability. This is a crucial point, and it's often misunderstood. Traceability is the ability to follow materials from the beginning of the supply chain to the customer who purchases a product. With this data and information, traceability plays two roles that support sustainability. It provides visibility on inputs and processes across the value chain, and it provides the source information for provenance and sustainability certifications.

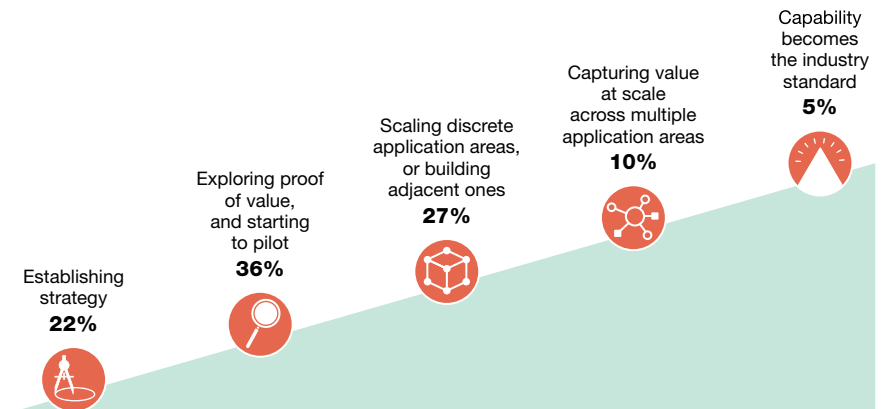
Traceability solutions can be deployed in many ways to bolster competitiveness. The first step, and a vitally important

one in defining a traceability strategy, is determining where tracing will generate the greatest value for the company. Leadership teams that fail to focus their investment will risk overwhelming their value chains with complexity. They

FIGURE 1

How traceability programs mature

Breakdown of respondents by current stage of their traceability program



Source: Bain 2021 Global State of Traceability Survey

are also likely to overinvest. Answering the following key questions can help leadership teams choose traceability applications that will pay big dividends.

- What is the strategic context for your industry, and what near-term and long-term goals are you trying to achieve?
- Which processes or inputs to a product do customers or regulators care about most?
- What new capabilities would deliver a competitive advantage in terms of unit economics, resilience, or sustainability?
- Where could a circular value chain create new business opportunities or business models?

Leadership teams can determine how fast they need to move by assessing the company's starting point and competitors' commitment to traceability. That approach makes sense for companies striving to catch up from behind and for those jockeying to stay ahead of the pack. It will also help identify potential ecosystem partners.

Connect traceability to business objectives

The two primary business objectives for supply chain management over the past century have been reliability and efficiency. To compete effectively, companies now need to ensure their entire value chains are also resilient and sustainable. That means looking beyond the materials provided by a company's Tier 1 suppliers and the first line

of customers who purchase their goods. The broader value chain includes every supplier's supplier and every customer's customer. In addition, they also must meet rising consumer demands for speed and customization, as well as stringent new regulations and evolving certifications and standards. This proliferation of objectives is making value chain management enormously complex.

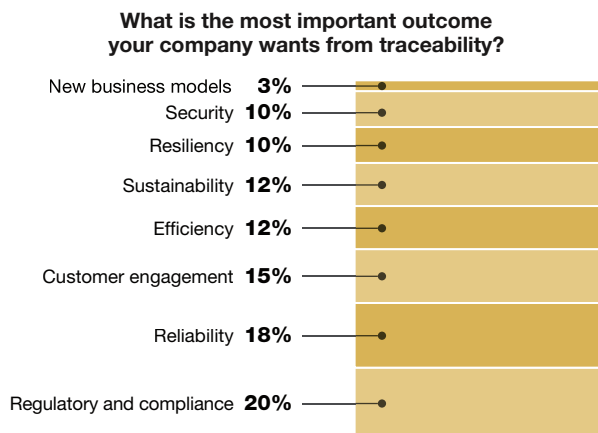
Managing that complexity well, however, can create a powerful competitive edge. The ability to trace products throughout a value chain will allow leadership teams to transform their operations and to create new business models. At the same time, traceability applications that span the value chain connect an ecosystem of partners that can spur additional value creation via increased visibility, collaboration and system-wide innovation. Leading companies in digital traceability understand that it is both an offensive and a defensive strategy, anchored in the company's core objectives. For these leaders, the role of the value chain goes far beyond fulfillment. It's a new competitive ace.

Our research shows that executives are relying on traceability to pursue multiple objectives related to value chain performance (see Figure 2). Today, their No. 1 goal is regulatory compliance. But they consider value chain reliability and digital engagement with the customer in real time nearly as important. Other top applications include efficiency and sustainability. As a result, the most powerful traceability application areas support multiple objectives.

FIGURE 2

Executives' top goals for traceability initiatives

Percentage breakdown of respondents to the question



Source: Bain 2021 Global State of Traceability Survey

A few leading companies are already using traceability tools to develop new business models through pre-competitive

collaboration. Ralph Lauren, for example, invested in traceability to support sustainability in its core business and to create new business opportunities. As the secondary market for luxury goods took off, the firm's executive team decided to build a traceability platform that would help consumers verify the authenticity of Ralph Lauren products being resold on digital platforms. The application, built together with EVERYTHING, Depop and Vestiaire, gives Ralph Lauren a connection to secondary market consumers while also prolonging the life span of its garments. Importantly, the traceability application helps curb counterfeit clothing that typically is produced in unregulated and dangerous working conditions and may contain harmful inputs. The authenticity application will enable Ralph Lauren to pursue new business models in the secondary market together with other ecosystem partners and in new customer segments.

Ralph Lauren's approach underscores how vital traceability will become as economies and business models become more circular. To reuse, remanufacture or recycle products and materials, for instance, companies will need to know where products end up after they are sold and used. Some leadership teams may consider the gathering of such information as the cost of doing business, but others realize it also can provide the foundation for new growth.

Of course, companies achieve the full value of any application when they scale it across their own value chain or the sector's value chain. In our experience, many traceability projects get stuck in pilot mode and lose momentum or fail to scale. Companies that roll out successful, large-scale traceability platforms plan the macro journey from strategy to implementation before they launch the first small-scale pilots. They identify their value chain objectives, potential trade-offs and pilot initiatives that can produce value across the entire supply network. And before getting started, they determine the key enablers, how to scale their first applications and how to communicate with stakeholders. Companies that delay this essential planning step risk launching a pilot only to discover it cannot be scaled.

Sparking collaboration

Successful traceability efforts require collaboration.

No company, no matter how large, can collect all the relevant information needed for robust traceability.

In fact, the value created by traceability technologies results from data sharing and collective standards among companies throughout the value chain. So, partnering strengthens the competitive advantage of individual

companies and the community ecosystem.

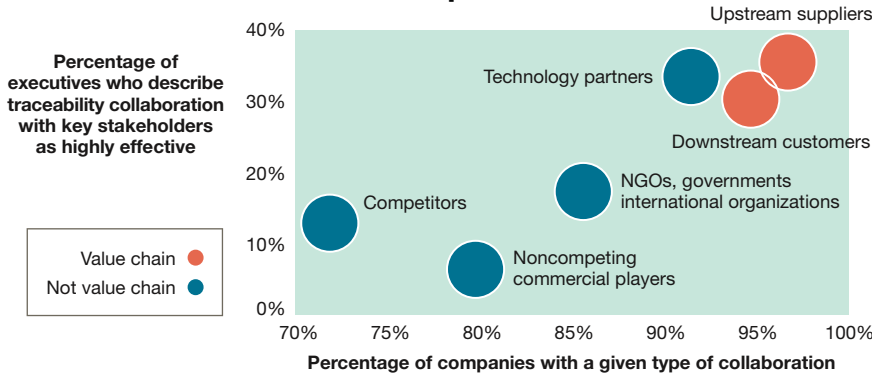
Most firms understand that collaboration is important, but they are reluctant to forge strong alliances (see Figure 3). One reason this occurs is because leadership teams are not accustomed to working with firms outside their business operations, such as competitors or Tier 2 suppliers. Emerging technologies

advantage. The companies that build the best value creation model linked to traceability will outperform the competition. In the future, all companies are likely to have similar access to traceability data. The winners will be those that wield the data skillfully to improve business processes and outcomes.

Traceability collaboration strategies need to be built on trust. Though some partners will be more committed than others, successful partnerships ensure that each member benefits from traceability and helps steer decisions instead of being forced to participate. Each company should define its position in the ecosystem and its role in connecting the disparate parts. Are you the heavyweight force that convenes other members? Do you act as a key influencer or participant in traceability applications? Or are you a follower, but one that is enthusiastic to help bring others onboard?

FIGURE 3

Traceability partnership capabilities are still nascent at most companies



Source: Bain 2021 Global State of Traceability Survey

and the right platform model can make cooperation easier.

How can a group of firms that compete within the same value chain collaborate on a traceability solution without losing their competitive advantages? We believe that, in most circumstances, the benefits of collaboration outweigh the downsides. Co-creating technology solutions and collaboration standards in a pre-competitive space can reduce the cost for everyone. Pooling influence to convince powerful or less collaborative firms to share required information can also develop high-impact traceability ecosystems. Finally, incentives can play an important role in convincing suppliers to collaborate. One example is Fishcoin, which is a means to reward the fishing community for information about their catch.

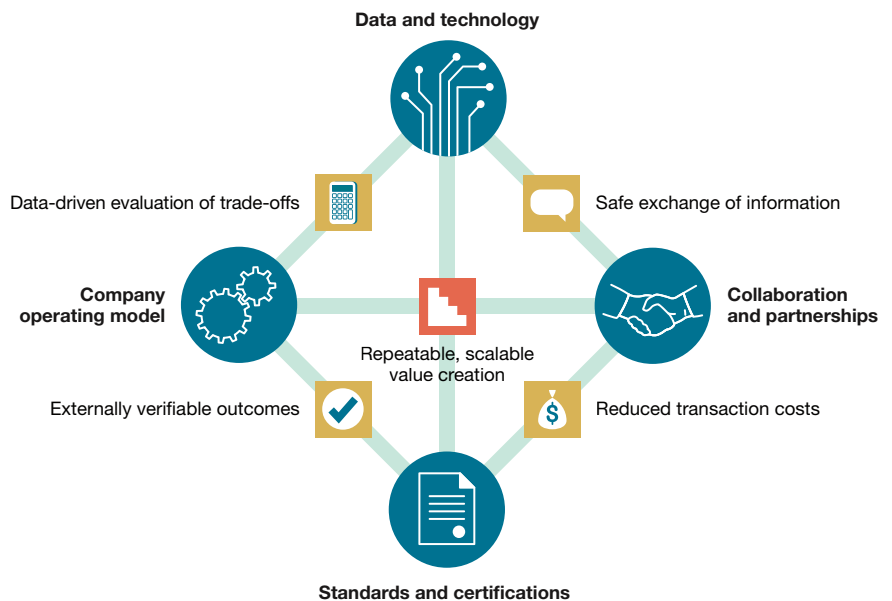
While collaborating with others can give companies access to vital information, it is up to each organization to translate this information into insights and build the required business processes that will transform insights into competitive

Understand the enablers

Leadership teams can give their traceability strategies the best chance of success by strengthening five key enablers. These include an internal operating model adapted to cross-functional strategies, a partner ecosystem, integrated data

FIGURE 4

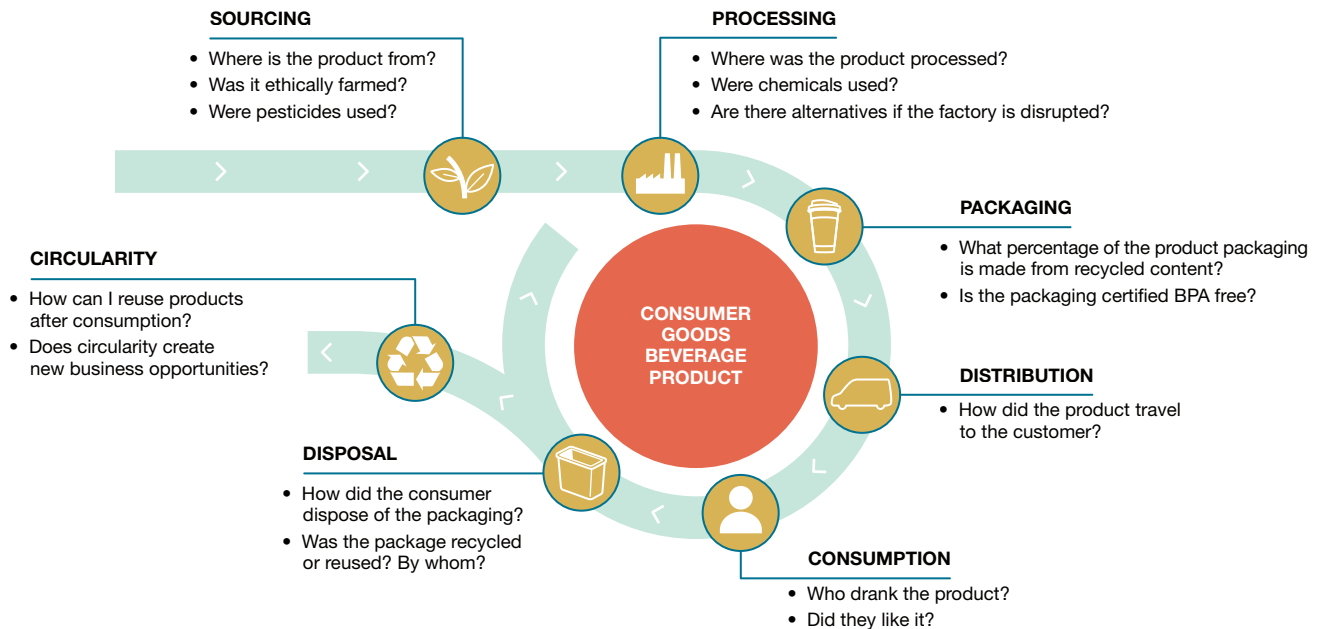
Traceability enablers are deeply interrelated



Source: Bain & Company

FIGURE 5

Traceability delivers value on multiple fronts



Source: Bain & Company

strategy, robust technology architecture and alignment on standards and certifications.

Too often, companies focus on only one or two of these elements and overlook how interconnected they all are (see Figure 4). To achieve the full potential of a traceability transformation, executives need to understand how each enabler positively reinforces the others. Likewise, they need to make sure the enablers don't impede one another, such as a technology that doesn't support the collaboration strategy.

Getting started

Leaders find opportunities to benefit from traceability in every part of the value chain. They may seek to optimize product design by trimming costs, improving the carbon footprint, or increasing supply resilience (see Figure 5).

Choosing the first pilot can feel overwhelming given the wide array of objectives. But the bigger risk is over-analyzing the options. A few key guidelines can help companies quickly narrow the choices. Select applications based on clear business objectives and the ability to create immediate value. That will help to convince partners and stakeholders of the benefits of a shared ecosystem. And focus on application areas that allow you to influence how other members of the ecosystem behave.

The biggest mistake companies and partnerships make when investing in traceability is to delay planning how to scale their pilot until it is up and running. That approach creates challenges with

the data, technology, operating model and growth of the ecosystem.

Companies leading in traceability tap several different scaling options when determining how to expand their pilots. For example, they may add new features or functionality. Another choice is to expand the collaboration to include new partners—a move that may establish the application as an industry standard. Surgere developed its AutoSphere application together with auto manufacturers and Tier 1 suppliers, creating an auto industry standard for traceability. Alternatively, companies may add a new application area with existing partners. Using a roadmap for each of these scaling options, executives can develop a plan to expand each pilot that will ensure a smooth rollout.

The pressure is growing on leadership teams in every industry to improve sustainability, performance and resilience in an increasingly volatile global economy. Traceability can help companies achieve all three of those goals and develop a powerful competitive advantage.

The rewards of getting it right are substantial. Companies that build robust traceability capabilities will be able to deliver the right product to the right place at the right time with the right level of customization and speed—all at a competitive cost. They'll also be in a position to meet stakeholders' key sustainability demands and regulatory requirements. And they will have greater resilience to respond to supply and demand shocks. Those capabilities will deliver strong growth and profits and enable new business models. ∞

Procurement has a significant role to play in the pursuit of ESG goals

BY ELOUISE EPSTEIN

By employing ESG across the supply base, it's possible to create an exponential gain of benefits.





Excerpted from "Trade wars, pandemics, and chaos: How digital procurement enables business success in a disordered world," by Dr. Elouise Epstein.

One of the lasting legacies of the post-COVID era will be how ESG jumped to the top of the corporate strategic objectives. In fact, it's such a popular board-level objective, visible in nearly every annual report, that the discussion is less about why to do it and more how to do it.

The previous laissez-faire approach to ESG is no longer tenable amid massive social upheaval. As individual brands seek to sell to a more socially conscious demographic (Millennials and younger), companies must put greater effort into how they produce products, reduce their environmental impact and create meaningful social change. In other words, to reach their targeted demographics, corporations must step in to fill a gap created as

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governments abdicate their social responsibility. However, this becomes a huge problem for procurement because many of our n-Tier suppliers are located at or near sites of unstable political upheavals. Russia's recent invasion of Ukraine made this all too clear.

In an alarming number of cases, a national government is simply a failed state (such as, recently, Myanmar). Non-governmental organizations such as the United Nations, World Bank and the World Health Organization are under severe political attack. In response, corporations are stepping in to fill the void. In fact, corporations have become so involved that there's now pushback from activists against corporations becoming too involved in social issues. For example, in advance of Pride each year there's usually a public questioning of whether Pride Month is selling out to corporations.¹ In 2018, Vox carried an article entitled "How LGBTQ Pride Month became a branded holiday," in which the author challenges whether corporate support of Pride is merely part of a branding campaign. The article notes that, for example, Adidas has a "Pride pack" of merchandise readily available for sale. Simultaneously, Adidas was a major sponsor of the 2018 World Cup held in Russia, a country that is continually hostile and punishing to queer people. If money spent on Adidas merchandise ends up supporting the Russian government and its persecution of the queer community, then Adidas is not serving its queer customers well.

Good ESG is complicated. This is part of a trend of "greenwashing," "rainbow washing" or "woke washing," whereby corporations purportedly make efforts in support of ESG but simultaneously make ethical trade-offs in pursuit of profit. Naturally, balancing these competing objectives is hard where weighing a passionate customer base against shareholders' interests leads to alienating one or both constituencies. Thus, any

opportunity to advance ESG while maximizing profit—something procurement is well positioned to influence—will be warmly received.

As Figure 1 shows, procurement is in a good position to spearhead corporate ESG, because its work with external suppliers and entities sits at the intersection of an enterprise's environmental, social justice, consumer safety, human rights and diversity, equity and inclusion efforts (DE&I). Procurement can influence—and in some cases require—suppliers to use sustainable materials, employ fair labor practices and be compliant with basic human rights. But procurement can extend further by looking at suppliers' workforce composition, diversity of ownership or the ESG expectations to be met by their suppliers' suppliers. In other words, by employing ESG across the supply base it's possible to create an exponential gain of benefits.

FIGURE 1
The ESG Venn diagram



Source: Kearney analysis

Sustainability

Fighting global warming and doing right by the world isn't new. It's not merely virtue signaling. And it's not some innovation created by the international elite at Davos. Automobile pioneer Henry Ford was an early and serious

believer in “industrial conservation,” or what these days is termed sustainability. Ford didn’t like production waste. He invested a huge effort to increase efficiency and reusability within the factory. One example—which portended today’s circular economies—was the creation of a “disassembly line” that took junked cars and recycled the materials to be used in new car production. Unfortunately, this effort proved to be too costly and was eventually abandoned. That’s a trend all too common in today’s supply chains, where what’s good for the environment isn’t always perceived as good for the near-term bottom line. But we can change that, especially within procurement, because money talks.

Sustainability has been a back-burner objective, background white noise, for far too long. Sustainability benefits historically haven’t been immediately evident, often being seen as taking years to make meaningful change. But that is shifting. Consider that Company A may spend millions of dollars to haul and dump trash in a landfill each year. Each load of trash affects the community surrounding the landfill, contributing to poor quality of life, toxic materials leeching into the ground water and increased localized greenhouse gas emissions. However, if we consider the true value, we might be throwing away perfectly good materials that can, with a little modification, act as an input to another production system and become a revenue source, a veritable trash-to-cash opportunity.

In the era of hyper-transparency, companies need to move beyond the traditional, tepid ESG mandate of “do no harm,” or relying solely on ratings. Tomorrow’s supply chains need to put both environmental impact and environmental amelioration front and center. Consumers are increasingly demanding it and governments will eventually do so too. Most consumers can see that global climate change is real and it’s having tangible impacts on their purchasing decisions. For example, Unilever reported that its sustainable brands grew 46% faster than traditional ones.² This trend points to the need for efficient manufacturing, packaging and delivery. So, supply chains need to be aware of these trends.

For example, consider a medical device provider that packages its products using sterilized plastic. Its

consumers may demand more sustainable practices. Or certain shareholders may demand an improved sustainability score. Either way, shifting that packaging to biodegradable plastic would be a big win. So, the question is whether procurement can quickly and efficiently find a supplier that can deliver biodegradable plastic—and if not, then how does the company find a partner to collaborate to develop it? In either case, it’s likely the incumbent supplier may not have a readily available solution so instead of purely focusing on the cost, the problem equation now gets focused on innovation. This is no longer simply a cost savings exercise—instead it’s a true measure of procurement’s ability to create value.

Companies that build physical products are faced with the fundamental question of whether to use raw materials extracted from the ground or figure out how to use recycled materials. This quickly becomes a trade-off in terms of cost, quality and manufacturing process. But if we can tie that back to creating a more commercially viable product that consumers will pay a premium for, then the entire cost equation changes.

Globally, multiple CEOs are committing that their enterprises will go net zero by as soon as 2025; the question now becomes how to achieve these goals. As a savvy CPO, you might sense the opportunity (or seize the moment) and raise your hand to sign up to deliver 50% of that commitment. As the person who has influence over the company’s entire external spend, you and your organization can influence significant results toward that goal. Not only that, but you also have some big (if not obvious) levers to pull that will drive benefits exponentially. These levers are requisitioning, sourcing, digitalization and operations.

Forced labor and conflict minerals

Perhaps the greatest gap identified throughout COVID-19 was the lack of n-Tier visibility in supply chains. This lack of visibility meant that companies struggled to map their risk effectively. When it comes to forced labor and conflict minerals, the same issue applies. Do you know how your suppliers’ suppliers are treating their suppliers? How are conditions at the farm level where cotton is grown? How are conditions in the mines where minerals are extracted?

Often, when it comes to supply chain risk management, the higher the risk the lower the visibility. Simply sending a survey to the Tier 1/2/3 supplier is not good enough because what happens at the source is not visible to the upstream suppliers (much less the brand). When transparency evaporates, workers become vulnerable to abusive situations.

The solution here is multifaceted. First, digital tools can certainly help with the scale and monitoring of these problems by doing extensive live scanning of news, government, NGO and social media. The ability to quickly and intelligently monitor and process potential risks (risk signaling) is a crucial, yet very basic, step in addressing this. To contextualize this, when talking about n-Tier risk, digital solutions only solve a minimal part of the problem.

When we're talking about forced labor (FL) and conflict minerals (CM) in particular, these usually occur in regions where bribery is common and governments are lackadaisical at best in their enforcement of human rights. News and information emerging from these countries is opaque, often controlled and/or censored by the government itself, thus neutering the efficacy of digital tools. And sometimes governments float in and out of failed states, making accurate intelligence gathering and response planning a guessing game. So, any good risk management capability that seeks to address FL and CM needs a comprehensive response that covers both digital tools to look at the macro picture and a boots-on-the-ground approach at the tail end of the supply chain.

Recently, Outland Denim, an international fashion brand, sought to do more to ensure that its suppliers complied with human rights standards by developing an even stronger social image. The brand partnered with PSG, a boots-on-the-ground intelligence solutions provider, to address the difficult challenges of supply chain traceability that numerous clothing companies across industries worldwide are facing. The pair developed a comprehensive communication strategy to solicit feedback from the most vulnerable worker tiers in the deepest level of their supply chain, which were the unregulated cotton farms.

The strategy consisted of posters, newspaper postings, television, radio broadcasts and use of social media. This on-the-ground system allowed the farm workers to quickly communicate concerns or instances of exploitation directly to PSG as an intermediary so it could investigate those conditions and then raise remediation opportunities to the supplier and upstream in the supply chain all the way back to the brand itself. Examples of worker complaints included

lack of clean water, wage disputes, access to personal protective equipment and living conditions. Another advantage of the boots-on-the-ground approach was that information sourced from workers outside of the workplace, rather than through a supplier feedback or grievance mechanism, had a higher level of integrity and proved to be highly actionable.³

It's important to note that the network effect can work here as well. Not every enterprise has to put boots on the ground, something that could unintentionally backfire; instead, this can be done through consortiums by commodity and geography. Most digital devices use as core raw materials a fair amount of cassiterite (for tin), wolframite (for tungsten), coltan (for tantalum) and gold ore. These minerals are mostly mined from the Democratic Republic of Congo (DRC). Since achieving independence from Belgium in 1960, the DRC has experienced a series of politically destabilizing events, wars and coups. There is a long history of human rights violations associated with the DRC. But the DRC is rich in the minerals that power the digital era.

As one might expect, tech companies are heavily invested in tracking and preventing these human rights violations. However, as an example, if you are a medical device or automotive manufacturer, chances are that you're using a significant number of electronic components and you may not have the visibility into these aspects. This is where tying into consortiums by commodity or region can have an exponential impact; you get the benefits by working with those that have a vested interest. For instance, companies in the high-tech space may place a premium investment on eliminating conflict minerals in their supply chains. This allows medical device or automotive companies to take advantage of these efforts without bearing the full cost.

When it comes to how to incorporate sustainability into procurement options, most people gravitate to the obvious categories of packaging and transportation, which is a good starting point. However, there are numerous other areas to deliver robust savings to both the planet and bottom line. For example, with IT hardware, simple tactics such as increasing the duration between refresh cycles of laptops and mobile phones can help reduce toxic electronic waste.

Frequently, sustainable products and services are expensive due to lack of economies of scale. If procurement across major companies decides to collectively demand and/or invest in sustainable offerings, the collective will action those at a reasonable price. For example, companies have been steadily moving en masse to cloud-hosting solutions at

a fairly rapid pace. The collective user base can demand, and more likely achieve, major cloud providers to operate sustainable data centers—powered by locally sourced renewable energy, energy-efficient servers/devices and sustainability climate-controlled facilities.

Digital levers to achieve ESG goals

We've seen how supplier diversity, sustainability and FL and CM may be key ESG goals. Your company may have others. Regardless of what your company's ESG goals are, my key message is that digital procurement has levers to accomplish these goals.

Requisitioning. An often-used adage, “we cannot achieve what we cannot measure,” is particularly relevant here. The requisitioning system can be a great place to gain complete dynamic visibility of what is being bought, set annual targets and closely track progress toward these sustainability goals. A well-designed requisition system will give users the ability to factor sustainability into their purchases. Specifically, when a user searches for an item and is given the available options, a good system will flag which is the sustainability choice (or any other ESG designation), replete with encouragement to ask them to make the right choice or even ask them why. That means every time a requisitioner makes a sustainable purchase, they will automatically contribute to a net-zero goal. If you imagine tens of thousands of requisitioners buying billions of dollars of goods and services, the ability for users to make a sustainable choice can make a meaningful change to a sustainability score—without any direct intervention from procurement. Software solutions are starting to provide this functionality as the default (see Figure 2).

Furthermore, if users are serially not making sustainable choices, then procurement can intervene to figure out why and fix the problem, whether it's user awareness or an issue in the system. For example, an even better designed requisition system would be programmed to intelligently make the green choice before offering up the options to the user. That way the cost-benefit trade-off is done across the entire spend without the business user ever being aware of it. Conceivably, one could imagine a scenario in which 100% of spend—in certain categories at least—could be from green suppliers at the same cost or

even less without users ever being any the wiser that they were contributing to the greater green good. It's important to recognize and reward buyers who make consistent green choices and contribute toward the enterprise goals; this can be a tool to drive the right behavior. One could even include gamification and leaderboards to spur competition toward driving better outcomes.

Part of an effective procurement operation is procurement's ability to effectively understand its supply base. When it comes to sustainability, having visibility to all suppliers' capabilities, not just the Tier 1 strategic ones, is crucial. In years past, lack of information transparency made this goal nearly unachievable. But now the data foundation discussed above makes this information ubiquitous. These networks enable buyers to include

FIGURE 2
ESG requisitioning example



Source: Kearney analysis

sustainability requirements in sourcing events and as the co-efficient for complex sourcing events as in the diverse supplier examples above. This information can also be used as a vital input in the supplier relationship management capability for balanced scorecards across all segments of suppliers.

Digitization. On a tactical level, the simple act of moving from paper invoices to a fully digitized payment process will automatically reduce paper and ink use and lower the carbon footprint from traditional mail delivery. Every digitization effort can be quantified as generating tangible progress toward the net-zero goal.

Sourcing. Historically, procurement has moved from cost savings to total cost and most recently total value, which includes risk, ESG, innovation and advanced cost levers.

Sourcing using a total value model means each of these variables can be factored into the awarding of business so as to deliver benefits against these objectives.

For example, every sourcing event can factor sustainability metrics into the various award options. That way, every award of business has a tangible sustainability benefit. The benefits could be as simple as compostable packaging or carbon-neutral delivery vehicles. You can also reduce carbon by sourcing green electricity, or through a vast array of green choices within facilities management (cleaners, light bulbs, HVAC). Each of these benefits can meaningfully contribute to ESG objectives.

Furthermore, there are going to be specific opportunities such as value engineering to design more sustainability into products. As several of our clients have done, this could be working to find innovative solutions to waste management. Instead of simply finding suppliers to haul waste away, savvy procurement people have engaged with different suppliers to break down the waste and sell it for alternative sources. Or by employing a combination of robotics, automation and intelligent systems, companies can improve the reuse of disposable packaging and components.

Finally, as 3D printing matures, there will be opportunities for procurement to engage 3D printing capabilities for certain categories. Currently some MRO items such as masks, tools, nuts, bolts or clamps can be printed. This means that for every printed item there is a benefit to be calculated for manufacturing, packaging and delivery environmental impact avoidance.

Next level. Several years ago, we did a prototype simulation project for a wind farm provider. We modeled dynamic simulation and “what-if” optimization of turbine service scheduling and crew planning. This example, while an operations problem, demonstrates

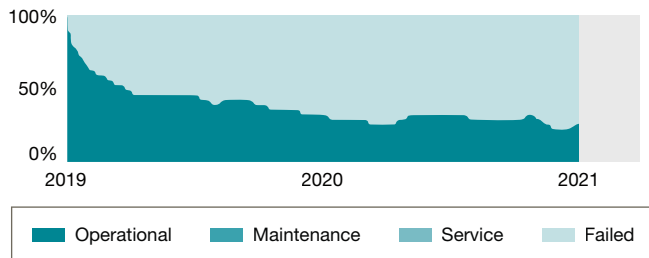
the power of visually simulating cost trade-offs, a skill next-generation procurement folks need to have and should be using today.

The goal was to evaluate different behaviors that

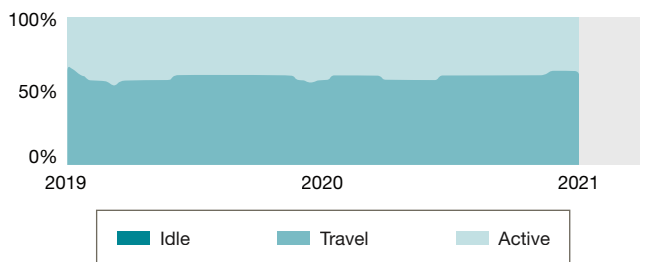
FIGURE 3

Dynamic wind farm simulation

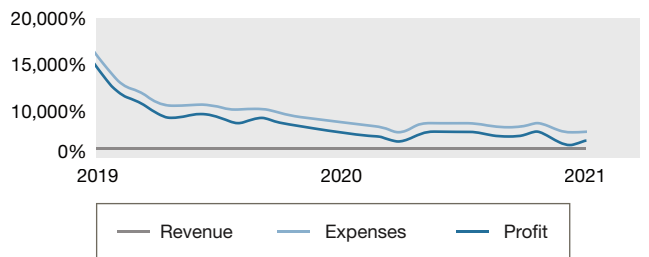
Operational availability



Operational utilization



Revenue and expenses



Source: Kearney analysis

factored in daily revenue per turbine, service crew costs, turbine replacement costs, repair costs and service costs. The goal was to maximize profit by optimizing service crew utilization with an optimal

repair plan that extended the life of each individual turbine. With this type of analytics, we were able to easily maximize profitability per unit while reducing maintenance costs. However, it would be easy to extend the model to incorporate sustainability into the maintenance side of the equation if we mapped the as-is maintenance scheduling and deployments and calculated the baseline carbon footprint. Then in the scenario planning we could model for sustainability improvement by either changing the types of vehicle, shortening routes or achieving other efficiency gains. Therefore, any recommended changes would contribute to the net-zero goal (see Figure 3).

Simulations and analytical models can be a great way to understand the long-term true impact of business/sourcing decisions. As mentioned earlier, moving the needle on sustainability may not happen within a few months or even years. Our ability to model sourcing decisions with variables to quantify the impact of sustainable choices in the long term can be very powerful, especially when evaluating trade-offs.

Conclusion: Running the meter

If procurement wants to add value in the digital era, it needs to think entrepreneurially. (I realize that sounds about as clichéd as a consultant can sound.) My point is that entrepreneurs are risk takers—usually high-risk, high-reward types. CPOs have the opportunity at this moment to be entrepreneurs. You can bet big and get high returns. You can commit to achieving 50% of the sustainability goal or awarding 50% of your business to diverse suppliers. You can sign up for strong year-on-year cost savings. Not only is it the right thing to do, but it's also achievable with the use of good digital tools.

You can simply set up a meter with three dials: cost, sustainability and diversity. As each sourcing award is made, each requisition made and

each cost savings generated, each individual meter will run. Imagine: every time a diverse supplier is awarded business, the meter ticks forward. Every time a user makes a green choice, the meter runs. You could even add a fourth dial that calculates opportunity cost. This will show the progress that could have been and gives the leadership and the diversity officer the ability to undertake direct programs to change behavior. Furthermore, you could embed clever gamification where users achieve various statuses (for example, advocate, difference maker, rising star, superstar). Studies have proven that award labels will spur behavior in particular directions.⁴ Taking this further, companies could reward this behavior with public acknowledgement and/or monetary rewards (or, ideally, donations).

It's abundantly clear that procurement has a significant role to play in the pursuit of ESG goals. In fact, who better to drive operational, tangible progress than procurement? And if not now, when? This is just another example of why procurement is the coolest place in the enterprise. ☺☺

1 Vox's "How LGBTQ Pride Month became a branded holiday," Mashable's "Dear Corporate America, leave our LGBTQ Pride celebrations alone," and The Washington Post's "Pride for sale," to name a few.

2 "Unilever's Sustainable Living Plan continues to fuel growth," Unilever press release, October 5, 2018, [unilever.com/news/press-releases/2018/unilevers-sustainable-living-plan-continues-to-fuel-growth.html](https://www.unilever.com/news/press-releases/2018/unilevers-sustainable-living-plan-continues-to-fuel-growth.html)

3 For more information on this program, please see Outland Denim 2020 Sustainability Report, cdn.shopify.com/s/files/1/0098/3669/1535/files/outland-denim-sustainability-report-2020-2.pdf?v=1596437271.

4 Anderson, Ashton & Huttenlocher, Daniel & Kleinberg, Jon & Leskovec, June 2013, "Steering user behavior with badges," *Proceedings of the 22nd International Conference on World Wide Web*, 95-106

How's your short game?

As turmoil disrupts global supply chains, executives eye reshoring and nearshoring.

By Mark Clouse, Per Kristian Hong, Omar Troncoso and Patrick Van den Bossche

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For decades, major North American companies have been playing the equivalent of golf's long game by operating global supply chains extending over vast distances. But several years of trade wars and tariffs, successive waves of COVID and Russia's invasion of Ukraine have made the vulnerability of global supply chains vividly clear. Companies continue

to struggle through ongoing supply disruptions, congested ports and skyrocketing charges—the average cost of transporting a container rose from \$1,362 in November 2019 to between 10 times and 15 times that amount at the height of COVID. It was still hovering around \$9,600 early in 2022. At the same time, demands on supply chains are heightened as consumers and customers expect more timely delivery and more personalized service.

Today's turmoil is triggering the biggest remaking of the global operating environment in our lifetime. Kearney's Global Business Policy Council warns that prolonged conflict and retaliatory economic sanctions may lead to a fragmentation of the post-Cold War global economy into regional hubs shaped by national ideology.

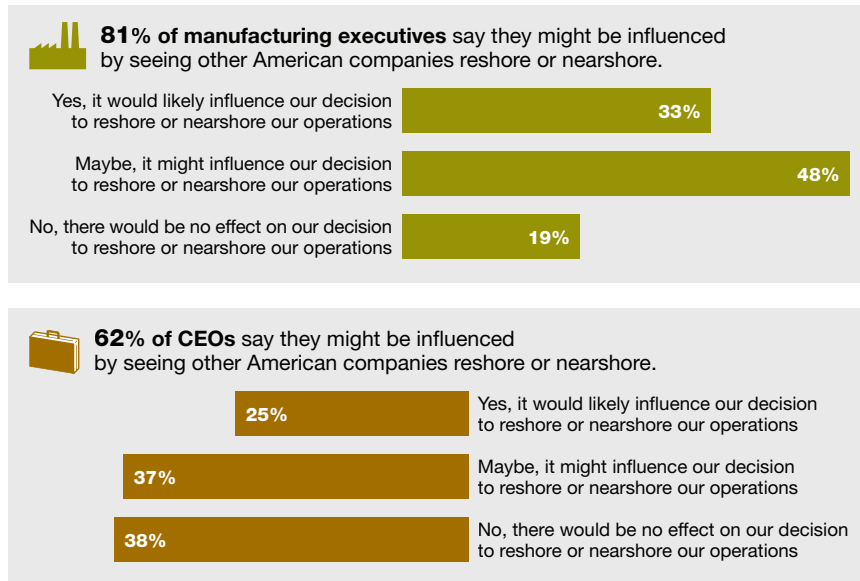
The challenges ahead demand much more than adjusting a few dials. We believe the most successful companies will use the current crisis as an impetus

to decisively restructure their value chains for resilience and agility, so that they can keep pace with—or better yet, stay ahead of—what will be an historic change in how markets are defined and operate. For all of these reasons and more, many companies are now strengthening their short game to make the cut and set the stage for sustained success.

An executive survey conducted in March 2022, in conjunction with Kearney's annual Reshoring Index benchmark study, suggests that a shift toward reshoring and nearshoring operations is imminent: 92% of manufacturing executives and 78% of CEOs said that they have considered reshoring or have already reshored some manufacturing operations to the United States. Intriguingly, 81% of U.S. manufacturing executives and 62% of CEOs say that seeing other U.S. companies reshore or nearshore would influence them to follow suit (see Figure 1).

FIGURE 1

Would seeing a rise in American companies' reshoring or nearshoring their manufacturing operations have an impact on your decision to reshore or nearshore your company's operations?



Source: Kearney analysis

Hints of reshoring?

While Kearney's 2021 Reshoring Index found no evidence that a shift toward reshoring operations is yet underway, there's solid evidence that companies see the United States as a viable place to produce goods. Several domestic and international manufacturers—including Amgen, Fujifilm, Intel and Saab—have committed to building manufacturing facilities in the United States, many starting up this year. Overall, U.S. manufacturing gross output levels are back above pre-COVID levels. The National Factory Activity Index hovered between 58 and 64 in 2021 (any number over 50 indicates manufacturing growth) and the early months of 2022 started off strong at nearly 59.

Tariffs and government funding continue to add momentum to American manufacturing.

The previous administration's tariffs on Chinese-made goods are, so far, still in place for many products. Moving manufacturing operations closer to either the United States or Mexico can help alleviate the tariff burden. Even government actions that appear to encourage importing from Asia, such as awarding grants for port-related projects to increase capacity and improve the movement of goods at U.S. ports, lean toward domestic manufacturing insofar as companies applying for these grants must agree to support domestic buying and building.

While many American consumers express a preference for domestically manufactured products, in practice they often opt for low-cost-country goods. Endemic inflationary pressures on global supply chains certainly lower consumer price sensitivity for products

made in the United States in the short term, as the high cost of operating long supply chains makes price differences less significant. Longer term, however, automation and productivity changes will be required to offset total delivered costs and ensure sustained competitiveness.

Manufacturing closer to where the demand exists also has sustainability benefits, such as smaller carbon footprints and generally improved scores on other environmental, social and governance (ESG) commitments. Our study found that ESG commitments play a major role in many companies' decisions to reshore or nearshore their operations. Manufacturing executives ranked reducing their carbon footprint and improving ESG values higher than trade policies and intellectual property protection. Reducing carbon emissions through reshoring is being implemented or actively considered by both medium and large enterprises.

Ironically, supply chain delays across multiple industries both underscore the need for reshoring and create delays in reshoring action. For example, the shipping container bottleneck for goods and materials, along with backlogs in industries such as steel manufacturing, has slowed manufacturers' ability to build new domestic capacity and quickly automate their existing capacity.

Underinvestment in transportation infrastructure is another headwind to U.S. reshoring. Many years of neglect to roads, bridges and other physical and digital infrastructure has led to inefficiencies and bottlenecks, raising costs to operate in the United States and making expansion of domestic operations less viable

for American companies. The signing of a \$1 trillion bipartisan infrastructure bill into law in November 2021 was a tangible reversal of this troubling trend.

Is Mexico coming of age?

This also seems a particularly opportune time for North American companies to watch what's happening in Mexico. There are two reasons for this: For one, Mexico is a logical place to bring operations and sourcing much closer to home, thereby shortening supply lines and making them less vulnerable to global disruption; and two, there are signs that Mexico may soon come of age as a competitive source for manufactured goods, potentially displacing much of the production the United States currently imports from China and other Asian low-cost countries.

Chinese companies are already building manufacturing assets in Mexico and the pace of their investment is expected to accelerate over the next three years. Examples of Chinese manufacturers with a significant presence in Mexico include Hisense, one of the world's largest white goods and electronics manufacturers; Kuka Home, China's largest furniture manufacturer; and Hangzhou XZB Tech, a manufacturer of high precision parts for the auto industry.

The most pronounced evidence of a manufacturing influx from Asia can be seen in and around Hofusan Industrial Park, near Monterrey. This strikes us as significant for several reasons. The concentrated buildup of globally established manufacturers should raise North American companies' confidence in sourcing from Mexico, as known and trusted suppliers

will now be much closer to the United States. As important, an ongoing buildup in the region should significantly increase demand for local sources of supply, setting the stage for development of a strong and diverse manufacturing ecosystem. This, in turn, could encourage more manufacturers—including U.S. companies—to join the party.

We also hear anecdotal evidence that the United States and other countries would like to operate or source more goods in Mexico but are frequently frustrated in their attempts to do so. Shelter providers approached by American, European and Asian companies for assistance in setting up shop in Mexico say there's almost no available industrial and warehousing real estate in border cities such as Tijuana. This will likely continue until 2024 or 2025, because nearly everything currently under construction is already sold or leased.

High quality manufacturers in Mexico are operating at or near capacity, serving their preferred customer base—primarily big American, European and Asian OEMs in automotive, aerospace and home appliances. It's therefore hard for potential new customers to attract their attention. Several Mexican manufacturers we know say they currently have a backlog of 50 or more requests for proposal from U.S. and overseas companies that want to shift some production to Mexico, up from just one or two such requests a year ago. Similarly, Tier 2 and Tier 3 “hunters” in Mexico report having six times or seven times more work than in the recent past.

So, it appears that considerable demand is waiting to be met. As Mexico's manufacturing momentum builds, the perceived risk of sourcing from and making products there will diminish, as will some of the challenges that currently discourage companies that are interested.

Mexico may then stand in very positive contrast to the sharply rising risks of sourcing from far-flung nations. Such a combination could rapidly speed up the pace of nearshoring. Is this a sure thing? Hardly. But the current operating environment demands that companies build more optionality into their supply chains. And Mexico is an option worth watching.

By reshoring production to the United States or nearshoring in Mexico, companies can achieve better communication, increased visibility into both supply and production and improved control of their supply chain. In some instances, the savings on freight and duties already make it more cost efficient to nearshore. The appeal of nearshoring will only increase as shipping prices and supply risk rise in a severely stressed global economy. ∞∞

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Requirements: Master's degree in Industrial Tech & Mgmt, Industrial Engineering or related field with concentration in Supply Chain Management or in the alternative for concentration will accept at least 2 grad courses in Supply Chain Management or related. Criminal, education & background checks required.

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by email to: Jobs@mtradinggroup.com.

Two years of disruptions have increased the awareness of supply chains

But “average Joes” and “supply chain pros” have differing views of the future of supply chain.

Marisa Brown is senior principal research lead, supply chain management, APQC. She can be reached at mbrown@apqc.org.

By Marisa Brown, senior principal research lead, Supply Chain, APQC



Over the last two years, the term supply chain management has gone from one primarily recognized by those within certain jobs to one frequently appearing in news stories. Supply chain disruptions are still regularly discussed by media outlets, and they continue to affect the lives of many: We refer to these as “average Joes,” or every day citizens who are outside of the profession but are affected by disruptions whenever they go to the store; and supply chain pros, or those individuals

who work inside the supply chain profession to keep the wheels turning.

Earlier this year, APQC conducted a quick poll of individuals both inside and outside of the supply chain profession to determine the extent to which supply chain disruptions have affected their lives. The poll also sought to identify the degree to which these impacts affected different age groups. The poll had 320 global participants ranging from age 18

to over 55 years old.

The poll's results show that nearly all of the respondents have experienced some level of disruption related to supply chains, and that about three-quarters of respondents were affected by higher prices related to supply chain issues. However, the degree to which respondents have been affected, and their opinion of the future of supply chains, varies by age group as well as whether they are average Joes or supply chain pros.

Getting familiar

As part of the quick poll, APQC aimed to determine how much the news about supply chains has made a difference in the familiarity of average Joes, defined as those who are not employed in roles related to supply chains, with the concept of the supply chain. Unsurprisingly, the number of individuals who lack familiarity with supply chains has dropped over the last five years.

As shown in Figure 1, the trend is across all age groups. The largest drop occurs among the youngest respondents (age 18 to age 34), with a 21% decrease over the last five years. Close behind are respondents age 35 to age 44, with a 15% decline over five years.

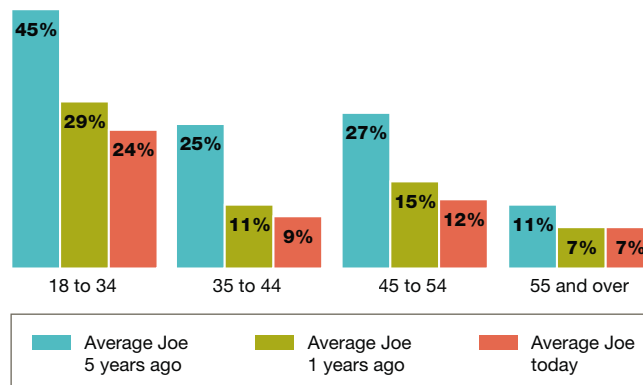
It makes sense that the largest drop is among the youngest respondents, because during this period of their lives they may have become more aware of how the products

they consume are manufactured and transported to retailers. For this and the other age groups, the fact that supply chain disruptions spanned multiple industries, coupled with the coverage of these disruptions in the media, has led to an overall greater awareness of the supply chain.

In-depth supply chain knowledge

In a related result from APQC’s quick poll, a greater percentage of average Joes have in-depth knowledge of supply chains now versus five years ago. This is true across nearly all age groups. As shown in Figure 2, the largest increase was among respondents in the age 18 to age 34 group, followed by the age 35 to age 44 group. The only group that did not have an increase was the group age 55 and older, which remained fairly consistent over five years.

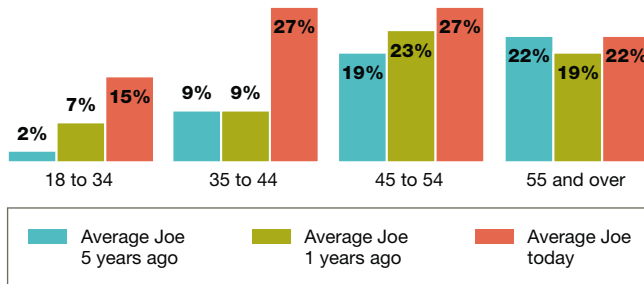
FIGURE 1
Lack of familiarity with supply chains by “average Joes” over time



Source: APQC

FIGURE 2

In-depth knowledge of supply chains by “average Joes” over time



Source: APQC

In the age 18 to age 34 group, the percentage of individuals with in-depth knowledge of supply chains increased 13% over the last five years. In the group of individuals aged 35 to 44, the amount increased by 18%.

These results are in line with the types of disruptions experienced across age groups. Respondents in the average Joes category indicated that they mostly experienced multiple ongoing disruptions or some minor disruptions in their lives that they believe are tied to the supply chain. Individuals in these age groups have experienced enough disruptions that they have paid more attention to how the supply chain can affect their daily lives.

It is worth noting that this poll question asked respondents to self-rate their knowledge of supply chains. Given that responses were from individuals outside the supply chain field evaluating their own knowledge of a topic outside of their normal expertise, we can expect for there to be a gap between respondents’ perception and their actual knowledge. We see this when evaluating poll respondents’ opinions about the future of supply chains.

Views on the future

Across all age groups, individuals not holding supply chain roles have become more aware

of the supply chain during the pandemic. APQC considered whether increased awareness among this group affected its attitude about the future of supply chains.

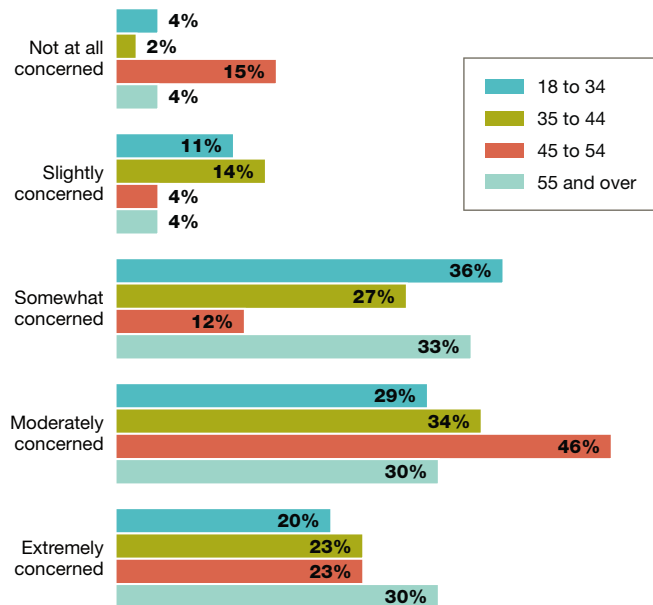
The results are mixed. As shown in Figure 3, average Joes have a wide range of concern regarding the future of supply chain. In particular, the age 45 to age 54 group has a relatively large group of respondents that are not at all concerned about the future, although the largest group is moderately concerned.

Among individuals holding a job related to supply chain (dubbed supply chain pros for the purposes of this analysis), there is a higher level of concern overall. As shown in Figure 4, the largest groups, regardless of age, are in the moderately concerned or extremely

concerned category. In fact, the only age group to have responses indicating no concern is the group age 55 and over. Every other age group has at least some level of concern.

FIGURE 3

“Average Joes” and concern with future of global supply chains

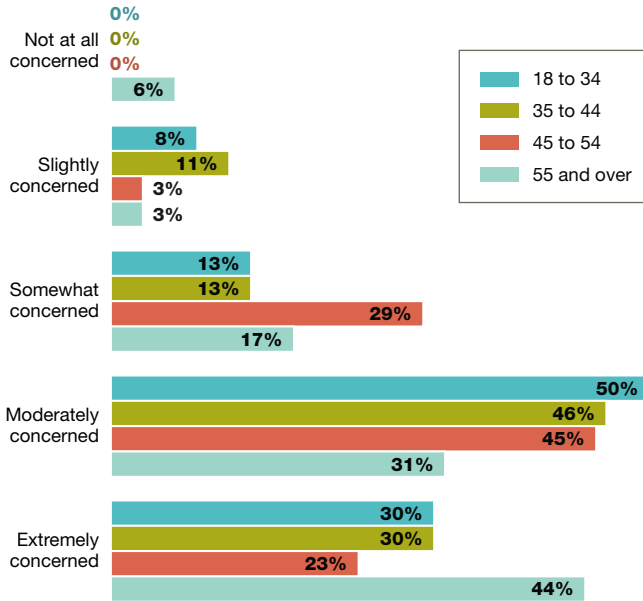


Source: APQC

concerned category. In fact, the only age group to have responses indicating no concern is the group age 55 and over. Every other age group has at least some level of concern.

FIGURE 4

Supply chain pros' concern with future of global supply chains



Source: APQC

These results show stark differences in the groups perception of the direction of supply chains. In the age 18 to age 34 group, there is a difference of 10% between the supply chain pros and the average Joes who are extremely concerned. The difference is even larger among those respondents age 55 and over: 15% more of the supply chain pros are extremely concerned compared with the average Joes.

Given their behind-the-scenes knowledge of supply chains, the pros are much more concerned about how well supply chains will bounce back from the disruptions of the pandemic. Many leaders of organizations fall into the 55 and over age group, making them uniquely positioned to understand the challenges supply chains still face. Average Joes, on the other hand, are not aware of factors that will affect global supply chains into the future, regardless of whatever knowledge they have gained during the pandemic.

Transparency is key

The heightened news coverage of the supply chain and its impact on all types of consumer

goods have made average Joes more aware of what supply chains are and how they operate. These individuals have most likely been touched by supply chain disruptions—although the degree to which they have been affected varies widely.

The pros in the supply chain field have insight into the causes and long-term effects of disruptions. This makes them more likely to be greatly concerned about the future of global supply chains. However, as disruptions continue to affect a variety of products and industries connected to the daily lives of average Joes, this group has become more concerned about supply chain resiliency into the future.

In addition to the steps they are taking to shore up the resilience of their supply chains and recruit workers to fill in gaps, organizations should consider how to remain transparent with their partners

and with consumers. Keeping partners aware of challenges allows them to address disruptions before they make further impacts down the supply chain. Providing honest updates on supply chain challenges can also build trust with consumers so that they remain loyal after disruptions have subsided. ∞∞

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MANAGEMENT REVIEW



TOP 50: 3PLs face big challenges and huge rewards

Just like last year, 3PLs continue to face a host of critical and pressing issues that challenge their skills at managing a client's supply chain. And while company financials for 2021 were staggering, the state of the market in 2022 depends on the pace of global recovery — which currently seems to be slowing.

BY KAREN THUERMER, CONTRIBUTING EDITOR



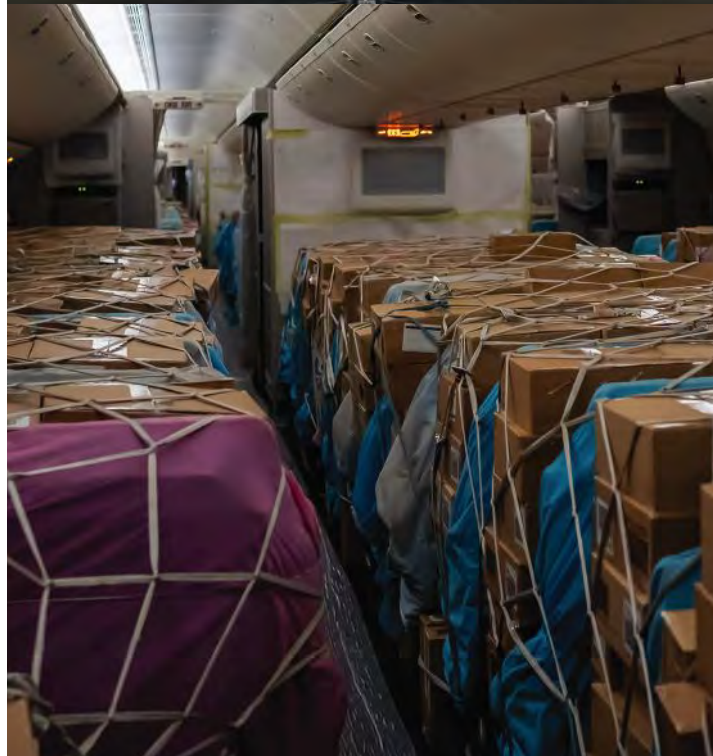


Just when the world's third-party logistics (3PL) providers thought they had seen the worst of the supply chain chaos, Russia invaded Ukraine and China implemented lockdown measures in Shanghai.

"The year 2021 was interesting for both ocean and air," reflects Tim Scharwath, CEO of DHL Global Forwarding. "But within the first two-and-a-half months of 2022, things became worse. We are, in a way, back to square one—back to the year 2021."

Just like last year, 3PLs continue to face a host of critical and pressing issues that challenge their skills at managing a client's supply chain.

"The biggest challenges facing us right now are very much like those facing shippers," says Sri Laxmana, vice president of global forwarding for C.H. Robinson. "The include ongoing capacity constraints, shipping delays, port congestion, labor and equipment shortages, and continued disruption due to myriad factors, and most recently, the Russia-Ukraine war, COVID-19 outbreaks and local travel restrictions."



Armstrong & Associates Top 50 U.S. 3PLs

(Largest U.S. 3PLs Ranked by 2021 Logistics Gross Revenue/Turnover)

2021 Rank	Third-party Logistics Provider (3PL)	2021 Gross Logistics Revenue (USD Millions)*
1	C.H. Robinson	22,355
2	Expeditors	16,524
3	UPS Supply Chain Solutions	14,639
4	Kuehne + Nagel (Americas)	12,980
5	J.B. Hunt	11,412
6	XPO Logistics	8,907
7	DSV (North America)	7,957
8	GXO Logistics	7,940
9	Total Quality Logistics	7,857
10	Uber Freight	6,440
11	Transportation Insight Holding Company	5,800
12	DHL Supply Chain (North America)	5,010
13	Ryder Supply Chain Solutions	4,612
14	Worldwide Express	4,600
15	Burris Logistics	4,300
16	Hub Group	4,232
17	Lineage Logistics	4,000
18	Landstar	3,838
19	Schneider	3,770
20	DB Schenker (North America)	3,750
21	Echo Global Logistics	3,745
22	Penske Logistics	3,700
23	CEVA Logistics (North America)	3,650
24	MODE Global	3,400
25	NFI	3,122
26	GEODIS (North America)	2,760
27	Americold	2,715
28	AIT Worldwide Logistics	2,292
29	SEKO Logistics	2,018
30	FedEx Logistics	1,920
31	Knight-Swift Transportation	1,900
32	Kerry Logistics (Americas)	1,860
33	Werner Logistics	1,837
34	ArcBest	1,810
35	Omni Logistics	1,798
36	Capstone Logistics	1,780
37	Maersk Logistics (Americas)	1,700
38	TFI International (North America)	1,662
39	Arrive Logistics	1,632
40	Ascent	1,600
40	Crane Worldwide Logistics	1,600
41	BDP International	1,552
42	Universal Logistics Holdings	1,502
43	Pilot Freight Services	1,350
44	Kintetsu World Express (North America)	1,327
45	syncreon	1,275
46	Allen Lund	1,225
47	Ruan	1,223
48	Radial	1,200
49	Odyssey Logistics & Technology	1,167

**Revenues cover all four 3PL Segments (DTM, ITM, DCC and VAWD), are company reported or A&A estimates, and have been converted to US\$ using the annual average exchange rate, as of April 2022. Copyright © 2022 Armstrong & Associates, Inc.



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Reuters recently cited a study by the Royal Bank of Canada that neatly encapsulates the problem. It states that one-fifth of the global container fleet is currently stuck due to congestion at various major ports. In early May, ships awaiting berth at the Port of Shanghai tallied 344—a 34% increase over April’s total.

“It will take a very long to dig out of this,” says Lars Jensen, CEO of Vespucci Maritime. “There’s no buffer capacity in the system, and it will take very little to go to an even worse situation.” As an analogy, he compares vessels delays in February being akin to sinking the entire fleet of CMA CGM to the bottom of the ocean. “That is the real situation we’re still in.”

Adding fuel to the fire are rising rates and costs. “Shipping costs have been rising sharply across the supply chain, and have reached historically high rates globally,” says Nia Hudson, research analyst at London-based Transport Intelligence (Ti). “This is the case particularly on shipping routes from Asia to North

America and Europe.”

Ti’s ocean freight tracker shows that in February 2022, rates on lanes from China/East Asia to the U.S. West Coast were up 175.6% year-on-year, while rates on the backhaul were up 30.2% year-on-year. Industry experts predict that shippers won’t see much rate relief until at least the third quarter of 2022. “Both DSV and Maersk have warned that freight costs are likely to remain high well into the year,” remarks Hudson.

Other affecting factors are rising oil prices, continued consumer demand, container shortages, and limited ocean and airfreight capacity, not to mention workforce shortages that have left 3PL providers facing high labor costs and fewer people to address volumes.

Critical cooperation

Nearly everyone in the industry concurs that these issues are unlikely to be resolved in the near term. However, 3PLs and shippers are continuing to work together to find creative ways to

overcome challenges and keep goods moving. In fact, all parties involved in supply chain logistics are finding creative solutions to work together.

“We feel everyone, especially the ocean carrier community, is trying hard to help support our customers to find the right solutions to make everything that can be available, available,” says Scharwath. “Everything that can swim is on the waters these days.”

Laxmana points out how C.H. Robinson is helping shippers manage ocean shipping delays by shifting some of their freight from full-container-load (FCL) to less-than-container load (LCL) shipping, including expedited LCL. “This provides cost and time savings, and more ability to make last-minute changes amid longer wait times at the ports,” he says.

At the same time, J.B. Hunt Transport Services Inc. and BNSF are launching a joint effort to substantially improve capacity in the inland intermodal marketplace, while also meeting the expanding needs of current customers.

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4	DB Schenker	27,648
5	C.H. Robinson	22,355
6	Sinotrans	19,097
7	Nippon Express	18,612
8	Expeditors	16,524
9	UPS Supply Chain Solutions	14,639
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12	J.B. Hunt	11,412
13	Kerry Logistics	10,516
14	Maersk Logistics	9,830
15	XPO Logistics	8,907
16	DACHSER	8,333
17	GXO Logistics	7,940
18	Total Quality Logistics	7,857
19	CJ Logistics	7,700
20	Toll Group	7,260
21	LX Pantos	6,541
22	Uber Freight	6,440
23	Hitachi Transport System	5,995
24	Transportation Insight Holding Company	5,800
25	Bolloré Logistics	5,701
26	Kintetsu World Express	5,501
27	GEFCO	5,200
28	Yusen Logistics	5,000
29	Ryder Supply Chain Solutions	4,612
30	Worldwide Express	4,600
31	Burris Logistics	4,300
32	Hub Group	4,232
33	SAIC Anji Logistics**	4,183
34	AWOT Global Logistics Group	4,058
35	Lineage Logistics	4,000
36	JD Logistics	3,946
37	Landstar	3,838
38	Schneider	3,770
39	Echo Global Logistics	3,745
40	Penske Logistics	3,700
41	Savino Del Bene	3,538
42	MODE Global	3,400
43	NFI	3,122
44	Culina Group	2,985
45	Hellmann Worldwide Logistics	2,972
46	C&D Logistics Group	2,967
47	Americold	2,715
48	EFL	2,680
49	Mainfreight	2,467
50	Sankyu	2,457

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Wider roles

Taking on a wider role, some of the biggest 3PLs are now dealing in end-to-end logistics, with companies increasingly trying to expand value-added services, achieve geographic expansion and accelerate company valuation.

As a result, mergers and acquisitions in the industry continue to take place. In fact, analysts say that mergers and acquisition activity is keeping pace with 2021.

In the airfreight and air transport sector, Kuwait's Agility and its subsidiary National Aviation Service have made an offer for the UK based aircraft handling company John Menzies. GXO, the contract logistics spin-off of XPO, has bid for the UK 3PL Clipper Logistics, and MSC has just reached an agreement to acquire Bollore Africa Logistics.

C.H. Robinson is expanding its global and Asian reach by opening a new office in Beijing that will also serve as its North China airfreight logistics hub. It joins C.H. Robinson's



existing airfreight hubs in Shanghai, Guangzhou, Shenzhen and Hong Kong. "Organizations with scale are likely to remain ahead of the market, especially during times of intense market disruption," comments Hudson.

For some shippers, using 3PLs with economies of scale offers wider benefits such as access to a larger network. "This is especially important for those shippers looking to expand into new territories," remarks Hudson. "Working with providers of scale is also likely to benefit shippers through lower costs as production becomes more efficient."

Consolidation within the market may also influence the visibility of shippers' supply chains as 3PLs gain access to new capabilities and new technology. Some 3PLs have been taking action to reduce order fulfillment expenses and offset the high costs of freight and rent. "Several companies have increased investment in automation to alleviate labor shortage pressures and optimize warehouse space," Hudson says.

DHL Supply Chain, for example, reported at the beginning of the year that it was investing \$15 million in robotics solutions from Boston Dynamics to further automate warehouses in North America that would be designed

Full steam ahead for diversified operations

Steamship lines are increasingly purchasing positions to marry their operations with those of 3PLs. This was particularly the case with Maersk in 2021.

"Maersk made no fewer than seven deals during the year, including several acquisitions that expanded its presence in the e-commerce market," says Nia Hudson, research analysts with Transport Intelligence Ltd (Ti).

One deal occurred in August with Visible Supply Chain Management, a U.S.-based B2C and B2B e-commerce fulfillment provider followed in December by Maersk acquiring LF Logistics, a Hong Kong-based contract logistics provider specializing in omnichannel and e-com-

merce logistics. The LF deal adds some 223 warehouses across Asia Pacific to Maersk's network that now covers 9.5 million square meters globally.

And just recently, on May 2, Maersk completed its \$1.68 billion acquisition of Pilot Freight Services, a move the carrier sees as offering customized international, domestic, and cross-border logistics to its North America landside logistics capabilities for B2B and B2C distribution models.

If approved, Maersk will also expand its trans-Atlantic airfreight cargo capacity this year by acquiring Senator International in the second quarter of 2022.

—Karen Thuermer



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specifically to remedy challenges within the warehouse space. “Many European companies—such as GEODIS, SEGRO, and DSV—are purchasing warehousing space nearer to the end customers in an attempt to keep costs as low as they can

3PLs are also introducing services with the intent of cutting costs. GXO’s Direct distribution network in North America, for example, places stock in strategically located distribution centers to provide shippers with a cost-effective, flexible distribution solution. “It’s these providers that are attempting to introduce cost-effective services that will be able to create additional value for consumers,” Hudson says.

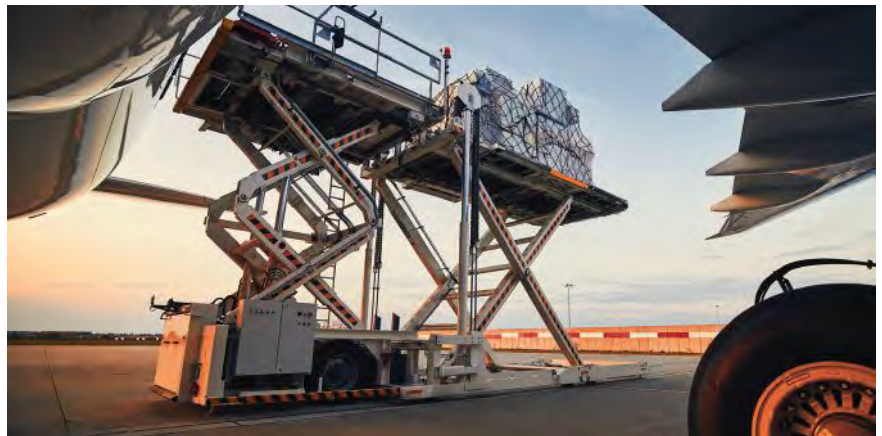
Significant growth

The challenges have created vast opportunities for 3PLs—and their financials reflect this. Armstrong & Associates, Inc. (A&A) estimates that U.S. 3PL market gross revenues grew a whopping 50.3% in 2021, bringing the total to \$347.9 billion.

A&A ranked C.H. Robinson No. 1 and estimated that the 3PL brought in \$22.3 billion in gross revenues compared to \$15.5 billion in 2020. For 2021, A&A ranked C.H. Robinson No. 5 globally, stating that C.H. Robinson’s Global Forwarding division more than doubled in 2021, with gross revenue growth of 117.1% to \$6.7 billion. Its net revenue increased 70.7% to \$1.1 billion.

“C.H. Robinson is now a top freight forwarder in the Asia to U.S. trade lane and with 1.5 million in total ocean export TEUs managed,” says Evan Armstrong, president of A&A. “It has surpassed long-time U.S.-headquartered competitor Expeditors International.”

Expeditors ranked No. 2 in A&A’s



Top 5 U.S. 3PLs, outpacing XPO Logistics (No. 6 in 2021; No. 2 in 2020) and UPS Supply Chain Solutions (No. 3 in both 2021 and 2020). Its 2021 estimated gross revenues were \$16.5 billion and \$10.1 billion in 2020.

“Expeditors International is the largest U.S.-based international transportation management 3PL revenue-wise,” Armstrong says. A&A finds that Expeditors’ 2021 gross revenue increased 67.7% to \$16.5 billion and net revenue grew 39.7% to \$4.5 billion. Growth primarily came from ocean freight where gross revenue grew 137% to \$5.5 billion from \$2.3 billion in 2020.

Expeditors’ ocean freight consolidation business grew 194%, primarily on exports from Asia. Airfreight gross revenue was up 58% to \$6.8 billion. Net revenue grew at a lesser rate due to increased costs of purchased transportation in both air and ocean, driving overall gross profit margin from 32.4% to 27% for 2021.

A&A finds that global player Kuehne + Nagel swapped places with DHL Supply Chain & Global Forwarding, by ranking No. 1 in 2021 as the largest global 3PL based on gross revenues. K+N grossed a whopping \$40.8 billion in 2021 up from \$25.8 billion in gross revenues in 2020 compared to

DHL Supply Chain & Global Forwarding, which grossed an estimated \$37.7 billion in 2021, up from \$28.4 billion in 2020.

DSV rose to third place with 2021 gross revenues of \$28.9 billion compared to \$18.3 billion in 2020 when the company was DSV Panalpina.

Going forward in 2022

While company financials for 2021 were staggering, the state of the market in 2022 depends on the pace of global recovery, which currently seems to be slowing.

“The global economy has entered 2022 in a weaker position than expected,” adds Hudson. “It’s perhaps too early to fully understand the impact of these factors on the market. It has, however, been predicted that supply chain disruptions will level out by mid-2022 as inventory levels begin to normalize to pre-COVID levels and shipping capacities begin to increase, although this remains to be seen.”

Its forecasts show that growth will therefore slow slightly in the coming years, growing by 7.0% year over year in 2022 and a CAGR of 4.7% by 2026. ☞

Karen Thuermer is a contributing editor for Supply Chain Management Review

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Redefining the Collar Blue
Mandy Rennehan
Blue-Collar CEO & Founder
Freshco, Inc.

Tuesday | 9/20 | 8:00 am • 9:15 am



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Tom Szaky
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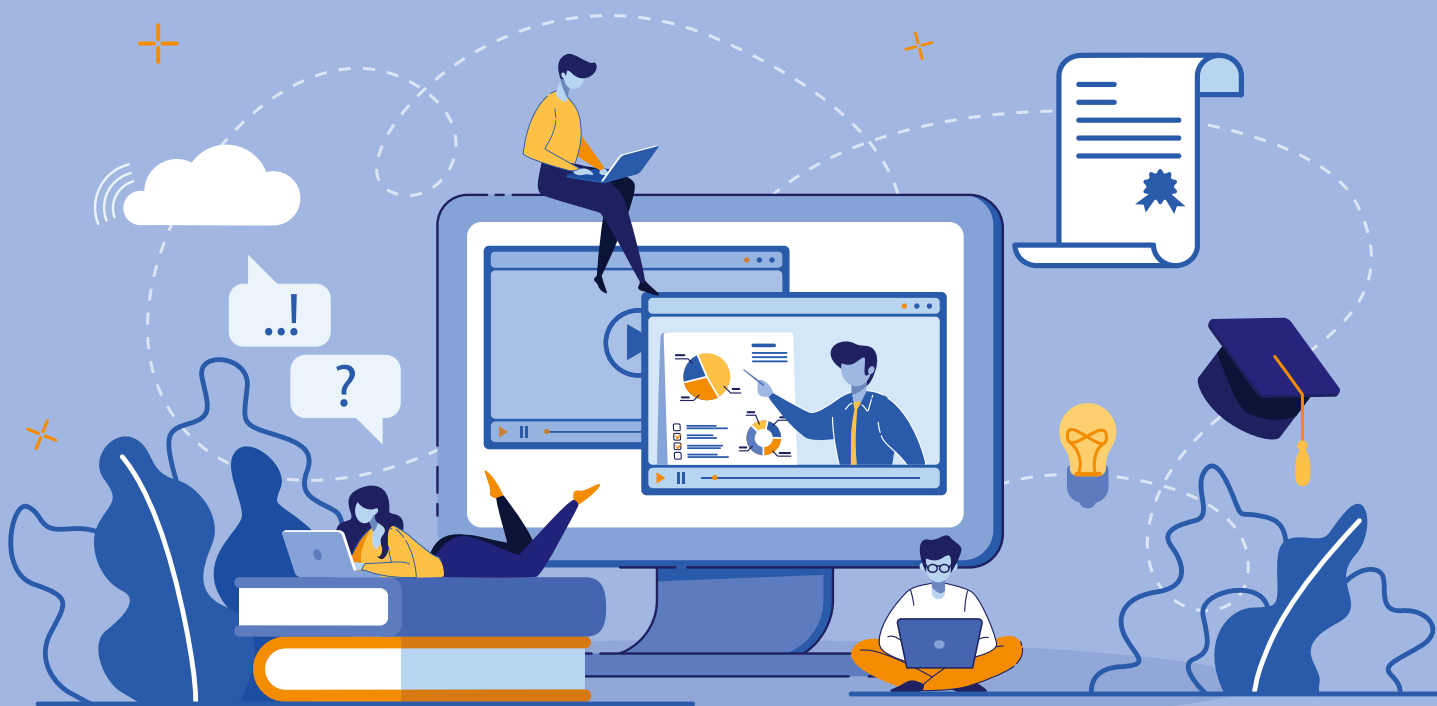
SUPPLYCHAIN
MANAGEMENT REVIEW

PUTTING SUPPLY CHAIN CERTIFICATIONS TO WORK

BY BRIDGET McCREA, CONTRIBUTING EDITOR

Supply chain certification providers are pushed to come up with new ways to serve up education on a broad level, but also for very specific, relevant topics.

Usually awarded by professional organizations or education providers, certifications show that someone has completed a course, passed an assessment and committed themselves to mastering the skills and knowledge needed to succeed in his or her profession. Within supply chain, certifications are often viewed as a route to higher salary levels, better job advancement opportunities and a way to edge out the competition in the workforce.



Some of the more popular acronyms you'll see following a supply chain professional's title include the Certified Supply Chain Professional (CSCP) from the Association for Supply Chain Management (ASCM), the Certified Professional in Supply Management (CPSM) awarded by the Institute for Supply Management (ISM) and SCPro Certification from the Council of Supply Chain Management Professionals (CSCMP). And while these tend to be the go-to certification options for the sector, there are other programs that help individuals master different aspects of the supply chain.

Specific to transportation, for example, SMC³ offers an online education and certification program focused on less-than-truckload (LTL) freight. Once they complete the course, professionals can become certified in LTL by SMC³, which recognizes that development of skills and competencies are required to succeed in today's LTL environment.

Brian Thompson, chief commercial officer at SMC³, says the current transportation market has sparked more interest in the company's online course and certification. Some of that is due to the fact that more people are operating remotely (and as such, looking for online education options) and some of the interest is based on the sheer complexity of the LTL market.

"Education has come to the forefront as companies look for ways to keep everyone informed about new industry trends and help employees do their daily jobs," Thompson explains. "LTL can be a foreign language for someone who was focused primarily on truckload or intermodal LTL; it's kind of its own animal." Pricing, terms

and carrier rules (e.g., limits on liability, contract conditions, base rate structures, etc.) are all tricky with LTL, he adds, and require some specialized knowledge to master.

"With LTL, it's never just a flat freight rate per mile. There are discounting programs and multi-layers to the pricing, including base rates, FAK (freight all kinds) structures, on-build discounts, off-build discounts and incentives," Thompson points out. Those complexities have increased over the last two and a half years as e-commerce volumes increased and freight capacity fluctuated across most transportation modes. In response, he says more professionals are looking for ways to educate themselves on the fine points of operating in the LTL market.

"We've definitely seen increased interest in LTL education," says Thompson. In addition to taking online courses and earning certifications, he says students are requesting access to industry experts. They want to ask them questions, get perspectives from other people in the sector and talk to carriers about current trends, challenges and solutions.

In response, SMC³ developed a live programming option that encompasses five courses, each of which runs for four weeks. The company brings in experts from carriers, logistics providers and industry associations to go over key topics and answer student questions that are often as fundamental as: "Where is the first place that you go for information?" This not only provides real-life perspective, but it also helps students get what they're asking certification providers like SMC³ for: Answers to some of their most pressing questions.

Switching up the approach

Challenged by ongoing supply chain disruptions, rising freight rates, the national labor shortages and high consumer demand for products, professionals are turning to associations and education providers for help. At ISM, Director Tom Martin says the volatile operating environment has driven more interest in topics like supply chain risk management. Professionals also want to know more about environmental, social and governance (ESG), diversity and sustainability, all of which have become hot button topics over the last few years.

Martin says supply chain professionals also want education that's more "actionable and less academic," and particularly when it comes to certifications. He says ISM helps to bridge that gap with its flagship CPSM certification, which covers the end-to-end supply chain while also factoring in the procurement professional's broader role in the end-to-end supply chain. The program also considers how procurement integrates with both internal and external stakeholders and takes a deep dive into subjects like Scope 3 emissions, which are generated by activities from assets not owned or controlled by the organization itself.

Recently, ISM also updated and relaunched its Certified Professional and Supplier Diversity (CPSD) certificate program, which focuses on diversity as one of the 11 principles of sustainability and emphasizes corporate social responsibility. Going forward, Martin sees even more opportunity to fuse topics like procurement, supplier management and ESG from the

educational perspective. He says ISM will also continue to focus on the basics while also exploring a micro-credentialing approach that would be based on a "hub and spoke" model. Everyone would take the same fundamental courses, but would then "spoke out" into more specialized coursework and exams (e.g., supplier diversity, ESG, etc.) as desired.

With the micro-credentialing, the goal is to build a body of knowledge that lets students come away from the experience with multiple credentials, according to Martin, versus learning about different topics in silos and not understanding how they all integrate with one another. This approach also caters to high-potential individuals who are advancing in their careers and wanting to learn more about specific topics like data science and analytics. "As professionals continue to learn they'll be able to earn additional credentials in different areas," says Martin, "versus just holding one certification and continuing to recertify over and over."

A growing awareness for education

As he looks around at the current certification environment and the companies and students that are leveraging it, ASCM's CEO Abe Eshkenazi says the emphasis is being split between academic fundamentals and professional development. One recent ASCM survey found that companies are especially interested in skills like critical thinking, collaboration and problem solving, most of which aren't being taught in the traditional academic setting. Instead, they're

innate, gained on the job and/or obtained via certification or other educational programs.

Asked whether today's certification programs are adapting to meet these needs, Eshkenazi says he's seeing the diversification of educational content. "Traditionally, we served the industry through our certifications, which historically were a corollary for the baccalaureate or master's degrees," he says, noting that ASCM has since expanded its content to include both entry-level and mid-career professionals, the latter of which may be on track for career advancement and/or seeking new jobs.

"Historically, our ecosystem centered on giving individuals foundational knowledge that they needed to be able to gain employment," Eshkenazi explains. Today, that ecosystem includes foundational, self-paced content (not all of which is certificate-based) plus new certificate opportunities for students who want to gain a deeper knowledge in procurement, warehousing or planning. The latter is in development and will be released in July.

Served up in bite-sized portions—versus three-to-six-month long programs—these certificate programs fulfill the need for immediate content in a just-in-time format. Through this evolution in supply chain certification, individuals can gain the specialized education they need to be able to advance in their careers, get a new position and/or perform even better in their current jobs.

Looking ahead, Eshkenazi anticipates a growing need for competency-based education in the supply chain field, where there's a clear difference between having an academic degree and actually being able to run, orchestrate and manage the various aspects

of a supply chain. This is yet another area where certification programs can step in and help to fill the gap. "The expectation is that [graduates] are going to hit the ground running, and that's a bit shortsighted given the current supply chain complexities," Eshkenazi points out. "Yet how do we prepare these individuals? And, where do individuals go to get the foundational knowledge and experience if you don't provide it for them?"

Instant credibility

As supply chain certifications continue to evolve, Thompson says the way these programs are viewed, used and leveraged is also changing. Where SMC's offering is focused on LTL and its related challenges, for example, he says the underlying issue right now is the ongoing uncertainty that supply chain professionals are grappling with on a daily basis. Having to step into the unknown creates additional hesitancy and anxiety for these professionals, who can avoid some of this angst by gaining more education in their specific areas of expertise.

Thompson says the benefits of certification radiate beyond the individual student and also touch the person's employer. A logistics service provider that can show its clients that its employees are up to speed and experts in their fields, for instance, may have a better shot of winning and keeping that client's business. "Especially for small to mid-sized logistics providers, or those that may be focused on a specific market niche," says Thompson, "certifications can help round out their portfolios and give the company and its employees instant credibility with potential clients." ∞∞

On the following pages, you can find a list of certifications and executive education programs to advance your career.



SMC³ LTL ONLINE EDUCATION



ON-DEMAND

INTERACTIVE



ENGAGING

CAREER-FOCUSED



The first of its kind in the industry, SMC³ online education provides a flexible learning experience with both professional certification and non-certification paths for the transportation professional looking to grow their knowledge and accelerate their career path.

Register today for the LTL203: LTL Carrier Pricing & Costing Hybrid course, featuring live industry experts each week. Class starts July 14.



Learn more about LTL online education and certification at www.smc3.com/onlinelearning.

Produced in partnership with LogisticsTrainingCenter.com

PROFESSIONAL ASSOCIATIONS

ASCM (Association for Supply Chain Management)

With over 45,000 members and more than 250 global partners, ASCM is the global leader in supply chain learning, transformation, innovation and leadership. The organization offers three certifications and one endorsement for individuals and one certification for corporate: APICS Certified in Production and Inventory Management (CPIM), APICS Certified Supply Chain Professional (CSCP), APICS Certified in Logistics, Transportation and Distribution, APICS Supply Chain Operations Reference Professional (SCOR-P) and the ASCM Enterprise Certification.

APICS Certified in Production and Inventory Management (CPIM)

APICS CPIM is recognized worldwide as the standard of professional competence in production and inventory management. Candidates learn the basics of production and inventory management, such as the required terminologies, concepts, demand planning and management, procurement, scheduling, continuous improvement and related areas. CPIM is a recognized addition to the profile of anyone looking to advance a career in supply chain management; it is almost a necessity for individuals whose day-to-day activities involve working in production and inventory management, operations, supply chain management, procurement, purchasing and materials management departments.

Candidates must pass two exams within three years to earn the APICS CPIM certification

- CPIM Part 1
- Module 1 — Basics of Supply Chain Management
- CPIM Part 2
- Module 1 — Strategic Management of Resources
- Module 2 — Master Planning of Resources
- Module 3 — Detailed Scheduling and Planning
- Module 4 — Execution and Control of Operations

There are a number of resources available to help candidates study for the Part 1 and Part 2 exams. apics.org/cpim provides tips to aid exam preparation and to tackle the questions asked during the exam.

Candidates must pass two computer-based 150-question exams to become certified.

To maintain the APICS CPIM certification status, candidates must earn a total of 75 points every five years. Failure to maintain may lead to the suspension of CPIM credentials and also require a candidate to re-take all of the exams.

APICS Certified Supply Chain Professional (CSCP)

The APICS CSCP certification was launched in 2006. Since then, more than 25,000 professionals from nearly 100 countries have earned this designation.

APICS CSCP certification distinguishes a candidate as an industry expert in the field of supply chain management. It is one of the most widely recognized certification programs and is also the most sought-after designation by many employers. APICS CSCP exams are offered at locations around the world.

The program focuses on improving a professional's expertise in the field of global supply chain management in areas such as customer relations, information technology enablement, logistics and international trade.

To be eligible for the APICS CSCP, one must have:

- three years of business-related experience;
- bachelor's degree; and
- CPIM, CFPIM, CIRM, SCOR-P, C.P.M., CSM or CPSM designations.

The APICS CSCP exam consists of three modules, which must be mastered for certification.

- APICS Supply Chain Management Fundamentals
- Supply Chain Strategy, Design and Compliance
- Implementation and Operations

There are a number of resources available to help candidates study for these modules. apics.org/acsp provides tips to aid exam preparation and to tackle the questions asked during the exam.

To maintain the APICS CSCP certification status, candidates must earn a total of 75 points every five years. These points can be earned by continuing education, publications and service to the operations management profession. Failure to maintain may lead to the suspension of CPIM credentials and also require a candidate to re-take all of the exams.

APICS Certified in Logistics, Transportation, and Distribution (CLTD)

The APICS Certified in Logistics, Transportation and Distribution (CLTD) designation assesses individuals based on a comprehensive body of knowledge, best practices and standards. Earning the CLTD credential validates a professional's expertise in the logistics, transportation and distribution.

Launched in 2016, this program features a single computer-based exam developed around new courseware, self-study and instructor-led education opportunities.

The APICS CLTD program consists of eight modules critical to the logistics industry, including:

- Logistics and Supply Chain Overview
- Capacity Planning and Demand Management
- Order Management
- Inventory and Warehouse Management
- Transportation
- Global Logistics Considerations
- Logistics Network Design
- Reverse Logistics and Sustainability

The APICS website (www.apics.org) provides many resources on the CLTD Learning System to help individuals prepare for the exam.

To apply for the APICS CLTD, submit an eligibility application two weeks prior to registration. The eligibility application must include:

- 3 years related business experience, or
- Bachelor's degree or the international equivalent, or
- CSCP, CPIM, CFPIM, CIRM, SCOR-P, CTL,

C.P.M., CSM OR CPSM designations

In order to maintain the certification, designees must abide by the APICS Code of Ethics, which can be found on the APICS website (www.apics.org/cltd). Additionally, an individual must earn a total of 75 maintenance points and apply for maintenance every 5 years. These points can be earned by continuing education - presentations, publications, and educational development - service to the operations management profession, and/or professional membership. If the credentials are not maintained, the certificate will be suspended. Each additional year of suspension, up to 5 years, requires additional professional development point in order for the certification to be reinstated. After 5 years of suspended credentials, the candidate will be

required to take the exam again.

APICS Supply Chain Operations Reference - Professional

APICS SCOR-P model helps supply chain professionals manage and measure the performance of a global supply chain using the SCOR model. Widely recognized, the SCOR-R endorsement enables professionals to increase the performance of their supply chains using the knowledge gained in SCOR model.

The APICS SCOR-P endorsement enables candidates to standardize performance metrics, create best practices that affect supply chain performance, and the management of critical supply chain resources. In order to be eligible for this certification, candidates must have five years of experience working in supply chain management. APICS conducts three days of training for the APICS SCOR-P exam. While attendance at the training sessions is not a pre-requisite to taking the exam, candidates are required to purchase the SCOR course in order to attend the exam.

After purchasing the SCOR course, the candidate will receive an e-mail with a Notice to Schedule (NTS) the exam date. This NTS is valid for six months

ASCM Enterprise Certification

The ASCM Enterprise Certification is the industry's first and only corporate supply chain designation that measures social responsibility, economic sustainability, and ecological stewardship. This program aims to empower organizations to reach goals, improve results, and be more competitive in today's global business world. This unique designation incorporates Supply Chain Operations Reference (SCOR) content and all certification bodies of knowledge.

Earning the Enterprise Certification can help your organization:

- Gain a competitive advantage through showcasing economic, ecological, and ethical supply chain practices
- Demonstrate transparency to prospective customers and consumers
- Ensure suppliers align with your organization's values
- Manage accountability to support your organization's ethical standards

- Embrace a culture of social responsibility
- Showcase your supply chain excellence

Evaluations of the ethical practices of an organization's supply chain include the review of the supply chain for: anti-corruption and anti-trust, codes of conduct, confidentiality of information, human rights and labor practices, intellectual property and patents, and responsible marketing and sales engagement.

Evaluations of the economic practices of an organization's supply chain include the review of the supply chain for: business integrity and company reputation, board and corporate leadership, enterprise risk and crisis management, materiality index, responsible tax, supply chain strategy and differentiated operating models.

Evaluations of the ecological practices of an organization's supply chain include the review of the supply chain for: circular economy, climate strategy, energy, water and waste, material usage, and product life-cycle stewardship.

Additional information can be found on ascm.org/enterprise

CSCMP's SCPro Supply Chain Management Certification Program

The SCPro Supply Chain Management Certification is offered by the Council of Supply Chain Management Professionals (CSCMP).

SCPro certification is a three-level certification process that validates a professional's ability to assess business challenges and effectively implement improvements in the area of supply chain management.

Level One. Level one certification consists of eight modules and demonstrates a solid foundation of knowledge in all areas of supply chain management. In order to complete this level, candidates are required to have a bachelor's degree or four years of relevant work experience.

Level Two. Level two certification covers the analysis and application of supply chain challenges. In order to be eligible for level two, candidates must have a bachelor's degree and three years of work experience or, alternatively, seven years of work experience along with level one certification.

Level Three. Level three certification requires candidates to perform hands-on analysis within a working environment and to create a detailed project plan that generates results such as increase in ROI, cost reductions and improvements. In order to be eligible for level three,

a candidate should have a bachelor's degree and five years of work experience or, alternatively, nine years of work experience along with level one and level two certifications.

Candidates with all three levels of certification can demonstrate to an employer that they are well versed with the most important concepts required to manage today's supply chains.

The Hackett Institute's Certified Enterprise Analytics Professionals

The Certified Enterprise Analytics Professional program, delivered via a dynamic e-learning platform, offers comprehensive training and development in the area of advanced analytics. The program is designed to build the analytics knowledge of business professionals at all levels and within multiple functional areas. Professionals will improve their mastery of the analytics techniques and tools necessary to effectively analyze, predict and influence business performance.

While this program is currently offered to organizations seeking to improve the skills of its teams, it will soon be available to individuals.

Information can be found on the Hackett Institute website www.thehackettgroup.com/certified-enterprise-analytics-professionals/.

ISM's Certified Professional in Supply Management (CPSM) Program

With nearly 45,000 members worldwide, the Institute for Supply Management is one of the largest global organizations focused on improving procurement and supply management. ISM has certified nearly 60,000 procurement professionals in more than 30 countries worldwide.

The Supply Management Program helps candidates

become experts in critical areas of supply chain management such as sustainability, strategic sourcing and forecasting. The eligibility requirements for this exam are:

- three years of experience in supply chain management with a bachelor's degree or equivalent;
- five years of supply chain management experience without a bachelor's degree; and
- successfully pass three CPSM exams.

In order to earn this certification, candidates must complete in order the following three exams.

- **Exam 1:** Foundation of Supply Management
- **Exam 2:** Effective Supply Management Performance
- **Exam 3:** Leadership in Supply Management

Preparation resources for this certification can be found on the ISM Website (instituteforsupplymanagement.org).

ISM's Certified Professional in Supplier Diversity (CPSD) Program

The Supplier Diversity Program (CPSD) is best for professionals who participate in the development of supplier diversity initiatives. The eligibility requirements for this exam are:

- pass the CPSD exam;
- Exam 1 for CPSD is waived if the candidate has CPSM certification;
- five years of experience in the area of supplier diversity or supply chain management;
- a bachelor's degree and three years of experience in the area of supplier diversity or supply chain management.

Preparation resources for this certification can be found on the ISM Website (instituteforsupplymanagement.org).

Next Level Purchasing Association

NLPA SPSM Certifications

The Next Level Purchasing Association (NLPA) currently offers three certification levels that are open to supply chain professionals who are members of the NLPA. A fourth level is expected to be available in 2017.

The SPSM program covers essential procurement skills

and consists of six online purchasing courses and an exam that focuses on the most effective purchasing and supply management techniques, tactics, and strategies. Candidates have up to one year to complete the program, but it can be completed in less time.

Level 2, or the SPSM2 certification, is open to individuals who have earned the SPSM certification and covers global procurement management. The program consists of four online procurement courses and an exam.

Level 3, or the SPSM3 certification, is available to individuals who have earned the SPSM and SPSM2 certifications. The program is designed to help professionals master the skills to collaborate with other departments leading to even better results and a greater bottom-line impact. The program consists of four online procurement courses and an exam.

Level 4 will cover social responsibility and strategic supplier diversity practices.

Information is available on the NLPA website (www.next-levelpurchasing.com).

Sourcing Industry Group (SIG University)

SIG University Certification

The SIG University certification is focused on implementing methodologies and best practices in the areas of strategic sourcing, outsourcing, governance, risk and compliance. A 12-week course is currently available for Certified Sourcing Professionals, with online courses being added for Certified Sourcing Executives and Certified Governance and Risk Professionals. The curriculum is offered to people at all levels in their sourcing careers who seek training opportunities. Each certification level consists of modules with interactive lessons and end-of-unit assessments. Each certification is valid for five years and was developed utilizing leading online best practices enhanced with relevant real-world experiences.

Information is available on the SIG University website (<http://sig.org/sig-university>).

CERTIFICATIONS OFFERED BY UNIVERSITIES

Apart from professional organizations, nearly 40 U.S. universities—and possibly more—have launched certification and degree programs in the field of supply chain management. The basic information on certifications is discussed below.

Air Force Institute of Technology **Graduate Certificate in Supply Chain Management**

This certification provides candidates with a graduate level education in the fundamentals of supply chain management with special emphasis on Department of Defense and Air Force applications. In order to be eligible for this program, candidates should have a bachelor's degree or equivalent with an overall GPA of 3.0 or higher. The curriculum consists of five graduate level courses, a total of 17 credits along with a non-credit business math review course. Candidates take one course every quarter and courses are offered once every year. Courses are available via video teleconferencing, online or in the classroom.

American Public University **Graduate Certificate in Logistics Management**

This graduate level certification provides the skills and knowledge required to excel in supply chain management and logistics. Eligible candidates are expected to have a bachelor's degree or equivalent. Candidates complete 18 credits hours, or six courses, to achieve this certification over a period of 12 months. While the program is taught in the classroom, an online version may be available on request.

Arizona State University **Supply Chain Management Certificate**

The Supply Chain Management Certificate at Arizona State University provides in-depth knowledge of industry best practices and benchmarks. This certification is ideal for professionals who have at least two to three years of experience in supply chain management. It consists of two core courses and a choice of elective tracks. Candidates can customize their certificate with a specialization in operations management, supply management and logistics management. Courses do not count toward academic credit but do qualify for 4.5 continuing education units (CEU's). These can be applied towards CPCP certification, CPM re-certification and APP re-accreditation program. The course is delivered online and can be completed in less than six months.

California State University at Dominguez Hills **Online Certificate in Purchasing Education and Training**

This certificate provides a broad level education

on the principles of purchasing and procurement management. It is ideal for professionals who are currently working in the area of supply chain management and quality assurance, as well as those anticipating a career change. Courses are offered via online trimesters each year. Courses start in January, April and September. Each course is 13 weeks long. In order to obtain the certification, candidates must complete a total of five required courses with a GPA of 2.5 or better.

Online Certificate in Supply Chain Management

This certificate provides a broad level education on the principles of supply chain management. It is ideal for professionals who are currently working in the areas of production and inventory control, manufacturing, quality assurance, purchasing and procurement as well as those anticipating a career change. Courses are offered via online trimesters each year. Courses start in January, April and September. Each course is 13 weeks long. In order to obtain the certification, the candidate must complete a total of five required courses with a GPA of 2.5 or better.

California State University at Fullerton **Supply Chain Management Certificate**

The Supply Chain Management Certificate gives candidates the opportunity to learn how to handle and manage various activities within the area of supply chain management. This certificate is ideal for professionals who have prior experience working in the field of supply chain management as well as those anticipating a career change. Candidates are required to complete a total of six courses in order to earn the certification. The certification can be completed within a period of one year; upon completion of the requirements, candidates are also awarded 12 Continuing Education Units (CEUs). The program is taught in the classroom, but an online version might be available on request.

California State University at Long Beach **Global Logistics Specialist Online Professional Designation Program**

This certification provides candidates with an insider's view of transportation and supply chain management. Offered through the Center of International Trade and Transportation, it is the only program that offers the Global Logistics Specialist designation. This certificate

is ideal for professionals who have prior experience working in the field of supply chain management as well as those anticipating a career change. Candidates are required to complete a total of five courses and an online capstone project within two years in order to earn the certification. All modules are available online and the designation can be completed within one year.

Columbus State Community College **Supply Chain Management Certificate**

The Supply Chain Management Certificate provides candidates the opportunity to learn about the planning and management of integrated supply and demand management processes across companies, both domestic and international. Anyone who aspires to a career in supply chain management can pursue this certification. The program is completely online and requires candidates to complete 6 courses in one year.

DePaul University **Logistics and Supply Chain Management Certificate Program**

The Logistics and Supply Chain Management Certification Program provides candidates with an overview of the critical aspects of supply chain management by not just taking the internal operations of a company into consideration, but by also including the supplier and end customer in the picture. This certificate is ideal for professionals who have prior experience working in the field of supply chain management or consulting and with experience with ERP systems. Completing the online 17-week course also prepares candidates for the APICS CSCP certification.

Georgia Institute of Technology **Distribution Operations Analysis and Design Certificate**

This certification equips professionals in distribution operations with the necessary skills for facility operations and improvements. It is ideal for professionals who have prior experience in distribution operations. A classroom-based program, candidates are required to complete three core courses and one elective within a span of six years.

Health and Humanitarian Supply Chain Management Certificate

This certificate is designed for professionals in non-

governmental organizations (NGOs), industry and government who take active participation in Health and Humanitarian activities. Courses are designed to provide the necessary skills to improve decision-making processes, response operations planning and system design. A classroom-based program, candidates are required to complete three core courses within a span of six years.

Lean Supply Chain Professional Certificate

The Lean Supply Chain Professional Certificate provides candidates with the skills in problem identification, root cause analysis and problem solving. Upon completion of the program, candidates will be equipped to develop, lead and implement lean principles within a supply chain. This certificate is ideal for professionals who have experience in supply chain management and are looking for opportunities to expand their knowledge. Courses are available in the classroom and online and require candidates to complete 3 core courses within a span of six years.

Strategic Sourcing and Supply Management Certificate

This certificate is designed to empower sourcing, planning and procurement professionals to lead their companies through the complexities, risks and rewards of a global sourcing environment. The program is classroom-based and requires candidates to complete three core courses within a span of six years.

Supply and Demand Planning Certificate

This certificate provides candidates with an understanding of the important techniques and components related to integrated supply chain planning. The certification is ideal for professionals who have prior experience in the area of supply chain management, ranging from engineers up to the chief financial officer. This is a classroom-based program that requires candidates to complete three core courses and one elective within a span of six years.

Supply Chain Management Certificate

The Supply Chain Management Certificate gives candidates a cross-domain understanding of how to handle and manage various activities within the area of supply

chain management. The certificate is ideal for professionals who have prior experience working in the field of supply chain management as well as those anticipating a career change. It is classroom-based and requires candidates to complete two core courses and two electives within a span of six years.

Golden Gate University
Graduate certificate in Global Supply Chain Management

The Global Supply Chain Management certificate is ideal for anyone who possesses a bachelor's degree and is looking for opportunities in the area of supply chain management. Courses are offered in the classroom and online. To earn this certificate, candidates are required to complete two core operations management courses, two elective operations management courses and two other elective courses. The elective operations management courses allow candidates to tailor their certificate.

Lonestar College System
First Line Logistics Leader Certificate

The Logistics Leader Certificate prepares graduates for employment opportunities in the area of supply chain management, materials management, inventory management and distribution. The certificate is ideal for professionals who have prior experience working in the field of supply chain management as well as those anticipating a career change. Courses are classroom-based and candidates are required to complete five courses within a semester.

Loyola University Chicago
Supply Chain Fundamentals Certificate

The Supply Chain Fundamentals Certificate is a graduate-level, five-course certificate that delivers an essential foundation in supply chain management. It provides the skills central to effective end-to-end supply chain management, and indispensable insights for today's supply chain professionals. The certificate is designed for current supply chain professionals who need to enhance their knowledge base. It is also offers

a specialization for students who are currently pursuing a graduate business degree, and a complement for MBA graduates who want to retool or enhance their resume.

Customized Educational Programs

Loyola's custom educational programs are designed for organizations, and not individuals. Though the Loyola Business Leadership Hub, the Executive and Professional Education Center team designs and delivers a training solution and professional development certificates with an organization's needs in mind. The training programs are fully customized to the audience in content, format and delivery, and focus on issues that concern a specific business. The portfolio of programs includes competitive supply chain strategy, risk management, leadership development, project management, change management, finance for the non-finance manager and online marketing for executives. Other programs can be developed.

Michigan State University
Master or Advanced Master Certificate in Supply Chain Management and Operations

Michigan State University offers 3-Course Master Certificates in Advanced Procurement Management, Global Supply Chain Management, Supply Chain Management and Logistics, Supply Chain Management and Operations, Supply Chain Management and Procurement and Integrated Supply Chain Management. The school also offers 5-Course Advanced Master Certificates in Supply Chain Management and Procurement and Integrated Supply Chain Management. Offered online, classes are available on the participant's schedule through an interactive and customizable learning experience. Upon completion, candidates will be able to identify key elements of manufacturing planning and control systems and develop leadership skills that will ensure continuous improvement. The certificate is ideal for professionals who have prior experience working in the field of supply chain management as well as those anticipating a career change.

MIT**Executive Certificate in Technology, Operations and Value Chain Management**

This executive certificate provides an opportunity for non-technical executives and tech-savvy managers to learn how to model and solve problems faced by companies within the current rapidly evolving technologies and global networks. The program is ideal for professionals who currently hold a position of senior manager or higher within a company. Candidates are required to complete four courses. The courses are classroom based and are two to five days in duration.

MITx (MOOC)**MicroMasters® Program in Supply Chain Management**

Gain expertise in the growing field of supply chain management through an innovative online program consisting of five courses and a final comprehensive exam. The MicroMasters Credential is an advanced, professional, graduate-level foundation in all aspects of supply chain management. Learners who earn the MicroMasters credential can then apply for an accelerated, on campus, master's degree program at MIT or other top universities. It represents the equivalent of 1 semester's worth of coursework at MIT and covers all aspects of supply chain analytics, design, technology, dynamics and end-to-end supply chain management. Access to the videos, problems and other materials is free and open to anyone while certification requires a nominal fee.

**Northeastern University
Supply Chain Management
Graduate Certificate**

The Supply Chain Management Graduate certificate is for professionals who wish to advance their careers in supply chain management as well as those anticipating a career change. Candidates must complete three core courses and two elective courses while maintaining a 3.0 GPA in order to earn this certificate. The certification can be completed in two semesters.

Penn State University**Graduate Certificate in Supply Chain Management**

The Graduate Certificate in Supply Chain Management provides candidates with the ability to develop supply chain solutions for their organizations while gaining an understanding of domestic and global supply chain networks. The certificate is designed for working logistics professionals; professionals with backgrounds in engineering, science and liberal arts are also accepted into the program. Courses are classroom-based and require candidates to complete four courses. The program can be completed in a span of two semesters.

Professional Certificates

In addition to the graduate certificate program, Penn State offers Professional Scholar and Executive Scholar certifications in seven areas: Strategy and Organizational Performance, Supply Chain Operations, Supply Chain Management, Supply Chain Leadership, Strategy and Organizational Performance—Emphasis in Supply Chain, Supply Chain Leadership—Emphasis in Organizational Performance, and a Custom Certificate. Participants choose from a curriculum of 16 short courses, offered twice year, with more courses in development. Professional Scholars earn any two professional certificates; Executive Scholars earn any three professional certificates.

**Portland State University
Graduate Global Supply Chain Management
Certificate**

Portland State's online master-level certificate is designed for current MBA and Master of International Management students to expand upon their business knowledge; the certificate is also an excellent stand-alone credential for those currently working in supply chain. The university has partnered with the region's top employers, including Boeing and Nike, to develop an integrated supply chain program for today's global supply chain professionals. The program consists of three required core courses and one additional elective. All courses can be transferred into the master's degree program.

Certificate in Supply Chain Management

The SCM certificate program is a class-room based program designed to help supply chain professionals expand their knowledge base with relevant, practical curriculum that builds your skills in this dynamic field. All of our courses are taught by experienced SCM industry professionals. The program consists of four required core courses and two electives. The program can be completed in two terms. Courses can be taken individually or can be applied to a certificate within a three-year limit. Courses completed outside of the three-year limit will need to be retaken to qualify for certificate completion.

Rutgers State University Supply Chain Management Certificate

The Supply Chain Management certificate program covers the major aspects of supply chain management such as sourcing, procurement, logistics and operations. Candidates learn how to execute a supply chain management plan in today's competitive world. This certificate is ideal for higher-level managers and directors who have at least five years of managerial experience. A three-day program, participants are required to complete assigned readings and case studies by the end of the program.

Shippensburg University Advanced Supply Chain and Logistics Certificate

The Advanced Supply Chain and Logistics Certificate is designed for working professionals who aim to gain an understanding in the area of supply chain management and logistics as well as those anticipating a career change. The program is also ideal for individuals who have prior experience in engineering, science and liberal arts. The candidate is required to complete six courses. Courses are classroom-based and can be completed within a period of one year.

Southern New Hampshire University Operations and Supply Chain Management Graduate Certificate

This certificate is designed to introduce candidates to key supply chain concepts, strategies and processes, such as inventory control, warehouse management, transportation and procurement. This certification is ideal for professionals in the area of supply chain management and quality assurance, as well as those anticipating a career change. Courses are offered online and are available throughout the year. Candidate must complete four core courses and two electives.

Southern Polytechnic State University Industrial Engineering Technology Department Certificate of Logistics

This certificate program provides training on current trends in supply chain management and improves the skills and knowledge of candidates. Applicants must have a high school degree or GED and have been out of high school for at least five years or have earned at least 30 credits from an accredited institution with a minimum 2.1 GPA. Candidates are required to complete seven courses. Courses are offered in the classroom and online and can be completed within a period of four to six semesters.

St. Louis University Integrated Supply Chain Management Program

The Integrated Supply Chain Management Program offers comprehensive management development tools and techniques for supply chain management professionals. The certificate is ideal for professionals who have at least three years experience in the functional areas of supply chain management. Each of the required seminars are offered twice a year. Candidates must complete all the seminars within a period of 18 months.

Stevens Institute of Technology Logistics and Supply Chain Analysis Graduate Certificate

The Logistics and Supply Chain Analysis Graduate Certificate focuses on the theory and practice of

designing and analyzing supply chains. This certificate is ideal for working professionals looking for opportunities to expand their knowledge, especially in the areas of transportation and inventory control. Courses are offered in the classroom and online. Candidates are required to complete four courses.

Syracuse University **Executive Certificate in Supply Chain Management**

The Executive Certificate in Supply Chain Management can be earned by completing any five of the following courses.

- Introduction to Supply Chain
- Six Sigma Black Belt
- Supply Chain Systems
- Project Management
- Fundamentals of Sourcing
- Lean Manufacturing and Lean Champion

Each course is roughly 10 weeks long. All programs have been designed for working professionals, from engineering up to the president of a company.

Towson University **Supply Chain Management Post Baccalaureate Certificate**

The Supply Chain Management Certificate provides candidates with a competitive advantage in analyzing and controlling the activities and trends within a supply chain. The certificate is open to anyone who wishes to learn more about the field of supply chain management. Successful candidates can continue on to the Master's program. Candidates must complete 15 credits or five courses. Courses can be taken in the evenings and can be finished within a year.

University of California at Riverside **Professional Certificate in Purchasing, Logistics and Supply Chain Management**

This certificate integrates the concepts of purchasing, logistics and supply chain management in one program. It is designed to help professionals develop their skills and capabilities in these areas and is offered in collaboration with the Institute of Supply Chain Management. The certificate is ideal for professionals who have prior experi-

ence working in the field of supply chain management as well as those anticipating a career change. In order to earn this certificate, candidates must complete three required courses and three elective courses. Classroom-based courses can typically be completed within a period of nine months to one year.

University of California at Los Angeles **Supply Chain Management certificate**

The Supply Chain Management certificate offers training and tools to help manage the critical aspects of supply chain management, logistics, purchasing and inventory management. It is open to anyone who wishes to learn more about the field of supply chain management. Courses are offered online and candidates are required to complete six mandatory courses and two electives with a grade of "C" or better. Courses have to be completed within five years.

University of California at San Diego **Certificate in Purchasing and Supply Management**

The certificate in Purchasing and Supply Chain Management provides the practical information and techniques needed to solve real supply chain issues. This certificate is ideal for professionals who have prior experience working in the field of supply chain management as well as those anticipating a career change. Courses are classroom-based and require candidates to complete three mandatory courses and six elective courses. Designed for working professionals, courses can typically be completed within a period of one year.

University of Michigan - Ann Arbor **Lean Supply Chain and Warehouse Management Certificate**

This certification program provides a comprehensive approach to developing lean supply chain and logistics systems that help tackle strategic and tactical challenges. It is ideal for professionals who have prior experience working in the field of supply chain management as well as those anticipating a career change. A two-week-long classroom program, candidates are required to complete two online exams.

University of Missouri at St. Louis
Graduate Certificate in Logistics and Supply Chain Management

This certificate is designed to provide a focused and intensive study on the important areas of supply chain management and logistics. It is open for anyone who wishes to learn more about the field of supply chain management. Candidates are required to complete six courses. The courses are all classroom based.

University of North Florida
Certification in Transportation and Logistics

This certification helps candidates identify best practices in costing, pricing, cost reduction and productivity improvements. Recognized internationally, the CTL certification is ideal for professionals who have experience working in the transportation and logistics industry. Those seeking this certificate are required to have a four-year degree or at least three years of experience in the area of transportation and logistics. Candidates are required to complete five modules. All modules are classroom based.

University of San Francisco
Advanced Professional Supply Chain Management Certificate

The Advanced Professional Supply Chain Management Certificate helps candidates understand the relationship between a company, the components of its supply chain and the role of the supply chain manager. The certificate is open for anyone who wishes to learn more about the field of supply chain management. Candidates are required to complete three courses, which are offered online.

Advanced Professional Sustainable Supply Chain Management Certificate

The Advanced Professional Sustainable Supply Chain Management Certificate helps candidates identify regulatory and sustainability issues within an organization and its supply chain. This certificate is ideal for professionals who have prior experience working in the field of supply chain management as well as those

anticipating a career change. Candidates are required to complete three courses, which are offered online.

University of Texas at Dallas
Supply Chain Management Certificate

The Supply Chain Management Certificate helps professionals create value, provide solutions and excel in effective and real world decision-making. The certificate is open to anyone who wishes to learn more about the field of supply chain management. Candidates are required to complete four modules (eight days on campus and four days online).

Washington University in St. Louis
Supply Chain Management Certificate

The Boeing Center at Washington University's Olin Business School offers a robust portfolio of professional training courses and certificate programs designed to accelerate your career to the next level. The center offers ten-day Management Certificates in two different tracks designed to indicate that the participant has acquired knowledge of the leadership, strategy and skills necessary to become an effective manager of people and teams. The center also offers four six-day Skill Certificates in a variety of topics designed to provide participants with the knowledge and skills necessary for career advancement. Participants can also customize their areas of interest from a menu of a la carte training courses. A la carte courses are two days each, and currently include operational execution, successful project management, business model innovation and lean process management. ∞∞

Editors note: The preceding list of supply chain management certifications was originally authored in 2015 by Prasharsha Sunkara, who was then a graduate student at Texas A&M University, under the guidance of Malini Natarajathinam. The list has been updated and expanded annually by the editors of Supply Chain Management Review on an annual basis since its original publication date.

Pacesetting talent development

Q&A with **Abe Eshkenazi**, CEO, ASCM

Q: All around the world, organizations are running short on their most valuable resource—people. How can industry professionals solve this problem?

A: The key to overcoming the current global labor shortage is being an employer of choice. At a time when people have so many options, it's essential to offer truly rewarding work, to recognize the importance of your employees and to compensate them well. And this isn't only about salary; training and education can be just as inspiring—especially with so many workers complaining of being undervalued and lacking potential for upward mobility. When you commit to training and education, you take into consideration those workers who may not currently have a particular skillset, but who have the ability and eagerness to learn and advance through certification, credentials, certificates and other types of talent development.

Q: How is the “Great Resignation” affecting the supply chain field, in particular?

A: According to ASCM's 2022 Supply Chain Salary and Career



Report, the Great Resignation had little effect on our field. This past year, only 14% of survey respondents found a new job, up just 2% from 2020. This is particularly inspiring considering the incredible pressure and constant disruption our industry professionals have faced recently. Importantly, the data also clearly shows that there's a high level of job satisfaction, and the majority of survey respondents would recommend supply chain as a career path to others.



Q: How can we reach the next generation of industry professionals and encourage them to take that path to a supply chain career?

A: Students and young professionals time and again say that the chance to learn and grow is extremely important both on the job and while evaluating employment opportunities. These people also are driven by meaningful work and are more likely to stay with an organization that demonstrates that it cares about its employees, its community and the world at large. Again, investing in your people is a must. Credentials such as the Certified in Planning and Inventory Management; Certified Supply Chain Professional; and Certified in Logistics, Transportation and Distribution not only give employees key opportunities for growth, but also lead to significantly higher salaries.

Lastly, it's more important than ever before to show workers of all profiles and backgrounds that your organization is making an impact by creating a better world through supply chain. Our field is uniquely positioned to set the pace of change and positively shape the future. By striving to fulfill this promise, ASCM members around the world are engaging and inspiring their people each and every day.

EXECUTIVE INSIGHTS

How can we deal with supply chain risk, ensure compliance and reduce cost?

Q&A with **Patrick Higgins**, Principal, PSCM Advisory, Avetta

Q: How can we combat labor shortage issues within our supply chains?

A: Hire from within and upskill your current employees. Adapt your workforce based on their skillsets for increased efficiency. Lastly, hire selectively based on your job requirements and the training needed. Many organizations have found that partnering with Avetta helps them to source the best talent to meet their needs within our marketplace, train them through our platform and manage their workforce. In short: train, adapt, recruit and automate.

Q: What would you say are the biggest risks to supply chains currently?

A: With current conditions, the seven biggest risks include: 1) workforce management; 2) financial viability; 3) cybersecurity; 4) liability; 5) sustainability & ESG; 6) health and safety issues; and 7) diversity and inclusion. Each of these areas has hidden risks that supply chain leaders need to review and manage regularly. To get more granular, go to avetta.com to learn how to confront each of these risks.

Q: What are the most important keys to qualifying suppliers efficiently?



A: Appropriate role selection of workers based on project and site requirements is vital. Verified documentation, training and insurance provide compliance and peace of mind. As these steps are followed, organizations can run smoothly and operate efficiently.

Q: To ensure compliance, what is the ideal process for onboarding a supplier efficiently and quickly?

A: First off, before onboarding, you need to determine what certifications and training need to be completed for each project and job site. Now, review

contractors and suppliers based on the risk you are able or willing to tolerate. Next, search for your suppliers and contractors, filtering out those who are too high risk. Utilize your preferred sourcing tool (or if you haven't found one yet, try out Avetta). Now you can start the onboarding process by collecting certifications, insurance documentation and other needed contractor information. Make sure to note and set reminders for expiry dates of insurance certificates. Last, but not least, track the performance, quality and safety of your contractors. Then, adjust accordingly.

Q: How can organizations streamline their supply chain management to reduce costs and improve internal communications?

A: Utilizing a SaaS-based supply chain platform can allow organizations to configure supplier requirements and applicability rules all in one platform, find suppliers that fit the appropriate classification and manage these workers. One Avetta client saw a 75% reduction in administrative expenses each year by utilizing our solutions, and their story is not unique. To learn more, visit avetta.com/avetta-one.



EXECUTIVE INSIGHTS

Are you preparing your workforce to be ready for what's next?

Q&A with **Alan Dunn**, Lead, Global Supply Chain Education, Caltech

Q: How do you see the state of the workforce as we emerge from the tremendous shock of the pandemic?

A: The word disarray comes to mind. Supply chains weren't just paused. The pandemic affected people. Lives were turned upside down, and I believe we were given a glimpse into what is truly important. We have to take care of others. Organizations must take care of their employees and partners. Supply chains of all domains—local, global—are stretched, assets are out of place and the orchestration is still primarily run by operators working from home and in the field. The overall effect of that strain is the inability to execute with clarity, capacity, resilience, responsibility and effective decision-making. Personal impact makes all that harder.

Q: What are the most significant opportunities for leaders?

A: Before the pandemic, I would have told you to prepare for a talent shortfall in supply chains. We were at the precipice of losing rich institutional knowledge from a generation of operators who knew business cycles. The talent crisis has



been exacerbated to an extent, and we have four other forces at work to be ready for. In the short term, it's the economic restart and reallocation of resources, such as positioning assets and people or reshoring to mitigate risk. On the mid-term horizon, autonomous systems and analytics adoption is a critical thread to focus on out of digitalization because it requires re-thinking transportation, networks and customer interactions. How organizations must be designed

and run will be profound. The central opportunity for leaders and teams is to be curious.

Q. What do you mean curious?

A: Given the myriad challenges, it's natural to feel overwhelmed. Curiosity helps keep you grounded by stripping away the complexity. The art of inquiry has greatly served scientists and leaders alike. That requires understanding context and some savvy. For a given idea or plan, what has to be true? Will different personal perspectives or data change things? Leaders need to build their curiosity muscles. Everyone does, actually.

Q. Can you tell me more?

A: We work with the companies that are on the frontier of technology and engineering. They have complex, global supply chains and incredibly diverse talent. Through personal coaching, workshops and tailored learning experiences, we help their teams learn the art of inquiry and curiosity, applying practical skills in real-world projects, and prepare them to be adaptive for new challenges to come. When we cascade that throughout an organization, there is nothing their talent can't achieve. Think of it as building better innovators.

Caltech

Wooden pallets can advance your sustainability goals

Q&A with **Gary Sharon**, Executive Vice President, Litco International, Inc.

Q: What are you hearing from prospects and customers about their interest in purchasing sustainable packaging materials such as shipping pallets?

A: We have noticed an increase in companies that want to explore pallets that are proven to be sustainable. Pallets can be made from a variety of materials, but wood is the most common. Because wood is a biobased, renewable material, it is naturally sustainable. These qualities make wood an ideal material for constructing shipping pallets.

In addition, wooden pallets can be recycled, making them an excellent fit in the “circular economy.” A circular economy is a comprehensive approach to recycling packaging products back into the supply chain. The goal is for the best use of resources, waste reduction and a decrease of the environmental impact of the production and usage of the pallet.

Q: How would utilizing wooden pallets benefit the buyer?

A: Because they can be repaired, reused and recycled, the use of wooden shipping pallets will definitely help to meet a company’s sustainability goals. In addition,



pallets are the primary interface between packaged products and forklift trucks. Therefore, when designed and properly built by a reputable source, they also provide a savings by reducing product damage and customer complaints.

Q: What options are available to choose from that will meet my sustainable objectives?

A: Pallets can be made from a variety of processes and any material

that meets the strength, stiffness and functionality requirements necessary to transport unit loads of goods safely through the supply chain. However, only a few can make a solid case for being classified as sustainable.

At Litco, we are a 60-year-old company that has been on the forefront of this movement before it was popular. Our Engineered Molded Wood™ pallets were the first to be certified Cradle to Cradle™ sustainable by MBDC. This designation acknowledges continuous innovation and improvement of products and processes to benefit people and the environment. They are also certified BioPreferred™ by the USDA for utilizing a large percentage of plant-based materials.

Litco’s pallets are space-saving and cost-saving. Engineered for strength, stiffness and functionality, they are compression molded from pre- and post-consumer wood waste that has been diverted from the landfill. They are an integral part of the circular economy, and they can also be bio-cycled after their useful life. In other words, Litco’s pallets can help replenish our biosphere after they are shredded for use in soil additives and other applications.



3 ways to reduce your LTL freight shipping costs

Tips and insights to control shipping costs from **Marc Brown**, VP of Marketing, MyCarrier

Choose the right LTL carriers for your freight

Determining which LTL carriers best fit your shipping needs is the first step to reducing your freight spend. Because most carriers specialize in different regions, rates will vary depending on the lanes you're shipping. Working with the carriers that provide competitive pricing on the lanes you commonly book is always a fiscally smart choice. You're more likely to receive better rates when working with a carrier that can move your freight efficiently within their network.

Another factor to consider when choosing a carrier is how you can communicate with them. Many carriers have the ability to connect via an API (Application Programming Interface) connection. An API connection enables shippers to easily share essential shipment information back and forth with their carriers. Being able to share this information leads to streamlined pickups, reducing business risk and securing capacity.

Integrate with your carriers via API for quoting, dispatching and tracking

More and more, carriers are giving higher priority to shippers they can

connect with via API. API integration serves as a digital bridge between the shipper and carrier, benefiting both parties. Unfortunately, most 3PLs utilize an EDI (Electronic Data Interchange) connection rather than an API. Info shared via EDI is processed in batches, whereas API data happens in real-time. When tracking shipments, real-time data is more accurate and, therefore, more useful for both the shipper and the carrier. An API connection is superior to EDI not only for tracking shipments but also for getting faster, more reliable quotes.

Use a powerful TMS

Without full visibility of your freight spend, controlling your shipping costs isn't feasible. A TMS with advanced data and analytics allows shippers to make informed decisions with comprehensive reporting across all their carriers. This data, which includes average transit time, cost per carrier, market share, average weight, etc. provides organizations with the insights needed to adjust pricing as needed, negotiate carrier rates, and optimize operations.

A TMS, like MyCarrierTMS, can eliminate redundant, manual and error-prone processes that can lead to substantial profit leaks. Some of these outdated, time-wasting processes include visiting several carrier websites to quote and track your shipments, handwriting bill of lading and other essential documents, dealing with invoice unknowns, etc. Replacing these processes with more efficient automation eliminates common shipper pain points and creates a cost-effective end-to-end shipping process.

Insights

MyCarrierTMS reduces shipping costs by an average of 15% and decreases human error by an average of 63%. With numbers like these, it's not surprising that more than 72% of shippers using MyCarrierTMS say that it's essential for running their business. The top-rated shipping management platform provides the visibility and efficiency needed to reduce your LTL freight shipping costs. To find out how much time and money you can save on your shipping process, visit our ROI calculator page.



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