SupplyChain
MANAGEMENT REVIEW

March/April 2025

High-stakes decisions PAGE 18

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It's time to stay focused

With AI and tariffs dominating the news cycles, it's important for CSCOs to avoid distractions that take away from building great supply chains.

We talk often about what a visitor from another planet would think if they landed on Earth? Well, the same applies if you open my inbox. Two out of every three messages these days centers on artificial intelligence or the impact of tariffs on supply chains. If you didn't know any better, those are the only issues facing chief supply chain officers today.

Yes, they are important. But in the modern news cycle with never-ending headlines of AI's potential and President Donald Trump's affinity for threatening tariffs, it is easy for a CSCO to lose focus. Now, though, is not the time to become preoccupied with news headlines. Yes, AI is important and game-changing for supply chains. Yes, tariffs are important and potentially game-changing (specifically for your bottom line). But there are other concerns that can't take a backseat. These include building supply chain resilience, sustainability and global ESG compliance, digital transformation projects, cost efficiency, risk management, visibility, and talent management. I've probably missed a few, but you get the idea.

Human nature leads us to the "shiny stuff"—those things that are new, interesting, and ever-present. Right now, AI and tariffs are the shiny stuff. But, if you focus too much attention on these, your supply chain may suffer. Are you ready for the European Union's Corporate Sustainability Due Diligence Directive regulation? How about new supplier transparency laws being passed in various countries? Are you prepared to attract talent to take advantage of new technologies? What about changing customer demands?

Prologis, in a recent report, said that global supply chains are in a "polycrisis," which it defined as a series of challenges that "span geopolitical tensions, economic instability, shifting regulatory pressures, fluctuating customer demands and pressing climate challenges." It found that only 40% of executives believe they have the tools and resources necessary to tackle these crises. "Lack of preparedness doesn't just heighten risk," Prologis pointed out, "it directly compromises organizational performance and the ability to adapt to unforeseen disruptions."

The point is there are plenty of demands on supply chains these days and CSCOs need to stay on top of them all.

NextGen planning underway

It may only be March, but planning for our 2025 NextGen Supply Chain Conference is well underway. As we went to press with this issue, we were finalizing the exact location and date for this year's conference. You can check the conference website at nextgensupplychainconference.com to get the exact date and locations. If you are interested in speaking at the conference, you can also fill out a form on the site, or you can send me an email at bstraight@peerlessmedia.com to inquire. We are especially looking for CSCOs, VPs and CEOs willing to share stories of successful projects within their supply chains, or pilot programs you may have embarked upon that others may be interested in hearing about.
I hope to see you all there in October.

Brian Straight

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SUPPLY CHAIN MANAGEMENT REVIEW

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. POSTMASTER: Send address changes to: Supply Chain Management Review, PO Box 677, Northbrook, IL 60065-0677.

Fragmented global supply chains coming?

If trading blocs develop, supply chain managers must adapt by developing payoff matrices for each, as inaction could lead to significant global business losses.

By Larry Lapide

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Fareed Zakaria conducted an interesting January interview with World Trade Organization (WTO) Director General Ngozi Okonjo-Iweala during an episode of his GPS (Global Public Square) CNN show from Davos 2025. The annual meeting of the World Economic Forum is where leaders from over 130 countries discuss the global economic challenges and opportunities that might lie ahead. Since the majority of the discussions dealt with the so-called Trump Tariffs, Zakaria focused the conversation with Okonjo-Iweala on their impact on global trade. Here are the major points I took away.

- The WTO's "Most-Favored-Nation" (MFN) principle requires member countries to generally treat all trading partners equally, per a free-trade approach. About 80% of today's trade among members is conducted in this way. She stated that global free trade has been very resilient over the past several decades. From 1995 to 2023, total trade in goods & commercial services grew to $30.4 trillion (growing an average of almost 6% annually). However, for the past five years protectionism among several members has started to rear its ugly head.
- Many members are currently worried about trade wars. She noted we saw this "movie" before the Great Depression. So, the WTO has been advocating greater transparency among members to foster a mature dialogue than what took place then—essentially tit-for-tat tariffs.
- In 1929, the U.S. Congress passed the Smoot-Hawley Tariff Bill that "aimed to protect U.S. industries by raising tariffs on thousands of goods." It had a negative outcome, worsening the effects of the Great Depression.
- Right now, it appears global trade is moving toward two geographically divided trading blocs. The director general estimated that if this happened, it would result in a loss of 6.4% in global GDP.

The interview reminded me that I needed to update the Insights column titled: "Flat Future? Don't Bet on It" (September 2008). It was inspired by American political commentator Thomas L. Friedman's book, "The World Is Flat: A Brief History of the Twenty-First Century." Through interviews with technology and supply chain professionals, it painted quite a rosy picture of seamless global supply chains. However, these experts generally loved solving problems in logistics; and are especially bullish in the knocking down of borders to get products to customers faster and more efficiently.

Per the column's title, I did not believe we would see a perfectly "flat" world. I pointed out that my (now deceased) predecessor for the Insights column, Professor Emeritus Bernard "Bud" La Londe, cautioned readers in his SCMR Insights column dated July/August 2005 that technology alone could not make the flat world a reality and discussed "surface bumps" along the road. I recommended that supply chain managers needed to hedge their long-term bets on some "non-flat" possibilities, e.g., "protectionism" happening as well.

In 2004 I began working at MIT's Center for Transportation & Logistics to help launch the Supply Chain 2020 (SC2020) Project. The project was tasked with assessing future supply chains in the year 2020. The project used a scenario planning approach in which the flat world was just one of three possible future scenarios. I then followed up the September column with a column titled, "Scenario Planning for a Successful Future" (October 2008).

In this column, I will summarize recent news over the past several years that is leading to worries about a trend away from free trade, and toward protectionism. This will be followed by reintroducing the three future scenarios developed during the SC2020 Project—and what you might need to do with them.

Globalization is in the news

The following six publications and quotes paint a free-trade picture that many are concerned about.

1. "How the Coronavirus Will Reshape World Trade" (*Wall Street Journal*, June 19, 2020). "In the post-pandemic world, more economic activity will be designated vital to national security, accelerating pressures on globalization," it said.
2. "The Messy Unwinding of the New World Order" (*WSJ*, Nov. 4, 2022). "The post-Cold War promised a globe stitched together by markets and cooperation among nations. That system has fallen into disorder, and left the world with rising inflation, trade conflict, military confrontation, and gnarled supply chains," it said.
3. "Supply Chains Ready for New Global Era" (*WSJ*, April 25, 2023). "Companies adapt their operations to changing market pressures, geopolitics," it said.
4. "Companies Try to Navigate Woes In Supply Chains" (*WSJ*, Oct. 31, 2024). "A new generation of strategies and technologies to manage risk is growing as the strains in supply chains persist following the upheaval during the COVID-19 pandemic that left many companies scrambling to plug gaps simply to remain in business," it said.
5. "The Waning Power of Globalization" (*Bloomberg Businessweek*, November 2024). "Manufacturing, long the world's economic engine, is no longer driving miracle growth," it said.
6. "Is Deglobalization Even Possible?" (*Bloomberg Businessweek*, February 2025). "That prevailing metaphor that the world is getting smaller and flatter, that borders will open and free trade will grow—has been under assault for the past decade. Over the last few months, it may have collapsed for good," it said.

Frankly, the supply chain failures during the COVID-19 pandemic had cast a long, dark shadow with the too-lean just-in-time (JIT) global chains that my generation developed. During the pandemic, countries found themselves lacking in the basic supplies of everyday living: food, clothing, shelter and health services. See Maslow's Hierarchy of Needs in Insights titled: "Supply chain heroes and lessons from COVID-19" (September/October 2020).

Prior to the pandemic, globalization since 1980 was touted as raising the economic plight of extremely poor people (those living on less than $1 a day). This population declined by 375 million people—for the first time in history (several 100 million in China alone). Thus, efficient supply chains before the pandemic were viewed positively. Certainly, shortages were largely responsible for the current negative view. Also exposed was the risk to national security.

Global trading blocs

The WTO's director general mentioned that it appears that global trade is moving toward two geographically divided trading blocs: How about more? For example, in the "Flat World" column, I posited three or four trading blocs centered on economic powerhouses such as the U.S., the European Union, China and Japan. During an APEC CEO Conference USA 2023 event, President Joe Biden "made America's case to national leaders and CEOs attending … that the United States is committed to high standards in trade and to partnerships that will benefit economies across the Pacific." "We're not going anywhere," he declared. So, my educated guess is that Asia/Pacific might have one for powerhouse China affiliates as well as for U.S. and Japan partners.

I'm hoping that the world blocs form around the concept of goods flowing primarily North-South and not East-West. That is: Africa as part of an EU-centered bloc; South America as part of the U.S.-centered bloc, and Asia-Pacific as part of the China and or U.S. & Japan-centered blocs. Today's East /West global supply chains have too many long-supply routes due to outsourcing. North-South chains would have shorter domestic and near-shoring supply routes. This would be good for sustainability and climate change and foster greater real-time collaboration among trading partners in adjacent time zones.

Each bloc would have its own rules and regulations regarding free trade vis a vis protectionism. For example, inside a bloc, free trade might exist for basic human needs. Countries outside the bloc would be subject to substantial tariffs on these and other goods and services. I suspect oil, natural gas, coal, and other commodities, such as copper and steel, would be closer to freely traded. In addition, rare earth elements used in high tech would garner stiffer tariffs, especially for non-member countries.

Should the world wind up with multiple trading blocs, companies will need fragmented global supply chains comprised of several supply chains, each one tailored to serve each bloc. This may force companies to start strategy projects envisioning these segmented chains.

The SC2020 scenarios

This can be done using the scenario planning approach espoused by the MIT SC2020 project, including the

FIGURE 1

Future scenarios of the world

SCENARIO 1

Synchronicity

- **Globalization** and **democratization**
- **Trustworthiness** and **integrity** are crucial values in business
- Constantly shifting **market demands** and **technological breakthroughs**
- Frenetic pace of **innovation** and **customization**
- Critical role of **knowledge** workers

SCENARIO 2

Spin City

- **Interventionist** policies of governments
- Complex web of conflicting **regulations**
- No international **consensus**
- **Globalization** remains strong but highly regulated
- **Trustworthiness** is a competitive advantage to compete globally

SCENARIO 3

Alien Nation

- People think and act **locally**
- **Mistrust** and **security** are highly sensitive issues
- Globalization restrained by **nationalistic** policies
- Trade **barriers** and national **champions**
- Secured **energy** resources
- Limited **migration** flows

Source: MIT Center for Transportation & Logistics Supply Chain 2020 Project three scenarios developed by it: Synchronicity, Spin City, and Alien Nation (see Figure 1).

Synchronicity is a world that very much resembles the flat world. It is a world in which globalization and democratization are the norms, as are trustworthiness and integrity. In essence, it's the future world everyone hopes to be living in. Alien Nation is the opposite. It's one in which people think and act locally with a high level of mistrust and security concerns. Global trade is restrained by nationalistic pride, protectionism, and limited immigration. Europeans often said it was "old Europe."

Lastly, "Spin City" lies between these two worlds. It is one in which governments intervene on a selective basis, through a web of conflicting regulations designed to protect some industries, while leaving others open to free trade. Globalization exists, but it is highly regulated. This resembles, for example, times in which governments intervene during economic hard times and when unemployment issues arise. These are what the WTO is concerned about. Additionally, the future might be a composite of the three worlds—with blocs following different trading scenarios.

Applying scenario planning

As I wrote in the October 2008 Insights column, scenario planning involves two major steps. The first step involves assessing how to be successful while living in each of the future scenarios. What achieves success in one future world, such as Synchronicity, may not turn out to be successful should another unfold, such as Alien Nation. It is important to understand when successful strategies for one scenario might turn out to be detrimental in another.

This step involves thinking about winning supply chain strategies for each future scenario for four important aspects. Start off with the demand side by thinking about implications for future products and services. This entails assessing what products will be successful, how to foster future innovation, and the extent to which intellectual property (IP) can be protected. For example, protecting IP might be harder under Alien Nation and easier under Synchronicity. Also consider to what extent global (versus regional) brands will be successful, and what types of product customization and services will be needed to be competitive.

From the demand-side strategies, one moves on to assess the implications for the supply network needed to support and enhance these winning products and services. An assessment might include successful deployment of vertical versus outsourcing strategies, which place greater reliance on suppliers. Coupled with this is the extent to which international suppliers can be counted on in a future world where global trade might be somewhat constrained.

Next, think about the investments that are needed to develop the capabilities required to achieve success. Investments in training, technology, and infrastructure will differ depending upon winning products and services and the supply network. Lastly, this is followed by assessing the implications for the organization and culture. For example, the extent to which a scenario limits open global trade will affect the type of organization, culture, and capabilities needed.

Once winning supply chain strategies have been developed for each scenario, the second step in planning for an uncertain future involves assessing how each winning strategy will fare in the other scenarios. For example, how successful will a strategy developed for Synchronicity be in the Alien Nation scenario?

Recommendations

Deciding on what supply chain strategies to deploy for each trading bloc is considered long-term decision-making under uncertainty. (See Insights column "Decision-making under uncertainty: A primer," May/June 2022). Thus, a payoff matrix needs to be established for each trading bloc, which shows the payoffs (e.g., revenues, market shares, or profitability) for each alternate strategy to be deployed when each of the three future scenarios occurs. These type of strategy projects will take a long time to do and involve a lot of resources.

Will it be worth the effort? Probably, because as posited by the WTO director general, two global trading blocs are estimated to result in a loss of 6.4% in global GDP. Three or four blocs would likely result in significantly more GDP losses. If your company does nothing about it competitively, it stands to lose a significant amount of global business. I recommend supply chain managers start helping it cut its losses, while there is still time to do so. •

Navigating the road to zero-emission trucking

MIT Center for Transportation & Logistics' roundtable discussion finds progress toward goals, but many challenges remain in the quest to achieve green trucking and lower the transportation sector's GHG emissions.

By Chris Caplice and Josué C. Velázquez Martinez

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The state of California recently withdrew from a mandate that would have required truckers to buy battery-electric and hydrogen fuel-cell vehicles. The retreat is part of a changing carbon emissions-reduction landscape in the U.S., shaped largely by the new Trump administration. As these changes take effect, this is an ideal time for shippers, carriers, and brokers to reassess their strategy and develop a cohesive approach to carbon reduction.

According to the U.S. Environmental Protection Agency, transportation was responsible for 28% of U.S. GHG emissions in 2022, the largest share of any sector, with medium and heavy-duty trucks contributing 23% of transportation's GHG load.

To help trucking companies understand future emissions demands, the MIT Center for Transportation & Logistics hosted a roundtable titled Approaching Zero Emission Trucking: Challenges and Opportunities, on Nov. 6-7, 2024. The MIT FreightLab and the MIT Sustainable Supply Chain Lab facilitated the event, bringing together 30 stakeholders, including motor carriers, shippers, brokers, non-government organizations, researchers, and government experts.

Weighing the options

Carbon emissions for a vehicle can be divided into two phases: well-to-tank for the production and distribution of the fuel and tank-to-wheel for the operational stage. Over the last decade, significant regulatory preference has been for transitioning all vehicles from internal combustion engines (ICE) to battery electric vehicles (BEV). Considering just the operational or "tank-to-wheel" phase of a truck's lifecycle, BEV is essentially the only choice for zero-emission trucks. The technology is well-developed, there are various EV models to choose from, and government tax incentives can enhance this option.

However, Class 8 electric trucks are relatively expensive, "a $350,000 asset," said one roundtable participant. Other classes of vehicles are less costly by comparison. A shipper with a fleet of last-mile delivery vans maintained that smaller EVs could be less expensive than equivalent gasoline-powered units.

When comparing EVs to other low-carbon freight transportation options, operational factors must be considered. Variables such as load weight, route topography, and driver behavior influence a vehicle's travel range per charge. A roundtable attendee gets around 250 miles on a single charge for its EV-supported drayage operation. In contrast, a shipper achieves a single-charge range of over 400 miles but limits its private fleet vehicles' geographic area of operation. Differences in electricity charges also affect the economics of EVs.

Serious doubts about the effectiveness of a single solution, BEVs, in reducing carbon emissions during the entire well-to-wheel lifecycle surfaced at the roundtable. Industry research on the total emissions generated by EVs (including external sources such as the emissions from mining the lithium required to make batteries) found only a 30% reduction in carbon footprints compared to vehicles that burn diesel fuel, when considering the entire well-to-wheel lifecycle.

Still, some participants were optimistic that Class 8 EVs would gain ground. "The economics are starting to look more attractive. If we can make the economics work in the U.S., that will incent adoption," said a shipper. However, "making the economics work" is a massive challenge limiting widespread adoption.

Many participants' main grievance with the single-minded push to BEVs is that it dictates a solution and thereby discourages and penalizes any innovation attempts that do not use electric vehicles. The objective of the regulations should be to lead to the continuing reduction of carbon emissions by all players. Keeping this strict goal but staying flexible on how different companies reduce their emissions is a better regulatory approach.

There are many other options for significantly reducing trucking emissions. These include the use of different fuels. Biodiesel, renewable diesel, and renewable natural gas are among the "green" fuels roundtable participants use. Factors to consider when evaluating these alternatives include varying fuel energy density, cost differences, and availability across the U.S. It was also pointed out that even "clean" fuels generate pollutants when combusted. According to one attendee, it costs about $30,000 to modify a truck to burn 100% renewables. However, another company blends biodiesel and regular diesel without significantly modifying its trucks. A major national carrier described natural gas as the fuel of the future since it can reduce emissions by about 70%. However, new engine technology is required for natural gas to become a top choice for truckers.

Speed bumps

Regardless of their chosen path, companies must navigate a bumpy road to achieving net—or near-net-zero trucking. Here are some of the main obstacles highlighted at the roundtable.

Measuring and reporting emissions. Emissions-reduction goals vary widely from company to company. One enterprise at the roundtable aims to achieve a 32% carbon reduction by 2034, but others have set more modest targets implemented over 5, 10, and 20-year time frames.

There was much uncertainty over how to measure and allocate GHG emissions to the emitters involved. Examples of approaches used include tallying gallons of fuel purchased and measuring ton-miles. A participant commented that the more granular the measurements, the more difficult it is to maintain a high level of accuracy. The task can be made easier by focusing on factors significantly impacting emissions reduction. Measuring methods should incorporate decision "levers," such as new equipment purchase plans, suggested an MIT CTL researcher at the event.

Whichever approach is used, emissions reporting can be a significant challenge. Participants noted that RFPs from large customers increasingly require minimum scores on sustainability practices. Gaining certifications from organizations like EPA SmartWay can help companies meet these demands. However, the certification process can be onerous. A roundtable company said that preparing a submission can take over 100 hours. Another participant described how it had to create a special supplier code of conduct to support its emissions reduction program.

The discussions also touched on what motivates companies to measure and report truck-related carbon emissions, given this is not a simple task. Motor carriers take on the work for two key reasons: to comply with regulations and to demonstrate their achievements to customers and investors.

Where is the ROI? Setting goals for cutting GHG emissions may be laudable but challenging without a sound economic case for the required investments. Every carrier at the roundtable agreed that most customers are unwilling to share the financial burden of these programs, even if they incur relatively modest charge increases of $60 to $90 per load.

Burdensome regulations. Complying with the patchwork of GHG emissions regulations at state and local levels in the U.S. imposes significant cost burdens on carriers and shippers.

Some delegates at the roundtable wondered whether states might become more aggressive if the new federal administration loosens environmental regulations. For example, an NGO at the event cited a consortium of 17 states that wants 30% of new heavy-duty vehicles to be net-zero models by 2030.

Technology and infrastructure barriers. According to participants, one of the top impediments to net-zero trucking is expanding battery capacity and range for Class 8 trucks. Another barrier is a lack of high-capacity electric supply. Utilities can take three to five years to provide the necessary supply infrastructure. Also, the lack of charging stations on interstate and state highways severely constrains EV travel. So, even if the BEV option was economically viable for trucking companies, the supporting infrastructure is years or decades away.

Next steps

The roundtable discussions underscored all stakeholders' need for vigorous and widespread innovation. The goal of dramatically reducing trucking emissions should be kept as a strict target while remaining flexible on how companies achieve it. Transition paths from one technology to another are never smooth, continuous, and known in advance. Federal, state, and local governmental agencies must accept that there is no single solution to achieving net-zero trucking. Meeting this goal requires collaboration between the stakeholders and flexibility in approaches.

While flexibility is required in different approaches, the goals must be strictly defined, and the method of measuring, allocating, and reporting emissions must be standardized.

In order to assist in decarbonizing the freight transportation industry, the MIT Center for Transportation & Logistics (MIT CTL) is forming a research consortium of shippers, brokers, and trucking companies. The MIT FreightLab and the MIT Sustainable Supply Chain Lab are collaborating to establish the Sustainable Transportation Consortium. This group will feature a strong governance framework incorporating representatives from all stakeholder groups, ensuring that diverse perspectives are considered in project selection and the overall research agenda.

Possible projects among the many under consideration are the following.

- Exploring the environmental and operational trade-offs of different energy sources (like hydrogen, electricity, and so on) and the financial effects and long-term economic benefits of decarbonization strategies.
- Defining better strategies to estimate carbon emissions.
- Creating industry-wide sustainability standards to make green logistics practices more consistent and frameworks for cost-sharing models for sustainable investments.
- Developing mutually beneficial CO_2 emissions allocations. •

** Organizations interested in joining MIT CTL's Sustainable Transportation Consortium should contact the authors for more information.*

Starting inside the company:

Supply chain resilience demands new initiatives and investments

So much is beyond any company's control, including geopolitical and economic issues, new regulations, natural disasters, and shifting sustainability expectations. What is in a company's control is to improve resilience systematically and sustainably.

By Julie Fraser

Julie Fraser is vice president of research for operations and manufacturing at Tech-Clarity and can be reached at Julie.fraser@tech-clarity.com.

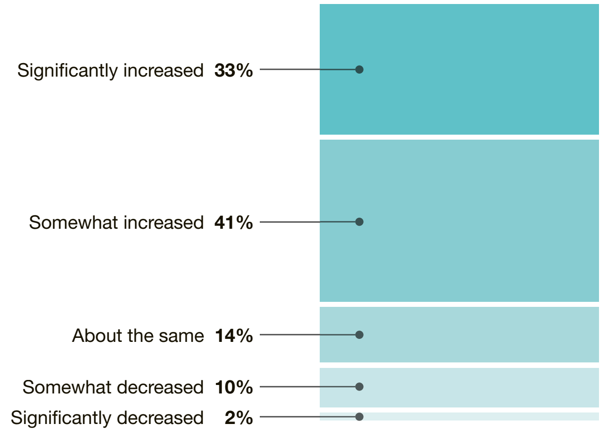
Supply chain disruptions are an ongoing challenge dictating resilience initiatives that must be strategic, prioritized, and systematic. Supply chains, especially as ecosystem supply networks evolve, are complex and ever-changing, reacting to demand variations from many interconnected disciplines and operations. While recognizing the market dynamics, supply chain executives struggle to get their companies over the goal line. Multiple coordinated initiatives are likely surfacing, some around people and processes, others around technology. Recent industry research findings from Tech-Clarity show that internal change to foster greater collaboration across the enterprise is a crucial differentiating foundation for implementing systematic operations resilience strategies.

Business disruption and risk are normal and normal is no longer 'new'

Uncertain and unpredictable business conditions have become normal in operations. As supply chains transform to ecosystem supply networks, the company must respond, not only to intended demand signals but also to unintended demand signals. Simply put we are suffering the consequences of the bullwhip effect at warp speed. In recently conducted Tech-Clarity executive research studies, nearly three-quarters of executives report that disruption and risk have significantly or somewhat increased over the past five years.

FIGURE 1

Business disruption and risk in the past five years



Source: Jim Brown, Executive Strategies for Sustainable Business Success 2023
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The competitive mandate: Develop a resilience vision/ strategy to soothe suffering

Do you feel a sense of urgency to make your supply chain more resilient to respond to these disruptions? Nearly half of the same group of executives listed supply chain disruption as having the most significant negative impact on the business. Supply chain disruption outranked financial market issues, the COVID-19 pandemic, geopolitical uncertainty, and more.

It's no surprise that supply chain disruptions significantly negatively affect business performance. Many core business processes rely on supply chain performance. Our research shows that most companies with negative supply chain performance suffer from longer lead times, market delays, pricing challenges, and lower customer satisfaction. These market-facing problems are just what our resilience initiatives aim to reduce.

Investing to implement resilience initiatives to cure supply chain suffering

If supply chain disruptions affect the business negatively, it's the result of our discipline suffering severe pain in responding to disruptive variations. In our research, every respondent (100%) reported supply chain disruption as the top challenge. Top consequences from disruption identified among supply chain executives are as follows:

- Volatility in supply and response lead times.
- Price increases.
- Workforce challenges.

There may not be much you can do to control variability, market pricing, and disruptions. In 2025, new tariffs and geopolitical tensions are already apparent, adding to the challenges. Climate change continues, raising environmental sustainability expectations. Uncontrollable transportation cost increases are driving COGS and creating price and profit pressure to maintain consumer confidence. The economy is shifting, and the unforeseeable future looms. Is that light at the end of the tunnel or an oncoming locomotive?

Most supply chain leaders are investing in resilience. In our 2023 research, over 70%

had already been investing in resilience for over a year. The good news is that these investments are paying off. A full 95% of companies that have invested in resilience have seen benefits.

In our 2024 Executive Research, we added supply chain resilience as a pillar for long-term business success. What companies report as their objectives varies, but reducing risk ranks at the top. Reducing external supply chain dependency points again to the need to work on the internal factors for supply chain success.

To address these objectives, companies are investing in supply chain resilience initiatives. The benefits vary and include planning accuracy, appropriate inventory levels, speed of response, and customer confidence. These support lower costs and improve the business's ability to capitalize on revenue opportunities.

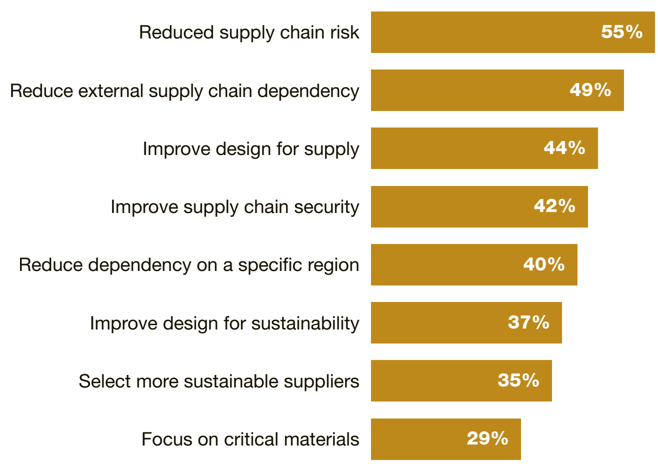
What resilience investments matter most?

As a supply chain professional, you are in the pressure cooker, trying to figure out how to be more resilient in the face of many challenges. Our research findings about what initiatives make the most difference in supply chain planning for outstanding business results may surprise you. Improved collaboration with production, engineering, and product development is the most cited initiative among top performers enabling the supply chain to positively affect the company. It's an inside job. For top performers, multidisciplinary collaboration ranked higher than visibility, more frequent planning, integrated systems, AI/ML-based optimized planning, or shifting the supply base.

The other key supply chain factors that contributed most to positive business impacts were as follows:

FIGURE 2

Supply chain objectives



Source: Jim Brown, Executive Strategies for Sustainable Business Success 2023
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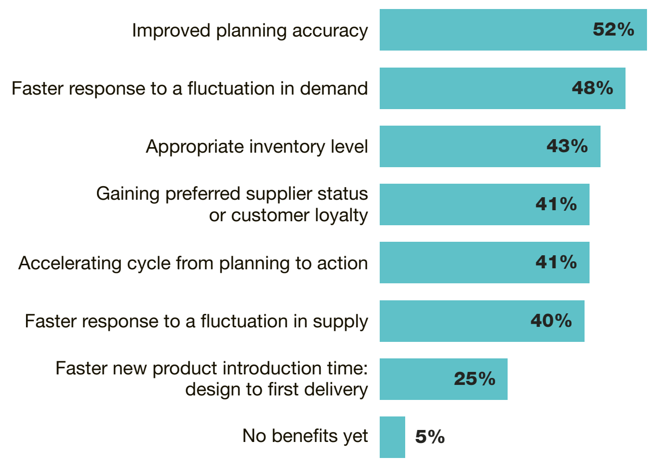
FIGURE 3

Benefits experienced from investing in supply chain resilience

(% investing in supply chain resilience)



Source: Julie Fraser, Transformation for Supply Chain Resilience: Engineering and Manufacturing's Crucial Role © 2023, Tech-Clarity, Inc.

- Good visibility across customers and suppliers—a similar portion in the high 60% for both top performers and others.
- Good visibility across the company was 67% for both groups.
- Automated and/or autonomous planning processes were 40% for top performers and 28% for others.

No other factor had even a 10% larger response from top performers vs. others. The differences are in multi-disciplinary collaboration and automation.

Seek consistent, speedy visibility into changes

In manufacturing, products drive the need for supply chain activities. Production is in the middle of the plan-source-make-deliver-return cycle that we manage. Yet, product design and production are separate disciplines, not typically included in the supply chain team. Their activities, outputs, and capabilities change frequently and ideally drive supply chain planning.

As a result, having consistent and rapid visibility into changes in products and production could significantly improve the ability to coordinate supply chain activities for greater resilience. Our research shows that visibility into production and product design changes is another area for massive differentiation between top performers and others.

Top performers are three times as likely as others to:

- see product changes immediately, in less than an hour;
- always see changes in production capability.

Achieving this improved visibility among design and operations groups is a foundation for more accurate supply chain planning and execution. It is also a basis for collaboration among the disciplines, which top performers found so crucial.

Transformation and optimization for collaboration & resilience

During a research interview with a data-savvy professional we asked, "Will you transform or optimize your supply chain?" While it was an engaging conversation intended to push for transformation, we realized that many companies should do both.

Transformation is typically required to overcome the differences among these disciplines. Creating cross-discipline, visibility, and collaboration will require transforming traditional ways of working inside each company. Transformation as an inside job will require new internal initiatives such as:

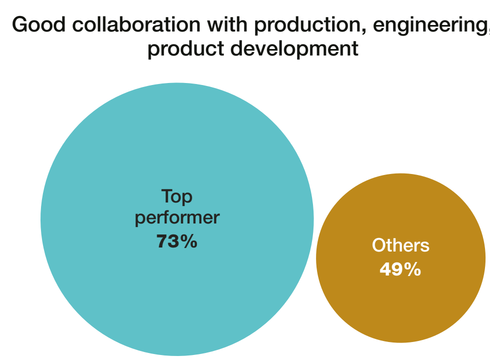
- The company may need to reorganize and set new, better-aligned metrics for various disciplines. Organizational behavior is driven by structure. You may have to change the structure to change the results.
- Reformulating processes to enable more visibility and collaboration without losing speed and autonomy for each professional to do their job will be a significant project.
- To support these new processes, new technology is likely needed.

Some technologies we have seen recently to support transformation include the following:

- Data fabric that enables all data from all disciplines to be available across the enterprise without moving it or replicating it.
- A value growth system that includes consulting and SaaS software to line up strategy, execution, and innovation across a company in ways that increase value to customers.
- Multi-tier supply chain control towers that not only address planning but multi-tier real-time response and resilient action.
- Agentic AI (language model with humans in the loop) that leverages a company's supply

FIGURE 4

No. 1 factor in supply chain having a positive business impact FACTOR



Source: Julie Fraser, Transformation for Supply Chain Resilience: Engineering and Manufacturing's Crucial Role © 2023, Tech-Clarity, Inc.

chain data for specific tasks from demand forecasting to materials planning to production planning, and agents for procurement as well as supply or sales for multi-tier activity.

- Systems that include both supply chain and manufacturing operations support capabilities.
- Industry-wide frameworks for manufacturing and supply chain interoperability.

Is transformation the chicken or the egg?

Transformation may be top of mind, yet, we believe optimization also has its place. Even while we learn new mindsets, craft new processes, and implement new technologies, we can improve our work. Optimization has always been important in supply chain planning. Today, we can augment our traditional algorithms with many other forms of analytics and AI. While AI programs face some hurdles, manufacturers are already gaining benefits based on early results of a not-yet-completed research study on analytics and AI in manufacturing.

Optimization and continuous improvement are disciplines that should not be lost. There will be places to optimize before, during, and after a significant transformation. Change in our markets is constant and must also be in our companies and supply chains. Are you ready for the inside job of change? •

About Global Links

Global Links appears in each issue of *Supply Chain Management Review*. Richard J. Sherman, retired guru of SCM, is the Global Links column editor. If you are interested in participating in the column, he can be reached at rsherman @goldanddomas.com.

RISK MANAGEMENT

The intersection of supply chain and aircraft availability

By Robert J. Delaney, MS, and Amanda L. Femano, Ph.D

With finite resources, it is in the best interest of any organization to properly quantify the risk associated with individual components. In both the military and industry, it is imperative that investments in the supply chain are prioritized based on the overall risk to the supply chain's ability to support business metrics.

Supply chains encompass a range of activities that stretch from raw material sourcing to the delivery of an end item for customer use. They are often complex global ecosystems that require stakeholders to employ supply chain risk management (SCRM) practices that can mitigate disruptive events. The national security implications of exposed Department of Defense (DoD) supply chains make them a prime candidate for employment of SCRM practices; identifying risk factors that may be used to calculate the vulnerability profile of individualized elements of the supply chain. Preemptive identification of risk factors is pivotal to mitigating disruptive impacts arising from supply chain distress.

While supply chains are often simplified as three-tier ecosystems, the structure can extend to multiple layers or subcontracted activities required to source raw materials, manufacture, and deliver an end product. Management of the parts associated with a weapon system (referred to as NIINs or National Item Identification Numbers) may be spread over several stakeholders who, in turn, engage with suppliers at the tier-one level. The notional supply chain illustrated in Figure 1 is useful when framing the potential vulnerabilities inherent to a military supply chain. The intricate web of suppliers stretching from tier one through tier three forms the activities required to mine and shape raw materials into the requisite specifications for installation onto the applicable weapon system. This complex network fosters an environment where risk factors may complicate the enterprise's task of developing a cohesive understanding of the supply chain vulnerabilities.

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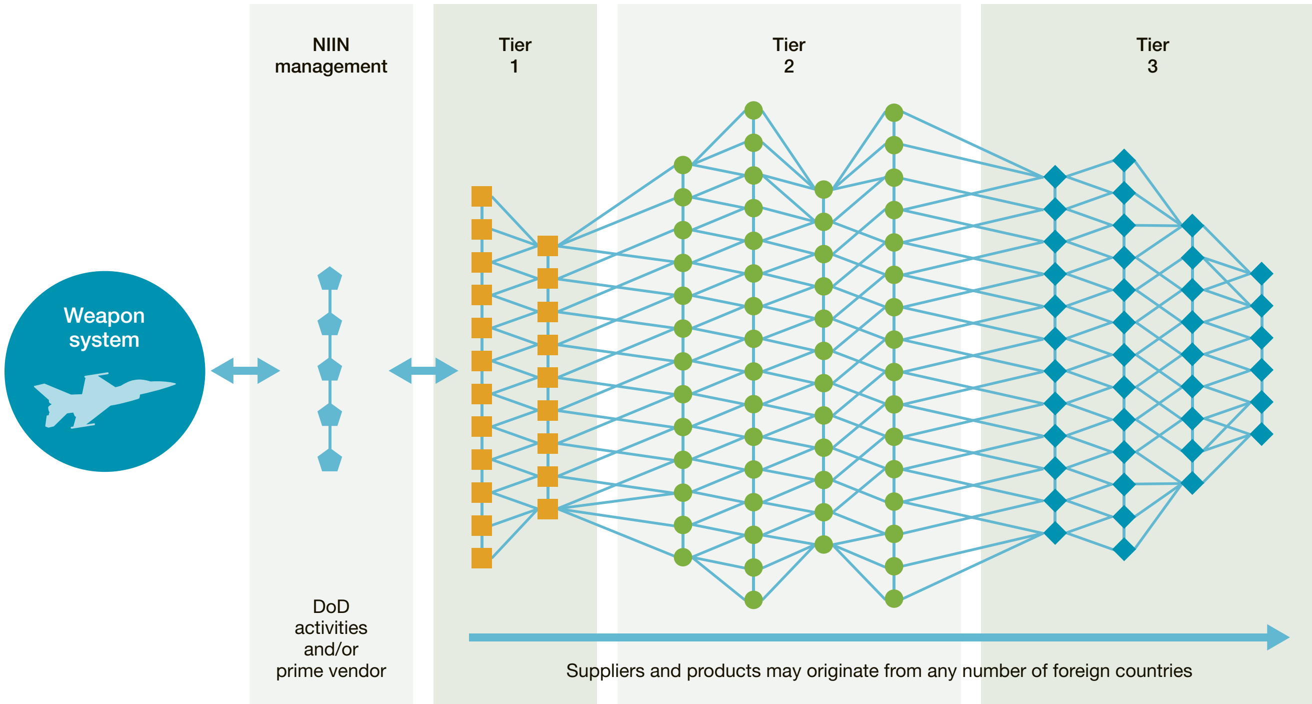
FIGURE 1

Notional illustration of a DoD supply chain



Source: DoD

The White House 2022 National Security Strategy (NSS) utilizes the phrase supply chain in 19 unique instances, calling attention to "insecure supply chains," "supply chain security," and "protecting supply chains" from political pressure and potential national security threats from countries like Russia and the People's Republic of China (PRC). The supply chain prevalence in the NSS signifies a clear national security pillar. Developing a DoD SCRM model to assign individual risk scores to individual part numbers (NIINs) of a major weapon system may be a small, but impactful step to assess the national security risk. By calculating and mapping impact and probability scores onto a risk matrix, synthesizing data from various sources, analyzing NIIN lists, detailed NIIN data fields, governmental reports, and other multi-agency contributions, units can uncover and address vulnerabilities at the NIIN level, providing actionable insights for which components require collective resourcing from supply chain stakeholders.

To guide the study and dig deeper into the collected data, this research focused on a list of parts within a single military aircraft, analyzing risk factors to assign a risk level to a given set of components, as well as how these risk factors can be combined to create a comprehensive tool for calculating a supply chain risk score. A comprehensive risk management model was developed to enhance the alignment of enterprise logistics efforts. The model was designed to pinpoint NIINs with elevated risk and offer critical insight into potential areas where future constraints to aircraft availability may emerge, while offering key NIINs for potential resource investment.

Data collection

The primary data collection method was solicitation to military, governmental, and commercial stakeholders with supply chain management roles for the studied aircraft. To narrow the scope of research, one aircraft was focused on for this study and the NIINs contained in an iteration of the 2023 MRSP were the subject of analysis. MRSPs are pre-assembled, air transportable, kits of critical aircraft parts and related maintenance supplies necessary to maintain aircraft in the field for a set period of time. Three organizational stakeholders were identified as responsible for at least one of the 285 NIINs selected. These three organizations provided data for this study in conjunction with a commercial consultant organization.

Additional quantitative and qualitative data was pulled from various military, governmental, and commercial reports accessed via unclassified systems. These reports introduced information ranging from the state of military supply chains, supply chain risk factors, geopolitical considerations related to raw materials, and other relevant areas.

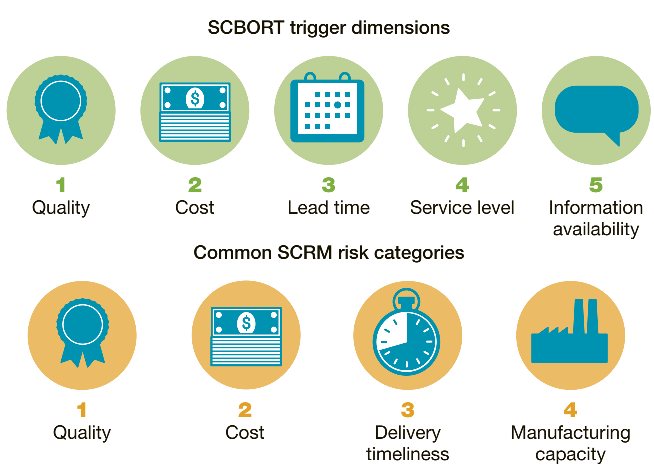
Risk factor identification

The Supply Chain Backorder Risk Trigger (SCBORT) model outlined by Rodger et al. (2014) is uniquely applicable given the study included military supply chains, risk management, and NIIN evaluation. Figure 2 demonstrates the similarities between the SCBORT model and the aggregated risk factors from the other included studies. Though all studies use different nomenclatures, all sampled works included individualized risk factors that captured (1) quality, (2) financial implications, (3) time, (4) scale of production or service, and in the case of the SCBORT model (5) the availability of information (Kabak & Oztek, 2022; Rodger et al., 2014). The similarities between these studies gave credence to the SCBORT model and informed the structure of this research. The SCBORT approach provides a qualitative description of each trigger dimension.

This study distilled the five SCBORT trigger dimensions into weighted impact and probability measurement metrics, as shown in Table 1. Risk factors within this model are selected based on their severity and likelihood of representing a disruptive condition relevant to aircraft availability (AA). All metrics used for impact and probability calculations are normalized and weighted on a 0 to 1 scale to ensure no risk factors disproportionately influence final risk scores.

FIGURE 2

Risk factor groupings between six studies



Source: Kabak & Oztek, 2022; Rodger et al., 2014, Authors

The number of aircraft Mission Impaired Capability Awaiting Parts incidents (MICAPs) represent the risk factor for the Impact-Quality category. A MICAP is generated when a component failure either fully or partially reduces the capability of the aircraft. MICAP events directly constrain AA due to parts or maintenance-related issues. The raw number of MICAPs directly hindering AA was interpreted as a measurement of quality. The Probability-Quality measurement within the model captured the rate of MICAP occurrence relative to all demands for the component.

The Impact-Cost category risk factor is the current NIIN price per individual unit. Many of the NIINs associated with an MRSP are considered repairable items. The new purchase price of the given NIIN may not be reflective of hidden costs such as activating a new production line or inflation. The Probability-Cost metric for the cost category was the number of the given NIINs required for each aircraft. NIIN requirements per aircraft were determined to be a method for gauging the likelihood of a requirement arising to purchase the given NIIN.

The Impact-Lead Time risk factor utilized net repair hours as the metric to represent the amount of time for a functional part to be generated by the supply chain. All NIINs within the sample are considered repairable, making net repair hours a suitable substitute for acquisition and production lead time. The Probability-Lead Time risk factor within the model was the NIIN failure rate, which is specific to aircraft flight hours. This measurement captured the average number of flight hours before a NIIN failed onboard the aircraft and was interpreted as a measure of the likelihood that the repair lead time process could manifest as an impact. Higher values for failure rate indicate greater risk.

The Impact-Service Level risk factor is measured by calculating the hours required to replace all MICAPs for the given NIIN. This measurement was selected as a representation of impact as it represented a level of support needed to replace the NIIN and to return the aircraft to full mission-capable status. The Probability-Service Level risk factor was the Mean Time Between Failure (MTBF) metric. The MTBF fundamentally represents the total operational time in hours that the component is installed on the aircraft before failing. Higher values for MTBF indicate lower risk, as the component has a longer operating life expectancy. This metric differs from NIIN failure rate, as MTBF includes both ground and air operations.

TABLE 1

SCBORT dimensions and research metrics

SCBORT trigger dimension		Impact metric	Probability metric
1	Quality	Number of MICAPs (24-month range)	MICAP rate (24-month range)
2	Cost	Price per unit (2023 price)	NIIN quantity per aircraft (24-month range)
3	Lead time	MICAP hours (24-month range)	Failure rate (24-month range)
4	Service level	Hours to replace all MICAPs (24-month range)	MTBF (24-month range)
5	Information availability	Number of PQDRs (Lifetime of the NIIN)	PQDR rate (24-month range)

Source: Rodger et al., 2014

The Impact-Information Availability risk factor was represented as the number of Product Quality Deficiency Reports (PQDRs) for the given NIIN over the component's history. The Probability-Information Availability risk factor measures the rate of PQDRs by measuring the number of aircraft PQDRs within a 24-month period against the number of PQDRs over the component's history. The PQDR process has been implemented to capture various disruptions that may arise through design, development, purchase, production, supply, maintenance, and other functions.

Creating a risk matrix

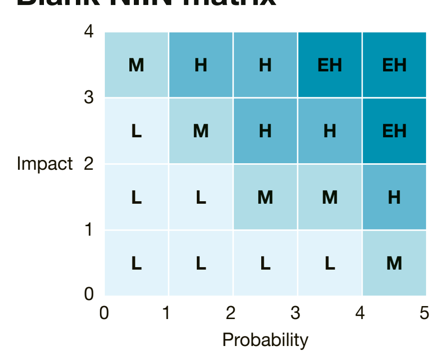
Impact and probability weights were derived from the literature (Rodger et al., 2014). The SCBORT model developers scored the quality of a NIIN as being the risk factor with the greatest likelihood of impacting operations—in this case, the aircraft availability (AA) of the studied aircraft; shown in Table 2. Moreover, the likelihood of the quality risk factor arising was the highest of all five risk factors. Lead time scored the lowest impact among the risk factors but the second highest when considering the probability of disruption affecting operations. Information availability scored the second highest among the risk factor impacts, but the lowest for probability of the risk factor impact operations.

These weights were transformed to create an Air Force risk matrix utilizing a 5-point scale for probability measurements and a 4-point scale for impact measurements. The impact and probability scales were directly carried over from the official Air Force regulation, Department of the Air Force Pamphlet (DAFPAM) 90-803, Risk Management Guidelines and Tools. All impact and probability measurements were normalized onto the appropriate scale and graphed using the Air Force risk matrix template.

As shown in Figure 3, this study adapted a risk matrix based on products from the United States Air Force and academia. When populated, the matrix visually represents the relative probability and impact risk levels to which each NIIN is vulnerable. The matrix adapts the SCBORT aggregate risk levels to the Air Force categories of low (L), medium (M), high (H), and extremely high (EH). Such a matrix is valuable for identifying risk clusters within a sample of NIINs.

FIGURE 3

Blank NIIN matrix



Source: Authors

Employing the risk matrix

Using enterprise-standard risk factors, risk scores were calculated over two tests: (1) all NIINs with academia-informed weights, and (2) top and bottom 10 NIINs with academia-informed weights. Both tests visualized results using an Air Force risk matrix. The model's results are relative to the sample of NIINs scored in a given iteration. All variables were normalized onto a 4-point scale for impact, and a 5-point scale for probability that allowed NIINs to be graphed onto the sample risk matrix shown in Figure 3. Impact and probability totals for each NIIN were weighted according to Table 2 and subsequently graphed based on the finalized scores.

Test 1

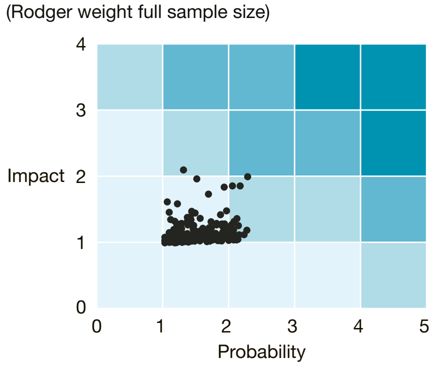
The first test scored all 285 NIINs using the weights shown in Table 2 (scores summarized in Table 3). Individual NIINs were graphed on the template matrix in Figure 4 depicting a large concentration of NIINs in the matrix's low-risk region. The results suggested that 262 NIINs (92%) fell into the low-risk area of the matrix, and 23 (8%) were scored as medium-risk.

A summarized heat map of impact and probability scores for all 285 NIINs is shown in Table 3. Data analysis suggests that MICAP-related variables were influential to the risk profile. This is perhaps no surprise, as MICAP conditions either partially or fully constrain the operational capability of the aircraft, and the model is oriented to AA disruptions and heavily weighted toward MICAP triggers. NIINs 142 and 78 were two of the highest scores when averaging impact and probability levels from this model. These high scores were anticipated, as the NIINs had high values across all impact and probability variables compared to the rest of the sample size.

FIGURE 4

NIIN risk matrix

(Rodger weight full sample size)



Source: Authors

NIINs 160 and 231 scored among the lowest impact and probability scores. All 10 risk factors for these NIINs were measured at the low end in relation to the population of 285 NIINs. No MICAPs were registered during the 24-month window for either NIIN, with minimal MICAP hours for the service level category. Moreover, these NIINs registered as low-cost NIINs

TABLE 2

Derived impact and probability weights

		Impact weight	Probability weight
1	Quality	.252	.265
2	Cost	.232	.175
3	Lead time	.119	.238
4	Service level	.166	.190
5	Information availability	.232	.132

Source: Rodger et al., 2014

TABLE 3

Summarized results and heat map

(Full sample size)

142	1.986	2.288	M
78	1.851	2.146	M
119	1.854	2.046	M
43	1.830	1.939	L
281	1.349	2.124	M
49	1.953	1.514	L
204	1.173	2.272	M
227	1.466	1.977	L
45	1.723	1.694	L
6	2.088	1.316	M
...	...	...	...
52	1.038	1.033	L
38	1.051	1.013	L
239	1.006	1.049	L
63	1.032	1.021	L
172	1.018	1.030	L
55	1.011	1.037	L
235	1.007	1.038	L
105	1.014	1.026	L
231	1.004	1.023	L
160	1.002	1.024	L

Source: Authors

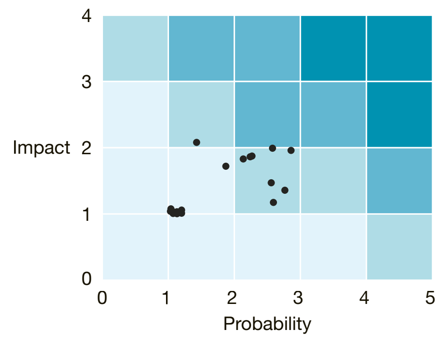
compared to the full sample of 285 NIINs, with NIIN 160 registering a cost of $3,322 and NIIN 231 costing $515. The component with the highest associated price was NIIN 45 with a listed price in excess of $915,000.

Probability scores were more varied in their variable predictors. NIIN 142 scored high in probability, with the lowest MTBF value and average inputs in all other categories. NIIN 117 registered an average MTBF, but the highest NIIN failure rate within the sample of 285 NIINs. This suggested that while NIINs 117 and 142 had among the highest likelihood of disruptive factors occurring, the associated impact of these factors was not definitively linked with elevated impact levels. NIIN 142 was assigned an impact score of 1.986, whereas NIIN 117 was assigned an impact score of 1.096. Three impact categories separated the two NIINs where NIIN 142 scored higher in comparison to NIIN 117: (1) Number of MICAPs, (2) NIIN Cost, and (3) MICAP Hours.

FIGURE 5

NIIN risk matrix

(Rodger weight top and bottom 10 scoring NIINs)



Source: Authors

Test 2

Impact and probability scores output by this SCRM model are relative to the sample of included NIINs. As such, a grouping of NIINs most and least likely to constrain AA may be assigned a different risk level when included as subgroups. This phenomenon is expected as constraining NIINs are anticipated to have similar risk factors within the model. As the model leverages the process of normalization, similar data elements are likely to suggest the absence of elevated risk. Alternatively, if these constraining NIINs are run against components less likely to impact AA, then the model is reasonably expected to assign less concentrated impact and probability scores. Test two scored the top 10 and bottom 10 scoring NIINs from test one, using the weights shown in Table 2. The results of this test showed that of the 20 NIINs, 11 (55%) fell into the low-risk area of the matrix, and nine NIINs (45%) were scored as medium-risk. Figure 5 graphs these 20 NIINs onto the Air Force risk matrix.

Table 4 shows a heat map of impact and probability scores comparing the model output of 285 NIIN risk scores and the subset of 20 NIINs. This table demonstrates the impact of running a non-random subset of NIINs against the full sample size of 285 NIINs. A noteworthy result of this test is that probability scores averaged higher, contributing to a 25% increase in the medium-risk category being assigned to a given NIIN compared to the full sample results.

The majority of the NIINs received similar impact scores between test one and two. However, 17 of the 20 NIINs (85%) saw an increase in probability scores, and three NIINs (15%) were assigned lower probability scores than in test one. Impact scores were not perceptibly changed at three decimal places. This phenomenon was likely attributable to the limited data variance between top and bottom-scoring NIINs within the impact category, whereas there was considerably more variance within the probability category.

The set of 20 NIINs was further broken down into two derivative tests where the top and bottom 10 scoring NIINs were scored separately. Figure 6 graphs the 10 NIINs with the highest aggregate risk score, and Figure 7 graphs the 10 NIINs with the lowest scores.

TABLE 4

Summarized results and heat map

All 285 NIINs				Top and bottom 10 NIINs		
Probability	Impact	Risk level	X	Risk level	Impact	Probability
2.288	1.986	M	142	M	1.986	2.581
2.146	1.851	M	78	M	1.851	2.260
2.046	1.854	M	119	M	1.854	2.227
1.939	1.830	L	43	M	1.830	2.142
2.124	1.349	M	281	M	1.349	2.762
1.514	1.953	L	49	M	1.953	2.866
2.272	1.173	M	204	M	1.173	2.588
1.977	1.466	L	227	M	1.466	2.567
1.694	1.723	L	45	L	1.723	1.877
1.316	2.088	M	6	M	2.088	1.425
1.033	1.038	L	52	L	1.038	1.195
1.013	1.051	L	38	L	1.051	1.029
1.049	1.006	L	239	L	1.006	1.064
1.021	1.032	L	63	L	1.032	1.024
1.030	1.018	L	172	L	1.018	1.191
1.037	1.011	L	55	L	1.011	1.199
1.038	1.007	L	235	L	1.007	1.200
1.026	1.014	L	105	L	1.014	1.139
1.023	1.004	L	231	L	1.004	1.086
1.024	1.002	L	160	L	1.002	1.134

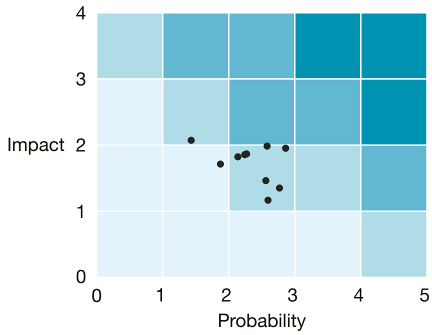
Source: Authors

Results from Figure 5 compared to Figures 6 and 7 generally demonstrated the localization effect of the model. The top 10 scoring NIINs consistently held high values in both impact and probability categories. This appeared to result in minor changes to overall scoring when the results of Figures 5 and 6 were compared. The inverse appeared true when the results of Figures 5 and 7 were compared. Figure 5 shows the bottom 10 scoring NIINs as a cluster in the low-risk zone. When scored separately in Figure 7, the distribution of these same NIINs stretched into medium and high-risk zones of the risk matrix.

FIGURE 6

NIIN risk matrix

(Rodger weight top 10 scoring NIINs)

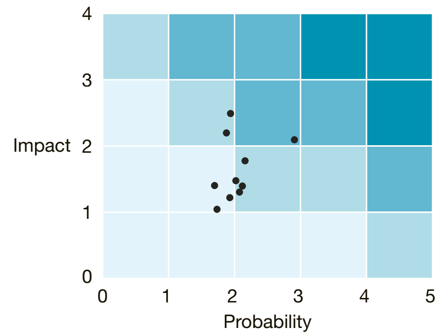


Source: Authors

FIGURE 7

NIIN risk matrix

(Rodger weight bottom 10 scoring NIINs)



Source: Authors

Conclusion

Several stakeholders in DoD and academia have highlighted the challenges inherent to SCRM. For military logisticians, challenges are exasperated by obsolescence, a diminishing supplier base, vast networks of subcontracted suppliers, and even the lack of a consensus in the SCRM framework. This model shows promise in assigning NIIN-level risk scores when aggregating several performance metrics to aid in data-driven decisions on resource investment decisions. By using a range of variables, stakeholders are provided with a diversified view of risk that can be manipulated through a number of supply chain resilience efforts.

Ultimately, this research serves as a bridge from qualitative SCRM approaches to a quantitative SCRM model, yielding an objective risk score based on key commodity metrics. The study also outlines a framework for visualizing large numbers of commodities on a single risk matrix in order to pinpoint factors that may be influencing impact and probability factors contributing to supply chain issues that manifest as constraints to aircraft availability.

Research priorities for the DoD supply chains have been identified through several sources and range from raw material sourcing, sole-source suppliers, supplier visibility, and obsolescence. Quantitative approaches are of greater value to stakeholders than qualitative ones, as quantitative modeling may allow organizations across the DoD and industry to rally behind consensus risk indicators. Subsequently, these qualitative models may allow for multiple organizations to be statistically represented within the SCRM, thereby enhancing the risk score's credibility.

It is in any organization's best interests to consider methods of properly allocating finite resources. An enterprise portfolio of several million unique commodities is not conducive to reliably targeting NIINs with the greatest risk predictors relative to aircraft availability, and perceptions of risk may differ throughout the supply chain as a customer's view differs from the suppliers. Therefore, the incorporation of a SCRM model that leverages agreed-upon data elements to calculate a risk score is a valuable tool when seeking to create a decision advantage on which parts to resource, for which aircraft, and with what sense of urgency. In both DoD and industry, supply chain performance plays a crucial role in the organization's ability to reach and exceed its performance metrics; therefore, it is imperative that investments in the supply chain are prioritized based on the overall risk to the supply chain's ability to support those metrics. •

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DEI IS DEAD; LONG LIVE DEI

(but you don't have to love it)

By Jim Roberts and Steven A. Melnyk

DEI, as a term, is effectively dead—there is too much negative baggage associated with it. However, the goals and the need for initiatives that recognize changes in demographics and enhance the ability of the firm to attract, evaluate, develop, promote, and retain customers, employees, and suppliers from a broader basis is still very much there.

As we head into 2025, certain omens are pointing to an important future state—DEI (Diversity, Equity, and Inclusion) seems to be on its last legs. To understand the nature of these omens, consider the following developments.

- In January , Donald J. Trump was sworn in as the 47th president of the United States. One of his major campaigning planks—the removal of DEI initiatives (especially within the federal government and educational institutions supported by public funding).
- On June 29, 2023, in an historic decision and by a vote of 6-3, the Supreme Court severely limited the use of affirmative action in college admissions.
- According to recent reports, companies such as Walmart, Ford, Harley-Davidson, Google, Meta, John Deere, Lowe's, Tractor Supply, Boeing, Molson Coors, Brown-Forman (the maker of Jack Daniel's whiskey), Toyota Motor Corporation, and McDonald's have been scaling back or dropping their DEI programs.
- A recent report from HR consulting firm Revelio Labs found that DEI executives were terminated at a much higher rate than all other executives in 2022.
- More than a dozen conservative attorneys general have issued letters threatening legal action for corporations' diversity initiatives.
- The apparent success of conservative political commentators and activists such as Robby Starbuck in combatting "woke" practices such as DEI in corporate America.
- The emergence of conservative consumers who are using their buying power to "punish" companies that push "woke" practices.

Yet, this apparent rejection of DEI is not universal. Some companies, such as Costco, regard DEI as a strategic imperative and critical to its long-term survival and development.

When reading this, we should recall the words of Mark Twain, who, when some newspapers had reported his death, said "the reports of my death are greatly exaggerated." To be clear, DEI, as a term, is effectively dead—there is too much negative baggage associated with it. However, as this paper will show, the goals and the need for initiatives that recognize demographic changes and enhance the ability of the firm to attract, evaluate, develop, promote and retain customers, employees and suppliers from a broader base are still very much there. Such inclusivity initiatives represent important changes. When it comes to change, we agree with the view of David Mixner, American activist and author: "Change comes with both fear and some pain. Those two ingredients create mistrust, misunderstanding, and misinformation."

Specifically, this paper looks at the various myths and misconceptions that appear to accompany the concept of DEI; for each myth, we identify the possible source of the myths, and then we will show why it is a myth. Ultimately, we try to show that, once properly understood, inclusivity initiatives can generate numerous benefits not only to the targeted minority groups but also to others both in the firm and in the supply. Finally, we will note that an acceptable goal, poorly implemented, harms the attainment of the goal.

DEI is a fad

According to this view, the push for DEI can be traced to the death of George Floyd (May 25, 2020). His death led to widespread protests and a demand for corporate responses to address the underlying racial injustices. The resulting diversity initiatives are best described as public relationship (PR) responses. However, over time, firms have backed off from these initiatives. Why? Because they are now faced by several new demands (e.g., the need to improve profits and reduce costs, the difficulty of quantitatively justifying investments in DEI initiatives, the emergence of a more active conservative customer segment). Consequently, firms have been forced to scale back their DEI efforts.

There are three problems with this view: (1) it overlooks certain critical demographic developments affecting every phase of supply chain management; (2) efforts at improving inclusivity are not new; and (3) DEI is a strategic issue.

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Demographics argue against the DEI as a fad view. The United States market is diversifying. According to the U.S. Census, from 1776 to 1950, Caucasians (white) were the largest population segment, accounting for 90% of the Census count. Yet, from 1950 to 2020, Caucasians fell to 60.1%. Furthermore, it is projected that white Americans will comprise only 44.9% of the total population by 2060. Consequently, it makes sense for firms to rethink what and how they sell and service this increasingly diverse market. What sells to one group may not necessarily sell to another. This factor was explicitly recognized by Costco, which noted that diversity is a critical business imperative, not a PR stunt.

Furthermore, new business startup growth reflects this increasing diversity of the population. Recent data has pointed out that Hispanic-led firms have grown by 46%, Black-led firms have grown 34%, and Asian-led firms have grown 22%. In contrast, white-led firms have experienced a 4.7% reduction in growth rates over this same time. These new startups impact the supply chain through both the demand side and on the supplier side (i.e., through the emergence of new suppliers).

Finally, there is a shortage of skilled workers in many industries in the United States. For example, the Manufacturing Institute projects that the industry will have 2.1 million unfilled jobs by 2030. In 2024, the construction industry needed to bring in 342,000 new workers. To address this shortage, firms must expand their efforts to recruit and train workers from a more diverse base.

Consequently, firms cannot afford to ignore the economic impacts, and the profit opportunities, associated with an increasingly diverse population.

DEI-like initiatives are not new. In contrast to popular opinion, DEI-like initiatives are not new. One of the first time that we saw an explicit attempt to diversify the workforce occurred during World War II. With many white male workers enlisting in the American armed forces, firms needed workers. They turned to women and to various minority groups. Rosie the Riveter reflected this new type of worker. Women workers formed a major part of the American workforce during this period. They not only built Liberty ships and B-24 bombers; they also built Gibson guitars. The Banner acoustic guitar, considered by many musicians to be one of the finest guitars ever built, was manufactured by Gibson's Kalamazoo Gals (located in Kalamazoo, Michigan). In New Orleans, Andrew Higgins was building the war's finest landing crafts and PT attack boats using a highly integrated workforce of men, women, Blacks, whites, and Hispanics. These initiatives worked because they addressed a real need.

DEI is a strategic issue. Ultimately, DEI is something that must be led by the firm's board of directors and by top management. It is a strategic issue because it affects how the firm competes in the market; it deals with identifying new markets and new sales opportunities. It also deals with the type of capabilities offered by the supplier base (through the emergence and integration of non-traditional suppliers). DEI, if successfully implemented, affects the firm's entire ecosystem—internally, upstream, and downstream.

DEI is a zero-sum game

This myth argues that DEI is essentially a poker game—a situation in which what one group gains in terms of job and economic opportunities at the expense of other groups. Therefore, DEI creates artificial winners and losers; it does not increase the size of the pot. It is a game where the stakes are stacked up against Caucasians.

Debunking this myth can be done in several ways. However, we must first note that to debunk this myth, we must assume that the organization is deploying DEI correctly. By correctly, we mean the following.

Successful DEI is a long-term process. It is based on elements: relationships (developing ties between the organization and the minority groups), communications (frequency and content of information flows) and commitment (developing a duty to these targeted groups that you are in it for the long haul). It is also based on the assumption that the groups (be they suppliers or employees) are similarly committed to the organization and to improving their performance. From this stance, these practices are readily transferrable to other groups both within the firm and within the supply chain, with the result that everyone benefits. In many cases, we have seen "DEI as PR" be confused with "DEI as strategy." With DEI as PR, the organization seeks to portray itself as champions of diversity by relying on a series of uncoordinated actions that give the appearance of being committed to DEI without the substance or systems needed to ensure that diversity is *successfully embraced as being important, necessary, and beneficial. A DEI office is established with its own head of DEI initiatives; training programs are rolled out (often requiring mandatory participation); investments in DEI-related organization are promised and made; if someone who is a minority is promoted (for whatever reasons), that promotion is publicly portrayed as being of the firm's DEI system. At first glance, these actions seem to be "right." Yet, ultimately, such systems are doomed to fail because they are not sustainable. They focus on outcomes (e.g., look how many minorities we now have in management) rather than on processes and systems. As will be shown later in this paper, they fail because they do not recognize that, to succeed, they must effectively change organizational cultures and the ecosystems in which employees and suppliers feel safe, comfortable, and appreciated.*

To debunk this myth, we must recognize that DEI creates two forms of benefits: (1) economic; and (2) organizational.

Economically, there are real dollar benefits to diversity. For example, it has been estimated that the growth of minority-owned businesses will add between $6 to $8 trillion of additional GDP to the U.S. economy. Considered by itself, this contribution alone would be the third-largest economy in the world. Furthermore, adding this amount to the current U.S. GDP would contribute an additional 24% to 32% to our economy. Next, there is the changing nature of the market that we are servicing—it is becoming more varied, more diverse. How and what we sell must change to fit these changing requirements. In short, the economics of diversity are too strong to ignore.

Organizationally, as previously noted, DEI is built on three foundational elements: relationships, communication, and commitment. These elements are not simply appropriate for working with minorities (racial and gender); they also work for all other forms of diversity, including special needs, age, socioeconomic, and educational (college, trade school). More importantly, they can be applied to the entire organization and its supply chain, thus benefiting majority and minority groups. If you add in transaction management, you get the foundations of a firm becoming a "good" customer and receiving "earned preferential treatment" from its suppliers (as noted by Melnyk et al., in the March/April 2021 issue of Supply Chain Management Review, pages 40-47). In other words, DEI, if done correctly, emphasizes the same business practices that you find in "good" supply chain management.

DEI initiatives do not work

This myth argues that these initiatives are doomed to failure because they do not demonstrate economic benefits and they are distracting to firms, forcing them to divert attention from those activities that add value and improve profit to other non-value-adding activities.

While many firms are having difficulty in demonstrating the value of DEI-type initiatives, there is other evidence that says otherwise—one coming from McKinsey and one coming from history. A recent McKinsey study (Dixon-Fyle et al., *"Diversity Wins: How inclusion matters,"* McKinsey & Company, May 2020) found that diverse companies outperform non-diverse companies by as much as 39%. This finding should be treated as being tentative because of concerns with the methodologies used.

Second, history provides us with numerous examples of American society successfully expanding and changing its view of what is acceptable. To illustrate this point, consider the following examples:

- The arrival of Irish immigrants in 1845.
- Italians arriving in the United States beginning in 1820s.
- The women's suffrage movement in 1920 that resulted in women getting the right to vote.

In every case, a group entered demanding access to opportunities; there was initially a negative reaction to these groups and their demands. However, over time, American society came to accept these changes, and, in every case, we found that these changes introduced new strengths and benefits.

One of the most compelling arguments supporting diversity is found in the experiences of the United States military—one recognized as being the gold standard for global military effectiveness. A critical contributing factor to this state can be traced to the decision to integrate the military.

The United States military was desegregated by Executive Order 9981 on July 26, 1948. Since then, that order:

- created opportunities for future generations of Americans.
- helped eliminate barriers that had previously prevented non-whites from serving in the military; and
- helped create a more skilled and effective fighting force.

On the last point, Max Boot, writing in the book *War Made New: Technology, warfare and the course of history, 1500 to today*, attributed much of the current success of the armed forces to the presence of the volunteer-based force that was integrated by both race and gender. A symbol of the success of these efforts can be found in the decision to appoint General Colin Powell to be the first black chairman of the Joint Chiefs of Staff in 1989. Powell noted the importance of the desegregation of the military in his autobiography when he wrote: "The military had given African Americans more equal opportunity than any other institution in American Society."

Middle management should be primarily responsible for DEI

This myth argues that DEI should be run by middle management. This management level has the most familiarity with the issues and problems associated with DEI initiatives; they understand and often know the personnel and suppliers affected, either directly or indirectly. Being closest to the problem, they are in the best position to make intelligent and realistic decisions and to take the appropriate actions. While this logic is difficult to argue against, it ignores several factors that ultimately make it a myth.

First, to be successful, DEI needs visible, consistent top management support. If top management is either indifferent to DEI or has yet to make any statements of support in favor of DEI, then the initiative is doomed. Second, because DEI is a strategic decision , it is therefore a top management issue, not an issue for middle management. Third, because DEI can ultimately impact the organizational culture, this decision must again default to top management. Fourth, DEI, as an initiative, requires significant investments in terms of time and money. Such decisions are most often made at the top management levels. Finally, if you assign the responsibility for DEI to middle management, be prepared for it to fail. This management level often does not have the time, resources and/or authority to properly support DEI. What you can expect to get is lip service and DEI as PR.

DEI is about quotas and reverse discrimination

At the heart of this myth is the tendency of many companies pursuing DEI to post the results of their efforts and to show how the demographics of the organization now more closely align with overall racial, gender and other similar measures of social composition. Initially, these numbers were intended to keep companies accountable. However, over time, they became misconstrued. As noted by Bo Young Lee, who was Uber's diversity chair from 2018 to 2023, in a Dec. 22, 2024, Wall Street Journal article ("They helped create DEI—and even they say it needs a makeover"):"By the time the message trickles down, it's heard as 'they won't hire a white guy.'"

Considering a recent federal appeals court ruling stating that Nasdaq's racial and gender targets for listed companies amount to unlawful quotas, there is legitimate concern about the future validity and viability of such actions. Furthermore, this focus on quotas is often associated with companies pursuing DEI as PR; it is not often observed in organizations pursuing DEI as strategy (e.g., companies such as Costco). To understand this mentality, consider what Young Lee did when she first took over her position at Uber.

One of the first questions she asked her staff was: "What's your job?" The answers she most often heard was that DEI was about empowering women and minorities. She rejected this answer. The purpose of DEI is to help the company make more money by ensuring discrimination does not cost the company talent, customers or a good reputation. To this view, we offer two important additions. First, DEI must also consider explicitly the issue of retention—keeping qualified talent within the firm. Second, it must extend to include suppliers and the supply chain.

That is the real bottom line of DEI. It is to increase profit; it is to enhance shareholder value. Quotas and reverse discrimination are inconsistent with these objectives.

Rethinking DEI

Having identified and debunked the various myths associated with DEI (the preceding discussion is not exhaustive), we must next lay out the steps necessary to successfully implement DEI.

Ditch the DEI name

This is a simple one to understand. The term, DEI, is now cloaked with strong negative connotations. Many companies have chosen to distance themselves from the term DEI while still pursuing the goals and objectives of DEI. A good starting point is to use a different title. Make it simple and self-explanatory. Ensure that it makes sense to the company or the supplier base.

Understand that we are essentially dealing with change management

DEI is about improving the competitiveness of the firm and its supply chain; it is also about changing organizational culture. These last three words are critical to a successful program. Consequentially, it makes sense to remember the major guidelines for successful management:

- **Identify the need for change.** This is a two-part challenge. The first part is to determine why change is needed. This is where we need to develop and present a compelling, data-driven business case. The second part is more difficult (and essential when dealing with culture)—discrediting the current approaches. Unless you can show the people involved how and why the current approaches are not working, then you will not succeed. As soon as any training program is complete, people will return to what they previously had done. This makes sense because they know the current system and, in general, they are comfortable with it.
- **Create a change management plan.** This plan should include objectives, stakeholders, communication strategies, and a timeline. This plan should also convey urgency—the need for action now.
- **Assess the impact of the change.** Determine how the changes will affect people, markets, processes, and systems.
- **Communicate clearly and frequently.** Keep everyone informed about the change on a regular basis.
- **Involve stakeholders.**
- **Plan for implementation.**
- **Monitor progress.**

Achieving DEI should be treated as a business process and a business decision—it must make sense for everyone involved. It must identify a clear future state and a path from the current state to the future state.

Ensure rock-solid top management support

Because DEI is a strategic decision, it should be made at the top management and board of directors level. Consider how Costco responded to a recent proposal presented by a conservative think tank, the National Center for Public Policy Research, as noted in a CNN Business article on Dec. 27, 2024, ("Costco is pushing back—hard—against the anti-DEI movement.") This proposal would require that Costco evaluate and issue a report on the financial risks of maintaining its diversity and inclusion goals. The group criticized Costco for possible "illegal discrimination" against personnel not "white, Asian, male or straight." The board of directors unanimously recommended to shareholders they vote against this proposal. The rationale—Costco has stated that its DEI efforts have helped Costco attract and retain a wide range of employees and improved the mix of merchandise and services offered in the stores. In other words, voting against DEI adversely affects the ability of Costco to compete.

We also need this top management support to be highly visible (think back to the Costco example). Ultimately, we need to convince top management to be committed to DEI by showing how it positively affects profit, reputation, and market share. It is not enough to argue that DEI is the "right" thing to do; it should be argued that it is good for business and essential or survival.

Remember: This is a long-term undertaking

Because DEI involves organizational culture, it is not an undertaking to be embraced lightly. Changing culture takes time and persistence; it involves identifying sources of resistance (especially from laggards—we will talk about this category later) and formulating and deploying strategies for overcoming these sources. It means demonstrating that DEI is working. In short, it takes time—accept that as a reality.

Be transparent

This recommendation is somewhat self-evident. It involves the following.

- Openly communicating the reasons for the changes proposed.
- Honesty about the potential challenges.
- Sharing decision-making processes with key stakeholders.
- Actively soliciting feedback from employees (current and those who have left) and suppliers (current, those who have left and those who are considering you as a customer).
- Clearly explaining benefits.
- Identifying next steps and timelines involved.

Being transparent is critical to building trust—both internally and externally. Trust is important because it creates goodwill and willingness to tolerate failure. With trust, people are willing to wait to see what happens rather than offering immediate condemnation.

Identify and defuse institutional barriers and biases

One nice aspect of change management is that it gives everyone an opportunity to identify practices and approaches present in the organizations that have (often) unintentionally cost the company good talent, customers, good suppliers, or harmed its reputation. This must be done at the outset.

These practices may have made sense in the past or they may have been introduced to deal with a short-term problem. However, when examined critically, they are often found to not make sense. To understand this position, consider the experiences of one of the authors.

When he approached the university with a request to become a supplier, he was told that his company wasn't qualified to be a supplier to the university. The reasons the company wasn't qualified included 1) they needed to have three other universities of their size as current clients, 2) they had to have at least $3B in assets under management, and 3) had to have been in business for at least 30 years. These were unreasonable requirements—especially for a new supplier and the only certified minority-owned firm in the state within that business segment. Several months later, since this author had been recognized as being a successful graduate by the university, he was approached by the university with a request for a donation. His response: "Why am I good enough to give you money, but not good enough to be a supplier?" This policy regarding new suppliers was probably introduced in the past to deal with a problem involving a new supplier. This same policy also effectively excluded new suppliers from competing for university business. Many of these new suppliers will most likely be minority/women-owned or led.

As a final point on this issue, identifying such practices and policies is often best done by bringing in an outsider. Such outsiders bring with them an important asset—a fresh pair of eyes.

Remember the three foundations: Relationships, communication, commitment

As previously mentioned, DEI programs are built on three foundational elements. The first, relationship management, deals with how the firm and its management deal with employees and suppliers and the overall quality of the relationship. Included in relationship management are elements such as the following.

- How the firm deals with problem-solving.
- Conflict resolution mechanism.
- Clarity of objectives and goals.
- Mutual trust and respect.
- Clearing of the mission.
- Openness to new ideas or suggestions.
- Risk sharing.

Communication flows have been previously discussed. However, it is important that this element includes the following elements.

- Performance measurement system.
- Consistency of messages and signals from the firm to others.
- Transparency.
- Frequency of communication.
- Early warning.

Commitment includes the following elements such as development programs for suppliers and employees and demonstration of commitment by the firm to the supplier and employee. It is here that we would include mentoring programs, where management from the firm mentors either employees or suppliers.

When you look at these actions and you compare them to what a firm must do to be viewed as a good customer, you find that many of the things that you do to help DEI succeed are the same things you do to develop and maintain good buyer/supplier relationships. It is our view that effective DEI draws on many of the same practices that you use to become a more effective supply chain manager.

Emphasize equality of preparation/ opportunities, not equality of outcomes

This guideline is simple to understand—everyone (employee or supplier) should be given equal opportunity to participate after having been adequately prepared (as discussed in the preceding point) so that they can successfully compete against others. It is now up to the employee and supplier to prove that they are up to the challenge. Minority employees and suppliers can fail just like anyone else. More importantly, qualified employees and suppliers succeed because they compete on a common field and meet and/or surpass the requirements for success. These groups succeeded not because they were drawn from minorities; they succeeded because they were good, and the company gave them the opportunity to succeed.

Equality of preparation/opportunities requires work; it requires investments of time and resources. Some firms, however, may simply reduce the need for work and investments by trying to seek equality of outcomes. If 19.1% of the United States population (using 2022 Census data) are Hispanics, then we make sure that 19.1% of our supply chain is Hispanic-owned or led. The problem with this approach is that the issue of whether these suppliers are qualified is not addressed. There is always the question of whether they got their positions because they were Hispanic rather than qualified.

Don't focus only on recruiting; recognize the importance of retention

It is not enough to attract qualified minority employees and suppliers, you must also ensure that you have created an environment that is safe and welcoming to the employees and suppliers. This means assessing the corporate environment and also the communities in which the employees live.
As one author experienced in a conversation several years ago, a corporation had recruited a very qualified African American woman to become the CEO of their company. The compensation package was very competitive and the opportunity with the company was attractive.

However, the candidate started asking questions about the community in which the company had its headquarters. She found the community didn't have the infrastructure and services geared toward people of color. As an example, she would have to drive an hour just to find a hair stylist who was experienced with African American hair.

Recognize that not everyone or every firm is an early adopter or early majority

This recommendation is based on the framework presented by Geoffrey Moore in his book, Crossing the Chasm (Crossing the chasm: Marketing and selling technology products to mainstream customers) he noted that, when dealing with change, people and companies fell into one of five categories.

- **Innovators.** Willing to embrace the change because it was new and different.
- **Early adopters.** Willing to embrace the change based on the promises offered by the change.
- **Early majority.** Along with late majority, formed the largest group of companies and users. Very risk-adverse; driven by actual results (i.e., show me the money), wanted to see the change in action. Often cost-focused.
- **Late majority.** Like early majority but more risk-adverse.
- **Laggards.** Very resistant to change, likely to sabotage efforts to introduce the change.

Only 15% tend to be either innovators or early adopters, the bulk of responses fall into early majority/late majority categories.

Using this approach, we expect different responses to DEI. However, it is up to the supporters of DEI to focus on demonstrating to the majority (the early and late majority) the viability, feasibility, and positive impact of DEI. Remember, when it comes to changes, this group is driven by a simple mantra: "Show me!" Another implication of this approach is that we should identify and explicitly address in advance laggards and the challenge that they pose. Members of this group will resist any change to the status quo.

Monitor effectiveness continuously: Measure, fail fast, learn, and repeat

Changing an organization's culture is a long-term undertaking. Expect errors to take place. Make sure that you are continuously measuring (this is not the same thing as setting quotas) performance and the extent to which goals are being met. When performance shortfalls occur, remember that measures are symptoms—they tell you that something has gone wrong; they do not tell why things went wrong. We need to quickly identify possible root causes and address them. People and organizations will tolerate failure as long as they know that the causes of the failure are being continuously identified and quickly eliminated.

In supply chain management, there is a mantra of "fail fast, learn, and repeat." That approach is equally appropriate to DEI.

Concluding comments

We began this article by noting that for many, DEI seems to be triggered by current events. What we have tried to show in this article is that DEI is not a response to a death that took place in Minneapolis in 2020 but rather a response to fundamental changes now taking place in the American market, in the American workforce, and in the American supplier base. We have also tried to show that DEI is strategically driven and that there are real benefits to be captured by pursuing DEI. We have also tried to debunk many of the myths and misconceptions surrounding DEI.

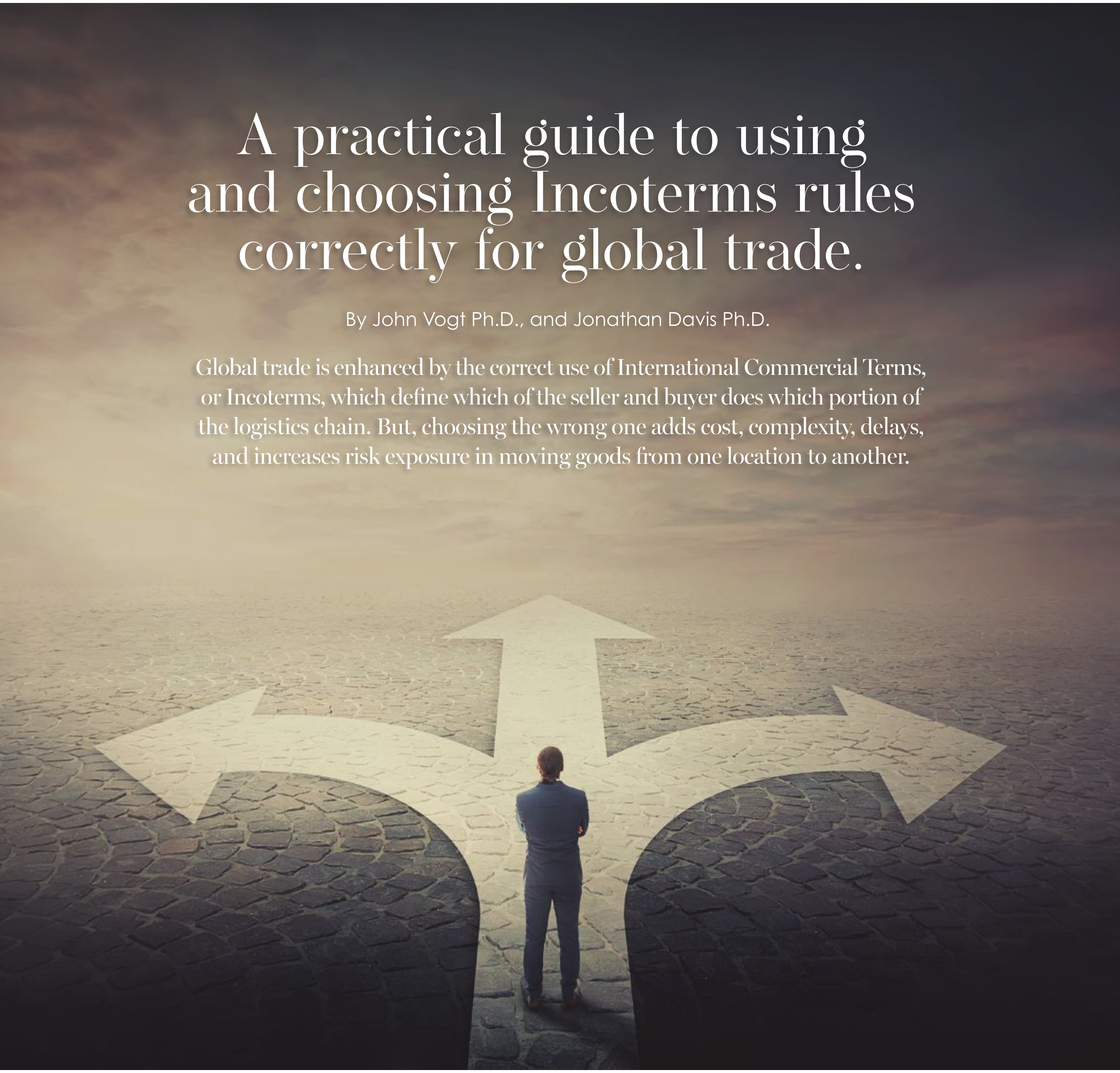
However, when everything is said and done, we have a simple message to share with the reader.

Faced by a drastically changing marketplace, faced by a labor shortage, and faced by the need to develop and maintain a vibrant, qualified scalable supply chain, we need some form of a DEI initiative. The good news is that we already have access to most of the tools needed to do so. The only thing missing is the will and determination to commit. •

A practical guide to using and choosing Incoterms rules correctly for global trade.

By John Vogt Ph.D., and Jonathan Davis Ph.D.

Global trade is enhanced by the correct use of International Commercial Terms, or Incoterms, which define which of the seller and buyer does which portion of the logistics chain. But, choosing the wrong one adds cost, complexity, delays, and increases risk exposure in moving goods from one location to another.



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In his 1983 radio address to the nation, President Ronald Reagan said: "The winds and waters of commerce carry opportunities that help nations grow and bring citizens of the world closer together." At the time, the world's trade industries were already almost 50 years into an experiment meant to help deliver on this promise: a unified code of communication called "Incoterms rules" or "International Commercial Terms." Incoterms are standardized rules that describe the roles and responsibilities of each partner in a trade, regardless of nation, and they succinctly summarize what would otherwise be a verbose explanation indeed. Incoterms make the mechanics of a trade quickly visible to all and truly grease the wheels of world exchange.

Despite their importance, Incoterms rules are not commonly understood, nor are they commonly used with expertise. It is well documented by now in academic literature that industry personnel tend to use Incoterms rules out of convenience, inertia, or expedience in making a trade, rather than out of careful consideration of a rule's impact on the end customer or the total landed cost. This is usually because those choosing the rules are, typically, procurement or sales experts, rather than experts on trade compliance, logistics, or the law. A non-expert making a decision on a complex topic will tend to use what has been used in the past, regardless of its suitability to the present circumstances. Moreover, a non-expert will introduce errors and oddities in the process simply by virtue of not understanding all the complexities. A 2021 survey of supply chain industry professionals revealed that many use Incoterms rules inappropriately indeed, or use rules that do not exist, such as "EXW International" and "FOB Delivered," or declare that they utilize the Incoterms 2015 ruleset, which does not exist. If you find yourself wondering what is wrong with those rules, then this article is for you.

The correct use of the Incoterms rules for each trade is not just a guess or a cookie-cutter standard, but chosen to give the best delivery time, highest reliability and the lowest landed cost, creating a powerful competitive advantage. Securing this advantage requires detailed knowledge of the trade circumstances, the routes involved, the capabilities of each trade partner, and the Incoterms ruleset itself. This is not at all trivial, so we offer the following to give supply chain practitioners a leg up toward achieving excellence in Incoterms rule choice.

The challenge: Four levels of Incoterms excellence

There is a knowledge and selection gap in many or most organizations that introduce problems. These can be roughly summarized as follows:

- a disconnect between those making the trade (usually procurement or sales) and the logistics team that has to implement it;
- a shallow understanding of how each rule preserves or discards advantage;
- standardized, one-size-fits-all rules that ignore the specific needs of any given trade;
- an over-reliance on third parties (trade partner, freight forwarder).

The challenge, therefore, is to develop useful tools to help guide professionals toward better outcomes. The authors are currently exploring heuristics, algorithms, and AI tools to assist professionals but in the meantime, until these are released, there are many easily applied ideas that will help you select Incoterms rules that preserve your strategic advantage.

Before we look at the four levels, let's explore what Incoterms rules influence. The rules define the obligations (and hence roles and responsibilities), as well as the risks and costs to be borne by the logistics functions of the seller and buyer. While the entirety of each trade partner's organizations may be engaged, it is the logistics functions that house the knowledge, skills and capability which is the most affected by the choice of Incoterms rules because these concern the handling, moving, booking of passage, and handoff of the cargo itself. This means that within your logistics department, there must be a core of well-trained, skilled logisticians who are really experts in the Incoterms rules, trade and customs requirements, regardless of who it is within your organization that picks the rules.

Level 1: Match Incoterms to appropriate trade uses

The first idea is to simply ensure that Incoterms rules are applied to situations that call for them. This sounds simple and straightforward, but it is the one that can be the hardest to detect for novice users. Here, a listing of common pitfalls will go a long way.

Geography. If your trade is international, be sure to pick a rule that obligates your partner to provide what you need and gives you the best chance of complying with trade laws. Consider that the Incoterms rule must also define the customs authority implications as well as the logistics requirements. Here are some dos and don'ts.

- **EXW is inappropriate for international trades, period.** The presumption of this rule is that of a domestic trade, and the signals that normally prompt a seller to ensure trade-law due diligence are not present. Furthermore, the paperwork needed for customs clearance is not a baked-in requirement under EXW. Violations of customs laws from the subsequent export by the buyer can reverberate back on the supplier. *EXW is only safely useful for courier parcels where the courier collects from the seller's premises.*
- **F rules and only F rules are for domestic deliveries**. Truly domestic trades should use FCA either with the place of transfer at the seller's premises or at the final destination where the buyer takes responsibility for the goods.
- **D rules are international, not domestic.** The presumption is that the goods are clearing export and import customs.
- **DDP requires foreign payments to third parties.** This is risky, time-consuming and costly if your company does not have an entity in the receiving country that can disburse payments in the foreign currency.
- **Mode of transport:** Certain rules are designed to support certain modes of transport and fail at others. Be aware and use the ones that apply to your mode.
- **FOB is a water-only rule (as is FAS)** and these are used for loading in ports onto ships. FOB and FAS are useful for bulk and breakbulk cargo. They should not be used for land movements. Use FCA instead.
- **FCA and DAP are purpose-built container rules,** with FCA being utilized where the containers are delivered to a container terminal for export and DAP for the import into a foreign country.
- **FOB is inappropriate for containers.** FOB creates ambiguity when damage occurs during a voyage because the container cannot be opened for inspection once loaded onboard the ship. As such, any damage occurring during the voyage cannot be distinguished from damage occurring during loading, even though the liability changes after loading onto the ship. The payment to the container terminal handling the container will also complicate this significantly, as this is usually included in the overall shipping costs to the container shipping line (paid by the buyer under FOB), but the seller must handle loading under FOB.
- **EXW is completely inappropriate for heavy cargo.** Sellers must usually operate the equipment on their own facility for efficiency, liability and practical reasons, but EXW requires the buyer to load. This creates an inherent mismatch between behavior and the description of responsibility, generating unnecessary risk. Use FCA instead, which requires the seller to load within the seller's facility and neatly sidesteps this problem.
- **The use of C terms means risk and responsibility are transferred at different places.** Beware of this as the risk increases significantly if the seller has the right to send the goods via any route and any mode without advising the buyer. If you want your goods on time and not wandering

around the world via the lowest cost movements, be precise when using these rules and specify in addition to the Incoterms rule on the route and mode. Specifically, be aware of:

o The CFR and CIF terms are from a port of departure to a named destination, the choice of shipping line or port is that of the seller, as is the method and route to the port, leaving a large portion of the logistics undefined, which is less than optimal.

o The better choice is that of CPT or CIP as these are for all modes not just a port origin and allow better logistics flexibility.

When a C rule is utilized, the agreement must specify the Incoterms rule as, for example: CIP (Named physical address where handover occurs) Incoterms 2020.

It is recommended that this follow with added details of the route, the modes and the service providers to be utilized in addition to the rule so the risk is known and minimized.

- **Avoid limited or obsolete versions of trade rules.** The incorrect use of "FOB (Loaded)" or "FOB (Delivered)" originates from the U.S. Commercial Code from the 1950s. This has no validity outside of the USA, has different interpretations in each state, and is not applicable in Louisiana which utilizes a different (and similarly obsolete) domestic code. These are not Incoterms rules in spite of the confusing use of the same three-letter code. There are also "phantom" U.S. domestic versions of EXW and FAS, which should be avoided as well in favor of the identically coded Incoterms rules.

Level 2: Involve the logistics group early

Many pitfalls can be avoided by bringing in the logistics personnel to get an opinion on the practicality of a trade. Too often a wild proposal has gone through sales and legal only to be signed and land on a logistics group that has no idea how to deliver. Logistics is left holding the bag and does its best, but this is hardly the most advantageous method. Instead, procurement and sales teams should consult with logistics on the following:

- **Ensure appropriate risk allocation.** Does your organization want the risk and revenue, or prefer to hand that to the other party? Logistics can help you understand the risk and contextualize the revenue.
- **Optimize costs and delivery timelines.** It may be possible to arrange transit into and across a country you've done business in before, but logistics may tell you that ensuring the best cost and best time involves a delivery at the destination port and allowing the buyer to use their connections to do a better job during on-carriage. Remember that the aim of any logistics operation is to deliver on time, every time. That implies they must choose the methods and routes to do so.
- **Comply with customs requirements.** Every so often a trade is signed that simply cannot be executed profitably because sales have agreed to deliver, for example, DDP into a country that the logistics department lacks the rights to clear customs in. At this point the logistics team is forced to engage a third party (eating into profits unexpectedly) or the sales team is forced to renegotiate the deal. Even more egregious is the choice of DDP without knowing the duty rate. Some countries have 40% or higher, which has caused contracts to be costly disasters.

Level 3: Tailor rather than standardize (the choice is ideally for each buyer and seller to fit the associated trade)

Over 60% of companies use just one or two Incoterms rules for everything they do. Often this is one rule for sales and one rule for procurement. This approach is tempting because it feels safe, but it is quietly introducing risk or hidden extra costs each time a trade deviates from that rule's application sweet spot.

- **Cost savings and efficiency.** Picking the right rule can best exploit the strengths of each trade partner. Walmart would not be smart for asking a supplier to deliver DDP because it would be failing to use its vast expertise in logistics, and the resulting trade would end up costing its customers more. In the same way, you and your trade partners will have strengths that should be used where one or the other has a comparative advantage.
- **Risk management.** Using a water rule for a land transport may work fine, until it doesn't. Any dispute that arises out of such a trade has discrepancies between the actual trade and the intended use of the Incoterms rule, complicating matters. In addition, a mismatch may create legitimate confusion about who is meant to perform an action, slowing movements or placing cargo in unexpected "limbo." Ensure a fit between the rule and the expected reality to avoid extra friction points in any dispute. In simple terms, use the right rule for the trade that is to be affected.

Level 4: A holistic approach to effectively select Incoterms rules.

Incoterms rules are not chosen, or at least are not correctly chosen, by one party demanding a shipping line or the one party performs all the logistics. To effectively select and apply Incoterms rules, organizations can follow this step-by-step approach.

1. **Assess trade lane and logistics capabilities**
   - o Identify the origin, destination, and key responsibilities (e.g., export/import clearances).
   - o Evaluate which party (buyer/seller) has the strongest logistics expertise and buying power in this lane. Yes, this is trade and lane-specific as one party may have greater skills and experience in heavy lifts, while the other may have more buying power for containers.
2. **Consult logistics teams**
   - o Include logistics personnel before the trade is cemented to identify the most appropriate rule for this route and trade. Take logistics' time and its reliability into account in discussions about the trade. Also remember different Incoterm rules introduce different costs to the buyer or seller. The price must take this difference into account, which implies the Incoterms rule must be chosen before the final trade price is set.
3. **Match Incoterms to transportation mode**
   - o Use maritime terms like FOB or CIF for bulk shipments.
   - o Apply flexible rules like FCA or CIP for containerized or multi-modal transport.
   - o Use the CIP to require insurance for the movements, and make sure the CIP rule with its "all risks" insurance coverage is chosen not the CIF with its restricted insurance coverage.
4. **Avoid high-risk rules (unless really justified)**
   - o Use DDP only if the seller has a local subsidiary to handle customs and payment in the foreign country.
   - o Avoid EXW, unless dealing with small parcels where the courier manages logistics.
5. **Review contracts for precision**
   - o Always specify the Incoterms version (e.g., *CPT, named location, Incoterms 2020*).
   - o Clearly define delivery locations in the named location, transfer of risk, and responsibilities. For C terms, always specify the origin, the route in detail, the modes and timing to the named location so there are no surprises.
6. **Train stakeholders**
   - o Provide regular, in-depth training to all the personnel involved in trade. Focus on practical scenarios and the correct application of both customs as well as Incoterms rules. Research has found that training is generally desired across the board for functional departments. The training was classified as 'extremely' or 'very necessary' for over 80% of all respondents. But training also has its problems. This is largely given by people or consultants who have utilized the ICC book on Incoterms rules, not done the research and performed trade as the authors here have. This means that issues such as EXW and DDP are not known or communicated to the trainees. While any improvement in the knowledge of the utilization of correct and appropriate Incoterms rules to the trade is welcome, this is only scratching the surface of the problem and not offering a correct solution if the research understanding is not added to the knowledge that is imparted. During the training done by the authors, it has been interesting to see that the people who come for the more advanced courses value not the simple regurgitation of the ICC book, but deeply appreciate the insights and the depth of understanding provided by research and practice married together.

With the above set, companies can choose an Incoterms rule that benefits the trade and promotes their competitive advantage. But there are a few other issues to consider, and we address them in the next section.

The role of freight forwarders and external advisers involved in the trade: Asset or liability?

One solution often argued is that freight forwarders (or other parties involved in providing services in the trade) routinely engaged will be able to navigate this complex topic reliably for their customers. In some ways this is true, but their influence comes with risks. It is tempting for small to medium businesses to hire a forwarder and trust them to make any terms of trade work, in part because the freight forwarder will simply "fix it" if things go awry. Freight forwarders themselves are not immune to the prevailing challenges of Incoterms rule selection and will happily offer FOB for non-maritime locations such as inland warehouses or prefer EXW for an international trade (when FCA in both scenarios would better protect everyone involved).

Freight forwarders may indeed smooth over problems that arise, but their good works do not undo the risks associated with contracting for something impossible, or establishing liability where none was intended or where, practically speaking, the liable party can't manage the risk. Forwarders, in fact, may smooth over issues so they retain the business, but when issues arise the seller or buyer will be the ones who are required to pay fines or endure the operational shutdowns associated with delayed shipping. If you examine the indemnity clauses under your freight forwarders' standard terms and conditions, you will likely find that they are maximally protected and you are not, including exposure to liens on your goods in cases of dispute or general average. Even major corporations will have a low liability limit with their freight forwarder.

Freight forwarders are not part of your company, and their salary and bonuses are paid based on their freight volume. Obviously, they want to offer your company a service and do not want to lose your business, but when faced with a choice forwarders will make a decision that maximizes their company's profitability and thereby benefits themselves.

Risk, cost, and profitability

Incoterms rules can influence the risk, cost and profitability of any trade. If the price for a trade is set prior to defining the Incoterms rule, then fairly large changes in the costs to either the buyer or seller can occur when the Incoterms rule is chosen. The cost of the move to merely deliver a container to the nearest port is very different compared to the cost of delivering the container to a foreign country. These change the profitability of the trade. Even more problematic is the use of DDP where the customs duty rate and other taxes may be significant and may vary during the trade or even when goods are in motion. The seller will be liable for these increased costs, and this happens more frequently than many companies will admit.

The correct method is to have the price set from the source of supply initially. The choice of Incoterms rule is then between seller and buyer as to the role and responsibilities to ensure the goods are delivered on time with high reliability. The costs appropriate to the seller are then added to the sales price, and the buyer has responsibility for the rest.

Insurance varies between Incoterms rules when it is included in the two rules of CIF and CIP. Do not be fooled into thinking insurance covers everything in the preparation and movement. Incoterms rules insurance covers only the specific movement defined in the rule, and only to a value of 110% of the value of the goods. Where risks are higher, it may be appropriate to carry more comprehensive insurance. And please remember, the insurance *never* covers the consequences of the loss of or damage to the goods to your business. You will get compensated for the value of the goods, not your loss of profit or other issues.

Conclusions

Any trade must be for the mutual benefit of the two parties—buyer and seller—if this is a long-term trading partnership. This implies both parties see the value in delivering the product to the correct location on time (an agreed time) and with high reliability at the most advantageous cost. Achieving this requires not just the sale price but also the movement costs to be agreed upon between both parties. This means Incoterms rules must be negotiated to utilize the best skills, knowledge and buying power between the seller and buyer to achieve this strategic objective.

The training of a core of logistics personnel to be experts—true experts—who can utilize the rules for maximum competitive advantage for the trade and the buyer and seller is essential. Without these skilled trade and Incoterms logistics professions, incorrect Incoterms rules will be chosen. While these may not reflect as a problem initially, eventually the probability is that the buyer and seller will see a problem and turn to the choice of Incoterms rule to determine who is responsible. If this is inappropriate, incorrect or just a poor choice, this can sour the relationship between buyer and seller very quickly. Always look beyond the nitty-gritty of the trade agreement and ask what logistics capabilities the buyer and seller have within this trade lane, who should do what and why, and then choose the most advantageous Incoterms rule to give the best delivery time with the highest reliability? It is in the answers to these questions that we will fulfill the promise of Incoterms as a streamlining force for global trade. Beware, caveat emptor applies to the choice of Incoterms rule as well. *

BALANCING RISK AND EFFICIENCY:

Strategies for global supply chain realignment

By V G Venkatesh, Ankur Rathi, and Yangyan Shi

Organizations that lead in building resilience are better positioned to benefit from future disruptions. Here's how your organization can join that exclusive group.

Introduction

The COVID-19 pandemic, ongoing war, and inflation brought uncertainty to supply chains in the last three years (BBC News, 2021). The United States released a 100-day review to assess the vulnerabilities within supply chains of four critical product groups (semiconductor manufacturing and advanced packaging; large capacity batteries; critical minerals and materials; pharmaceuticals and active pharmaceutical ingredients).

This report was released in June 2021, and since then, significant geopolitical and climate disturbances have happened worldwide. The major ones have been:

- the start of the Russia-Ukraine war and subsequent fallout effects across Europe;
- easing of China's Zero-COVID lockdown policy;
- restrictions to the export of advanced semiconductor chips to China; and
- "bomb cyclone" in the United States.

Even though the U.S. government released the report focusing on its geography, the challenges and recommendations mentioned apply to other countries across the globe in varying degrees and for different types of products.

Why it matters

The challenges mentioned in the report have been relatively well-known to businesses with complex global supply chains. However, taking concrete actions to reduce supply chain vulnerabilities would require the CXOs to align their expectations to ground realities. The U.S. government reports (100-day Review and the subsequent ones released by various U.S. agencies) do not provide detailed guidelines to navigate this complexity.

Add to that the additional complexity brought about due to the recent changes across the world that have led to the start of realignment in global supply chains across various industries (Cohen et al., 2021).

In this article, we present critical actions that an organization should immediately take to manage the realignment of supply chains while reducing supply chain vulnerabilities and also adhering to the recommendations provided by various government agencies worldwide.

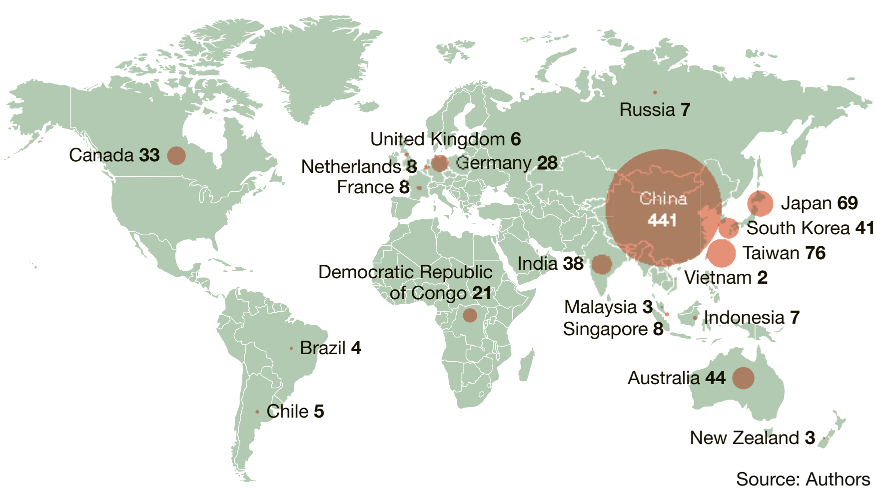
Background

U.S. 100-day supply chain review. It was the first time any government had strongly emphasized reviewing critical supply chains and highlighting the importance of bridging the vulnerabilities. The top two challenges highlighted in the report are:
1. the concentration of the supply chain in a particular geographical area; and
2. lack of domestic manufacturing capabilities.

An interesting factor in the report was the frequency with which the names of different countries were mentioned. China appeared much more than all other countries combined. The table shows the significant variation in the frequency.

FIGURE 1

Frequency of nations appearing in published reports



Source: Authors

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The top four recommendations mentioned in the report are:

1. strengthen the domestic manufacturing ecosystem using government funding;
2. increase global supply chain transparency and collaboration among allies;
3. increase inventory of critical products; and
4. build a strong talent pipeline.

Global risk report

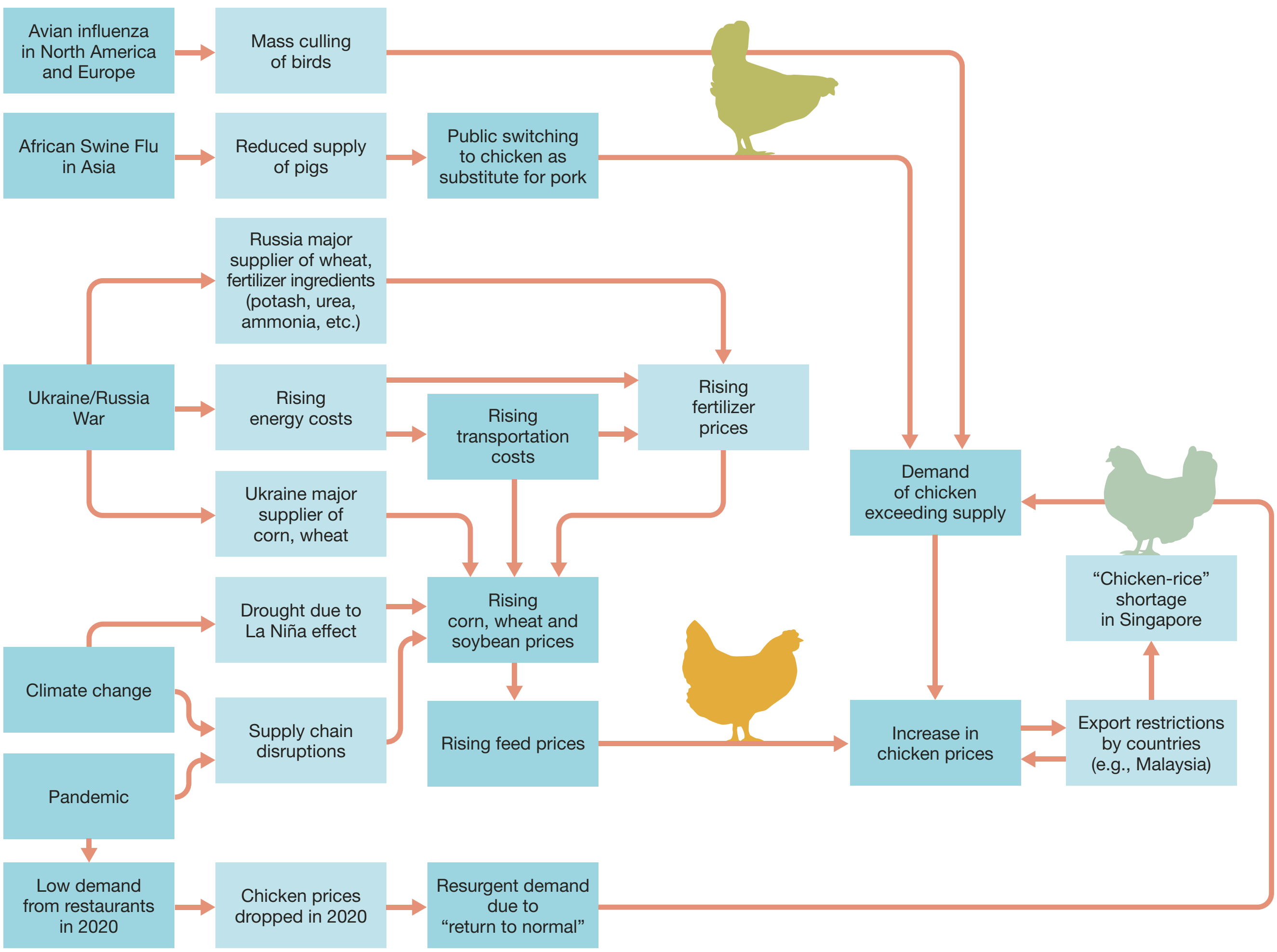
The top 10 global risks mentioned in the annual report produced by the World Economic Forum (WEF) are gradually moving in a direction where these risks will have a direct/indirect impact on the global supply chains. Due to the large contact surface area, here is a summary of how these risks (divided into five significant buckets) can affect supply chains.

FIGURE 2

Top global risks

Source: Authors

FIGURE 3
"Chicken-rice crisis"



Source: Authors

Major ground realities to be revisited by organizational leaders

Complete decoupling of U.S./China supply chains is next to impossible. Private organizations have consistently worked with the single aim of improving profits for their shareholders. The globalization of supply chains has occurred due to the inherent benefits of targeted value additions at specific locations across the globe and the subsequent positive impact on the bottom line.

Global supply chains run deep and have gradually honed their operational efficiency and effectiveness in the last five decades with the help of market forces and local government support. Various tiers of suppliers (beyond tier 5) in a supply chain are hidden from large customers and the end users of products.

Another element behind supply chain alignment is the highly polluting manufacturing process for certain products (rare earth refining) and the laxity in environmental regulations provided by specific regions.

Building a parallel supply chain with similar cost advantage and the ease of operations that existing supply chains provide would not be viable for all major industries. Here is a non-exhaustive list of variables that should be available for realignment.

- Land for manufacturing facilities.

- Resources such as water and electricity in viable costs.
- Favorable government policies.
- Inland transport infrastructure.
- Port infrastructure.
- Talent pipeline with technical and language skills.
- Supplier ecosystem tier 2 and deeper supply chains.
- Intellectual property restrictions.
- Cultural alignment for delivery excellence and transparency.
- Cost-effective workforce.
- Environmental regulations.

Recent examples

- Apple is in the process of diversifying its iPhone supply chain manufacturing outside of China. However, according to WSJ research, out of 180 suppliers, 150 are still located in China, while the supplier base in Vietnam and India is limited to 26 and 11, respectively.
- China refines 80% of the world's cobalt and 60% of the world's lithium, the two core inputs for high-capacity batteries.
- China currently supplies more than 80% of the photovoltaic modules to the world with over $50 billion in new investment.

Consistent push to increase collaboration will still leave vulnerabilities in the supply chains or open new vulnerabilities. Collaboration among allies may foster cooperation, yet it does not eliminate the imperative for individual nations to prioritize their national interests, often superseding the interests of their partners. Moreover, establishing multiple ecosystems for crucial supply chains proves economically unfeasible. Over time, the pursuit of cost and efficiency gains inevitably drives the consolidation of production in specific geographic regions, thereby exposing supply chains to heightened vulnerabilities.

These concentrations may arise due to various factors outlined earlier. Two notable instances from the past year highlight the repercussions of such realignments, further exacerbating vulnerabilities within the supply chain. These examples are reminders of the intricate interdependencies and risks inherent in contemporary global trade dynamics.

- Due to the Russia-Ukraine war, Germany found it necessary to reduce its reliance on Russian LNG. Consequently, this shift has increased dependence on LNG imports from the U.S.
- Following Malaysia's ban on chicken exports, Singapore experienced a surge in prices for its national dish, dubbed the "Chicken-rice crisis" by the media. This occurred despite Malaysia previously supplying approximately 34% of the chicken market. In response, Singapore diversified its sourcing, procuring chicken from 25 different countries, with Indonesia being a recent addition.

However, the expansion of sourcing to numerous countries has also widened the surface area of the supply chain, rendering it more susceptible to disruptions.

Increasing the stockpile of critical products, a.k.a. safety stock inventory, increases working capital requirements for the organization. Although maintaining a substantial inventory offers direct advantages in mitigating supply chain disruptions, implementing this strategy can prove challenging for companies. The heightened need for working capital and constraints imposed by shelf-life considerations inevitably escalate operating costs, a factor that may not sit well with stakeholders primarily concerned with profitability. Consequently, there is a pressing need to capitalize on the transformative capabilities of digitization to foster transparency throughout various supply chain tiers, as emphasized by Zhang et al. (2020).

Disruptions are the integral elements of supply chains

According to research conducted by the World Economic Forum and other reputable agencies, it is increasingly apparent that the effects of climate change will exacerbate the frequency of black swan events—unexpected and extreme occurrences with profound implications. These events can encompass a wide range of disruptions, from natural disasters to geopolitical upheavals, all of which have the potential to significantly disrupt global supply chains.

Recommended strategies for organizational/supply chain leaders

1. Exclusive team for creative risk scenario planning.

Setting up a dedicated cross-functional team under a CXO with unique skill sets to improve supply chain resilience. Again, it will be a small team setup using internal resources. We should be looking for individuals with the following skill sets and experience:

- multi-domain experience (supply chain/finance/manufacturing/technology hardware, data analytics, digital platforms);
- knack on building creative risk scenarios;
- high ownership mindset;
- self-starter;
- ability to "get work done;" and
- experience in organizational change management.

Because the supply chain disruptions are not going away, organizations can only stay ahead of competitors by building resilience. We have seen some recent examples of failures, and similar situations will continue to occur in the future.

- Failure of the outdated scheduling system was highlighted as one of the reasons for the massive chaos at Southwest Airlines during the last week of December 2022
- An incorrect database file was held responsible for the Federal Aviation Administration pilot alert system outage that stopped all commercial flights in the U.S. for a few hours on Wednesday, Jan. 11, 2023.

Such a risk assessment team can identify different kinds of scenarios that can help build risk mitigation strategies. That helps create the mindset of risk mitigation planning, which would be helpful with any real-world system that hits the organization.

2. Ring fence key talented employees who have domain experience and are gradually building technology and data analytics skills.

Building a rewards & recognition policy targeted toward individuals with domain experience and interest in building technology and data analytics capabilities is all the more important now than ever. This policy is essential to target employees with 3 to 12 years of experience (mid-level). Regular performance appraisal cannot be used to segregate such individuals.

The assessment process should focus on traits such as growth mindset, grit, self-starter, and adaptability to identify them.

According to a senior VP of supply chain at a Lifesciences MNC, the biggest bottleneck in their supply chain transformation journey has been the "availability of individuals with necessary skills."

Interestingly, with the abundance of free online resources, these traits could be identified by asking for clear examples for the following questions:

- Did they proactively register & complete any data engineering, analytics, change management, negotiation, or technical courses within the past two years?
- Have they proactively learned any new technical skill and used it to build specific tools, improve a process, or improve the quality of their work?
- For the completed courses, was it required to complete consistent weekly assignments or build a project? Was this work completed individually or while working with an external team?
- Did the individual take up diverse roles or proactively request involvement in projects outside his educational or previous work experience and required rapidly learning new skills?

According to the 2023 Korn Ferry Supply Chain Talent Study, companies are having challenges filling roles requiring three skills: end-to-end supply chain knowledge (57%), supply chain transformation (43%), data analysis & reporting (41%).

An interesting way to keep track of the skill shortage is to check the skills appearing repeatedly in the positions open within consulting companies.

This technique will help organizational leadership identify their talented employees. It's easier and more cost-effective to retain talented employees than to hire new ones.

3. Adopting chaos engineering within organization.

Chaos engineering deliberately introduces controlled failures or uncertainty into systems to test their resilience and identify weaknesses. The objective is to enhance the system's capacity to manage real-world failures and unexpected events, aligning supply chains with business needs (Lee, 2021). It is commonly facilitated by simulating failures or disruptions. This practice also aids in identifying bottlenecks and other areas of the system that require improvement (Akin Ates, 2022).

Companies such as Netflix (Chaos Monkey) and AWS have embraced this concept to improve system resiliency and response reliability. AWS has also built this as a service called Fault Injection Simulator. There have been instances of chaos engineering being employed to bolster resilience in technology architecture and supply chains. However, from a CEO's perspective, this concept can be applied across the entire business organization. It can be likened to the emergency preparedness planning and tabletop exercises conducted by the military.

H-E-B, a renowned Texas retailer, has won multiple praises for its emergency preparedness during the pandemic and other natural disasters faced by Texas over the last 20 years. Some of the critical features of H-E-B that are different from other companies are as follows.

- A dedicated full-time emergency preparedness team led by a senior executive
- They built their emergency preparedness plan in 2005 during the threat of H5N1. It was revised in 2009 during H1N1.
- During the pandemic, the emergency preparedness tabletop exercises were started as early as January 2020 after receiving news from China.
- They also took insights from Chinese retailers who had considerable experience in managing the crisis in the early days of the outbreak.

However, despite all the preparedness, they could not anticipate the toilet paper panic buying. That shows that despite rigorous planning, the unpredictability of consumer behavior may affect supply chains significantly.

4. SWAT team to start implementing long-term data strategy.

The time to take methodical and careful steps to build strategy and patient experimentation is over. Most organizations take time to select specific use cases and build a business case for implementation.

Mandating a leader to "experiment fast, fail fast" to identify use cases and rapidly build specific proof of concepts (POCs) is necessary to expedite the progress. Organizational inertia can be shifted by showcasing successful POCs and minimum viable products in a defined period and it is intertwined with their ordering and inventory policies (Xu et al, 2022).

According to a director of data analytics at a North American manufacturer, despite accepting the benefits of data analytics & AI toward the growth of business revenues, the adoption rate has been relatively slow due to a lack of a long-term data strategy. The teams still use spreadsheets to manage business operations and expect to continue to do so in the future.

Organizations sometimes hire external consultants to overcome this inertia while paying top dollar. A lot of it can be achieved internally by leveraging SWAT teams.

- A large North American pharmaceutical organization with a global presence has increased its pace of hiring supply chain professionals with deep data, analytics, and digital experience since 2020.
- Another North American organization has been evaluating the correct supply chain planning software to be implemented for the last three years.

This leader should have the following traits to be successful in this position.

- Strong stakeholder management experience and ability to influence leadership.
- Political climate assessment & change management experience.
- The knack for taking and facilitating timely decisions.
- Timely delivery of various programs: (getting things done).
- High ownership mindset.

5. Changing recruitment requirements for middle-level leaders.

While it is a known fact that experienced leaders across multiple domains can add more value to the business, the recruitment processes still require individuals in mid-level positions to be working in the same domain for 10 to 15 years. The recruitment stage rejects any external candidates not meeting the minimum experience. These rules are usually relaxed for internal candidates known to the hiring manager or teams.

When there is already a shortage of individuals with end-to-end supply chain and transformation program experience, it might be helpful to focus on changing such recruitment requirements. Some specific actions could be:

- showcasing (using profiles of company leaders) how diverse experience has been helpful to their career and organization;
- removing minimum "number of years" of requirements for non-regulated roles;
- analyzing profiles of the rejected candidates to understand the reasons behind the rejections; and
- increasing weightage on adaptability, achievements, and references, requiring an update to the application tracking system (ATS) search functionalities.

6. Understanding the regional culture and motivational forces.

Regional culture and customs can play a significant role in achieving the same level of efficiency and output as before realignment (Seuring et al., 2022)

A like-to-like factory with the same processes and number of skilled employees may still achieve dramatically different results. During supply chain realignments, companies trying to move into new regions endeavor to partner with a local partner for on-ground support.

Apart from this, it is also an excellent option to explore different ways of cultural immersion, such as watching essential regional movies, reading books by regional authors, and visiting locations where their new workforce is staying or eating. Some of this experience cannot be achieved by talking to a few regional leaders or attending online/instructor-led courses. One such recent example is the troubles faced by Apple while trying to diversify its iPhone manufacturing from China to India. Adapting the processes and ways to the regional context can deliver far better results. However, there will be an acceptable delay in achieving a similar output level. Moreover, adapting the ways to the regional customs may lead to higher efficiency in the long run.

Conclusion

Multiple research reports have confirmed that organizations ahead of the curve in building resilience will benefit from future disruptions. The time to take fast and decisive actions is now.

The team required to take such actions requires unique skills and mindset to achieve the required results. Based on the action plan and evidence above, you do not require external consultants to build these capabilities. A small, targeted team can start creating this change with the support of the right leader.
Along with that, a practical recruitment process and acceptability of regional differences can go a long way in achieving desired business results. •

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SPOTLIGHT ON

BUILDING RESILIENCE

By Brian Straight, editor in chief

Tariffs have been added to traditional disruptions such as climate and cybersecurity, creating a complex web of concerns for chief supply chain officers.

The new Trump administration has brought a heavy focus on tariffs. But for supply chain professionals, tariffs are just the latest in a long line of disruptions that must be managed. Geopolitics, natural disasters like the recent California wildfires, constant cybersecurity threats, and even the financial collapse of a supplier are just a few of the challenges chief supply chain officers face on a daily basis.

Sometimes, it is just too much. So, how do you go about building resiliency into your supply chain when faced with both known and unknown disruptions? It's not easy, but a recent report from RR Donnelley indicates that companies are trying just that. As nearshoring and reshoring conversations continue to dominate global trade headlines, and President Donald Trump floats widespread tariffs, 97% of survey respondents said they plan to reengineer their supply chain in the next two years, with 30% planning a "total and complete reengineering." As part of this, 69% of respondents are developing new relationships with alternative suppliers, 67% are increasing domestic sourcing, and 52% are seeking dual sourcing from geographically dispersed suppliers.

"Supply chain leaders are not just adapting, they are completely transforming their approaches to secure a more stable future," said John Marrow, president, Supply Chain Solutions, RRD. "Our report shows that while challenges remain, the right mix of innovation, risk management and proactive re-engineering can turn these challenges into opportunities for growth and resilience."

Inside the report

RRD's Future-Ready Supply Chain report revealed that 93% of supply chain leaders are at least somewhat confident in their resilience against future disruptions, with 66% saying they are very confident. The report, which surveyed over 300 supply chain decision-makers, highlights key strategies businesses are using to build stronger, more adaptive supply chains.

While talent shortages remain a concern, the report found inflation and price fluctuations are greater concerns in the future. Nearly all respondents noted an interest in supply chain re-engineering. Digging into the data a little deeper, RRD found the reasons for this included customer demand for a wider range of products (43%), rising transportation costs (42%) and enhanced supply chain visibility and control (42%).

Core strategies for building resiliency

While many companies are seeking supplier or geographic diversification, that is just one approach to building a resilient supply chain. Technology investments, contingency planning, and collaboration are tried-and-true methods that assist, and remain so today.

"Organizations that leverage [artificial intelligence] to become more resilient will gain an enhanced ability to sense, recognize, and react to disruptions as businesses continue to navigate an increasingly complex supply chain landscape," Darcy MacClaren, chief revenue officer, SAP Digital Supply Chain, said.

Writing in the January 2025 issue of *Supply Chain Management Review,* author Dr. Willow Yang, assistant professor of supply chain management at Sam Houston State University, and her co-authors noted the role supply chains now play as an important impetus to building resiliency.

"As supply chains are elevated to a critical component of national security and rise to the forefront of CEOs' strategic priorities, a renewed emphasis is placed on transparency, resilience, diversification, and technological innovation," they wrote. "Industry 4.0 technologies, including the Industrial Internet of Things (IIoT), blockchain, machine vision, robotics, artificial intelligence (AI), and machine learning, are at the heart of this shift. These transformative technologies are fundamentally reshaping how supply chains function, offering organizations unparalleled opportunities to bolster efficiency, transparency, and resilience through predictive analytics, automation, enhanced traceability, and real-time data integration."

These technologies are helping supply chains prepare for and respond to disruption, which is important because disruption is now ever-present.

"What were considered global 'black swan' events just two years ago are now a constant consideration for supply chain planning and execution. Resiliency 'actioned' is moving from investments into people, processes and technology with AI playing a key role. Data normalization is going to be key, along with investing in Centers of Excellence," explained Stephen Dyke, principal consultant manager, FourKites.

Courtney Rickert McCaffrey, EY's Global Geostrategic Business Group Insights Leader, believes scenario planning plays a key role in preparing supply chains for unexpected disruptions. On a recent Talking Supply Chain podcast episode, Rickert McCaffrey noted the challenges supply chains are facing today given the world's geopolitical climate.

"A lot of C-suite leaders really want predictability and certainty in the environment they face," she said. "That's actually more important … than maybe some of the specifics of what that environment is. Going forward, what we've seen is because of that uncertainty. A lot more C-suites and boards as well are turning to scenario analysis and tabletop exercises and other kinds of strategic foresight methodologies to try to … get their arms around [that uncertainty]."

Rickert McCaffrey noted that while companies can't plan for every scenario, there are ways to leverage what they can plan for to benefit the organization when the unexpected occurs. Scenario planning plays a significant role so organizations can "preposition their resilience," Rickert McCaffrey said, and identify "what they could change today, perhaps to create more resilience across a suite of potential scenarios related to that risk."

It is about creating a playbook that can be quickly implemented, Rickert McCaffrey said. Part of that playbook is also about rethinking the supply chain, which gets back to the RRD survey.

"What we're seeing is a lot of attention and desire to increase the resiliency of companies and global supply chains," Rickert McCaffrey said. "So, governments and companies are doing that in different ways depending on their footprint and their sector. But what we're seeing is some looking at localization in different ways, some looking at regionalization of supply chains.

"[It's] thinking about, not necessarily moves that need to be made today, but how to plan for how the world could evolve in the future. It's about identifying those actions or those strategies that you can take that would provide resilience across a variety of different potential scenarios."

Building supply chain resiliency is not a one-off event. It requires ongoing investment in technology, investment in innovation, and investment in partnerships. And it comes down to the ability to build a playbook that has enough answers to navigate the unexpected. •

Overcoming obstacles and embracing new supply chain priorities

Collaboration can help organizations remove barriers and achieve business goals.

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

So far, this year has been a continuation of 2024 with supply chains facing disruptions and challenges resulting from multiple factors beyond anyone's control. At the beginning of 2025, APQC wrapped up its 11th annual Supply Chain Management Priorities and Challenges research with 379 supply chain professionals from around the world and across multiple industries.

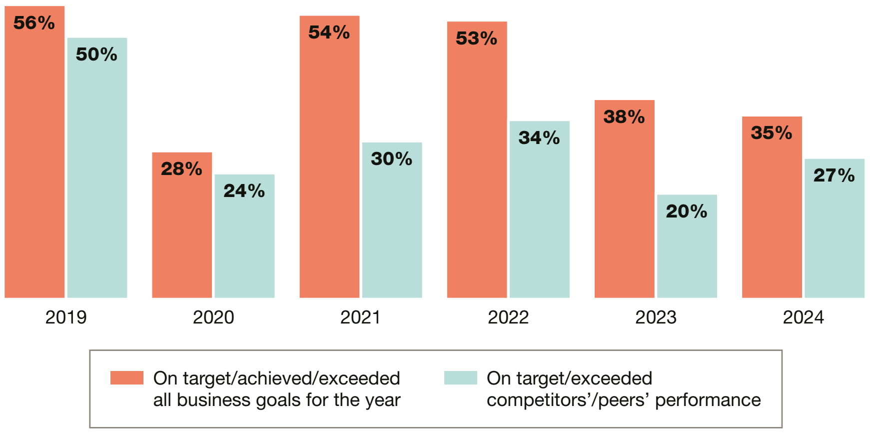
The research looked at organizations' supply chain management performance, priorities, and anticipated trends. The survey revealed that supplier relationships and supply chain visibility are top priorities for the year, although these are hampered by a lack of collaboration and challenges with the adoption of new technologies.

Current performance and obstacles

After years of instability, we can no longer be surprised when there is a supply chain disruption. Risks related to geopolitical issues, labor concerns, severe weather, natural disasters, and more have led to a downward trend with regard to organizations achieving their business goals (Figure 1).

FIGURE 1

Performance on 2024 business goals



Source: APQC

In 2024, there was a 7% uptick in the number of organizations that reported performing equal to or better than their competitors. This is still far short of the levels from before the pandemic, but perhaps indicates the start of a slow and hopefully steady improvement.

It is clearly a challenge for supply chain organizations to achieve their goals and match or surpass the performance of their competitors. Improving supply chain processes could help with these measures, but there are several obstacles preventing supply chains from making the necessary changes.

As shown in Figure 2, the top obstacle named by organizations is a lack of collaboration across functions and externally, followed closely by the implementation of new technologies.

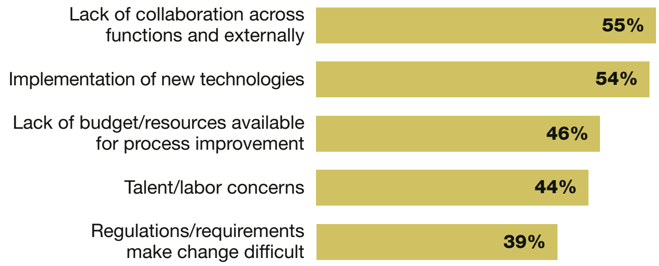
Supply chains encompass many different functions within an enterprise that must work together to ensure things run smoothly. In addition, supply chain functions must work with external partners such as suppliers and 3PLs/4PLs so that the entire chain performs optimally. More than half of organizations say that the working relationships among these functions and partners could be more collaborative, and that the lack of collaboration affects the company’s ability to improve.

Nearly the same percentage of organizations named the implementation of new technologies as an obstacle to improvement. New technologies such as AI, internet of things (IoT) devices, and drones add value and bring complexity to running supply chains. Many organizations use different legacy systems and continue to struggle with master data management. New tools may offer the promise of enhanced capabilities, but implementation requires training, investment dollars, and updated processes. An inadequate rollout can delay or prevent the organization from obtaining maximum benefit and return on investment.

Work on collaboration. Collaboration can take different forms, depending on whether both parties are within the same organization and the degree to which their work affects others. On the more time-intensive side, collaboration

FIGURE 2

Top five obstacles to improving supply chain processes in 2025



Source: APQC

can involve real-time meetings to identify points of collaboration, determine how they will work together, and how their collaboration will affect on-the-job actions.

Part of collaboration is sharing knowledge that benefits all parties involved, and knowledge management provides a framework for how that knowledge is captured and shared. This can be as simple as capturing ideas in a document that is shared with others. The organization must also determine how formal the efforts will be: whether knowledge will be captured in a centralized repository or passed directly from person to person. Some of these will be dictated by factors such as available resources, the existing infrastructure, and the level of buy-in for collaborative activities.

Changes in priorities

As part of its research, APQC asked survey respondents to identify their organization’s priority focus areas for investing resources, innovation, and hiring for 2025. As shown in Figure 3, the top two areas of focus are sourcing and procurement, and logistics and inventory management. This is the first time since 2019 that supply chain planning is not the top focus area.

The shift toward increased investments in procurement and logistics reflects organizations’ desire to change their strategies and tactics to mitigate the effects of ongoing supply chain disruptions.

Sourcing and procurement. This year, half of the organizations have made supplier and vendor relationship management a top priority for procurement (Figure 4). Next is risk mitigation, named as a priority by 34% of survey respondents. This may take the form of finding alternate suppliers to avoid relying on one region, factory, or supplier. Organizations may also choose to focus on their most strategic suppliers to create stronger relationships.

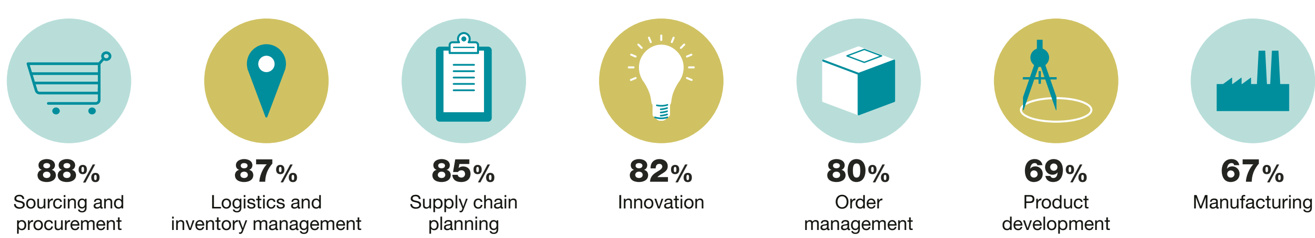
Looking at last year's research results, the percentage of organizations making supplier relationship management a top priority has increased (from 32% in 2024 to 50% this year). Many recognize the direct connection between strong supplier relationships and risk mitigation: these relationships allow for greater visibility into supply chain disruptions (and potential disruptions) and improved quality control.

One way organizations are creating closer relationships is through the Vested approach. In the Vested model, organizations develop highly collaborative, win-win relationships with their suppliers. These relationships start from a place where both parties are equally committed to each other's success. As a result, they can innovate in ways that improve service and reduce costs.

When considering the strategies they will take to reach their business goals, more than half of the respondents to APQC's survey say they plan to improve key supplier relationships. Over the last year, the percentage of respondents indicating this strategy has also increased from 40% in 2024 to 52% this year. These results align with organizations prioritizing supplier relationship management this year. Further, it supports the need for organizations to consider an approach like the Vested model to strengthen these key supplier relationships.

FIGURE 3

2025 overall supply chain areas of focus



Source: APQC

Logistics. Compared with research results from 2024, supply chain visibility is a top priority for more logistics functions. The percentage of organizations identifying it as a top priority in APQC's most recent survey is 61% (Figure 5), whereas in 2024 it was 47%.

As the last few years have taught us, supply chain visibility is critical in logistics and inventory management. Tracking goods and materials in real time enables organizations to pinpoint any unexpected bottlenecks and react swiftly to potential disruptions. Visibility also provides crucial support to the management of extended and outsourced supply chains because it ensures that organizations can follow raw materials from sourcing to the delivery of finished products.

After supply chain visibility, the next top priority for logistics is inventory management. Optimizing inventory can reduce both overstocking and stockouts, leading to cost savings. In fact, when it comes to the strategies organizations are adopting to meet their logistics goals, 62% are targeting inventory optimization.

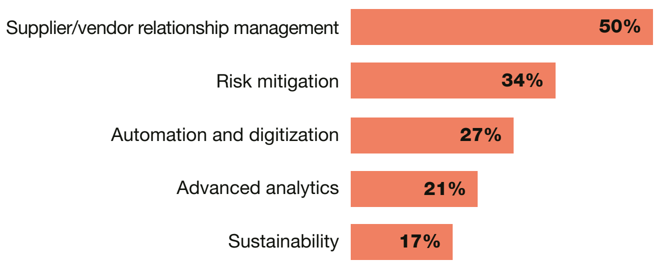
Other strategies organizations are adopting include standardizing processes (48%) and implementing methods to reduce transportation costs (46%). Standardized processes can support greater supply chain visibility. Organizations should consider standardized processes and strong data governance as necessary foundations and prerequisites for automation since automating a bad process just yields a faster bad process. Once key processes have been improved and standardized, then technology can help pinpoint opportunities for cost reduction and cycle time improvements.

Keys to success in 2025

With adaptability in mind, organizations should aim to innovate when thinking about 2025. There are opportunities to change which areas of the supply chain they focus on, as well as how they work with both internal and external stakeholders. Suppliers can be a source of innovation, and close relationships with key suppliers can result in new tactics that benefit both parties. Shifting from higher-level approaches to a closer look at processes, activities, and tasks within procurement and logistics can yield more actionable, tactical changes and improvements.

FIGURE 4

Top priority areas for sourcing and procurement



Source: APQC

With all the attention being paid to technology, it is too easy to lose sight of the importance of people and relationships to successful supply chain operations. Organizations should continue to invest in employee development to ensure that strategic decisions are well-informed and that operations continue in an efficient manner. People are also vital to effective collaboration. This key strategy requires staff who capture and share critical knowledge to improve efficiency, yield benefits, and develop innovative approaches.

If the last few years have taught us anything, it's that supply chains will face unpredictable changes and disruptions from multiple sources. Armed with that knowledge, supply chain professionals should plan accordingly. This means focusing on executing standardized processes while embracing change, developing novel solutions, and moving beyond ingrained ways of thinking to try something new. Thriving requires nothing less.

Data in this content was accurate at the time of publication. For the most current data, visit apqc.org. •

About APQC

APQC (American Productivity & Quality Center) is the world's foremost authority in benchmarking, best practices, process and performance improvement, and knowledge management (KM). With more than 1,000 member organizations worldwide, APQC provides the information, data, and insights organizations need to support decision-making and develop internal skills. Learn more.

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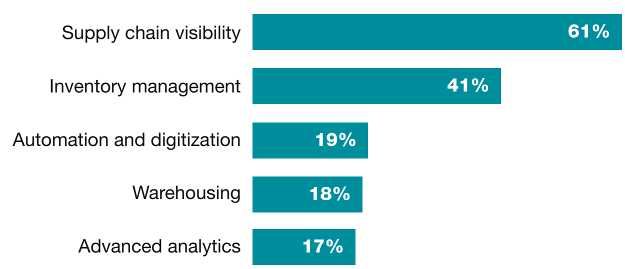
FIGURE 5

Top priority areas for logistics and inventory management



Source: APQC

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A SPECIAL SUPPLEMENT TO:

SUPPLYCHAIN
MANAGEMENT REVIEW

REACTING TO RISK:

AI'S ROLE IN SUPPLY CHAIN RISK MANAGEMENT

By Bridget McCrea, Contributing Editor

As supply chain risks continue to proliferate, more companies are turning to AI to help them identify potential disruptions, make data-based decisions and leverage new opportunities.

Supply chain risk just seems to be lurking around every corner right now, and it's being matched by a host of solutions that promise to help organizations more successfully identify, address and even avoid these risks altogether. As these problem-solving applications continue to proliferate, artificial intelligence (AI) is taking center stage as yet another "go-to" tool for risk avoidance.

By continuously monitoring global news, weather patterns, geopolitical instability, and economic indicators, for example, AI helps detect potential disruptions like natural disasters, geopolitical conflicts or unexpected demand shifts. Machine learning algorithms can also quickly assess historical supplier and carrier performance data to help companies identify the most reliable suppliers and efficient transportation routes.

The AI-supply chain risk connection, it seems, really couldn't come soon enough. According to a recent Supply Chain Intelligence Report from logistics real estate firm Prologis, 66% of the 1,000+ executives surveyed are "losing sleep" over supply chain issues right now. And, 86% say economic instability and geopolitical concerns are influencing supply chain decisions.

"Global supply chains face an unmatched 'polycrisis'—a web of challenges that span geopolitical tensions, economic instability, shifting regulatory pressures, fluctuating customer demands and pressing climate challenges," Prologis points out in its report. Just 40% of executives say they have the tools, resources and strategies to tackle cybersecurity attacks, technological disruptions and regulatory changes. And, preparedness drops even further for issues like geopolitical instability, trade wars, and climate crises.

"Lack of preparedness doesn't just heighten risk," Prologis points out, "it directly compromises organizational performance and the ability to adapt to unforeseen disruptions."

Suzie Petrusic, a risk expert in Gartner's Supply Chain Practice, sees more companies making proactive moves to avoid supply chain risk right now and says the issue is top of mind for most organizations. They realize that risk and volatility have become the new normal, and being prepared in advance for catastrophic disasters like the California wildfires, economic issues like higher import/export tariffs, and geopolitical problems like the Ukraine war can pay off in both the short and long term.

For example, Petrusic says companies are using buffers and backups to ensure that their networks continue to operate when the inevitable happens. That way, the inventory is in place to hold the organization over until it can get a more permanent response in place. This is just one of many ways companies are working to avoid issues like the pandemic-driven disruptions.

"Most organizations are trying to become more proactive at this point," says Petrusic, "because they're feeling the cost and operational performance impacts of constantly responding reactively."

A new ally on their side

As companies work to get out in front of the next supply chain risk they have a new ally in their corner. By analyzing real-time data and simulating various scenarios, AI helps predict potential disruptions and bottlenecks and empowers companies to make informed, data-driven decisions (e.g., where to put inventory, which suppliers are meeting service level agreements, which transportation providers are performing up to snuff, etc.).

Patricia Riedl, Americas supply chain and operations lead at Accenture, says AI can help drive down supply chain risk on two different fronts: making better predictions about what might happen and then responding faster—and autonomously—to these issues before they boil over into major problems. These two capabilities usually work in tandem. An AI-enabled digital twin replication, for instance, can map out all plant nodes, distribution centers, labor pools and product flows. It can then be used to stress-test the end-to-end supply chain.

"You can either start from the end of the supply chain and trace everything back to the consumer or vice-versa to understand what the connected impact of a disruption is across the supply chain," says Riedl. From there, companies can use AI to build out a quick-response operating model that incorporates data-driven, autonomous responses that don't require any initial human reaction. From there, team members can use established governance models to address issues like incomplete data sets.

Improving overall supply chain outcomes

With its knack for ingesting and making sense of large amounts of complex data, AI is also helping companies improve overall supply chain outcomes. For instance, Riedl says demand planning is one area where AI supports better decision-making and risk reduction. "This is where AI first came into play in the supply chain space," she says. "It made sense because predicting demand is extremely difficult, and the more external data that planners can bring into forecasting algorithms, the closer it gets to 'what you think you're going to sell where and when.'"

Take the beverage producer that wants to target beer consumption levels right down to very specific geographies during the summer months, for example.

To make the best predictions it needs to know expected weather conditions, competitive price points and expected sales volumes. The company also needs to know what major events (i.e., local festivals, concerts, etc.) are taking place in each geography.

"All of that data can be brought into a set of AI-driven algorithms that deliver a micro-targeted view of demand," Riedl says. Then, the company can use that intelligence—and, even more AI-enabled solutions—to determine specific volumes of inventory to each specific geography. This level of precision would take months or longer for someone to handle manually using myriad different internal and external sources, but AI can handle the heavy lifting in a fast and efficient manner.

Up next, Riedl expects more companies to start using agentic AI systems to run their supply chains and address the associated risks. This type of AI exhibits goal-directed behavior and adapts its actions to achieve outcomes in dynamic environments like supply chain. "Eighteen months age we weren't even talking about agentic AI," she says, "but now we have several examples of companies using it to drive the inefficiency out of manual processes. We expect to see more of that."

Look outside your four walls

Calling supply chain risk a "board-level dilemma," Interos CEO Ted Krantz says visibility remains a major pain point for companies that don't really know what their extended supply networks (e.g., Tier 2 and down) are doing. This lack of oversight can create substantial risk in a world where everything from weather events and factory fires to conflict minerals and cyberattacks can derail even the best-laid supply chain plans.

According to Interos, more than 480 S&P 500 firms are directly linked to high-risk regions; 3.3 million global firms have cybersecurity threat exposure; and 20 million companies will be impacted by catastrophic events this year alone. Krantz sees AI as a facilitator in the race to more effectively assess and mitigate these and other risks. However, he says these systems must factor in both internal and external data, the latter of which can be difficult to identify, gather and assimilate.

For example, Fortune 1000 companies have an average of 17,500 direct suppliers and 1.5 million relationships, according to Krantz. Knowing what all of those entities are doing at any given point is nearly impossible. AI can step in to help, but only if it's properly primed with the right data. "Forming an opinion around decision support in a supply chain ecosystem requires market relevance—both public and proprietary," Krantz says, "and not just your data and what you know about your supply chain."

Understanding the limits of the technology

As more companies start using AI to ingest and sort through massive amounts of data, risk identification is becoming an important use case for the advanced technology. The related applications help organizations determine what's most important, and then puts math and analytics into predicting geopolitical problems, supplier failures, ESG risk, tariffs or whatever else is being thrown at global supply chains at any given time. Most importantly, AI reduces the time it takes to identify, assess and react to these and other events.

"AI gives companies the power to sense what's happening very early, and alerts them about issues like supplier insolvencies before those types of issues turn up in the news," says Petrusic. Some organizations are also leveraging AI to help map out their supply chains. This particular kind of technology works best for organizations that have second- and third-tier supply bases, she explains, and lack a good understanding of what's happening in those segments of their supply chains.

"AI can help them understand what that map looks like by pulling in data from different sources, and then sorting that data and identifying what's important," says Petrusic. Armed with that information, companies can gain a better understanding of their current state and potential supply chain risk.

And despite what you may have heard, Petrusic says what AI can't do is predict the future. That means 100% accurate predictions around emerging risks are still a guessing game, at least for now. "If you have a relevant data set around a supplier failure, then the AI-enabled technology is going to be extremely helpful, but I don't know of a technology that can warn you in advance about a catastrophe like the Maryland bridge collapse," she concluded. "There are still limits around what the technology can really do for you." •

Digital Freight Matching Roundtable:

EVOLVING FOR A DIGITIZED FUTURE

By Jeff Berman, Peerless Media News Editor

As market conditions remain flat and capacity continues to loosen, digital freight matching (DFM) leaders are preparing for a technology-driven rebound, focusing on AI and automation to optimize future growth.

While the freight recession has been ongoing for more than two years, that does not translate into any type of lull for players in the digital freight matching (DFM) market—not by any stretch. Despite the current downturn in demand and tonnage, recent signals of increased freight activity offer a glimpse of optimism, fueling efforts to prepare for a higher-volume environment ahead. In fact, key industry stakeholders—shippers, carriers, brokers, and service providers—are more focused than ever on the future, particularly as freight processes grow increasingly digitized and automated.

Joining Peerless Media this year to help shippers put the DFM market into perspective are Evan Armstrong, president of Armstrong & Associates; Ben Gordon, managing partner of Cambridge Capital and managing partner of BGSA Holdings; and Lee Klaskow, senior freight transportation and logistics analyst at Bloomberg Intelligence.

Peerless Media: How do you view the current state of the digital freight matching market?

Ben Gordon: The digital freight market today is battered and bruised. We've just lived through the worst two-year freight recession in U.S. truckload history. And the bodies are strewn across the battlefield: truckload carriers, truck brokers, and digital freight companies. That said, the best companies are surviving, and should use this downturn as an opportunity to consolidate.

Lee Klaskow: In a word: exciting. The digital freight matching market evolution has been accelerated by the growth in artificial intelligence (AI). AI has been one of the few hyped developments that has true promise for all the industries that embrace it. We believe we're in the early stages of a transformational time for the freight industry.

DFM is becoming more sophisticated and powerful for shippers, capacity providers, and brokers. When used properly, these tools can drive better decision-making and profitability for all stakeholders as well as reduce fraud. All that being said, we expect the market will rationalize itself given the flood of new products that are using AI or machine learning.

Evan Armstrong: For the most part, medium and larger domestic transportation management/freight brokers are now utilizing either proprietary DFM algorithms within their transportation management system [TMS], or are using 'bolt on' DFM applications like Parade, or to a lesser extent Trucker Tools, to automatically match motor carriers to shipments. We have dubbed these Intelligent Capacity Systems.To see the real impact of the technology, 3PLs are paying closer attention to loads handled per-person per-day and revenue per-person per-year. These two key operating metrics can quickly tell you how efficient a freight brokerage operation is. From a buy-side, merger and acquisition [M&A] perspective, we look at these measures and use them in determining the enterprise value of a freight broker and how much they can benefit from further automation.

PM: What are some of the most pertinent trends you see evolving within the DFM space?

Klaskow: I'm going to be talking about AI ad nauseum today. It will be driving where the DFM market goes from here. I remain excited to see where the technology takes us and how it makes brokers, shippers, and capacity providers more productive.

As you know, there are a lot of inefficiencies inherent in trucking. DFM can help take some of those inefficiencies out, which could result in more efficient supply chains as well as lower costs, lower rates and more profitable loads. As I mentioned earlier, the tools that fight fraud are critical for every broker to have at their fingertips.

Armstrong: Best-in-class digital user experiences are becoming expected by motor carrier partners and shippers. Automated functions such as search, pricing, booking, and payments are now table stakes. Freight broker digital experiences are expected to be on-par with consumer digital experiences, and the digital platforms are exploiting this gap.

Straight-forward, user-friendly digital experiences help build sticky carrier capacity and create more liquidity on a freight broker's platform, allowing them to transact and execute bookings more easily.

Early adaptors, who build liquidity, will reap rewards in the form of valuable freight platforms with readily available carrier capacity. Every digitalized freight broker is focused on data-collection to continuously drive improvements in its carrier experience and freight matching. Gordon: I'll add that the big theme is convergence. The top DFM companies have built outstanding technology. But, so have the top traditional brokers. To customers, as the saying goes, 'it all tastes like chicken.' They view DFMs and brokers as similar solutions for the same problem: how to move freight effectively and efficiently.

> "The big theme is convergence. The top DFM companies have built outstanding technology. But, so have the top traditional brokers. To customers, as the saying goes, 'it all tastes like chicken.' They view DFMs and brokers as similar solutions for the same problem: how to move freight effectively and efficiently."
>
> *—Ben Gordon, Cambridge Capital, BGSA Holdings*

PM: With market conditions similar to last year at this time, with lower rates and excess capacity, how much of an impact does that continue to have on the DFM marketplace?

Armstrong: With the ongoing freight recession which started in late 2022, we estimate that the domestic transportation management 3PL market segment, which is 84% freight brokerage and 16% managed transportation, will decline another 4.2% in 2024 to $118.4 billion. For freight brokers, DFM is very important in times of tight carrier capacity to find capacity in the spot market. In the current environment, it's more about managing a loyal carrier base, increasing utilization within that base to ensure solid operational performance, and meeting the needs of contractual shipper customers.

Gordon: We remain near the bottom of the worst freight recession in history. This squeezes margins for DFMs as well as traditional truck brokers. That said, we're starting to see an improvement in rates. The data from Greenscreens.ai, the market leader in predictive pricing in trucking, shows that we're beginning to see a bounce back.

Klaskow: These technologies are partly to blame for the slow pace of trucking capacity coming out of the market. They provide small truckers with the resources to reduce empty miles and make informed business decisions about which loads to take.

The progress made over the last two years with DFM platforms will be felt more when the freight market turns from the current doldrums. It will allow brokers to scale their business at a faster pace than headcount and will give more options for truckers. I'm excited to see the productivity gains at freight brokers when demand picks up, which should result in better margins [this year].

PM: Do you see more entrants coming into the marketplace in the next couple of years, or are things in more of a holding pattern, given events like Convoy's exit [in 2023] as well as the sales of Coyote and the Transfix brokerage group?

Klaskow: Yes. This can be a good thing and a bad thing. The market is already saturated with companies looking to 'disrupt' the freight markets. This, along with plenty of private equity money, has helped nurture a number of companies during the downturn. It will be the market's job to figure out which of these companies have value and which don't. For niche players, being acquired into a larger platform might be the only option for those that can't build scale.

Armstrong: Given higher interest rates and Convoy's exit, we're seeing more DFM adaption within legacy freight brokerage operations and less outside investment in pure digital freight brokers. We think RXO acquired Coyote at a below market EBITDA multiple, and it was a strong strategic investment. With the adaptation of DFM and increased investment in other technologies by legacy freight brokers, it's getting harder for new entrants without network scale to compete. While it's still narrow, the competitive moat amongst leading freight brokers is getting wider.

Gordon: Lee and Evan both make some great points here. I will note that I'm not seeing more entrants. I am, however, seeing consolidation of existing entrants.

PM: What types of stakeholders are making the move into this segment and why?

Armstrong: As interest rates come down, we'll start to see increased targeted outside investment in 3PLs and in innovative point solutions for DFM; upfront quoting and pricing; visibility; and freight brokerage back-office functions. Strategic investors will continue to look for ways to fill operational and geographic scale through further M&A. This will include the acquisition of DTM 3PLs, and solutions providers.

Gordon: We're seeing consolidation across modes [LTL, TL, air, ocean], geographies [European and Asian companies buying U.S. platforms], and business models [DFM, traditional brokerage]. I expect we'll see more activity across all three themes.

> "The DFM market evolution has been accelerated by the growth in AI. AI has been one of the few hyped developments that has true promise for all the industries that embrace it. We believe we're in the early stages of a transformational time for the freight industry...DFM is becoming more sophisticated and powerful for shippers, capacity providers, and brokers. When used properly, these tools can drive better decision-making and profitability for all stakeholders as well as reduce fraud."
>
> — *Lee Klaskow, Bloomberg Intelligence*

Klaskow: Private equity remains active in transportation-related tech due to the market size and perceived ability to fix inefficiencies in the market through technology.

You're also seeing more traditional brokers make investments in the space to drive productivity and to remain relevant to customers that want to have the option for automation and human contact—and everything in between.

PM: Who are the biggest—or most important—players in this space, and what makes them stand out?

Gordon: First, there are DFM pure plays. But those have changed. Convoy sold to Flexport. Transfix sold its services and kept its technology. Uber Freight is really integrated with Uber.

Second, there are traditional truck brokers. Giants like RXO, C.H. Robinson and Echo have invested hundreds of millions of dollars into technology. They differentiate by virtue of combining technology with services.

Third, there are emerging specialists. This includes niche winners in fields like cold chain, LTL, and cross-border. And there are fast-followers, like Everest, who use best-of-breed technology like Greenscreens.ai, Revenova, and others, then integrate them to provide a superior combination.

Klaskow: Amazon Freight, Uber Freight, C.H. Robinson, Redwood Logistics, J.B. Hunt, and RXO are household names. It will be interesting to see the evolution of RXO once it closes its Coyote acquisitions. We're under the impression that the RXO tech will be beating out the legacy Coyote platform.

All these players have size that helps them stand out. We're seeing more traditional brokers getting into the market out of necessity to compete. We don't think a tech-only platform is the solution. It needs to be paired with people. This hybrid model of technology and people will win the day in our opinion.

Armstrong: Uber Freight and leading tech-enabled legacy freight brokers C.H. Robinson and RXO have automated shipment quoting, tendering, and acceptance with shippers. They're also automatically matching spot market loads to carriers. Most is done within private carrier networks using lane history.

In addition, they have 'book-it-now' functionality with carriers for automated tendering and acceptance and can real-time track 80% of shipments. Small- to mid-sized 3PLs often do not have these capabilities unless they partner with technology companies such as DTM AI providers Parade for DFM, capacity management, and instant booking, or Greenscreens.ai for upfront pricing.

PM: Do you think shipper usage and adoption of DFM technology has increased or decreased over the last year?

Klaskow: It has increased and will continue to increase as work flows evolve with technology advancements. It's hard to imagine shippers going back and decreasing their reliance on DFM technologies. The genie is out of the bottle, and there is no looking back.

Armstrong: Most shippers' systems interaction with freight brokers is via applications that rate shop the spot truckload market via freight broker quotes versus their contractual carrier and freight broker rates using application such as AVRL.

Outside of the rate shopping, most shippers are still managing primarily contractual carrier and freight broker relationships under a traditional lane-by-lane waterfall process with primary to tertiary carriers; however, the use of shipper load boards and interest in putting more volumes out for spot quoting is on the rise. For pure DFM technology, most shippers rely on freight brokers that are actively using DFM.

Gordon: I think shippers have increased their usage of technology. Some of that has come from DFMs. Some has come from pure-play technology companies. We've seen this in the Cambridge Capital portfolio, with ReverseLogix for returns, Parcel Perform for post-purchase tracking, Bringg for last-mile, and GreenScreens.ai for pricing. And some of that adoption has come from the fast follower 3PLs.

> "Transactional freight brokerage is getting closer to the automation levels seen in managed transportation. And in 2025, we estimate that there will be more than 50 truly digitalized digital freight brokers in North America that will account for more than 60% of total DTM segment gross revenues...We will be at a point where more than 10% of spot truckloads in the U.S. will be automatically tendered and booked with carriers."
>
> *— Evan Armstrong, Armstrong & Associates*

PM: Where do you see the DFM market in the next three years to five years?

Armstrong: We're getting to the point where the largest digitalized freight brokerages are seamlessly being tendered truckloads at a contractual or an automated spot price via interfaces from a shipper's TMS to the broker's TMS, and a broker's intelligent capacity system is then selecting the optimal carrier based upon detailed and data-rich smart carrier profiles, lane history, and multiple other data points.

Using the TMS, an appointment will be scheduled if needed. This will trigger the visibility management system to initiate transit status updates until delivery where back office automated proof of delivery information is uploaded into a TMS and freight bill payment/carrier settlement is triggered.

Transactional freight brokerage is getting closer to the automation levels seen in managed transportation. And in 2025, we estimate that there will be more than 50 truly digitalized digital freight brokers in North America that will account for more than 60% of total DTM segment gross revenues. We will be at a point where more than 10% of spot truckloads in the U.S. will be automatically tendered and booked with carriers. This number will increase further over the next five years.

Klaskow: My guess is that more and more loads will be transacted without human interactions. That's not to say that the freight world will be taken over by robots. People will remain key within the freight brokerage industry. It's that human connection that's critical between brokers and carriers as well as between brokers and shippers.

The ecosystem can focus on building out these relationships. In addition to relationships, brokers will be able to help customers with exceptions or more complicated loads. I also hope that the technology developments will be able to root out fraud. It's amazing the uptick we have seen in fraud within the trucking market. Technology is our best defense to sniff out bad players.

Gordon: In three years to five years, I believe the DFM market will be integrated with the traditional truck brokerage market—one large market. •


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