SUPPLY CHAIN MANAGEMENT REVIEW

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The disappearing supplier

PAGE 16

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BRIAN STRAIGHT *Editor in Chief* bstraight@peerlessmedia.com

Suppliers may evaporate, but leadership does not

Supplier volatility is just another risk that must be actively managed, and that means setting up processes to monitor all suppliers, not just those perceived to be most important.

When we talk about risk management, we often focus on the physical—weather, tariffs, even cyber. What we don't usually mention is the risk your suppliers bring if they are not financially sound.

It is one of the hardest truths supply chain leaders continue to confront. Stability is often an illusion. Suppliers that appear financially sound and our strategically aligned can disappear with little warning. That reality is at the heart of this month's cover story, "Suppliers can evaporate: Five ways to improve SCM risk management," which offers a practical and at times uncomfortable reminder: risk in supply chains cannot be eliminated, only understood and managed more intelligently.

In an era of supplier bankruptcies, transportation failures, geopolitical disruption, and financial volatility, the most dangerous posture for supply chain organizations is complacency. As the article outlines, effective risk management today depends on better visibility into supplier health, smarter contracting practices, disciplined insurance and liability controls, and balanced supplier portfolios that emphasize redundancy without sacrificing performance. In short, risk management is no longer a periodic audit exercise, but a continuous leadership discipline.

Moving on from risk, I want to announce that we are introducing a new feature this month. But, it is only available to our digital subscribers. Our first **Digital Extra** article, "From operations to orchestration: The CSCO's nexus role in a synergistic C-suite," explores how the chief supply chain officer has moved from functional executor to enterprise integrator.

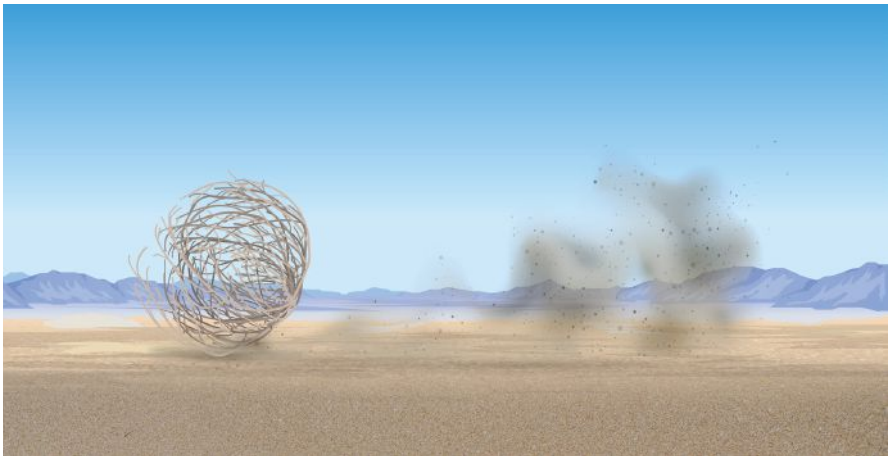
As supply chains become the connective tissue linking finance, technology, operations, and customer experience, the CSCO increasingly serves as the orchestrator of enterprise performance—not just a cost or logistics leader.

This Digital Extra is available exclusively to Digital Edition subscribers, and to all subscribers with an active account on **scmr.com**. We plan to publish several Digital Extra articles throughout the year, allowing us to go deeper into emerging leadership, technology, and organizational issues without the physical constraints found in our print format. So please check that out.

Finally, I'd be remiss not to look ahead. Planning is well underway for the 2026 NextGen Supply Chain Conference, and we are actively seeking practitioner speakers from organizations operating in our four focus areas: logistics and fulfillment, retail, chemicals and pharmaceuticals, and food and beverage. If you are leading real-world supply chain initiatives in these areas and are interested in sharing your experience, I encourage you to reach out directly.

We have also revamped our NextGen awards program for 2026, introducing clearer categories that reflect how supply chains are actually evolving—including Intelligent Transformation, Autonomous Operations, Visionary, Startup, and Partnership in Execution awards for both end users and solution providers. Full details and submission information is available on the NextGen website at nextgensupplychainconference.com, and I encourage you to consider nominating your organization or partners.

Brian Straight



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Futurists: Dubious long-term planning help

Futurism often overpromises insight into distant futures while offering limited practical value for the real planning decisions supply chain leaders must make today.

By Larry Lapide

A newly released book caught my attention recently. It is titled: *Could Should Might Don't: How We Think About the Future*, and written by Nick Foster. Andrew Stark wrote a review of it in the *Wall Street Journal* on Dec. 31, 2025. As someone interested in forecasting and supply chain planning, the title of the review immediately resonated with me: "A profession of prediction."

The book, however, talks less about business managers engaged in forecasting & planning, and more about what are termed futurists, such as those that go on speaking tours, as well as some science fiction writers & movie producers postulating future utopian/dystopian societies (e.g., the "Hunger Games" movies). The resulting talks, books and movies are interesting and highly speculative about these futures; yet they are somewhat "far-out" literally and figuratively (e.g., in terms of distant futures and outer space exploration). Today's most active futurists are focused on the recent uptick in interest in artificial intelligence.

Some futuristic thinking, back in the day

In 1968, the Club of Rome, an organization of intellectuals and business leaders, was founded to address global issues. It conducted computer simulations of the future. It attracted a lot of attention in 1972 with its first report, "The Limits to Growth."

"The report hypothesized that the growth of production and consumption could not continue indefinitely because of either resource depletion or high levels of pollution," according to a Wikipedia report on its findings. The report was a best seller, as well as a related book titled *The Population Bomb*, co-authored by Paul R. Ehrlich and Anne H. Ehrlich. The latter predicted worldwide famines due to overpopulation, as well as other major societal upheavals. It advocated immediate action to limit population growth. Today, we know that through innovation and advances in mass production, mankind's growing basic needs (e.g., for energy and food) have been and likely will be met for some time. It is forecast that the growing worldwide population will peak in 2084 at just under 10.3 billion from about 8.2 billion today. However, we still struggle to mitigate climate change due to high levels of CO_2 pollution.

There is a lot of speculation from futuristics regarding the good, bad, and the ugly futures that might arise from the increasing use of AI. An online *WSJ* article, titled "Models Will Run the World," was subtitled "The software revolution has transformed business. What's next? Processes that constantly improve themselves without need of human intervention" (Aug. 19, 2018). This smacks of a science-fiction viewpoint that robots will fend for themselves and take over the world such as depicted in the 1968 science fiction film "2001: A Space Odyssey." In it, a computer named HAL is slowly taking over the management of a spaceship in outer space. (A piece of trivia is that the HAL name was chosen because it is an alphabetic sequence shifted by one letter from IBM—the technology powerhouse at that time.)

In my Insights column "AI update: Decisionmaker or decision supporter?" (July/August 2024), I reiterated my earlier optimistic view that: "The promise of AI offers greater decision-making power, but there are some crucial decisions that AI just should not make).

The *Could Should Might Don't* book review

Mr. Stark's review of the book begins with a statement summarizing Mr. Foster's skeptical view of the futurism industry—of which he has been a part of for many years. That is: "Given the future's opacity, why should we expect self-appointed futurists—all those jet-setting consultants, risk analysts and TED Talk

presenters with their trend lines, and game plans—to know any more about what is going to happen than the rest of us." Mr. Foster labels four segments of his industry, as follows.

1. ***Could futurism.*** Driven by science fiction and claims the future will inevitably entail use of solar-powered cars, delivery drones, and jet-packs. It's happening whether you like it or not, because it is great stuff.
2. ***Should futurism.*** Discuss charts that show paths toward achieving future objectives. Seeing the future as knowable and amenable to our control.
3. ***Might futurism.*** Deems the future as an environment of uncertainties. Using risk analysis and game theory, it strategizes possible scenarios under which everything will be all right, and businesses will thrive.
4. ***Don't futurism.*** Originates in dystopian novels and exists "to dispense warnings, highlight issues, and point out consequences."

After studying each segment's activities, Mr. Foster concludes that "futurists disagree over how much of the future lends itself to our control and foreknowledge. Many focus too much on the grandiose. Furthermore, since the mundane is where most of us live [especially supply chain managers], futurists have failed to deliver even a low-resolution picture of the world in 10 or 50 years."

Futurists offer minimal planning support

My takeaway from Mr. Foster's exposé is that generally, futurists will offer little help to business forecasters and planners who rely on quantitative models to do operational, tactical, and even strategic planning. Most operational and tactical planning processes (such as the sales and operations planning process) usually involve decision-making under certainty or risk (vis-à-vis uncertainty). If any of these processes need futurist input, it would be strategic planning that has a planning horizon up to 15 years out. However, that long-term future is uncertain and unforeseeable.

Thus, a strategic planning process typically relies on scenario planning. As discussed in *Insights*, "Strategic planning under uncertainty: Long-term muddling-through" (July/August 2021), this approach entails developing multiple realistic future scenarios—often three, and commonly labeled as optimistic, most likely, and pessimistic. Much like the might futurism approach, organizations build strategies for multiple possible futures so they are prepared regardless of how conditions evolve. A decision process then guides which strategy to pursue to support long-term survival and success.

Conclusion

The key to the scenario planning process is developing realistic futures that may come to pass. I originally thought futurists might help model these. However, per Mr. Foster, "they have failed to deliver even a low-resolution picture of the world in 10 or 50 years." Thus, managers doing strategic planning would be best modeling their own futures because they know their own company's capabilities, how to compete, and their industry's trends best.

As I was writing this column my eye caught a huge one-page advertisement in the *WSJ* by Bain & Company (January 21, 2026). Bain—for those who might not have heard of it –was founded in 1973 and is a management consulting company specializing in business strategy. It was an offshoot of the Boston Consulting Group. The ad had five simple statements.

1. "Prediction looks ahead."
2. "Conviction moves you forward."
3. "In a world that changes daily, acting with clarity is more powerful than waiting for certainty. We help leaders find focus, respond now, and adapt as conditions evolve."
4. "Stop Scenario Planning."
5. "Start building a macro strategy."

At first glance I thought that Bain had given up on scenario planning. However, I think I interpret it as saying—do it; however, at some point, you have to commit to developing and deploying a strategy with conviction. It should not be a passive activity because the world is changing too rapidly to stand still.

I have to admit that I may have been perceived as a futurist in some of my MIT Supply Chain 2020 Project-related talks around the world. They were marketed as "a peek into the future." In 2004, I joined the MIT CTL group to launch a project looking at what excellent supply chains might look like 15 years out. I managed the project launch for its first three years. The project identified scenario planning for use in strategic planning and three scenarios dealing with the level of global free trade that might take place in the future. We also identified six major macro-factors that would shape future supply chains. They were as follows.

1. The aging of developed countries.
2. Oil prices.
3. The power shift toward the east.
4. Trading bloc formation.
5. Globalized green law.
6. Pervasive technologies.

See Insights (May/June 2012), titled "SC2020 Project Update: Uncertainties," for my latest update on these. After reading about Mr. Foster's book, I'd say my talks dealt 'with the mundane' where most supply chain managers live. I was trying to give them advice on the uncertainties of future global demand-supply chains. This was in contrast to other speakers at supply chain conferences at which I spoke at, who were upbeat about the future. So in conclusion, I'd say I was not a typical futurist. But being honest, I really love listening to those grandiose futurist talks, rather than ones like mine. •

Why Scope 3 demands collaboration—not just compliance

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Scope 3 is not a firm-level problem. It is a system-level problem, and it requires system-level solutions.

By Dr. Sreedevi Rajagopalan and Tori Arnold

Corporate climate credibility increasingly hinges on Scope 3 emissions, and yet individual companies have the least direct control over these emissions. Meeting ambitious Scope 3 targets requires industry-level collaboration that rewires incentives, standardizes expectations, and lowers the cost of decarbonization, especially now that turbulent climate, trade, and tariff policies can abruptly change the economics of low-carbon supply choices. Policy and tariff volatility does not simply increase costs; more widely, it disrupts sourcing strategies and undermines long-term decarbonization pathways by constraining access to low-carbon inputs.

Scope 3: Where the footprint really sits

For most companies, the majority of greenhouse gas emissions do not come from their own operations or purchased energy. Instead, they sit upstream and downstream in the value chain, embedded in purchased goods, supplier manufacturing, transportation, and distribution. These indirect emissions, known as Scope 3, typically account for around 75% of a company's total carbon footprint, according to CDP Worldwide Technical Note: Relevance of Scope 3 Categories by Sector (version 3.0).

Over the past decade, many organizations have made steady progress on Scope 1 and Scope 2 emissions. They have improved energy efficiency, shifted to renewable electricity, and optimized their own operations. Scope 3 emissions, however, present a fundamentally different challenge: they span thousands of suppliers, multiple tiers, and diverse geographies. This remains a persistent blind spot amid

mounting regulatory pressure from the EU Corporate Sustainability Reporting Directive (CSRD), and investor demands via the Carbon Disclosure Project (CDP) and the Science Based Targets initiative (SBTi). The result is a paradox: Scope 3 emissions matter most, but individual firms have the least visibility and leverage over them. Breaking this paradox requires treating Scope 3 emissions as a systems problem—one that no company can solve in isolation.

Why measuring Scope 3 emissions is so difficult

Across industries, the most frequently cited challenge in measuring Scope 3 emissions is the lack of supplier data. This forces companies to rely on imprecise spend-based estimates that mechanically link emissions to expenditure levels, overstating emissions for high-spend but low-intensity categories and substantially understating emissions for high-intensity categories. Methodological inconsistencies further complicate this, particularly the absence of standardized approaches and the complexity of calculating emissions across global supply chains. Companies must choose between spend-based estimates, supplier-specific data, or industry averages, often applying different approaches across categories and regions. Without widely adopted standards, results are difficult to compare across firms or over time.

Capability gaps further slow progress, ranging from limited internal expertise and high software costs to concerns around data privacy. In practice, many organizations still rely on spreadsheets to manage Scope 3 data. While spreadsheets may be useful for initial reporting, they do not scale to complex global supply chains or support continuous improvement. Together, these constraints mean that even highly motivated firms struggle to establish reliable Scope 3 emissions baselines.

Why reducing Scope 3 is even harder

Measuring Scope 3 is only the first hurdle. Turning numbers into meaningful reductions is often more challenging, even for companies that understand where their emissions are concentrated. The most frequently cited barrier to Scope 3 reduction is a weak business case. Many corporate investment decisions are evaluated on relatively short horizons, yet the benefits of upstream decarbonization (improved data transparency, greater investor confidence, and reputational gains) often accrue over longer periods. This conflict mirrors the difficulty of justifying investments in supply chain resilience: the payoffs are significant, but they arrive unevenly and prove difficult to capture in a traditional business case, making capital-intensive decarbonization projects difficult to justify. High implementation costs reinforce that perception, especially in sectors where margins are thin and payback periods are long.

Lack of aligned incentives is another constraint. When sustainability requirements are fragmented across buyers, each buyer sends unique questionnaires, sets different thresholds, and requests bespoke data formats, leaving suppliers to navigate a tangle of overlapping and sometimes conflicting requests. Responding becomes administratively expensive, leaving fewer resources for actual emissions reductions. At the same time, if no buyer offers credible long-term demand or cost-sharing, suppliers have little incentive to move first on capital-intensive decarbonization projects. Trade and tariff volatility tilts buyer priorities further toward short-term costs and political risk management, encouraging sourcing decisions that favor price stability or tariff avoidance over emissions performance.

Regulatory uncertainty further complicates planning. While disclosure requirements are expanding, companies remain unsure how rules will evolve, which methodologies will prevail, and how data will be verified. Such uncertainty discourages long-term investment and results in many firms carrying the accountability for Scope 3 targets without clear levers to meet them. This dynamic reveals a central truth about Scope 3: no single company can realistically train, fund, and decarbonize its entire supplier base on its own.

Recognizing these constraints, companies have increasingly turned to supplier engagement as a lever for Scope 3 reduction. Common approaches, such as incorporating sustainability criteria into supplier selection, requesting emissions data, offering training, and requiring third-party audits or certifications, are necessary, but they often rely on foundational procurement levers rather than stronger commercial mechanisms. Long-term contracts tied to sustainability performance, financial incentives, or shared investment models remain underused, leaving even well-designed programs to struggle to scale in isolation. Ultimately, without broader industry alignment, a supplier that invests to meet one buyer's requirements may see little reward if other buyers do not value those efforts.

How industry collaboration changes the game

Industry collaboration can turn this coordination failure into a shared opportunity. When companies work together by standardizing expectations, pooling demand, and sharing resources, they lower the cost and risk of decarbonization for everyone. The 2025 State of Supply Chain Sustainability Report (https://sustainable.mit.edu/sscs-report/) shows that 87% of companies participating in industry collaborations to track and reduce Scope 3 emissions reported concrete benefits such as stronger supplier engagement, better alignment on sustainability goals, and improved access to emissions data and reporting frameworks. In addition, 64% pointed to benefits from pooled expertise and shared resources, including tangible cost savings from joint sustainability investments.

There are already examples of industry collaboration across and within sectors addressing sustainability challenges, though not specific to Scope 3 emissions. The Better Cotton Initiative (BCI) coordinates farmers, brands, retailers, and NGOs around shared sustainability standards in cotton production, covering water use, chemical inputs, and labor practices. Standardized reporting and verification reduce duplication and enable sustainability improvements at scale. In maritime shipping,

the Clean Cargo initiative, hosted by the Smart Freight Centre, is a leading multi-stakeholder partnership supporting the decarbonization of ocean freight, bringing together shippers, carriers, and freight forwarders. This enables a standardized data exchange and standard carbon performance metrics across the industry. With a common methodology for emissions reporting, customers and carriers work together on low-emission freight procurement and supply chain visibility. Similarly, the Responsible Business Alliance (RBA) has established widely adopted standards for labor, environmental practices, and energy use across electronics and tech supply chains. These shared frameworks simplify audits, reduce redundancy, and improve compliance among global suppliers.

More recently, the Scope 3 Emissions Consortium (STEC), launched by the MIT Sustainable Supply Chain Lab, aims to unite companies, technology providers, and researchers to tackle Scope 3 challenges through collective innovation (https://sustainable.mit.edu/stec/). The consortium focuses on harmonizing data standards, building practical tools to support emissions measurement, and creating approaches to help companies better engage suppliers and scale reduction efforts across their value chains.

Turning collaboration into a strategy

For leaders responsible for Scope 3 targets, the question is no longer whether to collaborate, but how. At the company level, the starting point is clarity: identify the major Scope 3 hotspots and where collaboration would provide the greatest leverage, such as a high-emission material with a concentrated supplier base or a logistics lane shared with peers. In this case, procurement plays a central role. At the ecosystem level, firms can join or initiate industry collaborations that match their key categories and geographies. Companies can push for convergence in data requests, co-fund supplier training and audits, and explore shared financing mechanisms that help Small and Medium-sized Enterprise (SME) suppliers upgrade equipment or switch to lower-carbon inputs.

Ultimately, the companies that will meet their Scope 3 targets are those that reframe their approach from a compliance burden into a strategic capability built on collaboration. By aligning expectations, pooling demand, and investing in supplier capabilities together, they can turn a fragmented system into a coordinated decarbonization effort, one that delivers not only emissions reductions, but also resilience, innovation, and long-term competitive advantage. •

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DECISION VELOCITY: The new operating advantage for supply chain leaders

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In a world of constant disruption and exponential data growth, supply chain performance increasingly depends on how quickly leaders can detect change, decide with confidence, and convert decisions into coordinated action at scale.

By Karin Bursa

Your supply chain doesn't have a visibility problem; it has an action problem. Data is everywhere. Alerts are constant and often conflicting. Disruptions are routine. In today's "never normal" world, your competitive advantage shifts from "alerting" to "doing." Decision velocity is how supply chain leaders turn strategy into action at the speed and scale of today's market demands.

Decision velocity is your new superpower

Some leaders talk about speed as if it is simply a mindset shift to move faster, be agile, or make quicker decisions. That sounds good in a town hall, but it doesn't change what happens the moment demand spikes, a supplier misses a commitment, or a port delay ripples across your network.

Decision velocity is a capability you build. It is the repeatable ability to move from signals to decisions to actions quickly, without increasing risk. It shows up in the following three practical places.

- **Signal speed:** How fast you detect meaningful change.
- **Decision clarity:** How fast you isolate root causes and evaluate trade-offs.
- **Execution latency:** How fast a decision becomes action across planning and execution horizons.

When any one of these breaks, velocity collapses, and teams fall back on meetings, spreadsheets, and heroics.

Data is part of the problem

Many organizations lose time before they even get to the decision because the first argument is about the inputs. "Which number is right?" "Which hierarchy are we using?" "Is that supplier lead time correct?" "Did we include the latest external market signal?"

Decision velocity depends on available, accurate, connected data across both enterprise sources (ERP, planning, transportation, warehouse, manufacturing) and external signals (point of sale, supplier risk, weather, congestion, commodity movement, policy shifts). When data is fragmented or unreliable, teams don't just slow down; they second-guess everything.

In practice, the data problem shows up in the following four gaps.

- **Availability:** You cannot access the right data fast enough.
- **Accuracy:** Master data and definitions do not line up.
- **Context:** You see what happened but not the constraints and trade-offs.
- **Trust:** People will not act on what they do not believe.

AI turns planning into event-driven decision loops

Traditional supply chain planning and execution tools were built for more stable times: regular cycles, limited signals, and controlled variability. Today's market looks nothing like that. Data volumes are higher, disruptions are more frequent, and the daily decision load is too large to push through meetings, spreadsheets, and manual work.

This is why decision velocity is emerging as a differentiator that is delivering an operational advantage. AI can help teams separate noise from signals, evaluate trade-offs at scale, and trigger actions faster, especially when paired with governance and clear decision rights. This is not about ripping and replacing your existing systems. It is about upgrading and augmenting how decisions are made and executed across the systems you already have, while changing how work gets done.

Where AI accelerates decision velocity

Think about AI in three layers that work together. **Analytic AI**, including machine learning and optimization, is the workhorse layer. It can detect patterns, forecast more accurately, and run optimization to evaluate trade-offs across business drivers like cost, service, cash, and risk. This layer is established in many supply chain solutions, but it still depends on humans to engage and decide.

GenAI is an engagement accelerator. It reduces friction and quickly unlocks insights between people and systems by helping planners ask better questions, summarize what changed, explain why a recommendation shifted, and document assumptions. GenAI can also act as a switchboard that activates analytic models when needed: "Run 10 constrained supply scenarios and show me service and cash impact."

Agentic AI changes and accelerates workflows. Instead of just producing insights, agents continuously monitor events, prioritize exceptions, and trigger actions within guardrails. That can include updating replenishment parameters, proposing allocations, escalating supplier risks, and recommending plan changes. Most organizations will start with micro-decision automation and macro-decision recommendations that humans review and approve. Over time, the boundary of autonomy can expand as trust grows.

Decision velocity becomes a new KPI for performance

Most supply chain KPIs are backward-looking and designed for stability. Useful, but incomplete in a volatile market. When the environment changes weekly (or daily), leaders need a way to measure how quickly the organization can adapt.

Decision velocity is that KPI. It measures the health of your decision loop: how fast you detect change, clarify the decision, prioritize exceptions, and execute actions with control and confidence.

A practical scorecard includes signal speed (time to detect meaningful change), decision clarity (time to identify root cause and next-best actions), exception prioritization and response (time from detection to action), decision autonomy (human-triggered vs. automated within guardrails, split into micro and macro decisions), plan refresh (time to update the forward plan and understand cascading impacts), and decision load (volume of decisions per day with prioritization and consequence grading).

Successful supply chains will not rely on additional dashboards; instead, they will excel through quicker and more confident decision-making cycles.

A practical 90-day playbook to accelerate decision velocity

You do not need a multi-year transformation to make meaningful progress. You can build decision velocity in 90 days if you focus on the decision moments that matter most and fix the pipeline that feeds them.

Days 1–30: Fix the data-to-decision pipeline (make trust measurable)

Start by selecting three recurring "decision moments" that materially impact service, cost, cash, or risk, such as allocation under constraints, demand variability, inventory rebalancing, expediting approvals, or production plan changes due to shortages.

For each decision moment, map the flow: owner and decision rights, required inputs (internal and external), refresh rates, constraints, thresholds for escalation, and the actions that must follow. Then create a simple decision data framework that defines what data is required, who owns it, what quality checks apply, and how exceptions are handled.

Finally, add a minimum viable set of external signals that materially improves those decisions. The goal is not to collect more data. The goal is to reduce debate and increase confidence so the organization can act faster.

Days 31–60: Trade-off scenarios replace debate with discipline

Many organizations can generate scenarios one at a time, but they still debate outcomes

because the scenarios are difficult to compare side by side or they are analyzed in disconnected spreadsheets. Each function uses different assumptions and optimizes locally. The result is noise and the process is time-consuming.

Define shared trade-off rules (cost, service, cash, risk), standardize a scenario stack for each decision moment, and require assumptions to be explicit. If the decision intelligence system recommends an action, leaders should be able to see what changed, why it changed, and what constraints and downstream impacts are in play.

Days 61–90: Move from insights to actions and automate with guardrails

This is where teams earn back time. Classify decisions into three modes: decision support (humans decide), decision augmentation (system recommends and explains; humans validate), and decision automation (system executes within guardrails).

Guardrails are what make speed safe: thresholds, approval rules, exception logic, compliance requirements, and audit trails. Build closed-loop execution so decisions trigger action, outcomes are measured, and feedback improves the next cycle.

The metrics that improve decision velocity

Executives should demand a simple scoreboard. Track signal-to-decision cycle time, decision-to-execution time, percent of decisions made within SLA (by decision type), rework rate (decisions reversed due to downstream conflicts), and exception noise reduction (fewer alerts requiring human intervention). Then tie those improvements to business outcomes like expedited spend, service recovery time, inventory, and working capital.

Accelerate decision loops with confidence

Decision velocity is becoming the new operating advantage because it connects strategy to action under pressure. If your teams are drowning in alerts, debating inputs, and relying on spreadsheets to reconcile reality, you do not need more reporting. You need a better decision intelligence system. One that improves data trust, standardizes trade-off scenarios, and closes the loop from decision to execution.

The organizations that pull ahead will not be the ones with the most dashboards. They will be the ones that can repeatedly decide sooner, with confidence, and act without delay.•

About Global Links

Global Links appears in each issue of *SupplyChain Management Review*. Karin L. Bursa, CEO of NIRAKIO, LLC, supply chain industry advisor, Global Links editor, and 2020 Supply Chain Pro to Know of the Year, serves as the Global Links column editor and collaborator. If you are interested in participating in the column, she can be reached at kbursa@nirakio.com.

SUPPLIERS CAN EVAPORATE:

Five ways to improve SCM risk management

By Mark Trowbridge, CPSM, CSP, C.P.M. MCIPS,
President of Strategic Procurement Solutions LLC

Mark Zuckerberg once said that "the biggest risk is not taking any risk" and that "in a world that is changing really quickly, the strategy that is guaranteed to fail is not taking risks."

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Comprehensive supply chain performance is a top priority of many companies, especially those in the manufacturing sector. But much of a company's supply chain is located outside a company's own walls. Upstream of an organization are the suppliers who create goods and services used in the company's own operations, whether as raw components or materials that flow into "direct" manufacturing as raw materials, or the "indirect" products and services which facilitate the company's actual operations. The downstream supply chain is what an organization needs to efficiently distribute its products or services to customers. Contracted suppliers, both upstream and downstream, must be proactively managed as to minimize financial, confidentiality, operational, reputational, and legal risks.

In my final corporate role directing sourcing and contracting management activities for a firm in the Fortune 20, the executive to whom I reported gave me a curious objective in my written job description. From that year onward, along with other measurements, my boss evaluated my willingness to take "intelligent risks." You see, he realized that an overly-aggressive approach to sourcing and management for an enterprise with 195,000 employees and 110 subsidiary companies around the world could hinder our ability to be "fast and nimble" in the economic sectors where we competed.

Over the next few years, that focus made a huge difference in my career as I learned how to execute well-researched business plans while properly managing risk. My success was measured by balancing well-researched, cost-saving initiatives with carefully thought-out fallback plans. I always knew that my performance evaluations would suffer if I failed to push the limit of what we could succeed in the supply chain arena.

Unfortunately, too many business people weren't taught that taking appropriate risk is "intelligent." Far too many procurement or supply chain leaders are being beaten down into cumbersome processes by their firm's own risk or legal groups. This may give the appearance of diligence, but actually reduces the firm's ability to truly manage SCM performance in a risk-averse manner.

Shouldn't we try to eliminate all supply chain and legal risk for our employers? The answer is "no." Because the only way to truly eliminate risk would be to never conduct any procurement or contractual activities using third-party suppliers. Instead, a more rational objective for procurement and supply chain leaders should be to create a secure but high-performing supply chain. One in which risk can be minimized while value-added business relationships can flourish. True leaders should take intelligent risks. My boss would (annoyingly) remind me of Wayne Gretzky's comment: "You miss 100% of the shots you never take."

In the years since, I've been privileged to work in the consulting realm with many world-class procurement clients. The senior supply chain leaders who are most impressive are those who demonstrate a willingness to move forward with key supply chain improvement opportunities. These are people willing to take realistic risks in order to generate profits for the bottom line. These leaders though, are frustrated by staff and peers who fail to act quickly to enact positive change.

As this article's title pledges, we'll discuss five supplier risk management techniques here that any firm can deploy at little cost to enhance protections across your entire supplier portfolio.

Supplier risk management technique 1: Don't be surprised when suppliers evaporate

Evaporation is an interesting occurrence in that it causes water to disappear from view, partially or completely. Fact: Out of any supplier population, a statistically valid portion of providers are going to experience a material change that compromises their ability to perform. Even worse, seemingly strong suppliers sometimes go "poof." WatchMyCompetitor reports that "more than half (52%) of the companies in the Fortune 500 list of 2003 no longer exist today." The U.S. Bureau of Labor Statistics confirmed in 2024 that 65% of companies fail during the first 10 years of existence. And recent reports indicate that YOY commercial bankruptcy filings increased by 26% from July 2024 to 2025 [note, some are driven by increased Chapter 11 filings due to restructuring opportunities]. So, how close to home are potential failures in your company's supply chain?

Readers of *Supply Chain Management Review* who rely upon transportation sector providers were affected by many recent instances of supplier evaporation, such as the following.

- In 2017 when one of the seven-largest maritime shipping companies in the world (HanJin Shipping) announced bankruptcy and literally stopped operations in one day, leaving thousands of containers locked aboard ships anchored in harbors or tied up to docks around the world. This firm alone processed nearly 10% of Asia-American container shipments, plus many others impacting other trade locations between other national trade partners. This supplier failure left as many as 400,000 containers stranded.
- In 2023 when Yellow (Freight) Corporation closed its doors. At the time of bankruptcy, Yellow was the country's third-largest less-than-truckload (LTL) carrier. With Yellow, subsidiaries like Reddaway and Holland also closed their doors, idling approximately 60,000 rolling units. NBC News reported that "The USA lost as much as 15% of its small-batch trucking capacity," while the *Wall Street Journal* reported "The trucker's competitors are reaping a windfall of business, while customers face rising shipping costs."
- Business closures continued in 2024-2025, including carriers like 10 Roads Express (affecting 2,500 trucks), Arnold Transportation (402 trucks/trailers), Kal Freight (800 trucks), LTI Trucking (300 trucks), Davis Express, TGS Transportation, Montgomery Transport, Epic Lightning, etc.

Did these firms' customers see these closures coming? Most did not and had shipments lost or delayed in transit. Failure to have simple visibility into just supplier financial stability can be partially blamed on these firms' supply customers. Too often, users of freight services fail to regularly perform financial reviews or might occasionally do spot checks using a well-known rating service which has been criticized as having "data accuracy issues, including errors and missing info, leading to inflated or deflated scores, and data gaps, as not all vendors report, leaving incomplete pictures." More about that firm's deficiencies can be read at the Federal Trade Commission's website.

The good news is that better sources for managing supplier financial and operational stability have now emerged in the marketplace, which rely upon 'predictive financial stability' reporting that is provided by a major credit rating agency on all of your firm's suppliers. Including a

broad range of other supplier stability information (like the insurance COI collection services mentioned later in this article), the availability of predictive financial stability data for a firm's entire supplier community can be outsourced with little/no budgetary expense so that this information is available in digital platforms that warn procurement leadership of potential supply chain failures before they occur.

Supplier risk management technique 2: Innovation & efficiency in contracting management

Another example of taking "intelligent risks" can come from a procurement group's approach to contracting management. The author's firm regularly assists leading companies in revising or creating strategic portfolios of pro-forma contract templates. Contract streamlining is an emerging trend as smart companies understand the significant cost of negotiating bulky old-style contracts that are "onerous" (i.e. written in legal prose, lengthy, difficult to understand, one-sided protections, etc.). Many legal and procurement groups are finding that it is better to approach the marketplace with concise and well-balanced contract documents that result in greater acceptance from the suppliers. "Bigger is not always better" in commercial contracting. But today, many procurement contract portfolios are a great example of how "legal risk" can outweigh "business balance" and affect the contracting cycle time (and procurement efficiency).

Supplier risk management technique 3: Have strategic requirements for supplier insurance & limitations of liability

Whenever we use an external supplier to provide products or services on the upstream or downstream sides of our operations, we must evaluate our firm's exposure to potential liability. A good contract should address the three-legged stool of (i) limitation of liability, (ii) indemnification, and (iii) supplier insurance protections. We should require every supplier to carry insurance for two reasons: First, so that the supplier firm is protected from legal or financial exposure that could limit its ability to continue supporting our contractual commitments. Second, so that our organization has a buffer of protection against direct or indirect claims from other third parties who may be affected by the contracted supplier's actions or inactions.

A frequent point of failure by many procurement organizations is to fail to inspect a properly executed and endorsed Certificate of Insurance (COI) (known as Evidence of Insurance or EOI internationally) from each contracted supplier before contract actions occur. I'll admit, it's a pain to collect and properly review COIs from every contracted supplier. But studies performed by leaders in this space indicate that 80% or more of initial COI submissions do not conform to the language in our contract! An additional failure point is that a supplier's policies of insurance rarely expire on the same date as the contract itself. Failure to proactively ensure that each policy is renewed and continues in effect through contract expiration means that our third leg of protection can disappear without our knowledge.

Any procurement team that is proactively managing the three-legged stool of risk protection must have resources in place to proactively collect and knowledgeably review COIs. The good news is that there are several no-cost supplier risk mitigation resources in the marketplace that can

do this with little/no expense—thus effectively outsourcing these reviews to a highly-skilled team of professionals without any budgetary impact. For every one of your suppliers, and at little/no cost to a corporate customer (not a typo), these technology providers' cloud platforms perform realtime tracking and notifications on key risk factors listed:

- verification of the supplier's taxpayer identity;
- predictive financial stability ratings of supplier creditworthiness;
- active, continuous digital collection and verification of every supplier's insurance policy coverage values (per occurrence and aggregate) and endorsements (additional insured, waiver of subrogation rights, etc.) against your firm's requirements;
- active ongoing reporting (and initial 5-year lookback) for supplier bankruptcies, judgments, and lien filings;
- review supplier against up to 1,500 global watch and exclusion lists (including U.S. OFAC SDN, EU Consolidated, UK Modern Slavery, FATF/Wolfsberg, etc.);
- cyber security review of supplier's outward-facing technology infrastructure;
- ongoing monitoring of 30,000 media sources for negative news regarding the supplier (for example, geopolitical event impact, labor disputes, legal disputes, plant closures, etc.);
- identification and verification of supplier diversity ownership credentials;
- optional collection of additional supplier data (for example, confidentiality requirements, code of conduct commitments, ISO certifications, OSHA/MSHA incidents, environmental compliance, etc.); and
- current contact information for the management of every supplier.

The last of these seems simple, but it is a mission-critical failure point for many companies. Does your firm even have current contact information for every supplier that sustains your operations? Currently, verified sales manager name, mobile number, and email are lacking for most companies' suppliers in any centralized database. And what about the same contact information at a senior level within the supplier company? Who will be able to recover their shipments sooner after a hurricane, the shipper who is trying to call the carrier's 1-800 switchboard number on a weekend, or the firm that has the carrier's president's or COO's cell numbers?

How simple to move the collection, creation, and reporting of this type of information to an automated third-party at little or no cost. *(Contact the author directly for names of provider(s) of the above information for your suppliers.)*

Supplier risk management technique 4: Provider optimization & redundancy

Basic blocking and tackling here. As part of initial strategic sourcing and supplier selection, risk exposure techniques should be employed to ensure that over-consolidation of the supplier community does not occur. Too often, aggressive "sourcing" groups can award a contract to a 'single source' sole award contractor. That works fine until a disaster occurs, such as the financial failure of the supplier or a plant shutdown, etc.

Proper strategic sourcing should select a balanced supplier portfolio that neither requires multiple plants nor data center redundancy under the same provider (i.e. ability to manufacture, process data, or perform services in multiple locations) nor segment the provider relationship across multiple suppliers in a primary and secondary contractual manner. Doing this will ensure that we can sustain supply chain operations even in the event of a failure in one production location.

Once we have selected the right suppliers, we must manage them to ensure performance and minimize risk exposure. When the readers of this article were in school, they received report cards. The reason for report cards was threefold: First, to

give the student feedback on their educational accomplishment. Second, to provide their parents with visibility into their child's performance.

Third, to provide a useful reference tool for conversation between the teacher, parents, and student to discuss areas of potential improvement. Let's face it, I would not personally have tried nearly as hard in school all the way through university level if those report cards didn't keep showing up.

Far too many companies fail to provide their suppliers with a report card and feedback on how they are performing. For most companies, the exceptional few suppliers that do receive any scorecard are fewer than those that don't. Any supplier who does not receive frequent feedback will probably assume that what they are doing is quite fine … even if they are not.

Top companies separate their supplier portfolio companies into categories based on financial spend or assigned risk using techniques like the Pareto Principle, for example:

- Class A suppliers: the 15% of suppliers representing 75% of total spend.
- Class B suppliers: the 25% of suppliers representing 15% of total spend.
- Class C suppliers: the 60% of suppliers representing 10% of total spend.

Using the type of categorization, a strategy of scoring and providing feedback can be developed. One useful strategy is to automate score carding and reporting to Class B and C suppliers utilizing systematized data capture on those firms' many providers. Class A suppliers can be given report cards that contain more-subjective scoring feedback data. Often, Class A and some Class B providers are met with a 'parent/teacher/student' model so as to identify improvement opportunities and corrective actions for deficient performance. Class C suppliers are rated and moved 'up or out' based on their ability to meet objective performance objectives.

Supplier risk management technique 5: Look outside the box

Far too often, fear of failure causes business people to:

- unhealthily resort to "that's the way we've always done it" in decision-making;
- avoid making difficult decisions;
- fail to try better ways of doing things;
- shift responsibility onto others;
- fail to acknowledge/confront problems; or
- try to eliminate every conceivable chance of failure.

As the old expression goes, "Nobody ever got fired for hiring IBM." Great company. Long history. Safe. But in our company roles, are we making supplier selections with providers that are "safe" but quite average in performance? Or are we, with careful diligence, choosing innovative partners who will transform our business model?

I'll bet your personal investment portfolio is not all in a single stock (if it is, please talk to a finance professional). A properly balanced portfolio will contain a number of investments across types, industries, and risk. Similarly, to manage risk in a high-performing supplier base, consider diversifying your portfolio of providers.

Billionaire Warren Buffett has referred to three types of firms that participate in any marketplace: "First come the innovators, then come the imitators, then come the idiots." In your firm's supplier portfolios, make sure you mix high-performing established firms with innovative market disruptors. Consider how companies like Amazon Freight, Uber, DoorDash, etc. are beginning to overlap into the arenas occupied by FedEx, UPS, DHL, etc.

To summarize, taking "intelligent risks" doesn't mean we can fail to carefully research and structure our supply chain decisions. Writer John A. Shedd said this: "A ship in harbor is safe—but that is not what ships are for." The same is true in supply chain management. If we don't take some intelligent risks, we're not going to provide maximum value to our employers. •


CO_2

CIRCULAR SUPPLY CHAINS:

The backbone of a successful circular economy

By Joseph Sarkis

Circular supply chains are emerging as a foundational operating model for the circular economy, enabling organizations to drive sustainability, resilience, and long-term value through closed-loop material flows, strategic partnerships, and disciplined execution.

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The circular economy envisions a system where materials, products, and resources are continually reused, regenerated, and reintegrated into production cycles—minimizing waste and maximizing value. The circular economy is an idea born of necessity. Ideas born of necessity tend to endure. The concept of a circular economy was born from society's need to thrive without destroying our environment, an environment on which humanity depends.

At the heart of the modern vision of a circular economy lies circular supply chains (CSCs), which enable the flow of materials in closed loops. Beyond their environmental advantages, CSCs can deliver critical benefits in sustainability, resilience, efficiency, and even social and economic well-being.

CSCs inherently promote sustainability by reducing dependence on virgin materials, minimizing waste, and extending product lifecycles. Through remanufacturing, recycling, and reuse, companies can reduce greenhouse gas emissions and resource extraction, thereby alleviating some environmental and social burdens.

Industries adopting closed-loop supply chains, where all waste is reused to generate new products—a critical aspect of a CSC—for metals and plastics significantly cut carbon footprints while improving material efficiency. The Aluminum Association estimates that recycled aluminum uses up to 95% less energy than aluminum produced from extracted ore. Aligning CSCs with ecological sustainability goals helps organizations as global environmental regulation becomes more stringent and consumer awareness of environmental issues rises.

However, the value of CSCs extends beyond ecological sustainability—these systems also enhance supply chain resilience. As it has become painfully evident that modern supply chains face risks from global disruptions, resource scarcity, and geopolitical tensions.

Circularity mitigates these risks by creating alternative material sources, particularly critical resources such as rare earth elements used in electronics and renewable energy technologies. Recovering and reusing these materials from end-of-life products allows firms to reduce dependency on vulnerable global supply chains.

Circularity also fosters localization, strengthening regional economies and reducing exposure to global shocks. End-of-life materials and products can be collected and processed near urban centers, keeping resource flows closer to where demand exists. This local resource loop aids organizations by allowing them to bypass trade barriers, tariffs, and political conflicts that have historically disrupted global supply chains—such as China's control over rare earth metal exports. CSCs not only enhance environmental sustainability but also serve as buffers against geopolitical volatility.

The social benefits of CSCs are equally significant. By sourcing materials from local recovery processes rather than from conflict-prone regions, companies can reduce their involvement in exploitative or unethical supply chains. This shift supports human rights, fair labor practices, and community stability, contributing to the broader goals of social sustainability.

Economically, circular supply chains can also become revenue generators. Recovered materials, refurbished products, and industrial byproducts can be new profit streams if managed strategically. Companies that innovate in byproduct design—for instance, converting waste heat into

energy or repurposing scrap materials into new products or saleable materials—can achieve both environmental and financial gains. I recently saw an example of this when I visited Australia, where I purchased stuffed koala bear souvenirs made of waste plastic.

Building circular supply chains

While circularity benefits—sustainability, resilience, social responsibility, and economic gains—are compelling, challenges remain. Achieving the benefits of CSCs requires an organization to have a structured and strategic implementation process.

Transitioning to a CSC is an ambitious goal, but it is achievable. It requires thoughtful planning, collaboration, and execution. The following six-step framework outlines how organizations can practically move toward circularity within their supply chains.

1. Understand your market, industry, materials, and products

Organizations must assess their value chains, product lifecycles, and material flows to determine where circularity can be integrated. Mapping the supply chain from raw material extraction to end-of-life materials management, identifying inefficiencies, waste points, and opportunities for resource recovery is an important foundation. Understanding customer expectations and regulatory environments is especially pertinent as many industries now face sustainability mandates or shifting consumer preferences toward environmentally responsible products. Companies should also evaluate which materials are most critical, scarce, or environmentally impactful to effectively prioritize their circularity efforts.

The case of Patagonia is one example. The outdoor apparel and gear company extensively mapped and increased the transparency of its supply chains to implement circularity, especially through its Worn Wear program. Patagonia mapped its supply chain specifically for circularity by analyzing the materials, processes, and product flows that determine how garments can be repaired, reused, or recycled. By understanding where and how each component was made and what it was made from, the company redesigned products for durability and standardized materials to improve recyclability. It was also able to identify partners capable of fiber-to-fiber recycling. This mapping enabled the organization to build effective repair and take-back systems, expand the Worn Wear trade-in and resale program, and include recycled inputs into production.

Supply chain mapping allowed Patagonia to pinpoint where circular practices were feasible, redesign products accordingly, and create CSC pathways that keep clothing in use longer, reducing dependence on virgin materials.

2. Identify the products and materials that can be easily included

Once the CSC is understood, the next step is identifying where circular practices can begin. Not all materials and products are equally suitable for circularity—some degrade to unmanageable and poor-quality levels, while others such as aluminum can be recycled indefinitely.

Identifying the low-hanging fruit is essential. Products that are durable, modular, or made from recyclable materials are often good starting points. Electronics manufacturers may focus on reclaiming rare metals from used components, while food producers might explore repurposing organic byproducts. This stage often involves lifecycle assessments to measure environmental impacts and

determine where interventions can yield high returns in terms of sustainability and cost efficiency.

I have visited and written about facilities that process end-of-life computers. My research colleagues and I found that a triage is necessary to determine whether returned computers can be reused immediately without refurbishment; refurbished for resale; taken apart for usable parts; or destroyed, disassembled, and recycled. Understanding product and quality characteristics at their end-of-life is necessary to determine and design CSC. CSC designs for remanufacturing of complete products and components may be different than elemental materials recycling.

But, even early in the design process, lifecycle assessment (LCA) tools can be used. LCA can quantify environmental impacts (energy, emissions, waste) across the product's lifecycle. This quantification is important for design and decision-making. There are effective and widely available LCA support tools that have started to mature over the decades—these tools include SimaPro, GaBi, and OpenLCA.

Material flow analysis (MFA) is another material accounting tool to help track flow of materials into, through, and out of an organization or region and across value chains. Similar to LCA, MFA is not a new tool. It has decades of use and development and can be very useful for CSC design and can be applied to help determine current and past flows of products and materials that can be used to feasibly support CSC.

Even general supply chain mapping tools, as in the case of Patagonia, are becoming more popular and can be useful for CSC product and materials identification. Available platforms like Resilinc, Interos, or SAP Ariba can visualize supplier networks and highlight vulnerabilities or circularity opportunities for various material and product sources.

German company Schaeffler Group took advantage of the innovative SAP Returnable Packaging Management module. Schaeffler identified packaging and logistics material, such as pallets, that would need a CSC. The material and industry-specific solution aided returnable and reusable packaging material circular flows. This system included containers, boxes, and pallets—from inter- and intra-company movements and the journey back to the company. It allowed Schaeffler to incorporate end-to-end integration of the container management cycle.

3. Determine the necessary infrastructure and systems required

CSCs depend on robust infrastructure to collect, sort, process, and reintegrate materials. Organizations must evaluate the physical, digital, and logistical supply chain systems needed to close the loop. Evaluation should include designing reverse logistics networks, implementing traceability technologies such as blockchain or internet of things (IoT) sensors, and ensuring quality control for reused materials. Developing standardized procedures for repair, remanufacturing, and recycling helps ensure that recovered materials meet performance and safety requirements. Investments in digital tools for data tracking and performance monitoring can significantly enhance operational efficiency and transparency.

A team I am part of has been studying the transportation, logistics, digitalization, and circularity issues in a joint research effort between Worcester Polytechnic Institute (WPI) and the Université Polytechnique Hauts-de-France. A very fundamental question we have been trying to address focuses on what efforts are needed from an organizational and supply chain perspective; many of which I have touched upon in this article. The broader social and built environment infrastructure needed for

circularity is not always clear. It may not be up to the industry to determine the solutions alone. Government and infrastructure development for circularity is necessary. A basic question is whether the current public transportation and logistics infrastructure is satisfactory for effective CSCs. We do not have an answer, but the question needs to be asked by companies and society. This brings us to our next important step.

4. Form the necessary partnerships

No single company, or even supply chain, can achieve circularity in isolation. Building partnerships across the value chain—suppliers, recyclers, logistics providers, governments, and even competitors—is essential. Collaborations can enable access to shared infrastructure, facilitate material exchanges, and promote industry-wide standards—circular economy standardization efforts by the International Standards Organization (ISO) have been in the works for years with some standards developed, but the work continues.

Public-private partnerships can also play a role in developing recycling facilities or incentivizing resource recovery programs. In many cases, industrial symbiosis—where one firm's waste becomes another's input—emerges as a powerful model for achieving circular efficiency at scale.

These efforts are occurring with public-private partnerships in various regions of the world. For example, in Japan there is the Regional Circulating and Ecological Sphere (Regional-CES) which calls for innovative business models as well as efforts by urban planners, green technology, and product development efforts. Stakeholders of the Regional-CES approach seek to develop and expand this model around the world, which can effectively support globalizing CSCs.

5. Complete some pilot projects and keep track of data

Before any large-scale implementation, organizations should conduct pilot projects to evaluate circular initiatives in controlled environments. Pilots provide valuable insights into operational challenges, material quality issues, customer acceptance, and cost implications. Meticulous data collection during these trials is vital. Tracking material flows, environmental savings, and economic outcomes allows for data-driven decision-making and continuous improvement. The lessons learned here inform future scaling efforts and help justify investments to stakeholders.

But to be able to track data, there is a need to determine baseline and ongoing circularity performance. Circular assessment tools exist. For example, the Circulytics tool offered by the Ellen MacArthur Foundation helps evaluate an organization's circularity and can be applied to supply chain partners as well.

Industry-specific circular performance measurement and evaluation tools also exist. One specific example is the ITU-T L.1023 standard from the International Telecommunication Union (ITU) which provides a method for circular scoring for information and communication technology (ICT) products and components. It also offers a detailed methodology for evaluating product circularity. This standardization effort involved a number of stakeholders such as the Global Electronics Council and EPEAT, as well as university participants including myself and WPI.

Pilot projects do not necessarily have to be supported by industry alone. Over the past two decades, the Chinese government has been a leader in helping organizations and their supply chains improve circular economy practices. To support these CSC efforts, China regularly funds demonstration projects. The motivation here is not

only for companies to build their business models, but to help society address resource depletion and extensive emissions from supply chains.

6. Implement and scale

Pilot results are meant to provide evidence; after evidence is gathered, companies can implement CSC practices. Scaling requires careful change management by aligning leadership, workforce, and stakeholders with new processes, technologies and behaviors around the new system. Continuous monitoring ensures that processes remain efficient and adaptive to changing conditions. Over time, the organization can expand its circular network, diversify recovered materials, and integrate new product and process technologies.

Many business models and examples exist or have existed. Some of these go back decades. Xerox long ago adopted a product service system business model based on leasing models for its copiers to be remanufactured and updated. They would lease new models until leases expired. Thereupon older leased copiers would be upgraded or used for parts for new models. The customers accepted the remanufactured copiers because Xerox became The Document Company, not a copier company. The company involved multiple functions of its organization including purchasing, marketing and sales, engineering, and production to help make the business model successful.

Philips uses a similar "product-as-a-service" model for its medical equipment. IKEA has also joined the effort by working toward becoming a fully circular system by 2030. Dell has formed a consortium for ocean plastics recycling called NextWave Plastics to operate a CSC for ocean plastics by building a network of organizations that can manage end-of-life plastic materials.

Ultimately, a structured process emphasizes that circular supply chain implementation is not a one-time initiative but a continuous journey. Commitment, collaboration, and strategic investment mean organizations can transform their supply chains into engines of sustainability, resilience, and long-term value creation. As you can see with the IKEA case, the planning is over years and in the case of countries like China and Japan, decades. The transition to CSCs and circularity does not stop at one project.

Circularity in supply chains is about sustainability and more—it's about building resilience, driving efficiency, and supporting social and economic progress. While implementation requires careful planning and collaboration, the benefits to organizations are manifold, and the path to circularity, though challenging, offers a powerful route toward a more sustainable and resilient future.

Implementing circular supply chains successfully requires a combination of analytical tools, digital technologies, and management approaches. These tools help organizations collect data, design circular systems, manage reverse logistics, and measure impact.

Challenges and a prospective future

I have presented a way to transition our supply chains to be more sustainable by becoming more circular. A variety of current examples, across countries and industrial sectors, exemplify how CSCs and circular practices can provide resilient, social, environmental and economic benefits. Many tools and practices have shown success and promise, but many of society's and industry's current beliefs and practices will need some adjustment.

Many of our current legacy technologies such as enterprise resource planning need adjustment.

Systems like SAP S/4HANA for Sustainability or Oracle SCM support some circular data integration across procurement, production, and logistics—but these are optional and have extra costs. To further normalize the idea of CSCs, these organizations could start making them basic offerings.

My research colleagues and I have presented several transitionary requirements within organizations, across supply chains, industrial, governmental, and even community and consumer actions. Organizations will require difficult change-management frameworks. Examples include Kotter's 8-Step Process or the ADKAR (Awareness, Desire, Knowledge, Ability, and Reinforcement) model to guide organizational transformation and employee engagement. Transition starts internally with some of these models. But, societal and consumer (economic) model transitions are even harder. There are sustainability transition models that exist, but they are complex.

There is a new transitioning perspective that academics and scholars are using to qualitatively present a desirable future: a future with no waste. Studies call this approach "Prospective Theorizing."

A prospective and desirable future for the circular economy and circular supply chains can be shaped through validated and rigorous prospective theorizing, which helps us envision futures that are not only imaginative but also grounded in evidence, systems thinking, and scientific plausibility.

Researchers use structured foresight methods—such as scenario building, backcasting, and transition modeling. These approaches allow us to identify pathways in which materials circulate continuously, waste becomes a resource, and economic activity decouples from environmental degradation—a relationship decoupling related to ecological modernization theory.

Within prospective theorizing, these approaches ensure that envisioned futures are: (1) plausible—that the envisioned future is aligned with physical, technological, and ecological limits; and (2) feasible and achievable through coordinated changes in technology, policy, business models, and social behavior. Rigorous theorizing within prospective theorizing validates which levers matter most and how complex interactions—between markets, infrastructure, regulation, and culture—shape transition trajectories.

Such prospective models also help define what a socially desirable circular future looks like: one that promotes fairness, well-being, resilience, and shared prosperity. For successful and wide adoption and transition, these elements need to be solidly ingrained in designs and decisions.

Instead of focusing solely on resource efficiency, this future prioritizes inclusive access to products and services, ethical sourcing, meaningful work, and reduced environmental burdens on vulnerable populations. By integrating justice, governance, and community values into foresight frameworks, we can design circular supply chains that support thriving local economies, regenerative ecosystems, and globally sustainable production networks.

This approach is about rigorous prospective theorizing. It is a guide for steering today's decisions, technologies, tools, and processes toward a circular future that is not only possible, but genuinely better for society.

Together, CSCs play an increasingly important role for this and future generations. These tools and approaches are needed to form an integrated circular economic ecosystem that supports the planning, execution, and scaling of circular supply chains—turning sustainability ambitions into operational reality. •


AI

FROM HUMAN-IN-THE-LOOP TO HUMAN-ON-THE-LOOP

An AI agent architecture for proactive planning

By Saravana Venkatachalam and Arunachalam Narayanan

How coordinated AI agents enable continuous, event-driven planning that surfaces risk earlier while keeping humans accountable for decisions.

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Supply chain planning tools are not new. Most organizations today rely on established systems for demand planning, supply planning, inventory optimization, and network design. These tools are typically operated in a human-in-the-loop model: planners run scheduled processes (weekly, monthly, or quarterly), review outputs, interpret exceptions, share with multiple silos, and decide on corrective actions. Reports are generated, plans are disseminated, often with limited visibility into how quickly conditions may change between planning cycles.

While this approach has served organizations for years, it becomes increasingly inefficient as supply chains grow more complex. Multi-echelon networks, volatile demand signals, variable lead times, and frequent disruptions require faster detection and response than periodic planning cycles can provide. Specifically, in large, multi-tier organizations, the cognitive and coordination burden placed on planners often leads to delayed decisions and reactive firefighting.

Recent advances in large-scale computing and AI infrastructure are enabling a shift from human-in-the-loop to human-on-the-loop planning systems. In this model, planning systems continuously monitor the network, detect anomalies, and evaluate risks against service and cost KPIs. Rather than relying on humans to periodically run models and interpret outputs, AI-driven agents proactively highlight emerging risks and recommend actions while keeping humans in control of oversight, validation, and approval.

This case study presents an architecture in which multiple specialized AI agents coordinate to monitor the supply chain and respond to anomalies as needed, rather than on fixed schedules. A monitoring and orchestration agent continuously evaluates data from core systems such as ERP, WMS, and TMS. When anomalies are detected, it selectively engages downstream agents—such as demand planning, inventory simulation, and network optimization agents—to reassess forecasts, simulate inventory impacts, and evaluate response options. Planners are alerted only when KPIs are at risk, with recommendations and supporting analysis.

The result is not full automation but a scalable, responsive decision-support framework with humans in the loop. Humans remain accountable for decisions, but the system shifts from reactive analysis to proactive guidance, allowing planners to focus on judgment, trade-offs, and execution rather than on routine problem-solving, anomaly detection, and action-plan coordination.

As shown in Figure 1, the AI agent–based architecture operationalizes traditional sales and operations planning (S&OP) and integrated business planning (IBP) processes in a continuous, event-driven manner. Rather than replacing S&OP or IBP, the architecture enhances these processes.

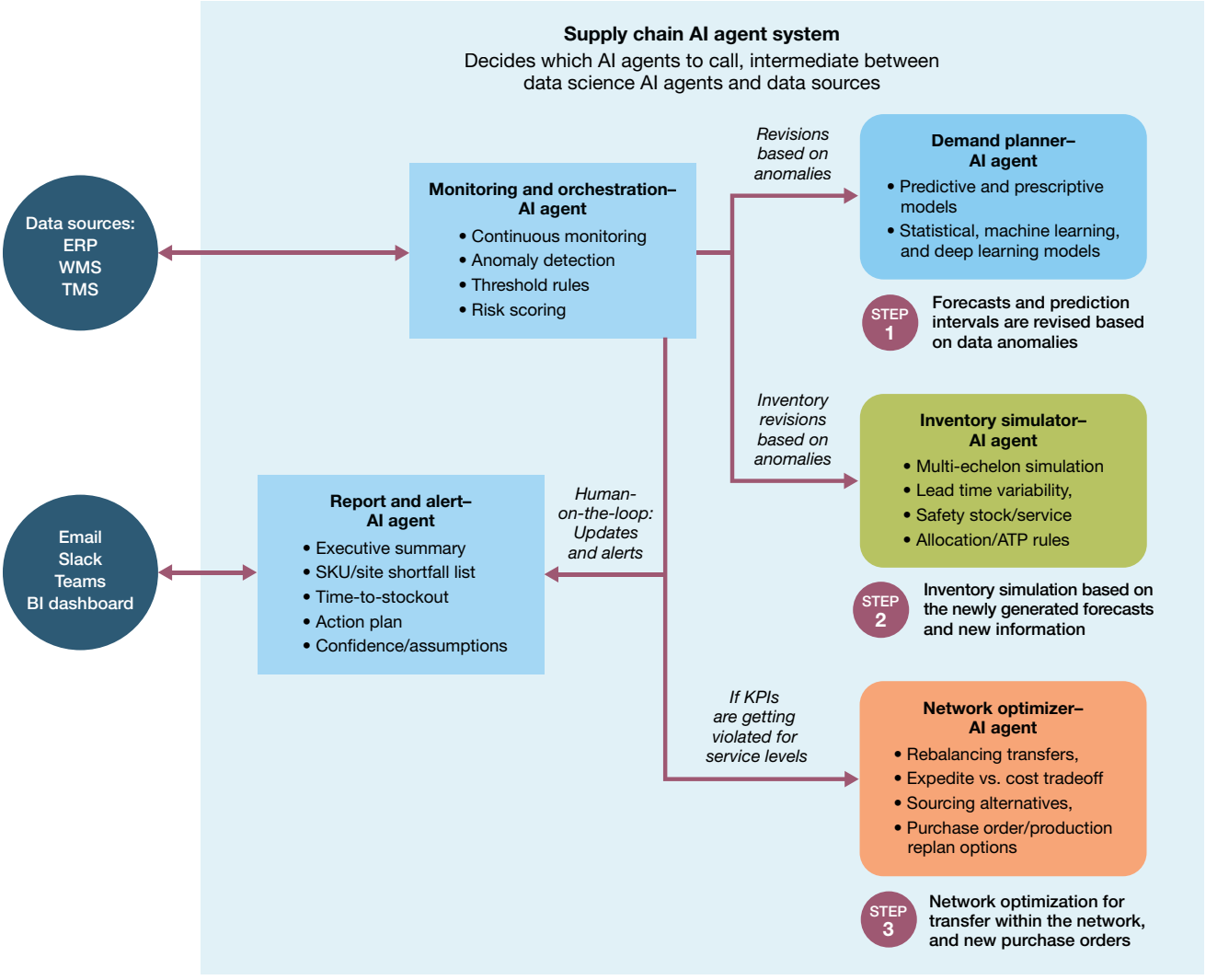
Continuous plan health monitoring (between S&OP/IBP cycles)

In a traditional S&OP or IBP process, the business plan is assessed during scheduled demand, supply, and executive review meetings. In the architecture shown in Figure 1, the monitoring and orchestration AI agent continuously monitors the approved S&OP/IBP plan using live data from ERP, WMS, and TMS systems. This agent tracks performance against key KPIs, including forecast accuracy, customer service levels, inventory exposure, and capacity utilization. When deviations from the approved plan are detected, the agent evaluates the potential impact and determines whether further planning actions are required.

Demand review (demand planning and forecast consensus). When demand-related deviations are

FIGURE 1

AI agent–based supply chain planning architecture



Source: Authors

Figure 1. AI agent–based supply chain planning architecture. The figure illustrates a human-on-the-loop planning system in which a monitoring and orchestration AI agent continuously evaluates data from core enterprise systems (ERP, WMS, TMS). When anomalies or KPI risks are detected, the orchestrator selectively engages downstream AI agents for demand planning, inventory simulation, and network optimization. An AI agent reports the prioritized insights and recommended actions to planners for oversight and decision-making.

identified, the AI agent initiates a focused demand review in line with standard IBP demand planning practices. The demand planner AI agent reassesses forecasts using updated demand signals and revises forecast ranges to reflect current uncertainty. This step supports demand planners by automatically highlighting exceptions that materially affect the consensus demand plan, allowing planners to focus on judgment and alignment rather than manual analysis.

Reconciliation and scenario evaluation. If misalignment between demand and supply is identified, the network optimization AI agent supports the reconciliation step of IBP. It generates and evaluates scenarios such as inventory rebalancing, expediting, alternative sourcing, or production adjustments. These scenarios allow cross-functional leaders to understand trade-offs between service, cost, and working capital before decisions are escalated.

FIGURE 2

Generic AI agent architecture for demand planning, inventory simulation, and network optimization

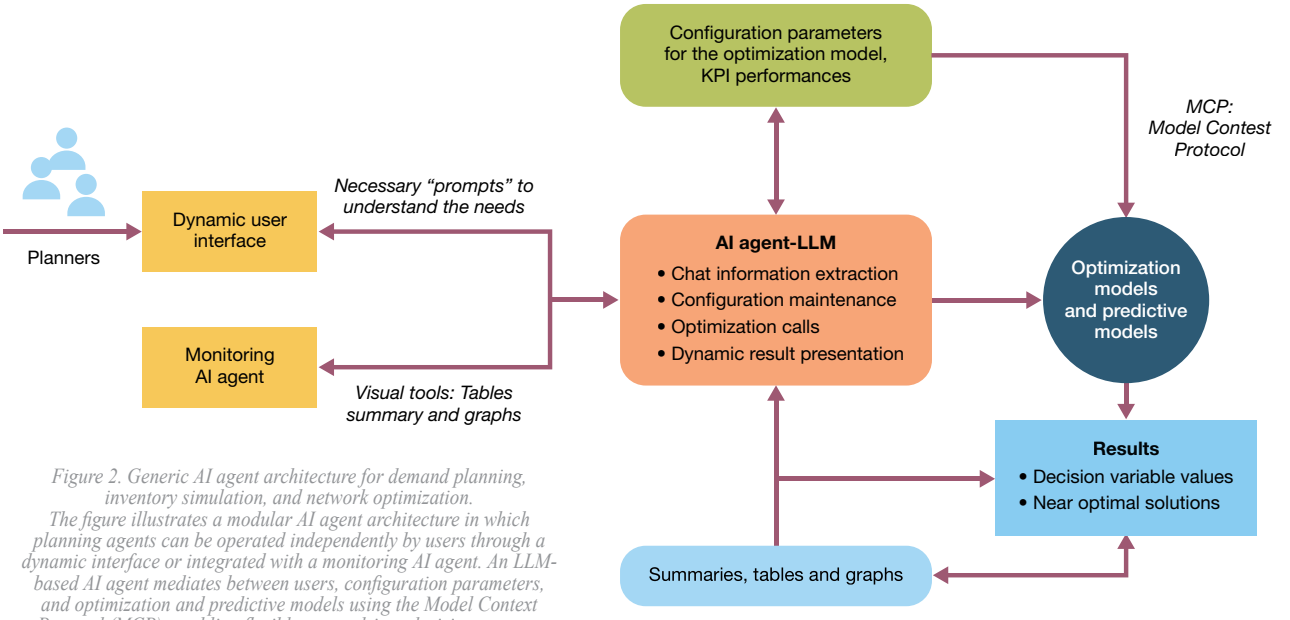


Figure 2. Generic AI agent architecture for demand planning, inventory simulation, and network optimization. The figure illustrates a modular AI agent architecture in which planning agents can be operated independently by users through a dynamic interface or integrated with a monitoring AI agent. An LLM-based AI agent mediates between users, configuration parameters, and optimization and predictive models using the Model Context Protocol (MCP), enabling flexible, event-driven decision support.

Source: Authors

Supply review and inventory assessment. Revised demand scenarios are passed to the inventory simulator AI agent, aligning with the supply review phase of S&OP/IBP. This agent evaluates inventory coverage, time-to-stockout, service-level risks, and supply feasibility across the network. By simulating inventory and supply outcomes under updated assumptions, the system provides early visibility into potential shortages or excesses that would otherwise come later in the planning cycle.

Executive review and decision support. The report and alert AI agent aligns with the executive review step of S&OP/IBP. It consolidates insights into executive summaries that highlight emerging risks, financial impacts, and recommended actions. This ensures that managers are informed in a timely manner and can make decisions based on a consistent and data-driven view of the plan.

Operating model shift

In traditional S&OP and IBP processes, issues are often identified during scheduled review meetings. In the architecture shown in Figure 1, issues are identified between cycles, allowing formal reviews to focus on decision-making rather than problem discovery.

Generic architecture

As shown in Figure 2, the architecture represents a generic AI agent pattern applicable across demand planning, inventory simulation, and network optimization use cases. The design emphasizes modularity, human oversight, and flexible deployment, allowing agents to operate either as standalone decision-support tools or as part of a coordinated, monitored system. It is not necessary to have all three levels in a system, such as demand planning, inventory simulation, and network optimization; a company can choose one, two, or all three.

User interaction and independent operation. Planners interact with the system through a dynamic user interface. In this mode, users can operate planning agents independently, similar to traditional planning tools. Natural-language prompts and structured inputs enable planners to specify objectives, constraints, and scenarios without directly configuring mathematical models.

LLM-based AI agent as the control layer. At the center of the architecture is an LLM-based AI agent that interprets user input, maintains configuration parameters, invokes optimization and predictive models, and presents results in business-friendly formats. This layer abstracts technical complexity and enables planners to focus on decisions.

Configuration and planning logic. Configuration parameters for optimization models and KPI targets are maintained separately from model logic. These parameters may be defined by users or updated dynamically based on monitoring signals, ensuring alignment with business objectives.

Optimization and predictive models. Optimization and predictive models represent the analytical engines for forecasting, simulation, and network optimization. These models are invoked via the model context protocol (MCP), which standardizes how context, objectives, and constraints are passed to AI agents.

Results interpretation and presentation. The AI agent translates model outputs, including near-optimal decision variable values and projected performance metrics, into summaries, tables, and graphs suitable for planner review and decision-making.

Integration with monitoring via MCP. The same planning agents can be connected to a monitoring AI agent using MCP. In this integrated mode, anomalies and KPI risks trigger automatic planning runs, enabling event-driven decision support while preserving human oversight.

PRACTITIONER TAKEAWAY

This architecture enables S&OP and IBP processes to operate continuously in the background, with humans remaining accountable for approvals and execution while AI agents support earlier detection and faster response.

How this differs from traditional planning tools

Traditional demand planning, inventory planning, and network optimization tools are typically executed on fixed planning cycles (weekly, monthly, or quarterly) and require planners to manually configure scenarios, run models, interpret outputs, and identify exceptions. The responsibility for detecting issues and deciding when to take action rests primarily with human users.

In contrast, the AI agent architecture shown in Figure 2 introduces a fundamentally different operating model. Planning logic is encapsulated within AI agents that can be invoked dynamically as needed, rather than on a schedule. Monitoring and orchestration logic continuously evaluates plan health and determines when demand, inventory, or network models should be re-executed.

Another key difference is the role of the LLM-based AI agent as an interpretation and control layer. Instead of planners interacting directly with model parameters and solver settings, planners express their intent through natural-language prompts or high-level inputs. The AI agent translates this intent into structured configuration parameters and manages model execution.

Traditional planning tools also tend to operate in functional silos, with limited coordination across demand, supply, and network decisions. In the proposed architecture, agents can operate independently or be coordinated through a monitoring agent using the model context protocol (MCP), enabling cross-functional, event-driven decision support.

Finally, while traditional tools emphasize report generation after planning runs, the AI agent architecture emphasizes continuous insight delivery. Results are proactively summarized and visualized to planners when KPIs are at risk, supporting a human-on-the-loop model in which humans retain accountability while the system reduces manual monitoring and coordination effort.

A case-study: How coordinated AI agents prevented a stockout before it happened

Most supply chain leaders are familiar with the pattern: demand changes, but that signal arrives late. By the time planners discover the issue—often during a weekly or monthly review—service levels are already under pressure, and options are limited.

This case illustrates how an AI agent–based planning architecture enables earlier detection and coordinated response, allowing planners to intervene before service levels are affected.

PRACTITIONER TAKEAWAY

The architecture allows demand planning, inventory simulation, and network optimization agents to function either as standalone tools or as coordinated components of a monitored, AI-driven planning system—without changing the underlying models.

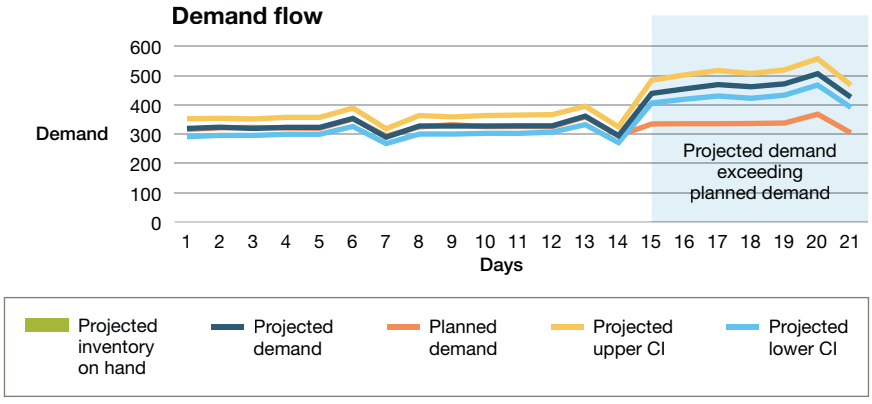
The starting point: A stable plan

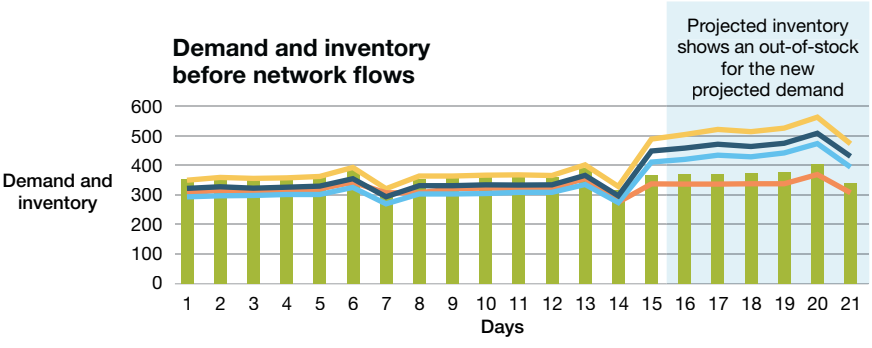
A consumer-packaged goods manufacturer was operating under an approved integrated business planning (IBP) plan. Forecasts were stable, inventory was balanced across two distribution centers, and projected service levels exceeded the 95% target. Nothing in the latest S&OP cycle suggested risk.

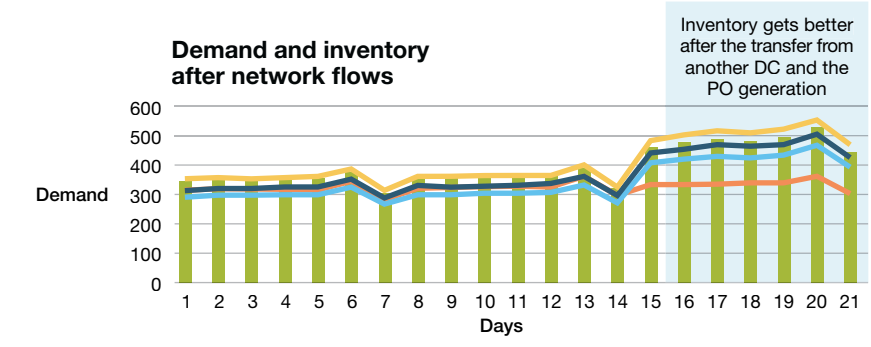
An early warning signal emerges. Five days into the month, the

FIGURE 3

End-to-end illustration of anomaly-driven replanning and network response







Source: Authors

Figure 3. End-to-end illustration of anomaly-driven replanning and network response. The figure shows (top left) projected demand exceeding planned demand and breaking forecast confidence limits, triggering anomaly detection; (top right) the resulting inventory shortfall when projected demand is applied without corrective action; and (bottom) the improved inventory position after network optimization actions, including inter-DC transfers and purchase order generation, restore service levels under the revised demand scenario.

company's monitoring AI agent detected something unusual. Order intake and point-of-sale data in the East region were running more than 5% above plan and were expected to run 30% above plan from day 18. At the same time, external signals suggested a competitor stockout and an unplanned regional promotion. Individually, none of these signals would normally trigger action. Together, they raised the probability of a service-level breach to over 80% within the next two weeks. Instead of waiting for the next planning run, the system acted immediately.

Forecasts revised—a proactive, resilient plan. The monitoring agent triggered the demand planner AI agent, which reassessed the forecast for the East region using short-term demand signals. The three-week forecast increased from 7,000 to 8,00 units, while forecasts in other regions remained largely unchanged. Crucially, the agent did not regenerate the entire forecast. It focused only on the portion of the network affected by the anomaly, saving time and avoiding unnecessary disruption.

Inventory risk becomes visible. The revised forecast was passed to the inventory simulator AI agent, which evaluated inventory positions under the new demand assumptions. The result: available supply at the East distribution center was insufficient, a stockout was projected within 14 days, and service levels were expected to fall from 96% to just over 80%. At the same time, the simulation showed excess inventory at a central distribution center—inventory that could be redeployed.

AI agent identifies the best response. With service risk confirmed, the network optimization AI agent

FIGURE 4

Example of an AI-generated exception alert for proactive supply chain decision-making

Alert sent to planners and managers

SUBJECT:
High-risk service degradation detected–action recommended

SUMMARY:
- Demand anomaly detected in East region **(+30%)** from **day 15**
- Forecast revised to **8,500 units**
- Projected stockout on **day 15** without intervention

RECOMMENDED ACTION:
- Transfer **1,000 units** from DC-Central to DC-East
- Execute within the next **48 hours**

KPI IMPACT:
- Service level improves from **81%** to **96.2%**
- Incremental logistics cost: **$1.6K**
- Estimated revenue protected: **~$300K**

CONFIDENCE LEVEL:
High (based on current demand persistence over **5 days**)

Source: Authors

Figure 4. Example of an AI-generated exception alert for proactive supply chain decision-making. The figure shows a decision-ready alert produced by the AI agent system when a high-risk service degradation is detected. The alert summarizes the underlying anomaly, quantifies projected service and financial impact, recommends a specific corrective action, and provides a confidence level to support timely human approval and execution.

evaluated possible corrective actions. Expedited production was considered but proved costly and slow. Doing nothing would result in significant lost sales. The optimal solution was a targeted inter-distribution-center transfer. Moving 1,000 units from the central facility to the East facility restored projected service levels above target with minimal transportation cost.

Planners alerted—with a clear recommendation. Rather than sending raw data, the report and alert AI agent delivered a concise, decision-ready alert to managers. The message summarized what had changed, what would happen if no action were taken, and the recommended action, along with the costs, service impacts, and confidence levels. Planners remained fully accountable for approval and execution, but the analytical work had already been completed.

PRACTITIONER TAKEAWAY

The real value of AI agents in supply chain planning is not replacing planners—it is ensuring that planners see the right problem early enough to act.

Why this matters

In a traditional planning environment, this issue would likely come up only weeks later—after service failures had already occurred. In this case, AI agents compressed detection, analysis, and coordination into hours. •

TO LEAD WITH GEN AI BECOME AN INTEGRATOR

By Tom Davis and Dennis Oates, DBA

As generative AI reshapes knowledge work, supply chain leaders must orchestrate people, processes, and intelligent systems, shifting from automation to integration to unlock real performance gains.

In transportation and logistics, the term integrator describes firms that manage complexity on behalf of others, coordinating transportation, warehousing, procurement, and data across vast networks of providers. These organizations thrive by synchronizing people, processes, and technology into a single, reliable system of execution.

Tom Davis *is a clinical associate professor in the strategy area at the University of Pittsburgh's School of Business and a former Fortune 100 strategy and technology executive in financial services.*

Dennis Oates, *DBA, is an assistant professor of practice in supply chain management at Marquette University and a former Fortune 100 senior executive in the transportation and logistics industry.*

That same mindset now applies to leadership itself. As generative AI (Gen AI) reshapes knowledge work, every team must evolve into an integrator that brings together human expertise and intelligent systems to achieve greater performance.

Leaders in supply chain management are uniquely familiar with integration. Whether aligning procurement with production, or coordinating last-mile delivery through multiple carriers, success depends on harmonizing diverse components into a unified system. Today, the rise of Gen AI requires the same orchestration within organizations, aligning human and digital contributors to work seamlessly together.

How we got here: A brief history of work

A recent due diligence project in the logistics sector showed how dramatically work has evolved. One of the project's lead authors, who had no formal coding background, used Gen AI within a secure cloud environment to analyze thousands of shipment records, model transportation costs, and visualize network options. Tasks that once required a full analyst team or an external consulting firm were completed in just a few hours.

This example reflects a broader transformation in how, where, and by whom work gets done. Over the past two decades, these three dimensions have continuously evolved, reshaping the very nature of work itself.

Where work happens. The era of "hoteling" offices gave way to remote work, which later evolved into hybrid arrangements that balance flexibility with in-person collaboration. For global supply chain teams, the shift was profound. Planners, buyers, and logistics managers who once collaborated around whiteboards now collaborate through digital twins and shared analytics dashboards.

When work happens. The rise of "chronoworking" aligned tasks with individual productivity cycles, building on the earlier "follow-the-sun" model of globalized, around-the-clock workflows. Many supply chain control towers now operate 24/7, relying on distributed teams that mirror the real-time flow of goods across time zones.

Who does the work. Workforces have blended full-time employees with contractors, gig workers, and crowdsourced talent. This fluid mix of talent, sometimes referred to as blended work, blurred organizational boundaries and prepared the ground for the next transformation.

Gen AI has now removed these boundaries all together.

The next evolution: Enter "vibe work"

Generative AI shifts the focus from who or where to how work is accomplished. This is not simply automation; it is joint optimization, where human reasoning and machine intelligence collaborate to solve problems faster and smarter.

We call this new mode vibe work, extending from the software engineering concept of "vibe coding" where professionals steer intent while Gen AI handles execution. Vibe work emphasizes problem framing, creativity, and contextual judgment, qualities that are uniquely human but now strengthened through collaboration with intelligent systems.

In practical terms, Gen AI acts as a 24-hour collaborator. It identifies patterns, tests hypotheses, drafts policy frameworks, and visualizes data. The professionals who thrive in this environment are not necessarily the most technical; they are the most integrative, those who can direct, interpret, and apply AI-generated insights effectively.

From coding to cognition: A shift in how work feels

Early automation replaced repetitive labor, while Gen AI enhances cognitive work. It changes the nature of work from process-driven to exploratory. For many professionals, interacting with Gen AI feels like brainstorming with an exceptionally fast colleague who never tires and always offers an answer. The challenge, and also the opportunity, lies in learning to ask the right questions.

This transformation is already visible in the logistics sector. At DHL, AI-powered digital assistants now support planners in real time, analyzing live data feeds from vehicle telematics, fuel prices, driver schedules, and weather forecasts to recommend optimal route configurations. These systems not only shorten planning cycles but also help planners balance service levels, emissions, and cost. What once required hours of manual route modeling can now be done in minutes, allowing teams to focus on customer experience and network design.

At Amazon, Gen AI supports operations managers by forecasting potential bottlenecks before they occur. Drawing on thousands of daily data signals from fulfillment centers around the world, predictive models identify where capacity imbalances or shipping delays are most likely to arise. Managers can then take proactive action by reassigning labor, redirecting inventory, or rescheduling outbound loads before customers experience any disruption.

In both organizations, humans remain firmly in control, but their roles have evolved. The planner's value lies less in producing data and more in interpreting, contextualizing, and acting on it. Work has become less about execution and more about integration, reflecting the orchestration that will define the next era of leadership.

Why it matters

Most organizations are not prepared for this shift. The obstacle is not technological; it is organizational. Many leaders have invested heavily in tools but far less in the structures, culture, and mindsets required to use them effectively. Without intentional design and leadership commitment, vibe work may be dismissed as another digital trend rather than recognized as a lasting productivity revolution.

Gen AI is a textbook case of disruptive innovation. As Harvard Business School professor Clay Christensen argued, true disruption democratizes capability by giving new users access to performance once reserved for experts. MIT economist David Autor describes this as augmentation, in which technologies expand the quality, variety, or productivity of human work.

Real-world cases prove the point. In logistics, managers use Gen AI to clean datasets, generate routing models, and build freight forecasts that were once outsourced to specialists. In operations, product teams use AI-generated visuals to align decisions faster across procurement, engineering, and marketing. In human resources, Gen AI drafts hybrid work policies that leaders refine collaboratively.

In every example, professionals remain in control, leveraging AI for speed, insight, and range within a collaborative ecosystem. They are, in essence, acting as integrators.

The role of the integrator

Recasting your team's function as an integrator requires rethinking how people, processes, and intelligent systems interact. Three imperatives—access, autonomy, and achievement—define where to begin.

1. Access: Make AI ubiquitous, not exclusive
Empower everyone to experiment with Gen AI within secure, ethical boundaries. Too many organizations limit access to "power users" or IT teams, unintentionally reinforcing silos. Instead, broaden participation.

A recent Gartner survey found that in organizations where at least half of the employees use Gen AI weekly, productivity gains doubled compared to firms that restricted access. When AI tools become as common as email, innovation scales naturally.

As JPMorgan Chase CEO Jamie Dimon noted in his 2024 shareholder letter, the right lens is not cost-cutting but waste-cutting. The same principle applies here: use AI to remove friction, not headcount. Shifting from efficiency to effectiveness reframes Gen AI as a collaborative partner rather than a threat.

2. Autonomy: Encourage safe experimentation
Create conditions that allow employees to use AI tools with confidence, supported by clear ethical and security frameworks. Innovation depends on psychological safety, which permits people to explore new ideas without fear of reprimand.

Outdated workflows often block progress. Functionally siloed teams, restrictive data policies, and legacy approvals slow experimentation. Leaders must model trust and curiosity.

One global manufacturer recently discovered that productivity surged only after it decentralized AI experimentation, allowing supply chain analysts, engineers, and planners to build their own copilots. Similar results are emerging across the industry: FedEx's DataWorks platform enables teams to test AI-driven demand forecasts, while Maersk's digital labs invite cross-functional teams to co-develop algorithms for cargo tracking and carbon optimization.

Autonomy without accountability can create risk, but autonomy with guardrails transforms AI from a liability into a resource.

3. Achievement: Reward human–machine mastery
Redefine what success looks like. Traditional performance systems reward task completion and functional expertise. Vibe work rewards the ability to frame problems, generate insights, and collaborate with intelligent systems.

Incentivize those who integrate Gen AI into real workflows, whether it is a planner optimizing routes, an analyst visualizing trends, or a buyer modeling supplier risks. Treat this ability as a recognized and valued competency.

Forward-looking organizations are already embedding AI proficiency into leadership frameworks. At Maersk, for example, digital labs train planners to use machine learning and "what-if" network modeling to optimize routes, balance carbon targets, and reduce operating costs. DHL has introduced AI-enabled planning tools through its RAPTOR platform, which helps logistics teams simulate delivery schedules and predict disruptions in real time. Across both organizations, AI-assisted planners have improved forecast accuracy and decision cycle times, allowing leaders to focus on strategic questions rather than data wrangling.

The goal is not to turn everyone into a coder but into a more capable decision-maker.

From augmentation to integration

Vibe work and integrator leadership together represent a shift from technical adoption to cultural integration. Supply chain leaders are especially well-positioned to guide this transition. Their daily responsibilities, which include balancing demand and supply, optimizing networks, and coordinating partners, are inherently integrative.

This same orchestration skill now applies within the organization. Managing hybrid human and AI teams follows the same principles as managing multi-tier supplier ecosystems. The most effective leaders will use Gen AI to sense, synthesize, and act more quickly, much as visibility platforms transformed logistics two decades ago.

For example, consider how supply chain control towers have evolved. Once centered on dashboards and manual data entry, next-generation towers now use AI agents to interpret signals and generate recommendations in real time. The role of the human planner is no longer to find the data but to verify, contextualize, and decide, which is precisely the work of an integrator.

Leading the cultural shift

Becoming an integrator is not a technical transformation; it is a cultural one. Leaders must set expectations that experimentation is encouraged, that insights trump hierarchy, and that human oversight remains essential.

To do this, start small. Encourage teams to apply Gen AI in specific use cases: a procurement analyst drafting supplier scorecards, a transportation manager summarizing carrier performance reports, or a sustainability team mapping emissions data. Each small success builds confidence and trust in the new workflow.

At the same time, communicate boundaries. Data governance, intellectual property protection, and ethical review must evolve alongside access. The most advanced organizations are pairing AI "champions" within each department with centralized oversight teams that ensure consistency and compliance without stifling creativity.

The lesson from past technology waves—ERP, cloud computing, robotic automation—is clear: tools succeed when people trust them and see value in using them.

Unleashing the opportunity

Vibe work is no longer an emerging concept; it is the operating reality. The difference between firms that thrive and those that stall will depend on leadership posture, not tool choice.

Organizations that embrace access, autonomy, and achievement will build adaptive, high-performing teams that view Gen AI not as a shortcut but as an accelerator. The true differentiator will be integrators, leaders and organizations that align human creativity with machine intelligence to achieve shared goals.

For supply chain organizations, this moment represents an important inflection point. The same capability that once defined operational excellence—the ability to coordinate across silos—will now determine competitive advantage in knowledge work. Just as physical supply chains have evolved from linear pipelines into dynamic networks, cognitive work is becoming a connected system of collaboration between humans and machines.

Manager's checklist: Leading the integrator shift

1. **Reframe AI adoption:** Move from automation to augmentation.
2. **Democratize access:** Make AI tools as common as spreadsheets, safely and securely.
3. **Encourage experimentation:** Build trust, not control, around new workflows.
4. **Reward integration.** Recognize those who combine human and machine insight to deliver better outcomes.
5. **Model the mindset:** Show curiosity and adaptability in your own work; it will cascade through your team.
6. **Connect technology to strategy:** Ensure every AI initiative links directly to measurable business outcomes.
7. **Invest in fluency, not fear**: Provide training that builds comfort and confidence, not compliance checklists.

Conclusion

Generative AI will continue to evolve, but the leadership imperative is already here. To lead with Gen AI, think like an integrator: coordinate people and machines, unify creativity and computation, and design workflows in which human judgment and digital intelligence work in harmony. The leaders who master this integration will not only adapt to the future of work; they will define it. •

34th ANNUAL STUDY OF LOGISTICS AND TRANSPORTATION TRENDS

The Great Disconnect: Bridging the knowing/doing gap in logistics

By Christopher A. Boone, Ph.D., Associate Professor, Mississippi State University; Karl B. Manrodt, Ph.D., Professor, Georgia College and State University; M. Douglas Voss, Ph.D., Professor and Scott E. Bennett Arkansas Highway Commission Endowed Chair, University of Central Arkansas; and Joseph Tillman, Manager Education Programs, SMC3

Our survey team discovers a persistent gap between knowing what's possible in logistics and actually putting it into practice. From AI adoption to talent development and technology integration, leaders understand the path forward—but action still lags behind insight.

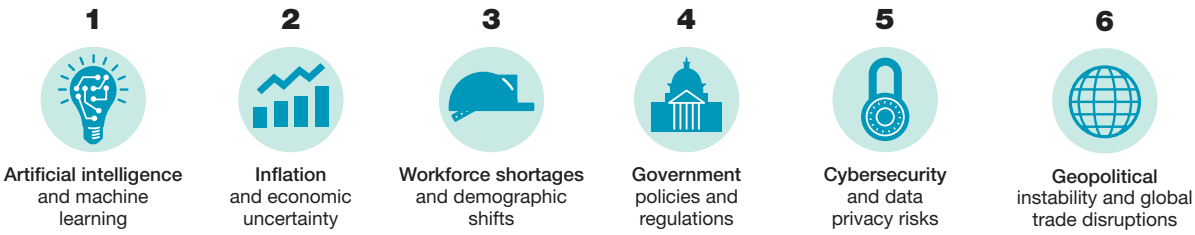
One of our co-authors recently shared a story about his granddaughter. After visiting an elderly neighbor, she came home and marveled: "They have a phone that's attached to the wall."

In an era of mobile phones, AI-powered smart devices, and real-time connectivity, using a phone connected to the wall—though it still works—seems disconnected and out of sync with what's available and possible today.

The same feeling—better tools and approaches are available, yet we continue to rely on those that worked well in the past—was evident in the 34th Annual Study of Logistics and Transportation Trends. Across the three pillars that keep supply chains moving—people, process, and technology—respondents revealed what we're calling The Great Disconnect: the knowing/doing gap between recognizing what's needed and possible and then consistently acting on it.

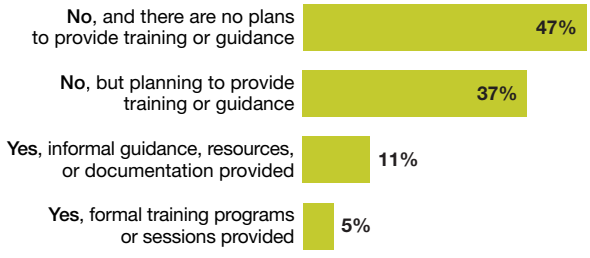
Over the next few pages we're going to put context behind the 2025 study's findings and explore five distinct disconnects that highlight gaps in how the industry manages its people, processes, and technology—areas where what's needed and possible is well understood, but action is still required to close the gap.

Greatest impact over the next 3 to 5 years



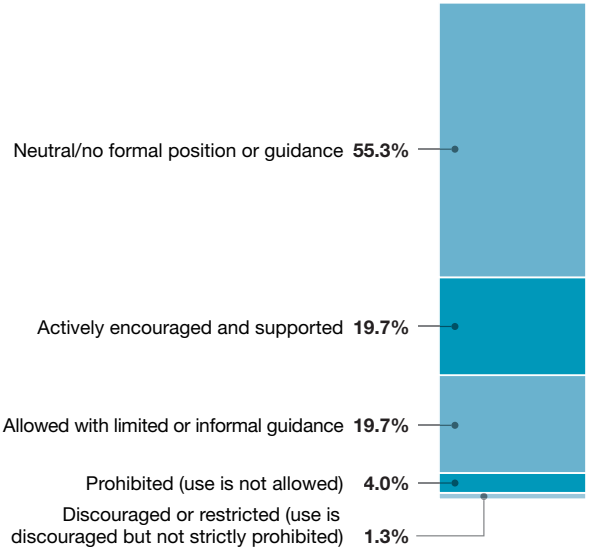
Source: 34th Annual Study of Logistics and Transportation Trends

Does your organization provide training or guidance on using AI tools effectively and ethically?



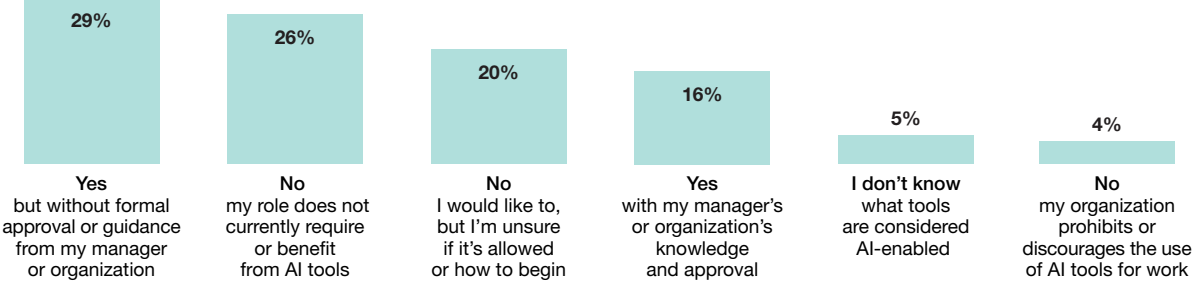
Source: 34th Annual Study of Logistics and Transportation Trends

Your organization's current position on employee use of AI for work-related tasks



Source: 34th Annual Study of Logistics and Transportation Trends

Do you use AI tools to assist with your job tasks and responsibilities?



Source: 34th Annual Study of Logistics and Transportation Trends

Voices from the field

Now in its 34th year, the annual study surveyed 281 logistics and transportation professionals across a diverse mix of company sizes, industries, and roles. Three out of four respondents hold director-level or higher positions, and 85% have more than 15 years of experience in the industry. These are experienced leaders who understand the industry's complexities, have weathered its cycles, and recognize both the progress we've made and the barriers that remain.

Respondents overwhelmingly recognize the technologies and workforce strategies that will shape the future, but actions are not keeping pace with the change. It's as if we see the new mobile phone on the table, but we're still tethered to our landline.

There's a gap between knowing what to do and being able to do it. That's the heart of "The Great Disconnect." This year's survey revealed five key disconnects that managers should avoid and resolve to improve.

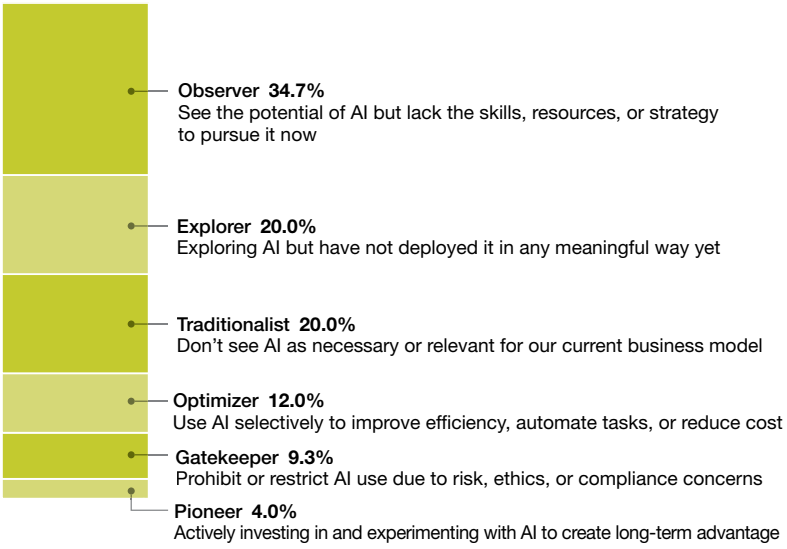
Disconnect #1: Watching AI instead of using it (Technology)

Ask logistics leaders what's reshaping the industry, and most will give the same answer: artificial intelligence (AI). It topped the list of trends respondents expect to affect their organizations over the next three years to five years, outranking inflation, labor shortages, automation, and even geopolitical instability.

But when we examined actual engagement with AI inside companies, the tone shifts.

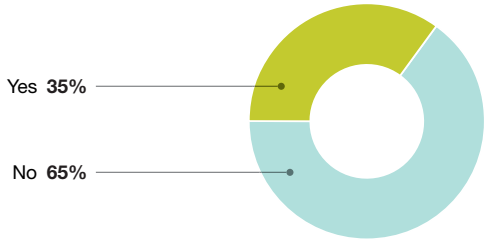
• Only 5% of respondents say that

Describes your organization's current approach to AI-enabled tools and technologies?



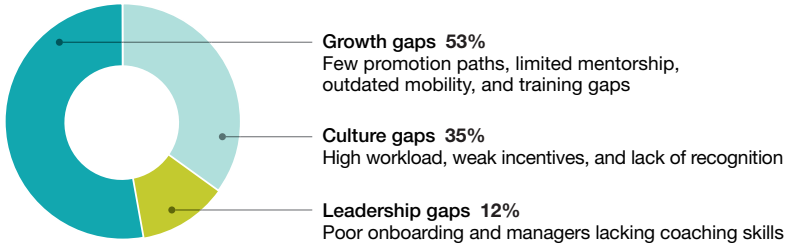
Source: 34th Annual Study of Logistics and Transportation Trends

Does your organization have a dedicated learning and development or training department/office?

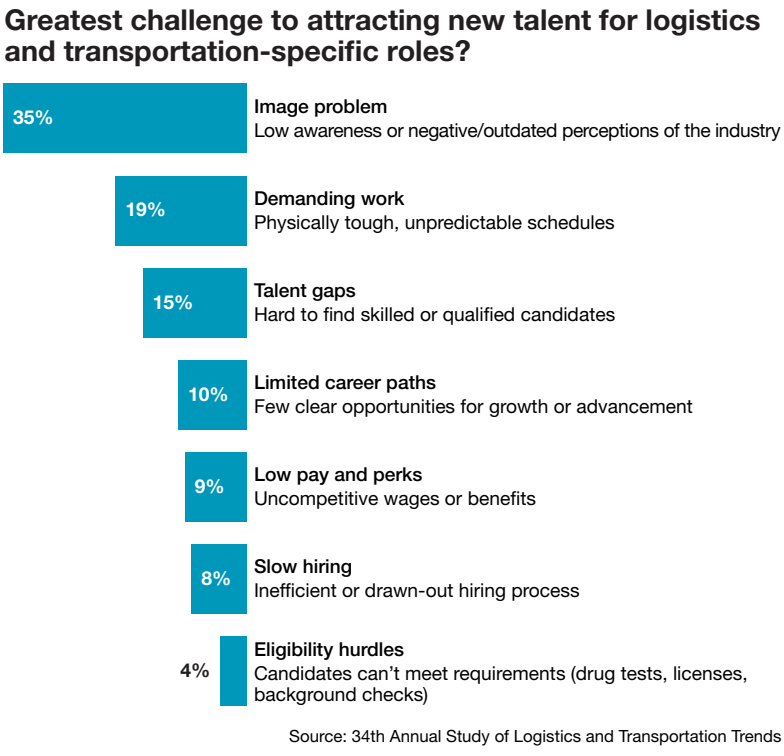


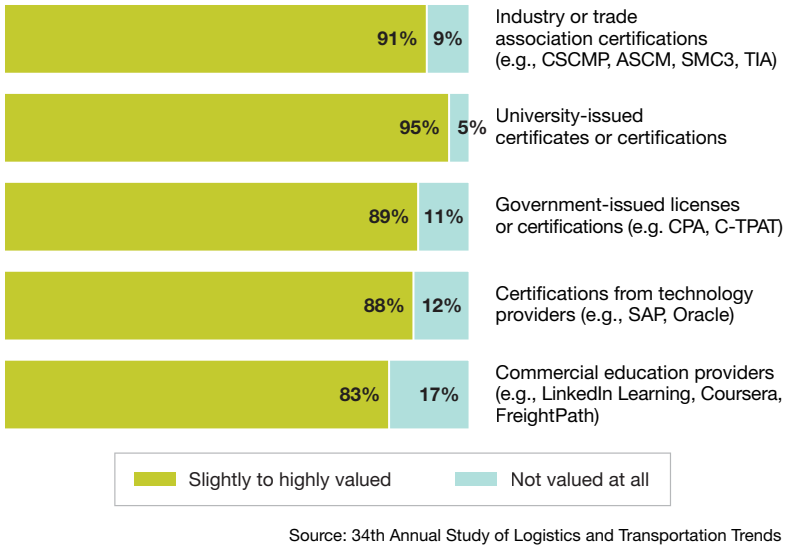
Source: 34th Annual Study of Logistics and Transportation Trends

Biggest challenges to retaining and developing talent for logistics and transportation roles?



Source: 34th Annual Study of Logistics and Transportation Trends





their organization provides structured training or guidance on AI use.

• Fewer than 20% report that their companies actively encourage or support AI experimentation.

• Only 16% say they use AI for work with their manager or organization's approval, and 29% report using AI without formal approval or guidance.

The contrast is stark: while most believe AI will be the top industry driver in the next three years to five years, only 4% say that their organizations are true "pioneers" who are actively investing in and experimenting with AI to create long-term advantage. Most (34.7%) describe their organizations as "observers" who see the potential of AI, but lack the skills, resources, or strategy to pursue it.

We see this as part of the disconnect and gap between knowing and doing. AI-enabled tools are available, use cases are growing, and leaders recognize that logistics operations will be affected. However, a gap between knowing and doing is created by the lack of systems, support, and leadership alignment necessary to leverage these tools effectively.

Disconnect #2: Talent is a priority, but few act like it (People)

The next major disconnect shows up in the workforce, where talent is widely seen as critical, but it is often treated as optional. When asked which factors would have the most significant impact on logistics over the next three to five years, respondents ranked workforce shortages and demographic shifts as one of the top three challenges.

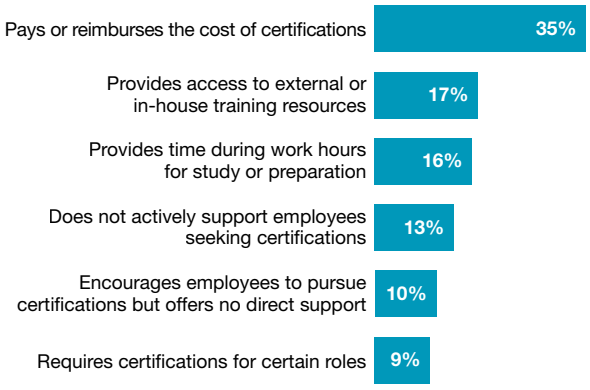
Yet, when we asked what companies are doing to secure, grow, and keep talent, the gaps were hard to miss.

• Only 35% say that their company has a dedicated learning and development (L&D) function.

• Another 35% believe outdated perceptions and low awareness hurt the industry's ability to attract talent.

• More than half (53%) cite limited career paths, leadership development, and mobility as significant retention challenges.

Organizational support for employees seeking to earn external credentials?



Source: 34th Annual Study of Logistics and Transportation Trends

This disconnect is both operational and cultural. Many companies acknowledge the urgency of workforce development, but haven't aligned their systems, structures, or incentives to support it.

Disconnect #3: Credentials valued, not supported (People)

We also explore the use and support of external credentials and certifications, tools that have long been used to standardize knowledge, signal professional growth, and close skill gaps.

Transitioning from a landline to a cellular system requires some training; using today's advanced tools will necessitate even more training. Once again, the story is mixed.

- 95% value university-issued credentials; 91% value those from industry associations like CSCMP, ASCM, SMC3, and TIA.
- 89% value government-issued credentials (e.g., CDL, FAC-P/PM, FAC-C) while 88% value tech-provider credentials (e.g., SAP, Oracle).
- However, only 35% said their company would help cover certification costs, and only 16% allow study time during work hours.
- Even fewer (6%) said certifications boost promotion chances, and only 3% said they lead to higher pay.

It's a textbook example of the knowing/doing gap in action. The value is recognized, but the follow-through is missing. Companies claim that credentials matter, but often fail to support the time, cost, or structure required to earn them.

This gap is especially risky given a lack of internal L&D opportunities (e.g., Disconnect #2). Certifications would allow firms to outsource training, which is critical in today's labor market. Younger professionals expect growth opportunities. Mid-career workers need reskilling. And the best talent is likely to gravitate toward organizations that put action behind their values.

Disconnect #4: Strategy not delivering (Process)

Faced with ongoing market volatility, policy changes, and global uncertainty, companies have adjusted their strategies to remain competitive.

In this year's study, we asked respondents about the strategic moves their organizations made or were actively planning to implement in response to evolving conditions. The most common responses include the following:

- adjust sourcing, production, or routing;
- freeze hiring or reduced their workforce;
- renegotiate service levels or contract terms;
- delay or cancel capital or technology investments; and
- enhance internal capabilities to reduce reliance on external providers.

The question is: Have these moves actually strengthened people, processes, and technology—or are they just keeping pace?

As in previous years, we asked respondents to compare their company's performance with that of its competitors across five key performance measures: profitability, return on assets (ROA), revenue growth, market share, and customer satisfaction.

This scale provides insight into how respondents perceive their performance where it matters: in the market.

The results? Virtually unchanged from 2024 and still well below 2023—evidence that reactive moves have maintained parity, not create competitive advantages.

While the industry has faced unprecedented challenges over the last couple of years, the disconnect between strategy and outcome serves as a reminder that short-term fixes can stabilize operations. However, without sustained planning and investment in people, processes, and technology, they rarely deliver lasting gains.

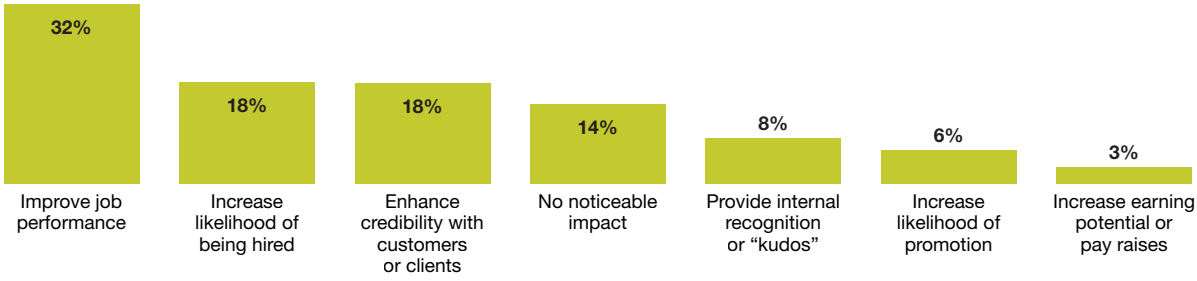
Disconnect #5: Technology for the people who use it (Technology)

When we asked participants what they wished their logistics, transportation, and supply chain systems could do that they don't do now, the answers were telling.

The top wishes include the following.

- Integration: systems that seamlessly connect with partner and customer platforms.
- Intragation: seamless connectivity among internal systems like TMS, WMS, ERP, and finance.
- Automation: tools that automate and simplify repetitive processes.

What benefits do external credentials provide to employees in your organization?



Source: 34th Annual Study of Logistics and Transportation Trends

• Analytics, Prediction & Visibility: better forecasting, market trends, cost predictions, and custom reporting.

• Improved User Experience & Accessibility: Intuitive, easy-to-use systems accessible to all users.

• Security & Fraud Prevention: Stronger protection against cyber threats and freight fraud.

• Compliance & Regulatory Adaptability: Technology that quickly adapts to evolving regulations.

• Future-Ready Systems: Scalable platforms ready to integrate emerging technologies.

• Workforce Enablement & Support: Tools that enhance training, skills, and daily decision-making.

None of the wishes seem unrealistic, and most, if not all, should be table stakes for a modern digital supply chain. Yet here again, the knowing/doing gap stands in the way.

Bridging the Disconnect: From knowing to doing

The 34th Annual Study of Logistics and Transportation Trends reveals an industry that's not lacking in awareness. Leaders know what matters and recognize the trends, but moving from "we should" to "we did" remains the real hurdle.

To help bridge this knowing/doing gap, here are five practical actions, one for each disconnect, that organizations can take.

From AI Awareness to AI Readiness. Stop just watching. Start small. Identify low-risk use cases, assign internal champions, and encourage peer learning to reduce fear and build confidence around AI-enabled tools.

From Talent Talk to Talent Development. Move from acknowledging the talent shortage to actively building capability. Establish or expand learning and development programs—even informal ones such as job rotations, mentorship, or lunch-and-learns—and formalize career paths to attract and retain emerging talent.

From Valuing Credentials to Supporting Them. If certifications matter, invest in them. Offer tuition assistance, allow study time, and connect credentials to performance reviews, promotions, and raises to reinforce their value.

From Strategy Implementation to Strategic Outcomes. Shift from reacting to market conditions to building lasting advantage. Evaluate whether recent strategic moves improved service, margins, or resilience; restart delayed initiatives that close capability gaps; and avoid short-term workforce cuts that might weaken future competitiveness.

From Tech Availability to Tech That Works for People. Focus on tools that truly support users. Prioritize systems that integrate across platforms, automate routine tasks, improve visibility, and adapt to changing needs. Involve end-users early to ensure solutions are intuitive, accessible, and seamlessly integrated into daily operations.

Overcoming The Great Disconnect and bridging the gap between knowing and doing will not happen overnight, but it can start now. Small, intentional steps can turn awareness into action—building the flexibility, responsiveness, and resilience organizations need to succeed today and in whatever future the supply chain delivers next. •

Response to market conditions

1 *Adjusted sourcing, production, or routing strategies in response to tariffs or trade policy changes*
2 *Frozen hiring or reduced workforce*
3 *Renegotiated service levels or contract terms*
4 *Delayed or canceled capital/technology investments*
5 *Enhanced internal capabilities to reduce reliance on external providers*
6 *Diversified supplier or transportation partnerships to reduce risk*
7 *Consolidated carrier or supplier base*
8 *Increased outsourcing or use of third-party services (e.g., 3PLs, consultants)*
9 *Increased reliance on private or dedicated fleets*
10 *Shifted more volume to the spot market*
11 *No significant changes made*

Source: *34th Annual Study of Logistics and Transportation Trends*

How procurement teams are managing Tier 2 suppliers to lower costs and improve resilience

As tariffs, volatility, and compressed launch cycles expose the limits of Tier 1 oversight, procurement leaders are leveraging AI-driven Tier 2 visibility to cut upstream costs, reduce hidden risk, and strengthen resilience.

By Venky Arun & Karthik Rai

Venky Arun is a Kearney partner who focuses on large-scale operations transformations and can be reached at venky.arun@kearney.com.

Karthik Rai is a Kearney manager focused on procurement transformation and enterprise value creation. He can be reached at karthik.rai@kearney.com.

Most procurement and supply chain teams focus their efforts on Tier 1 suppliers and contract manufacturers—tracking performance, negotiating pricing and managing SLAs. But when input costs swing wildly, tariffs shift overnight and product launches compress into weeks, relying solely on Tier 1 relationships leaves critical gaps. The real operational leverage sits one layer deeper, with Tier 2 suppliers.

Tier 2 visibility has become essential for finding cost reduction opportunities while protecting supply bases from hidden risks. AI-powered analytics tools and supply chain platforms have made this visibility achievable without massive teams or perfect data. Core innovation and technical know-how now live at Tier 2.

Without that visibility, teams operate blindly on cost drivers and face concentration risks they can't see. Direct relationships and transparency with Tier 2 suppliers enable collaborative innovation, cost validation and compressed lead times, making supply chains more responsive when it matters most.

Why Tier 2 has become mission-critical

Supply networks have grown simultaneously more fragile and more strategic. Tariffs, trade shifts and inflation now demand visibility into cost and performance drivers across all supply tiers, not just Tier 1. As IP, specialized materials and design know-how migrate to Tier 2 suppliers, many companies now depend on invisible contributors they neither contract with nor understand.

AI-driven supplier mapping, automated data extraction and predictive analytics have made deep-tier management feasible at scale, a critical development for COOs and operations executives facing pressure from two directions. They must simultaneously shield the organization from cost volatility and hidden risks while unlocking the innovation and agility that Tier 2 suppliers possess.

Translating Tier 2 visibility into business value

Leading companies now co-design solutions with suppliers by mapping the broader ecosystem's cost drivers, then harmonizing materials, rationalizing suppliers, and building resilient dual-sourcing structures. This shift elevates supply chain management to a boardroom issue by tying directly to enterprise priorities:

• **Revenue growth.** Tier 2 co-development accelerates product qualification and gets launches to market on time, turning supply chain into a competitive advantage.

• **Operating model.** Harmonizing materials across tiers and negotiating enterprise-wide pricing cuts complexity while driving down cost.

• **Risk management.** Multi-tier sourcing strategies eliminate dangerous single points of failure in the supply base.

• **Capital efficiency.** Coordinating payment terms and accelerating cost pass-throughs across tiers directly improves cash conversion cycles.

• **Talent and culture.** Cross-functional governance on Tier 2 issues breaks down silos, speeds decision-making, and makes collaboration the default.

• **Sustainability**. The hardest Scope 3 emission reductions sit deep in the supply chain—and can only be achieved through multi-tier partnerships.

Tier 2 visibility isn't a universal solution. It delivers the most value in categories where material inputs, supplier networks, and switching costs shape the majority of total cost, innovation potential or risk exposure. Three environments stand out:

1. Limited-leverage environments. When suppliers own design, IP or specifications, companies can become locked into opaque costs and limited leverage. Tier 2 mapping restores influence and enables joint cost validation and redesign.

2. Commoditized or semi-commodity inputs. In categories like packaging, resins, excipients and basic materials, Tier 2 suppliers often drive pricing more than Tier 1 intermediaries. Consolidating demand and engaging Tier 2s directly can improve scale leverage, increase transparency and secure better terms.

3. Regulated or high-qualification sectors. Food, beverage, pharma, automotive and electronics, where qualification cycles and compliance barriers limit switching, capture outsized value from transparency and structured co-innovation.

Embedding transparency, metrics, and governance for Tier 2

Sustained structural improvement comes from linking cost transparency to operating model change. In practice, leading COOs use deep-tier analytics to pinpoint cost drivers, then adjust governance and incentives so teams keep capturing savings quarter after quarter.

1. Write visibility into supplier terms
Tier 2 visibility is moving from a "nice to have" to standard language in Tier 1 agreements. Companies are baking in access to pricing and specs, along with volume and shipping terms, then treating compliance as part of supplier performance. AI-driven supplier intelligence tools are accelerating the work by pulling data together automatically and keeping it current.

2. Turn information into operating decisions
Forward-looking COOs are translating supplier data into KPIs that track with board-level outcomes. Metrics like supply concentration or dual-sourcing coverage show up alongside cash and service measures because they predict resilience and margin. The point is straightforward: supply structure becomes measurable, then manageable.

3. Build governance that holds through the cycle
Tier 2 oversight is getting a standing forum, with a repeatable cadence and clear owners. Cross-functional councils are becoming the mechanism, especially when operations and finance need the same facts to make trade-offs. That rhythm keeps transparency reviews tied to design choices and supplier collaboration, so the discipline persists after the initial push.

Top executives must insist on transparent data, unified performance metrics and coordinated oversight of Tier 2 management.

Operationalizing Tier 2 sourcing for measurable value

The companies getting the most out of Tier 2 sourcing treat it as a repeatable capability with clear ownership, not a one-time initiative. Teams run targeted RFIs to pull SKU-level price, spec and volume data, then standardize it into a should-cost baseline and push the best opportunities through a clear decision path. TPMs handle the renegotiations using benchmarks, and enterprise rates get applied when they fit.

Governance stays streamlined, with disciplined execution. Shared data rooms keep the same facts in view, decision logs record what changed and why, and information-sharing rules reduce friction with suppliers and internal stakeholders.

Progress is managed through a concise set of enterprise KPIs, including the share of Tier 2 spend under transparent terms and variance-to-should-cost closed. Dual-sourced SKU coverage and payment-term alignment provide additional line of sight into resilience and working-capital impact.

Supplier visibility unlocks enterprise value

Tier 2 sourcing influences costs at the source by shaping upstream materials and production choices, reducing inputs before markups while protecting supplier profitability and relationships. Greater sub-tier visibility also strengthens resilience by surfacing concentration, financial and capacity risks early, improving forecasting and compliance monitoring, and enabling proactive mitigation.

Scale advantages tend to emerge once the underlying structure is made visible. When common Tier 2 suppliers are identified across TPMs, demand can be pooled, components can be standardized and quality variation can be reduced. Many Tier 2 partners also hold distinctive materials and design know-how, which makes them natural partners in co-development and can shorten development cycles.

When tied to enterprise outcomes, upstream visibility delivers measurable results, including shorter time-to-launch and stronger on-time performance, lower complexity and cost, reduced concentration risk, and faster cash flow. It also helps identify disruptions before they hit the P&L, stabilizing costs and improving service continuity. Predictive analytics and risk intelligence make this proactive management practical, supporting more stable, high-performing supply networks.

Tier 2 as a strategic advantage

Tier 2 visibility positions procurement to protect margin and supply continuity while shaping the next wave of supplier advantage. The opportunity is clear: Tier 2 supplier data can transform supply networks from cost centers into engines of speed, resilience and innovation. Procurement organizations that seize this advantage will set the standard for manufacturing agility in the decade ahead. •

SUSTAINABILITY AND AI:

A complicated and often overlooked relationship

Organizations have a gap between adoption and accountability.

By Marisa Brown, APQC

Marisa Brown is the senior principal research lead for Supply Chain Management at APQC. She leads APQC's supply chain team that conducts research to provide insights into benchmarks, best practices, and process improvements in supply chain planning, procurement, logistics, manufacturing, product development, and innovation. Marisa is a leader in supply chain with almost 30 years' experience in business, research, writing, speaking and consulting.

Supply chains are expanding the use of AI across functions, and that expansion means more data storage and more computation, which all require more electricity use and potentially more greenhouse gas (GHG) emissions during electricity production. APQC recently conducted a survey of 2,500 business leaders to assess organizations' environmental sustainability strategy, performance, and governance. The results indicate that AI adoption is outpacing accountability for sustainability. APQC recommends that organizations account for increased energy consumption tied to AI when calculating their sustainability performance. They should also be aware of how AI can affect their emissions goals.

Planning for the impact of AI

In this research, APQC found that companies are not connecting increased AI usage with the need for an increased focus on sustainability. At the median, only 30% of organizations' AI initiatives incorporate sustainability considerations, data, and insights. This increases to only 40% at the 75th percentile.

These results reveal a disconnect between organizational strategy and execution. For 2026, leaders are looking to rely even more on AI for business functions. More AI usage requires more energy, and the production of that energy often yields more GHG emissions. At the same time, companies have established emissions targets and publicized goals for reaching net-zero emissions.

Renewable energy. One approach companies take to reduce GHG emissions is to use energy from renewable sources. Although these sources result in GHG emissions during manufacturing and installation, they yield significantly lower emissions than fossil fuels.

At the median, organizations in APQC's study report that 50% of their energy consumption comes from renewable sources. This leaves half of the energy sourced from traditional sources. Even at the 75th percentile, only 65% of energy comes from renewable sources. This calls into question how organizations plan to source the energy needed for AI. If they have not already sourced the majority of their energy from renewable sources, the power needed for AI will likely result in increased GHG emissions.

Net zero emissions targets. Of course, GHG emissions matter to companies, countries, and consumers alike. Not surprisingly, all of the organizations in APQC's research have a target year to achieve net-zero emissions. The target dates are key to corporate strategy and investor expectations.

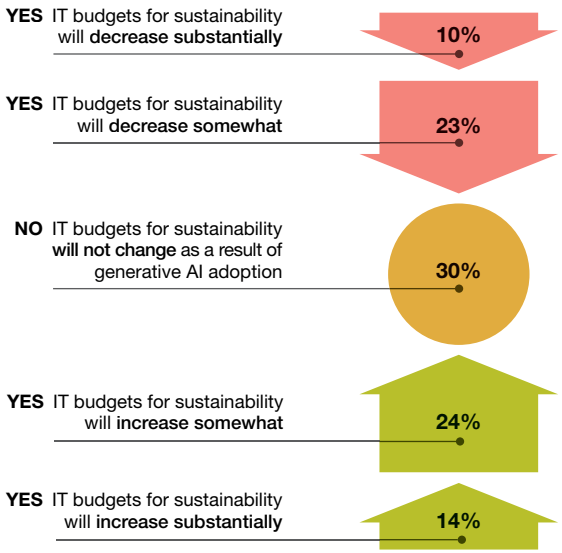
At the median, companies have set 2040 as their target net-zero year. For the 25th percentile, it's slightly sooner, with 2035 as the target date. A lot can change in the years between now and the target dates. Whether these targets are attainable given increased use of AI remains to be seen. If companies do not incorporate sustainability data and insights into their AI plans, they will not be able to determine whether AI will have a negative impact on their ability to achieve their target year for net-zero emissions.

Focus on the intersections between sustainability and AI

In a related development, companies give mixed responses when it comes to how their IT budgets for sustainability will change as a result of AI. As shown in Figure 1, 33% believe their budgets will decrease, and 38% say they will increase.

FIGURE 1

Will IT budgets for sustainability change as a result of generative AI adoption?



Source: APQC

As for lack of focus on sustainability, as mentioned previously, at the median, only 30% of organizations' AI initiatives incorporate sustainability considerations, data, and insights.

Let's put that into context with other initiatives. As Figure 2 shows, sustainability is overlooked in several types of initiatives—many of which could affect energy usage, and thereby GHG emissions.

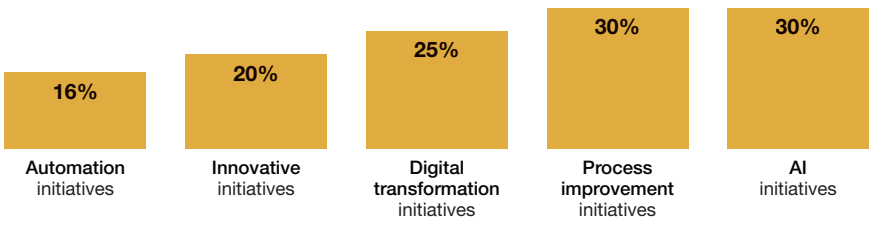
It is worth considering which of the departments on this list are more likely to use AI. For example, customer service is a department with a clear use case for AI, including chatbots, intelligent routing, and personalized customer recommendations. However, sustainability is a consideration for this department in only 21% of organizations.

And although many departments consider sustainability when making decisions, this

FIGURE 2

Percentage of initiatives that incorporate sustainability considerations, data, and insights

(Median)



Source: APQC

APQC also looked at whether the reverse is true: do organizations include AI in their sustainability initiatives? At the median, only 20% do so. This amount is likely to increase as company leaders push for more usage of AI across their organizations.

Sustainability in decision-making and strategy

Many departments across the enterprise report that they include sustainability as a consideration in their decision-making. As shown in Figure 3, nine departments meet this criteria for over 50% of organizations.

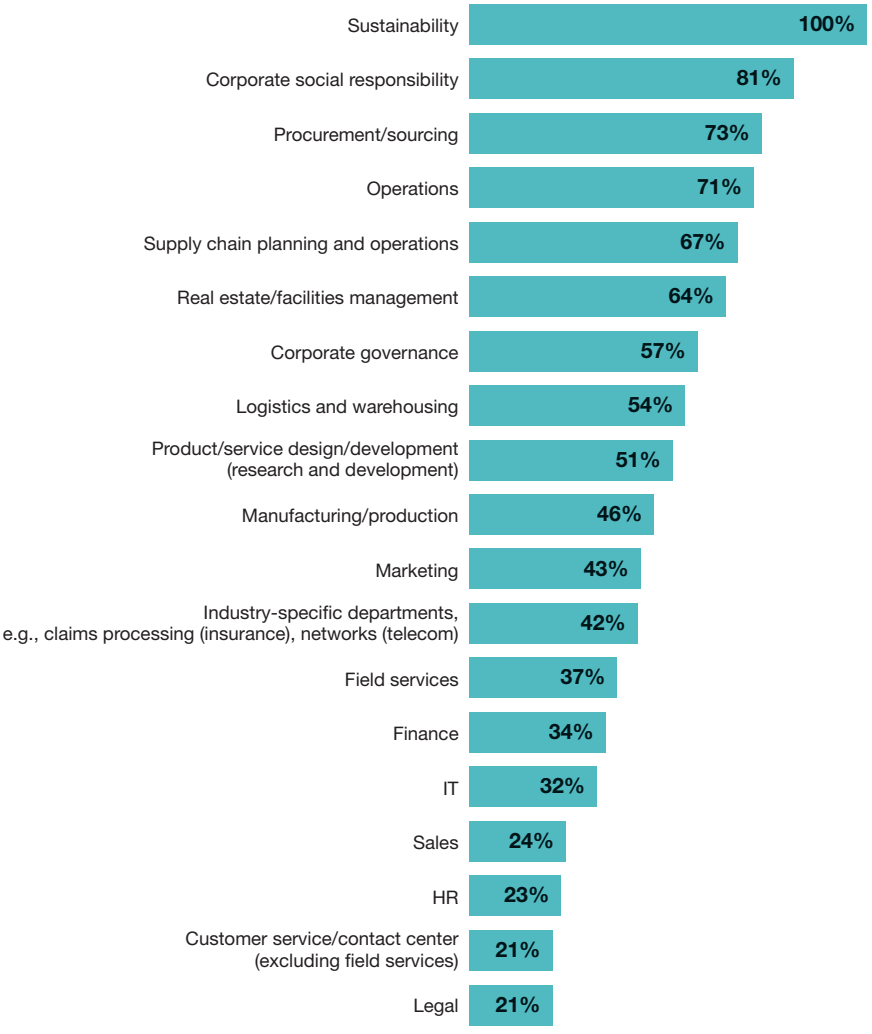
trend doesn't hold when it comes to including a sustainability impact assessment during strategic decision-making. As shown in Figure 4, a median of only 30% of strategic decisions include this kind of critical assessment.

Leverage carbon budgets to measure emissions

Carbon budgets can serve as a framework for managing GHG emissions, particularly carbon dioxide. They are designed to help organizations monitor emissions to ensure they stay below a certain limit. Even without considering the added impact of

FIGURE 3

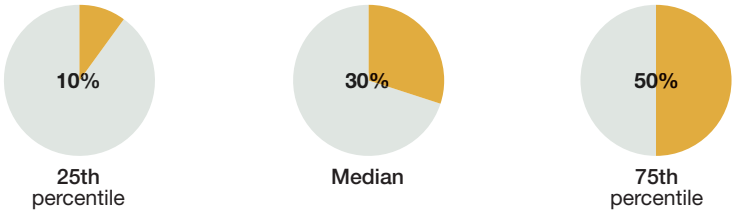
Departments that incorporate environmental sustainability in decision-making



Source: APQC

FIGURE 4

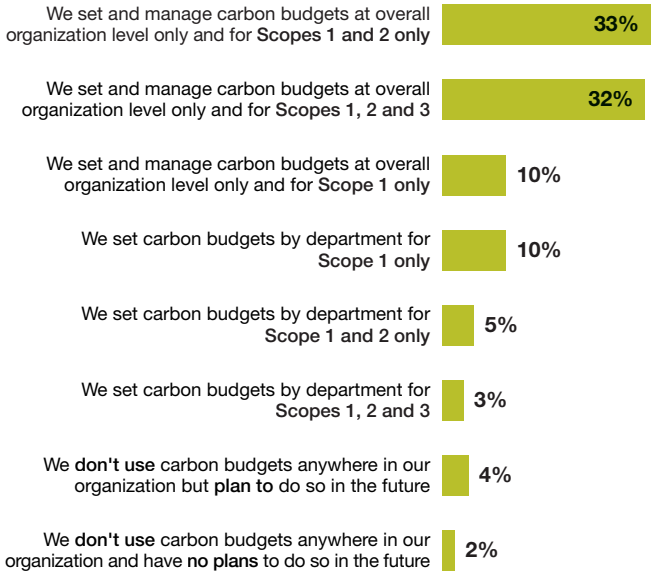
Percentage of strategic decisions that incorporate a sustainability impact assessment



Source: APQC

FIGURE 5

How organizations manage carbon budgets



Source: APQC

AI usage on GHG emissions, organizations may not have the full picture of their carbon impact and cannot establish comprehensive, accurate carbon budgets. This will only become worse as AI use (and therefore energy use and emissions) increases.

Typically, organizations use the GHG Protocol to measure the different types of emissions tied to their business. This ranges from Scope 1 (direct emissions), to Scope 2 (emissions from purchased or acquired energy), to Scope 3 (emissions a company is responsible for outside of its walls). The majority of total corporate emissions come from Scope 3 sources, which are often overlooked by organizations when managing their carbon budgets.

As shown in Figure 5, only 35% of organizations take all three scopes into account when managing carbon budgets, either at the department or organizational level. Thirty-eight percent take Scopes 1 and 2 into account, and 20% take only Scope 1 into account. This gap highlights the lack of visibility too many organizations face with GHG emissions.

Keep sustainability on track

AI is here to stay, even as organizations refine where it is used and to what extent. Organizations need to keep up with tracking sustainability associated with this new technology. Leaders must make a concerted effort to sync organizational AI goals with broader sustainability goals.

Although most organizations have set carbon budgets, some have not set them across all scopes. Regardless, they should prioritize assessing the impact of GHG emissions from the increased energy consumption that comes from using AI. They can then set explicit AI energy (and thus GHG emissions) targets. These can inform decisions about energy sources.

When possible, companies should revisit their use of renewable energy sources. This can aid in offsetting the increased energy use associated with AI. Further, they can shift AI activities to times and locations with greater availability of renewable energy.

Companies have been operating without a clear image of the sustainability impact of AI, but it does not and should not stay that way. Through better tracking that leads to strategic updates, companies can both embrace the capabilities of AI and keep their sustainability targets on track. •

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.

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2026 MARKET UPDATE:

LTL HOLDS THE LINE

Carriers maintain rare pricing discipline in a tepid market, but rising costs and lingering overcapacity will test how long that resolve can last.

By John D. Schulz, Contributing Editor

Despite ongoing weakness in the much larger for-hire truckload sector, carriers in the $53 billion less-than-truckload (LTL) market are extending a three-year run of strong yield management.

Yet even as they continue to flex their pricing power in a sector defined by high barriers to entry, industry leaders say they have not seen a market this soft in a generation or longer. "In one word, I would describe it as 'tepid,'" says Chuck Hammel, president of Pitt Ohio, a major Northeastern LTL carrier.

That's not for lack of occasional false starts. "We will, at times, get surges, but then it backs off a week or so later," Hammel adds. "I've never seen a market like this last so long."

Still, LTL carriers are hardly printing money. Some freight that once moved through LTL networks has been absorbed by struggling truckload carriers, some of which have lowered their minimum shipment weights to as little as 10,000 pounds.

"Nothing jumps off the page to me to indicate an economic resurgence is around the corner that will materially improve the freight market," says Peter Latta, chairman and CEO of A. Duie Pyle, the nation's 16th-largest LTL carrier. "I hope I'm wrong."

Following Yellow's cessation on July 30, 2023, its roughly 10% share of the LTL market was redistributed largely among the remaining top 25 carriers. While some moved aggressively to expand, others notably passed.

As carriers weighed bids on Yellow's former 325 terminals, the biggest capacity gains went to FedEx Freight, the largest LTL carrier, and Saia, the sixth-largest. One of the sector's strongest players, Old Dominion Freight Line (ODFL), initially considered acquiring all of the former Yellow facilities, but ultimately balked at prices that in some metropolitan markets exceeded $100 million per terminal.

"I'm concerned the industry may slide into the LTL environment that carriers hated in 2009," says Satish Jindel, principal of SJ Consulting. He recalls how the 2008–2009 downturn prompted major carriers—led by FedEx Freight—to launch a discounting war aimed at putting Yellow out of business.

"In the process, they took themselves over the cliff," Jindel says. "It took the LTL industry five years to recover from the sharp decline in rates."

Will the LTL sector learn from the past? In our annual deep dive, we examine the market fundamentals, how carriers are managing overcapacity, and how long-established LTLs can maintain pricing discipline before competitive pressure risks another damaging rate war.

A SPECIAL SUPPLEMENT TO:

SUPPLY CHAIN MANAGEMENT REVIEW

"In one word, I would describe it as 'tepid.' I've never seen a market like this last so long."

— Chuck Hammel, Pitt Ohio

How strong is the LTL sector?

Even with additional capacity coming from former Yellow properties, LTL pricing has remained fairly strong, experts say.

ODFL led the latest round of rate increases in mid-October, announcing a 4.9% general rate increase (GRI) effective Nov. 3. FedEx and ABF Freight System matched ODFL's move, while Saia implemented a 5.9% GRI on Oct. 1—three weeks earlier than most, though 200 basis points lower than its 2024 increase.

Still, for most large LTL carriers, a customer's actual rate depends on individual freight characteristics, including how shipments fit within a carrier's network and broader freight mix.

"Even as LTL networks pick up smaller shipments and experience some turnover, carriers have kept a keen eye on profitability and network efficiency," says Mich Fabriga, vice president of LTL pricing for AFS, which helps more than 1,800 companies analyze freight costs and manages more than $11 billion in transportation spend.

Emphasizing yield over volume has proven to be a winning strategy in past down cycles, and rates are again "proving resilient," Fabriga adds, "even in the face of negative indicators such as the ISM Manufacturing PMI, which has shown contraction in 33 of the last 35 months."

"The market has largely reached equilibrium," says Latta. "I hope the surviving carriers have vicariously learned the lessons—and effects—of irrational and undisciplined pricing." Maybe they have. And maybe they haven't. Only time will tell.

Challenges ahead

Like much of the industry, LTL carriers are grappling with rising costs across nearly every category—labor, insurance, equipment, repair parts, and the growing expense of defending themselves in court against so-called "nuclear verdicts" in wrongful-death lawsuits.

Insurance, in particular, is climbing at a punishing pace. "It's not unusual to hear about good companies having their fleet insurance go up 75% to 125% year over year," says Pitt Ohio's Hammel. "That's crazy. I don't know how many companies can overcome this kind of cost increase." He adds that both fleet insurance and healthcare costs are now rising at double-digit rates.

Latta of A. Duie Pyle agrees, noting that both his company and Pitt Ohio operate heavily in the congested Northeast. "It's an inherently risky business, and the scales of justice are unfortunately not balanced," he says.Latta believes addressing jury awards that can exceed $20 million in wrongful-death cases will require two changes:

1. eliminating plaintiff-lawyer contingency fees that bear little relationship to the actual cost of legal services; and

2. requiring the losing side to pay the winner's legal costs.

Until that happens, carriers must focus on protecting themselves. At Pyle, that has meant investing in road-facing, side, rear, and inward-facing cab cameras across the fleet, while remaining vigilant against what Latta describes as fraudulent claims involving repeat lawyers, doctors, and claimants.

"When the cameras demonstrate we're at fault, we know it's best to accept responsibility and seek to expeditiously close the matter in a fair and equitable manner," Latta adds.

Classification changes accepted

One bright spot for LTL carriers—and shippers—has been how smoothly changes to the National Motor Freight Classification (NMFC) rating system were absorbed by the market. About one-third of the revisions took effect last July, with the remainder scheduled for this year.

"It really was a non-event," says Pitt Ohio's Hammel. "One of our executives said it reminded him of Y2K. There was all of this buildup—and then nothing." Part of the smooth transition, he says, was that carriers identified affected customers early and addressed the changes in advance. Broader adoption has also been aided by the rollout of dimension-measuring equipment across most large trucking facilities.

The updates place greater emphasis on package dimensions, not just weight and destination. By better accounting for density, carriers can load more smaller shipments and utilize weight capacity more effectively, rather than "cubing out" first on lighter, less-dense freight.

The relationship between weight and cost per shipment continues to highlight strong pricing discipline in the LTL sector. AFS data from the third quarter of 2025 show shipment weight down 7.4% year over year, while cost per shipment declined just 0.7% over the same period.

Rates down the road

The LTL market continues to prioritize cost per shipment over volume, helping rates remain relatively steady, according to AFS Logistics.

Satish Jindel of SJ Consulting expects 2026 LTL rate increases to be "flat to low single digits," roughly in the 2% range. However, he notes that with fuel surcharges down from a year ago, carriers' true revenue is likely slightly lower—at least in the early part of the year.

LTL carriers are emphasizing yield rather than volume, an approach that has worked well in previous down cycles. But demand is unlikely to rebound until the U.S. economy fully recovers—an outcome made more uncertain by shifting tariff policy. Economists caution that this recovery could take time.

AFS data show that LTL cost per shipment declined just 0.7% year over year in the third quarter, even as shipment weight fell 7.4%. "A longer-term indication of carriers' successful yield management and margin protection efforts is that cost per shipment has held steady at elevated levels since the second quarter of 2023—a period of nine straight quarters," the AFS index reported.

Looking ahead, AFS adds that the fourth-quarter 2025 LTL rate-per-pound index is expected to remain above its January 2018 baseline, marking eight consecutive quarters of year-over-year growth.

So where did this pricing discipline come from? Geoff Muessig, chief marketing officer at Pitt Ohio, says most large LTL carriers now rely on highly accurate costing models that account for virtually every pound of freight.

"That has led to price discipline," Muessig says. "When you run a shipment through the costing model, you can see whether it makes sense or not. It's not that trucking executives are any smarter—the models have simply gotten better, more accurate, and more widely used." •

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SUPPLY CHAIN MANAGEMENT REVIEW

FROM OPERATIONS TO ORCHESTRATION:

The CSCO's nexus role in a synergistic C-Suite

By Paul Hong, Doug Reinart, and Steve Miller

As volatility, digital acceleration, and cross-functional complexity intensify, the CSCO is evolving from operational leader to enterprise orchestrator, aligning finance, technology, and market strategy into a unified system of resilience and growth.

Once confined to logistics and cost control, the chief supply chain officer (CSCO) now often operates as the enterprise's strategic integrator—linking operations, finance, technology, and marketing around shared purpose and synchronized execution. In today's volatile global environment, the CSCO's nexus role has become a central organizing principle of resilient, growth-oriented leadership. This article introduces the concept of Nexus Leadership, showing how supply chain maturity and behavioral agility together empower CSCOs to orchestrate enterprise performance across the C-suite.

In the post-pandemic decade, global enterprises operate in an era defined by pervasive volatility. Supply disruptions, geopolitical realignments, AI-driven automation, and corporate responsibility imperatives have collapsed the traditional boundaries between functions. Strategy is no longer formulated in the

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boardroom and executed on the factory floor—it now unfolds dynamically across an interdependent ecosystem of data, capital, and customers.

Leadership coherence has become as critical as innovation. The competitive frontier is not just speed or efficiency, but the ability to synchronize operations, finance, technology, and marketing around a shared purpose. This is where the chief supply chain officer emerges as the pivotal integrator—the executive who translates complexity into coordination and turbulence into trust.

The transition from operations to orchestration marks a profound redefinition of leadership. What began as a focus on cost and logistics has evolved into a cross-functional command center that connects sensing, strategy, and execution across the C-suite. The CSCO's evolving mandate now defines how enterprises achieve resilience and growth in equal measure.

1. The CSCO as the enterprise integrator

Supply chains have moved decisively from the backroom to the boardroom. In a world defined by geopolitical fragmentation, digital acceleration, and volatile trade flows, cross-functional synchronization has become the new frontier of competitive advantage. The ability to align multiple functions around a unified operating rhythm now determines whether a company can respond to disruption with coherence or collapse into incoherence. Yet many organizations still operate within legacy silos—where financial prudence, customer insight, and technological innovation remain disconnected. This structural fragmentation weakens enterprise agility and exposes the limits of traditional management models.

Amid these pressures, the CSCO has emerged as the enterprise's logical integrator. The CSCO sits at the intersection of capital, operational capability, and customer value delivery—translating market signals into actionable strategy and synchronized execution. Unlike the historical view of supply chain leaders as efficiency managers, today's CSCO operates as a systems architect who connects sensing, analysis, and delivery into one intelligent flow.

In doing so, the CSCO bridges the gap between strategic vision and operational reality, transforming uncertainty into opportunity and friction into synergy. As classic resilience models emphasize risk mitigation rather than orchestration (Chopra & Sodhi, 2014; Sheffi, 2020), today's enterprises must integrate financial discipline, digital intelligence, and market insight into a unified strategic rhythm.

This integrative leadership is not confined to operations. The CSCO's reach extends across the entire C-suite: aligning financial discipline with adaptive execution through the CFO, linking digital infrastructure and visibility with the CTO, and harmonizing customer promise and value delivery with the CMO. Each function brings vital strengths, but it is the CSCO that ensures they operate in concert. The modern supply chain thus becomes the central nervous system of the enterprise—where data, decisions, and actions move fluidly through an orchestrated ecosystem rather than a rigid hierarchy.

In essence, the CSCO embodies a new kind of executive intelligence—one that combines enterprise visibility, analytics, and operational agility. By synthesizing information across the enterprise and beyond, the CSCO fosters shared understanding, trust, and decisive action among peers. This integrator role defines the next phase of leadership maturity: from functional command to cross-functional orchestration. As turbulence becomes the norm, the organizations that thrive will be those whose CSCOs can transform the supply chain from a cost center into a strategic conductor of enterprise resilience and growth.

2. Strategic contexts shaping the CSCO's nexus role

For decades, the CSCO was perceived mainly as a functional executor—tasked with cost efficiency, delivery reliability, and operational control. That paradigm no longer fits. Today's volatile global environment demands a new kind of leadership: a nexus role that connects operations, finance, marketing, and technology into a unified system of decision and execution. Operational excellence remains necessary but no longer sufficient. Sustainable success now depends on the CSCO's ability to orchestrate strategic alignment, analytic insight, and enterprise-wide responsiveness across the C-suite.

Recent research highlights how digital

TABLE 1

Five contextual drivers requiring the CSCO's nexus role

	CONTEXTUAL FACTOR	EXTERNAL CHALLENGE	WHY NEXUS LEADERSHIP IS ESSENTIAL	CROSS-FUNCTIONAL INTEGRATION FOCUS
1	**Geopolitical fragmentation and regional realignment**	Global supply networks splinter under trade nationalism, tariffs sanctions, and regional blocs.	The CSCO must orchestrate resilience through diversified sourcing and localized agility.	CFO – risk allocation CMO – market repositioning CTO – visibility and digital resilience
2	**Market volatility and demand uncertainty**	Inflation shocks, shifting tariffs, policy swings, and erratic demand undermine forecast reliability.	Nexus leadership synchronizes sensing, analytics, and execution to convert disruption into agility.	CFO – cost analytics CMO – real-time demand sensing CTO – adaptive systems
3	**Digital acceleration and data silos**	AI and automation expand data but fragment decision systems.	The CSCO becomes digital orchestrator, uniting disparate information flows into a single intelligence network.	CFO – financial data CMO – customer insights CTO – integrated data model
4	**Sustainability and business accountability**	Stakeholders demand verifiable environmental and social performance.	The CSCO links purpose and profit by embedding sustainability metrics into core operations.	CFO – capital discipline CMO – brand stewardship CTO – innovation enablement
5	**Customer-centric value chains and experience expectations**	Customers expect immediacy, transparency, and personalization.	The CSCO aligns supply precision with marketing promise and digital delivery to ensure system-wide experience integrity.	CFO – profitability controls CMO – customer promise CTO – CRM and digital interface design.

Source: Authors

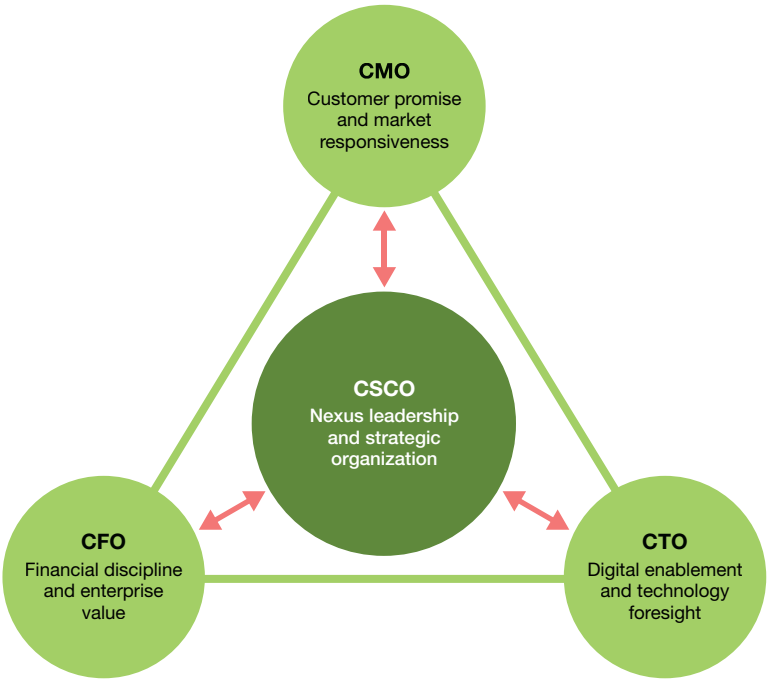
transformation and ESG governance must converge to sustain long-term value creation (Alkaraan et al., 2025; Mendonça et al., 2025). This reinforces the idea that the CSCO's nexus role extends beyond operational control toward embedding sustainability, transparency, and technological intelligence as interconnected leadership imperatives. The shift arises from a convergence of powerful external forces that have redrawn the boundaries of management. These patterns of global realignment reflect broader industrial dynamics in which structural capability and policy coordination determine long-term competitiveness (Hong, Park, Hwang, & Sepehr, 2024)

Global trade fragmentation, persistent market shocks, accelerating digital complexity, heightened ESG scrutiny, and rapidly evolving customer behavior all intersect to challenge traditional hierarchies. Each of these forces demands synchronization across multiple domains—financial risk, digital infrastructure, and customer experience. The CSCO, uniquely situated at the crossroads of supply visibility, capital flow, and fulfillment capability, has become the natural integrator who ensures coherence amid turbulence.

Table 1 summarizes five contextual forces reshaping enterprise leadership. Each factor demonstrates that the CSCO is ideally positioned to enable the integration of financial stability, market responsiveness, and technological enablement into one synchronized system. This nexus role transforms external turbulence into coordinated agility, ensuring that strategic coherence becomes a lasting source of competitive advantage.

FIGURE 1

The triad of strategic synergy: CSCO as the nexus of enterprise integration



Source: Authors

Taken together, these forces—geopolitical disruptions, volatile markets, digital fragmentation, ESG imperatives, and escalating customer expectations—underscore why the CSCO has become indispensable to enterprise leadership. Organizations that continue to view the CSCO as a cost controller rather than a strategic orchestrator risk losing not only efficiency but strategic coherence itself—the ability to adapt, compete, and grow in a turbulent global landscape.

3. Nexus leadership: Balancing agility and discipline

Today's organizations must be strategically ambidextrous—flexible enough to adapt, yet grounded enough to stay coherent. Nexus leadership depends on blending two complementary capabilities: dynamic agility and structural discipline. Dynamic agility refers to the *Sensing–Searching–Synergizing* (SSS) behaviors that allow leaders to detect shifts, explore adaptive pathways, and align cross-functional responses in real time. Structural discipline, represented by the *Strategic Structural Core* (SSC), embeds process, governance, and scalable execution across the enterprise. Agility without structure leads to chaos, while structure without agility results in rigidity. The CSCO's art lies in synchronizing both, transforming organizational maturity into mastery and reaction into orchestration. This duality echoes a recurring theme in supply chain leadership—balancing exploration and control to achieve both resilience and performance—a topic long recognized in practitioner and scholarly dialogues (Sheffi, 2020; Chopra & Sodhi, 2014)

This nexus role becomes visible in how CSCOs collaborate across domains. With the CFO, they strengthen financial resilience by linking supply chain metrics to working-capital efficiency and enterprise value creation. Unilever's finance supply chain councils, for example, convert forecast accuracy into cash-flow improvement. With the CMO, they uphold the customer promise by aligning promotions, inventory, and fulfillment so that marketing commitments remain operationally feasible; one leading consumer-electronics company achieved over 90% service levels during seasonal peaks through such synchronized planning. And with the CTO, CSCOs drive digital enablement by co-leading analytics, AI, and digital twin initiatives that turn data into foresight—exemplified by Siemens' digital thread, which connects design, procurement, and production in near-real time. Together, these collaborations reveal the CSCO as the orchestrator of enterprise rhythm, ensuring that agility and structure move in harmony.

These partnerships define what we call the Triad of Strategic Synergy—finance, market, and technology—anchored by the CSCO's nexus role, an active orchestrator rather than a symbolic participant. Serving as the connective core of the modern C-suite, the CSCO links these functions through continuous feedback and decision flow.

Figure 1 visualizes this integrative perspective. It depicts the model of CSCO Nexus Leadership, connecting the dynamic agility of the SSS framework. The SSS framework represents how leaders detect shifts, explore adaptive pathways, and align cross-functional action. At the intersection stands the CSCO as the collaboration nexus, translating dynamic sensing into structural execution—transforming maturity into resilience and synergy across the C-suite. The bidirectional arrows emphasize constant exchange—turning functional alignment into strategic integration and enterprise agility. This visualization highlights how the CSCO's leadership extends beyond coordination to continuous orchestration of insight, strategy, and performance across the organization.

The outer triangle among the CFO, CMO, and CTO represents routine collaboration that keeps core functions aligned in daily operations. In contrast, the central connections radiating from the CSCO signify

TABLE 2

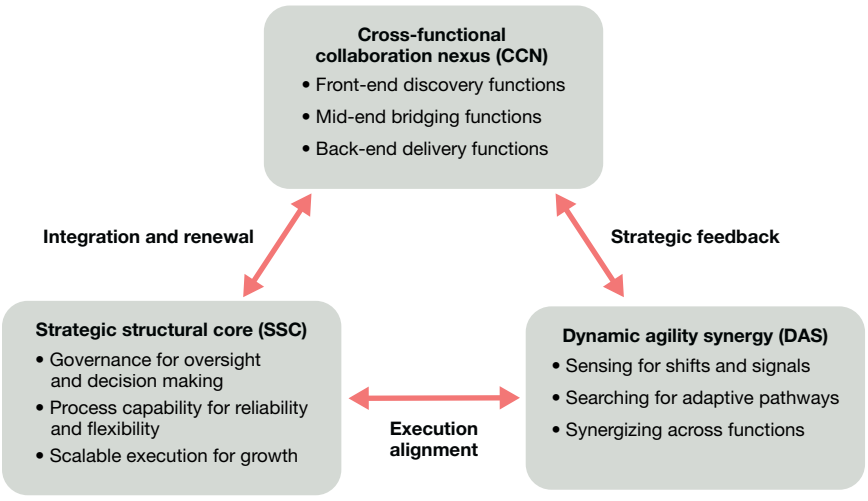
Three competencies of a nexus-ready CSCO

	COMPETENCY	WHAT IT LOOKS LIKE IN PRACTICE	STRATEGIC EFFECT
1	**Cross-functional impact**	Co-leads strategic initiatives with CFO, CMO, and CTO; aligns supply-chain KPIs with enterprise scorecards.	Elevates supply-chain performance and innovation to the board level as a competitive differentiator.
2	**Data-driven foresight**	Uses predictive analytics, AI, performance insights, and what-if analyses for proactive decision-making.	Converts historical performance and real-time sensing into strategic foresight and faster enterprise response.
3	**Purpose-aligned execution**	Integrates ESG, resilience, and innovation metrics into end-to-end design.	Ensures agility and corporate responsibility impact move in tandem, reinforcing trust and value.

Source: Authors

FIGURE 2

CSCO nexus leadership model: Sustaining synergy through agility



Source: Authors

dynamic leadership—energizing and synchronizing the triad to sustain agility, resilience, and innovation. Positioned as the organization's fulcrum, the CSCO harmonizes customer direction (CMO), technological enablement (CTO), and financial discipline (CFO). This geometry captures the essence of the CSCO as the enterprise integrator who translates strategy into coordinated performance.

Three diagnostic competencies reveal when a CSCO has fully evolved from operator to orchestrator. Cross-functional credibility emerges when the CSCO co-chairs strategic sessions with finance, marketing, and technology leaders. Data-driven foresight is shown through predictive analytics and scenario modeling that shape corporate strategy rather than merely support operations. Finally, purpose-aligned execution incorporates ESG and innovation goals into supply chain design, aligning performance with principles. When these competencies converge, the CSCO becomes the central integrator of value, speed, and trust across the organization.

As shown in Table 2, three defining competencies—cross-functional credibility, data-driven foresight, and purpose-aligned execution—characterize a "nexus-ready" CSCO. Such a leader is no longer a cost controller but a strategic orchestrator. This evolution marks a profound shift in leadership logic: the CSCO is no longer silo-focused on logistics coordination or cost optimization but represents the organization's integrative intelligence. Acting as both translator and orchestrator, the CSCO converts uncertainty into coordinated action, aligning sensing, decision, and execution into a cohesive system. The true leadership value lies in harmonizing strategic intent with operational reality, transforming the supply chain into the connective tissue of enterprise agility and coherence.

While the Triad of Strategic Synergy illustrates how the CSCO connects core enterprise functions around a shared purpose, Figure 2 expands this idea into a full enterprise system of leadership flow. The CSCO Nexus Leadership Model shows how synergy is sustained through continuous feedback among

TABLE 3

Key aspects of the CSCO nexus leadership model

	CONSTRUCT/LOOP	DEFINITION	PRACTICAL ILLUSTRATION	ISSUES TO HANDLE
1	**Cross-functional collaboration nexus (CCN)**	The central coordination hub linking front-end discovery functions, mid-end bridging functions, and back-end delivery functions.	A global manufacturer's "control tower" aligns real-time sales, production, and logistics data to balance inventory and customer commitments.	Avoiding siloed digital tools; maintaining information transparency; ensuring integrated KPIs across functions.
2	**Dynamic agility synergy (DAS)**	The capability to sense shifts, discover adaptive pathways, and synergize actions in real time.	A consumer-electronics firm rapidly adjusts sourcing and promotions in response to semiconductor shortages and changing consumer sentiment.	Data latency; inconsistent forecasting models; over-reaction to short-term noise versus structural change.
3	**Strategic structural core (SSC)**	The system of processes, governance, and scalable execution that anchors agility.	A diversified retailer standardizes supplier performance metrics and process automation to maintain reliability across regions.	Bureaucratic rigidity; failure to adapt structural controls with emerging technologies and markets.
4	**Strategic feedback**	Continuous information flow translating front-end sensing into back-end learning and strategic response.	Weekly cross-functional reviews between supply chain, marketing, and finance integrate demand forecasts with working-capital allocations.	Information distortion; feedback delays; lack of accountability for decision outcomes.
5	**Execution alignment**	Synchronization between dynamic decisions and operational processes to ensure rapid, coordinated action.	During a product recall, finance, operations, and customer service teams coordinate through shared dashboards and escalation protocols to ensure a swift, transparent response. Likewise, real-time insight into demand and supply shifts—such as semiconductor shortages that forced automakers like Toyota and GM to pause production—drives rapid adjustments in inventory, procurement, and supplier coordination to maintain business continuity and trust.	Misaligned incentives; lag between decision and implementation; cross-regional coordination gaps.
6	**Integration and renewal**	The process of embedding lessons learned into new standards, processes, and partnerships for continuous improvement.	A CSCO leads post-crisis reviews that convert temporary workarounds into permanent design-for-resilience practices.	Learning fatigue; inadequate institutionalization of best practices; resistance to change

Source: Authors

Dynamic Agility Synergy (DAS) through Sensing–Searching–Synergizing and the enterprise's structural core via the *Cross-functional Collaboration Nexus* (CCN). Rather than emphasizing process maturity, this model underscores leadership rhythm—the ongoing cycle of feedback, alignment, and renewal that transforms cross-functional collaboration into enduring organizational agility. It reveals how the CSCO orchestrates strategic alignment across three reinforcing loops: strategic feedback, execution alignment, and integration & renewal. At the center of this system lies the CCN, where sensing and learning become coordinated action across finance, technology, and market-facing teams. The *Strategic Structural Core* (SSC) ensures that this agility remains grounded in governance discipline, process capability, and scalable execution, enabling the CSCO to translate speed into sustained enterprise stability.

Table 2 defines the CSCO *Nexus Leadership Model* for practitioners. Each aspect—such as Cross-functional Collaboration Nexus, Dynamic Agility Synergy, and Strategic Feedback—shows how the CSCO converts strategy into coordinated execution. The table provides plain-language meanings, real-world illustrations, and the key issues leaders must manage to sustain performance. Together, these aspects depict how sensing, decision, and delivery are continuously linked through feedback, alignment, and renewal. Rather than a static framework, the model functions as a living system for cross-functional orchestration and enterprise learning.

Understanding these leadership aspects establishes the groundwork for identifying the personal capabilities that make them work. The next section, "The Nexus Leader," examines the evolving skillset of high-impact CSCOs—those who combine strategic vision with operational empathy through storytelling, cross-functional fluency, and digital-ecosystem awareness. These competencies turn the CSCO from a process manager into a true system integrator, capable of aligning insight, technology, and enterprise purpose.

The frameworks presented so far establish the systemic foundation of Nexus Leadership, yet structure alone does not produce orchestration. Effective integration depends on the leader's human capability to sustain rhythm, interpretation, and trust across functions. The ability to convert insight into influence—and frameworks into collaboration—rests on the CSCO's personal competencies. These capabilities translate the architecture of Nexus Leadership into daily executive behavior, ensuring that sensing, alignment, and renewal occur not only through systems but through the leader's mindset and interpersonal fluency.

4. The Nexus Leader

The most effective CSCOs are redefining executive leadership through a blend of strategic vision and operational empathy. They act not as process overseers but as system integrators—linking operations, finance, marketing, and technology into one synchronized enterprise rhythm. Three emerging competencies distinguish these nexus leaders from traditional operators.

Cross-functional fluency allows the CSCO to "speak" operations, finance, marketing, and technology simultaneously, translating metrics into meaning and strategy into alignment. Digital-ecosystem awareness equips leaders to navigate AI, cloud, and data-trust architectures, connecting operational performance with innovation velocity. Strategic storytelling enables the CSCO to frame supply chain initiatives as enterprise narratives that inspire action at the board level. Microsoft's CSCO, for instance, positioned sustainability dashboards as part of a corporate story of responsible growth—elevating operational transparency into shareholder value.

When the CSCO consistently demonstrates these competencies, collaboration turns into measurable performance. Organizations with CSCOs that effectively demonstrate nexus leadership experience faster decision cycles, higher trust among functions, and sustained value creation. These outcomes confirm when the CSCO's role extends beyond efficiency—and ultimately achieves enterprise coherence and competitiveness.

5. Conclusion

The transformation of the chief supply chain officer from operator to orchestrator represents one of the most profound shifts in modern enterprise leadership. As volatility, digital acceleration, and stakeholder expectations converge, the CSCO's nexus role has become the foundation of organizational coherence—defining how strategy is translated into execution, how collaboration becomes capability, and how resilience becomes renewal. This article reframes supply chain management as the strategic language of integration, showing that the CSCO is not merely reacting to disruption but shaping the enterprise's adaptive rhythm through agility, structure, and shared purpose. Organizations that recognize and empower this role will not only withstand turbulence but transform it into insight and momentum. Ultimately, the message is clear: the future of enterprise leadership will move at the speed of its supply chain—and the CSCO stands at its very center, turning orchestration into advantage. •

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