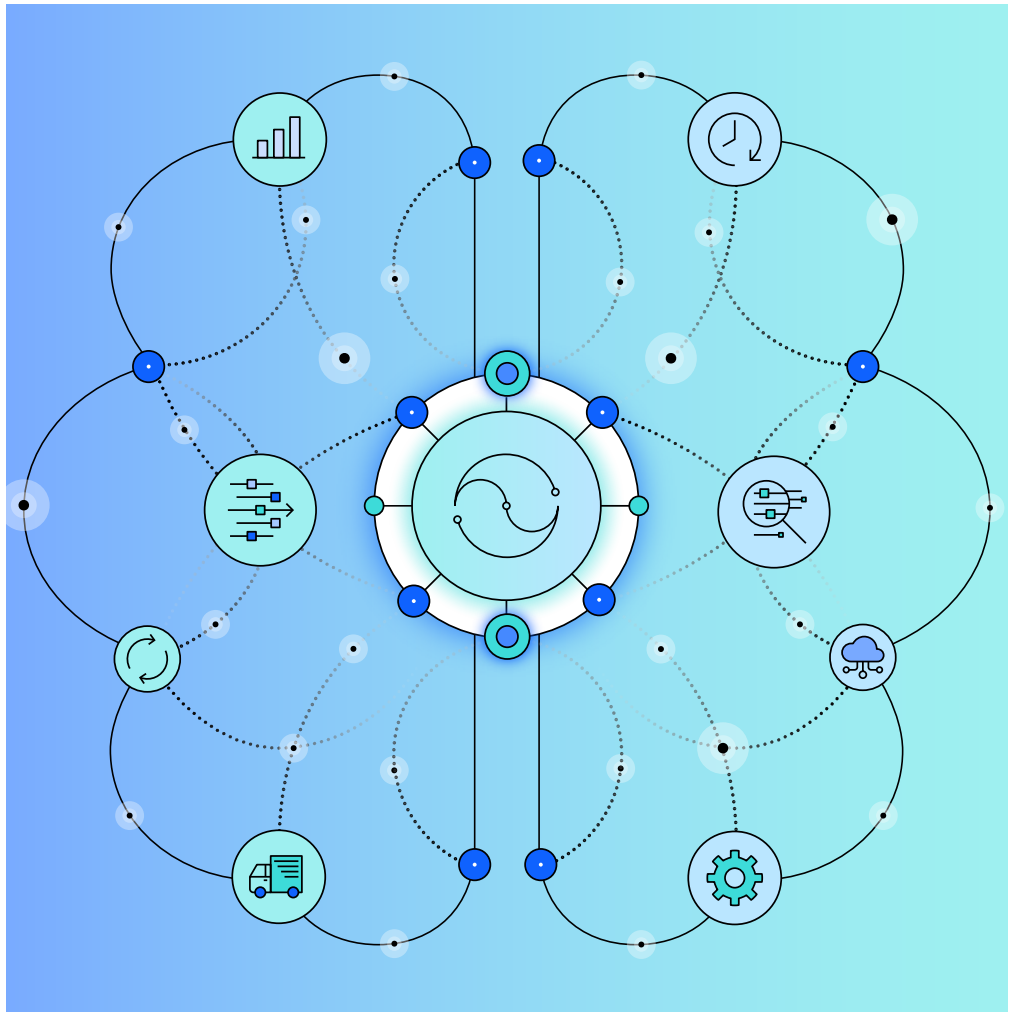
The intuitive supply chain

Predict disruption, deliver growth



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Generative AI can preempt supply chain disruption and unleash growth opportunities.

Generative AI has put supply chains in flux. 64% of Chief Supply Chain Officers say gen AI is completely transforming workflows.

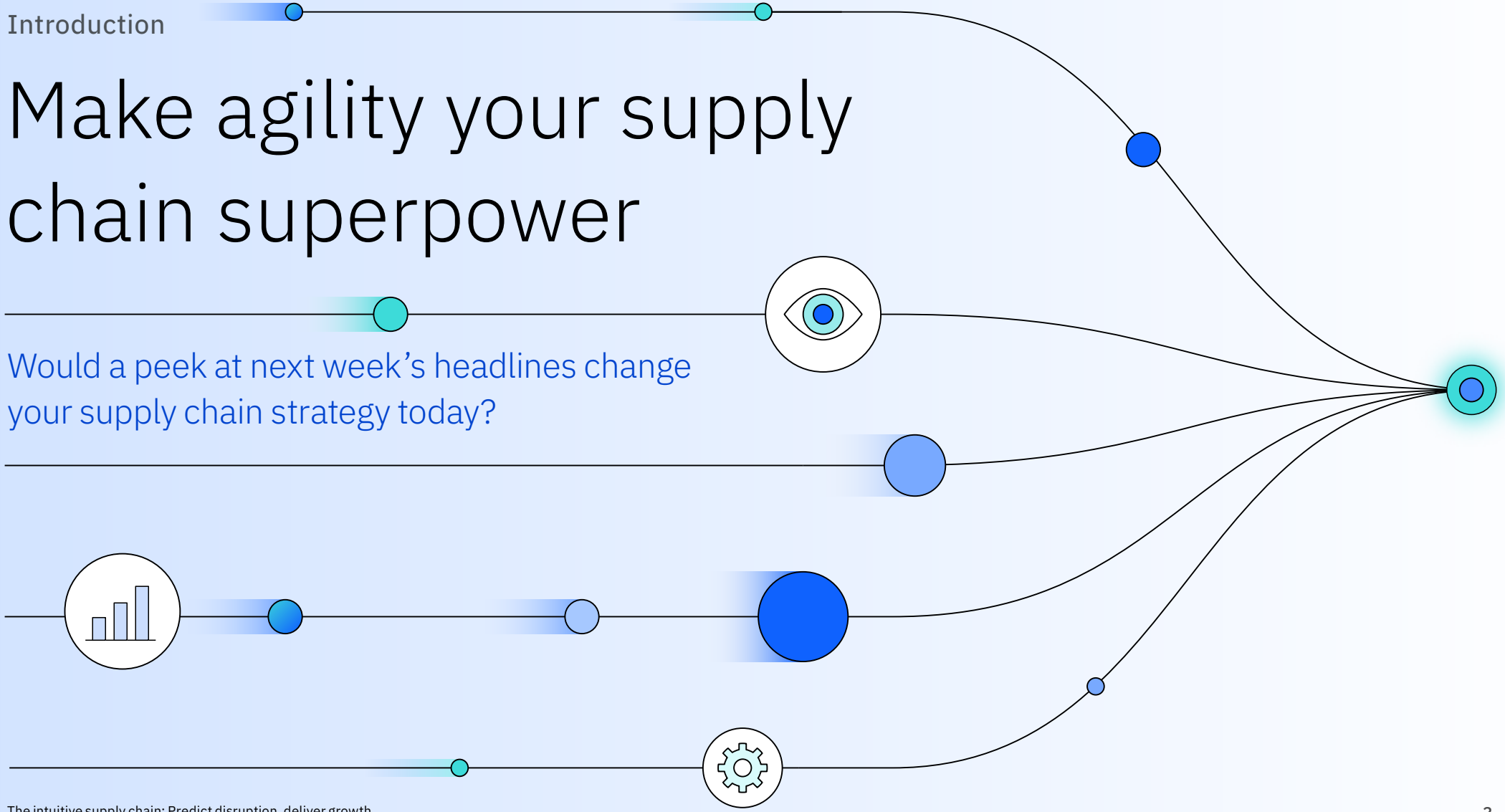
Supply chain teams must work differently. 60% of operations and automation executives say AI assistants will handle most traditional and transactional processes by 2025.

More decisions will be automated. Operations and automation executives say generative AI will increase the volume of decision-making by digital assistants by 21% in the next two years.

Predictions will improve, igniting sustainable innovation. 76% of supply chain and operations leaders say gen AI will help innovate their product design and make product lifecycles more sustainable.

Make agility your supply chain superpower

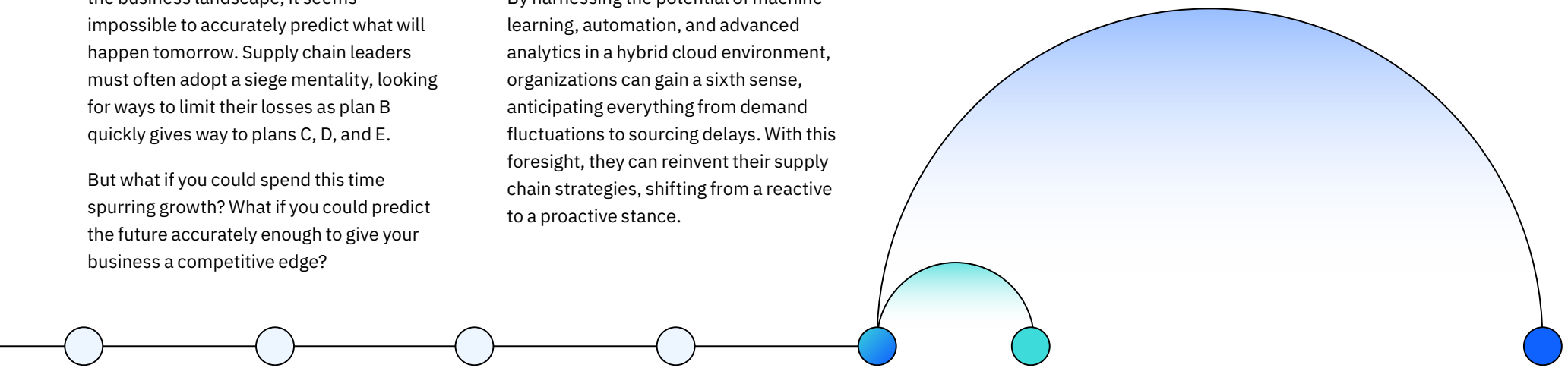
Would a peek at next week's headlines change your supply chain strategy today?



Supply chain certainty is an elusive target. With so many fault lines stretching across the business landscape, it seems impossible to accurately predict what will happen tomorrow. Supply chain leaders must often adopt a siege mentality, looking for ways to limit their losses as plan B quickly gives way to plans C, D, and E.

But what if you could spend this time spurring growth? What if you could predict the future accurately enough to give your business a competitive edge?

The combined power of generative AI and cloud computing could make that possible. By harnessing the potential of machine learning, automation, and advanced analytics in a hybrid cloud environment, organizations can gain a sixth sense, anticipating everything from demand fluctuations to sourcing delays. With this foresight, they can reinvent their supply chain strategies, shifting from a reactive to a proactive stance.



Leaders in gen AI adoption and data-led innovation—those who view gen AI capabilities as the primary driver of their automation investments—are reaping outsized rewards.

17%

report higher annual revenue growth than the competition

72%

report greater annual net profits

Already, leaders in gen AI adoption and data-led innovation—those who view gen AI capabilities as the primary driver of their automation investments—are reaping outsized rewards. They report 72% greater annual net profits and 17% higher annual revenue growth than the competition. And *all* the supply chain leaders we surveyed expect their revenue growth from AI-enabled operations to more than double over the next three years.[1]

Looking at these numbers, it's no surprise that 72% of the top-performing CEOs we surveyed for the IBM Institute for Business Value (IBM IBV) *2024 CEO Study* say competitive advantage now depends on who has the most advanced gen AI. But the high-speed race to meet short-term goals is hindering their progress. Overall, global CEOs agree that a focus on short-term performance is their top barrier to innovation—and 66% say their organization is currently meeting short-term targets by reallocating resources from longer-term efforts.[2]

That's a big problem for supply chain leaders, who know they need to invest in next-gen tech today to make their operations more agile and resilient for an uncertain future—from dynamically rerouting shipments and adjusting production schedules in real time to identifying bottlenecks and risks before they materialize.

How can gen AI solve these persistent supply chain problems? To find out, the IBM IBV, in partnership with Oxford Economics, surveyed more than 2,000 global Chief Supply Chain Officers (CSCOs), operations executives, and automation executives from organizations that are currently implementing AI-enabled automation. We discovered that these leaders are focused on creating what we call "the intuitive supply chain"—agile, adaptive, and perpetually prepared, safeguarding brand reputation, customer satisfaction, and the bottom line.

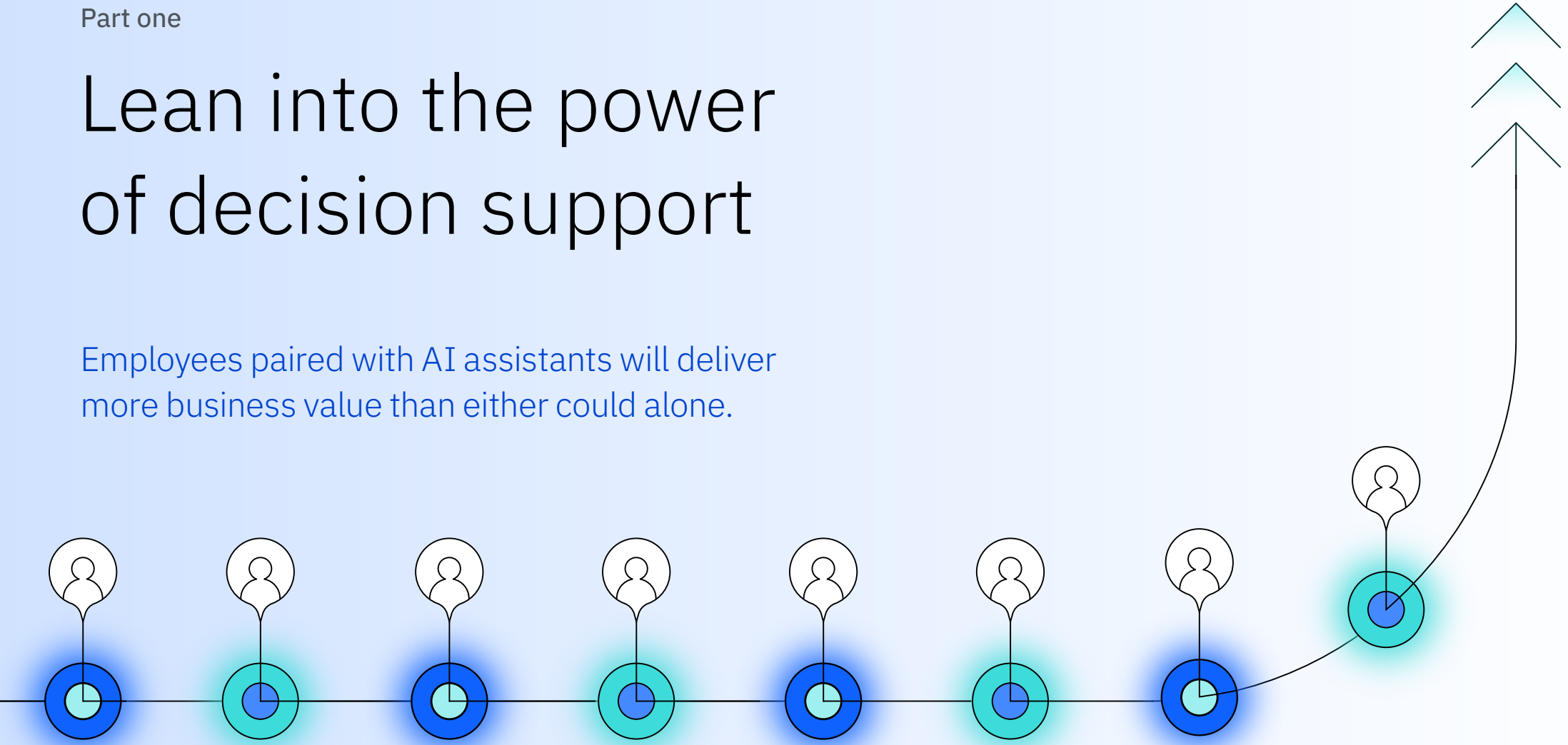
In this paper, we'll lay out the steps organizations are taking to get there. In part one, we'll explore the role of AI assistants, which are quickly becoming less like chatbots and more like full-time employees. Part two explains how accelerating supply chain intelligence can help companies leverage real-time data faster and more effectively than ever before. And in part three, we'll explore how gen AI-enabled digital twins, or virtual models, can help organizations improve their position in the competitive landscape, as well as in the eyes of customers. We conclude with an action guide that outlines how to plan, prioritize, and perform to make every move count.

Supply chain leaders need to invest in next-gen tech today to make their operations agile and resilient for an uncertain future.

Part one

Lean into the power of decision support

Employees paired with AI assistants will deliver more business value than either could alone.

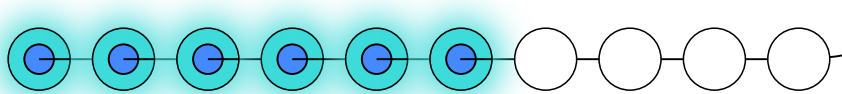


Today's supply chain teams are drowning in a sea of disconnected data. They increasingly have access to the long-awaited real-time information they need to make smarter, faster, decisions—but there's so much to sift through that many opportunities go unnoticed until it's too late.

Gen AI-powered digital assistants are changing all that. With their ability to analyze vast stores of data almost instantaneously, they can bubble up critical insights for supply chain teams to skim from the surface. Plus, their natural language skills make it easy for employees to ask for the information they need—and find out where it came from—with a few simple prompts.

For example, AI assistants can analyze which supplier is contributing the most to delays and identify issues causing disruption, such as weather, financial obstacles, or transportation bottlenecks. Then, AI-fueled predictive models can outline how the situation is most likely to evolve, allowing AI assistants to offer targeted recommendations that help supply chain teams prepare for what's next.

Already, 60% of executives say AI assistants will handle most traditional and transactional processes by 2025.[3] And 90% say their organization's supply chain workflows will incorporate intelligent automation and AI assistants by 2026.[4]



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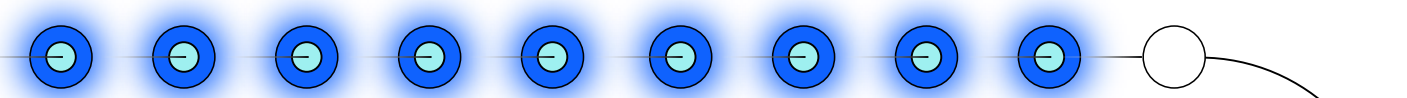

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say their organization's supply chain workflows will incorporate intelligent automation and AI assistants by 2026.

When employees use gen AI assistants to quickly query their supply chain platform for credible data, rather than manually searching multiple systems, they can manage change faster—and pivot more precisely. Instead of using the dedicated procurement solution to change purchase order delivery dates, for instance, employees can simply ask their assistant to make the change for them.

But that's only the beginning. Supply chain teams aided by AI assistants are cultivating a new human-technology dynamic that will touch virtually every point of the supply chain, from planning to sourcing to manufacturing to distribution. In fact, 64% of CSCOs say gen AI is completely transforming their supply chain workflows. And CSCOs and automation executives say gen AI will increase the volume of decision-making by digital assistants by 21% in the next two years.

It's not just about explaining how materials will get from point A to point B. It's also measuring the supply chain cost of every business decision—and making sure those costs are considered from the start. Beyond the sales a new SKU will drive, product development strategies should account for the total cost of ownership, forecasting the cost of delivering a new item in conjunction with the losses that come from holding on to products that don't sell.

Then there's the sustainability dimension. As both consumers and regulators demand more comprehensive reporting on environmental impact, supply chain leaders must be able to track sustainability metrics all the way to the last mile—and do the hard work of designing more eco-friendly product lifecycles. This is another place where gen AI can help, with 76% of supply chain and operations leaders agreeing that it will help innovate their product design and make product lifecycles more sustainable.

By leveraging AI assistants, CSCOs can aggregate and distill intel, bringing insight to the boardroom quickly and confidently and making sure supply chain implications continue to inform strategies as they evolve. As decisions are made and then tested in the market, AI assistants can accelerate the feedback loop, giving executives the real-word, real-time data they need to see if their strategies are delivering the desired results—and change tactics quickly if they aren't.

With gen AI assistants, employees can manage change faster—and pivot more precisely.

Building an intelligent supply chain using a supply chain AI assistant

IBM employs supply chain staff in 40 countries and makes hundreds of thousands of customer deliveries and service calls in over 170 nations. IBM also collaborates with hundreds of suppliers across its multitiered global network to build highly configurable and customized products to customer specifications. Historically, the IBM supply chain ran on legacy systems spread across different organizational silos, making information-sharing slow and incomplete. Employees also performed much of their work on spreadsheets, which impeded collaboration and real-time data transparency.

IBM supply chain management set out a bold transformation vision to build a cognitive, intelligent supply chain more than a decade ago. The aim was to have an agile supply chain that extensively uses data and AI to lower costs, exceed customer expectations, ruthlessly eliminate or automate non-value-add work, and exponentially improve the experience of supply chain colleagues.[5]

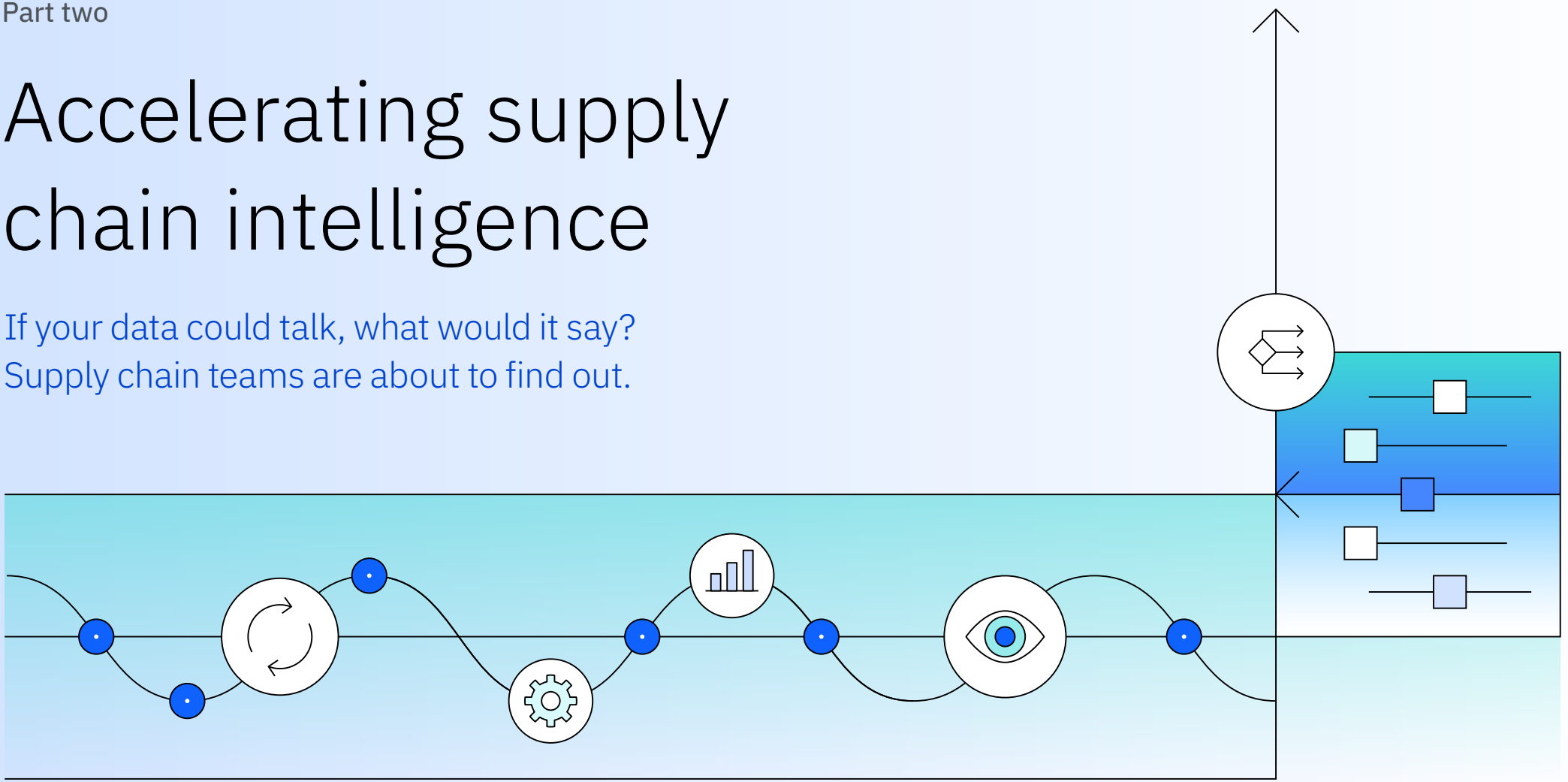
At a high level, the IBM supply chain digital transformation revolves around building sense-and-respond capabilities. This was accomplished by democratizing data—automating and augmenting decisions by combining a cognitive control tower, a cognitive advisor, demand-supply planning, and risk-resilience solutions. Now, the cognitive control tower has evolved into an enhanced generative AI intelligent layer using a supply chain digital assistant.

The system uses IBM's AI technology to enable natural language queries and responses, which accelerates the speed of decision-making and offers more options to correct issues. Users can ask, in natural language, about part shortages, order impacts, and potential trade-offs. To date, IBM has saved $388 million related to reduced inventory costs, optimized shipping costs, faster decision-making, and time savings (days to hours to minutes to seconds).

Part two

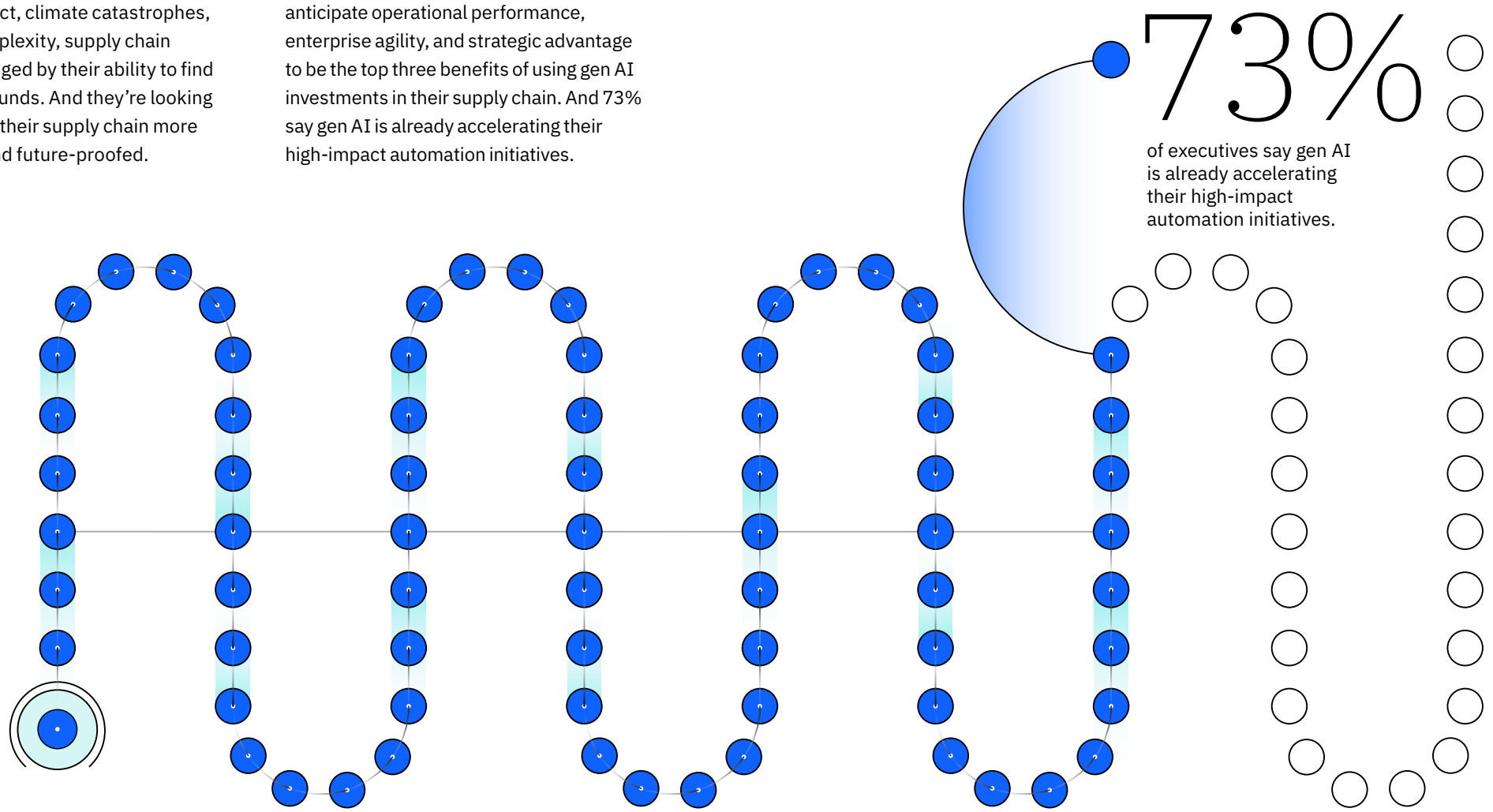
Accelerating supply chain intelligence

If your data could talk, what would it say? Supply chain teams are about to find out.



Whether disruption is caused by geopolitical conflict, climate catastrophes, or increasing complexity, supply chain leaders will be judged by their ability to find effective workarounds. And they're looking to gen AI to make their supply chain more agile, adaptive, and future-proofed.

In fact, the executives we surveyed anticipate operational performance, enterprise agility, and strategic advantage to be the top three benefits of using gen AI investments in their supply chain. And 73% say gen AI is already accelerating their high-impact automation initiatives.



The key is to make the entire ecosystem more responsive. By allowing gen AI assistants to interact directly with the intelligent layer of the supply chain system—the cognitive core that pulls insights from vast stores of data—internal and external teams can collaborate more seamlessly.

The goal is for AI assistants to continually communicate the intelligent layer's findings to the appropriate part of the supply chain team, along with recommended actions. While the enterprise resource planning (ERP) system remains the system of record and core transaction engine, supply chain teams no longer need to interact with it directly. And that goes for other specialized supply chain apps, from procurement to warehouse management to transportation logistics, as well. This approach lets employees drill deeper, allowing for real-time analysis and optimization each step of the way.

The convergence of gen AI and cloud-based solutions has also enabled autonomous automation (see "Future-proof your supply chain with cloud-enabled innovation"). In addition to automating workflows, gen AI assistants can automate the process of workflow reinvention. They can learn from supply chain metrics and transaction history, make proactive recommendations, and even repurpose or redefine new workflows based on what they've learned.

This helps streamline workflows to make them more efficient, cost-effective, and environmentally responsible. In fact, 63% of supply chain and operations leaders say integrating sustainability and circularity into workflows is a key reason their organization is investing in automation.

Perspective

Future-proof your supply chain with cloud-enabled innovation

With the combined power of cloud computing and generative AI, companies can accelerate supply chain innovation and improve business outcomes to a degree that wasn't previously possible.

Deploying gen AI on the cloud lets companies train and deploy models faster and at scale, without the need for expensive hardware or infrastructure. It lets multiple teams collaborate on the development of gen AI models, moving them between different cloud environments and integrating them with other cloud-based services and applications seamlessly.

Then, of course, there's cost to consider. With pay-as-you-go pricing, cloud infrastructure can ease capital expenditure constraints, allowing companies to focus on innovation, rather than the financial implications of investing in new tech. When applied strategically, this tech combo can improve efficiency, reduce costs, and increase agility. Here are a few ways your supply chain can benefit from cloud-enabled innovation powered by gen AI:

- **Forecast future demand.** Optimize inventory levels, reduce stockouts or over-stocking, and improve cash flow.
- **Optimize delivery routes.** Reduce fuel consumption, lower emissions, provide dynamic distribution, and improve delivery times.
- **Manage supply chain risk.** Predict the likelihood of disruption and recommend proactive mitigation measures.
- **Increase supply chain visibility.** Identify bottlenecks and recommend corrective actions teams can take to keep operations from being disrupted.

Achieve end-to-end visibility with AWS Supply Chain

Supply chains are vast, interconnected networks. The multitude of participants, disparate systems, and lack of seamless data sharing make it difficult to accurately forecast future demand, track inventory levels, and align supply. The fragmentation of data hinders supply chain planners' ability to understand fluctuations, predict future needs precisely, and position optimal inventory where it's needed most.

The cloud-based AWS Supply Chain business application directly addresses these challenges. By harmonizing disparate data sources into a unified supply chain data lake, it lays the foundation for improved end-to-end visibility, forecasting accuracy, inventory optimization, and overall supply chain resilience.[6] Here are a few of the key business benefits of moving to this type of cloud-based solution:

Address data fragmentation

A supply chain data lake harmonizes disparate data into a flexible, scalable canonical data model that aggregates and associates supply chain information into a unified data asset. By incorporating a generative AI-powered data onboarding agent, companies can also automate data transformation from any native format into the data lake's canonical model. Customers can seamlessly extract and upload raw data, with the agent leveraging large language models for automated data mapping through a guided, module-driven user interface experience.

Increase forecast accuracy

Machine learning-powered forecasting capabilities can help organizations improve forecast accuracy and reduce excess inventory levels. Machine learning algorithms can incorporate variables such as seasonality, product characteristics, vendor characteristics, and destination-origin sites, along with historical order history, to train the model.

Improve supply chain visibility

The AWS business application can examine warehouses, distribution centers, and stores in detail, showing on-hand, in-transit, and at-risk inventory levels. It then uses machine learning algorithms to automatically generate, score, and rank multiple inventory rebalancing recommendations to mitigate risks. Gaining visibility into network-wide inventory levels, movement patterns, and potential risks empowers organizations to optimize inventory positioning and mitigate imbalances, overstocks, and stockouts.

Improving supplier visibility and collaboration

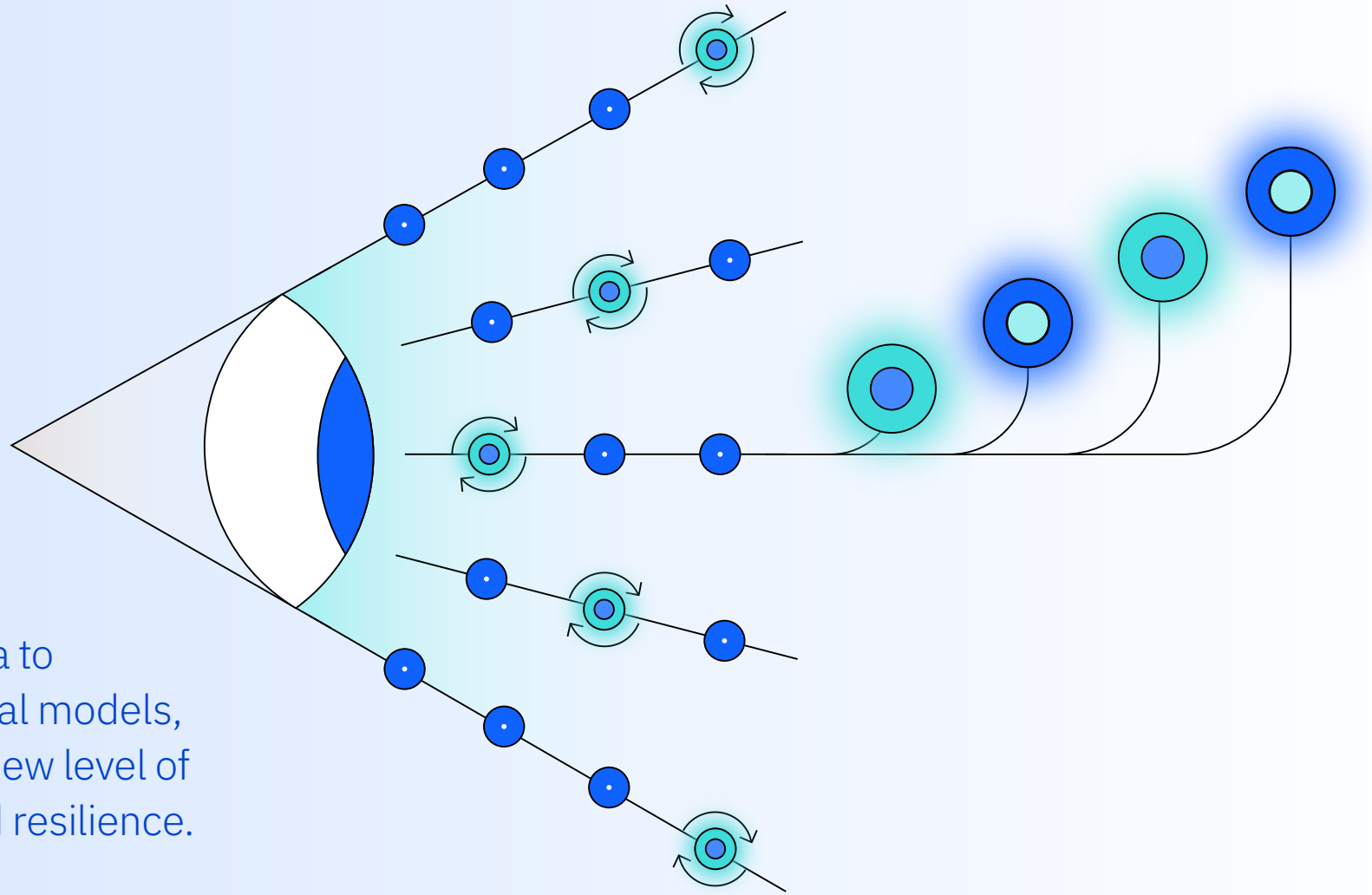
The AWS application analyzes supplier lead times, makes future projections compared to orders and forecasts, then identifies issues. It displays all connected trading partners, enabling supply chain leaders to view and collaborate across multiple tiers. Built-in chat and messaging capabilities also facilitate seamless communication and data sharing.

Simplify sustainability compliance processes

Cloud-based sustainability features create a more secure and efficient way to obtain mandatory documents and datasets from your supplier network. You can request, collect, and export artifacts, such as product lifecycle assessments, certificates on product safety, or reports on hazardous substances used at any point in the supply chain. Amazon's Global Trade and Product Compliance (GTPC) team used the AWS application's sustainability features to transform their compliance data management process and now expect to save approximately 3,000 operational hours per year.

Part three

Visualize the future

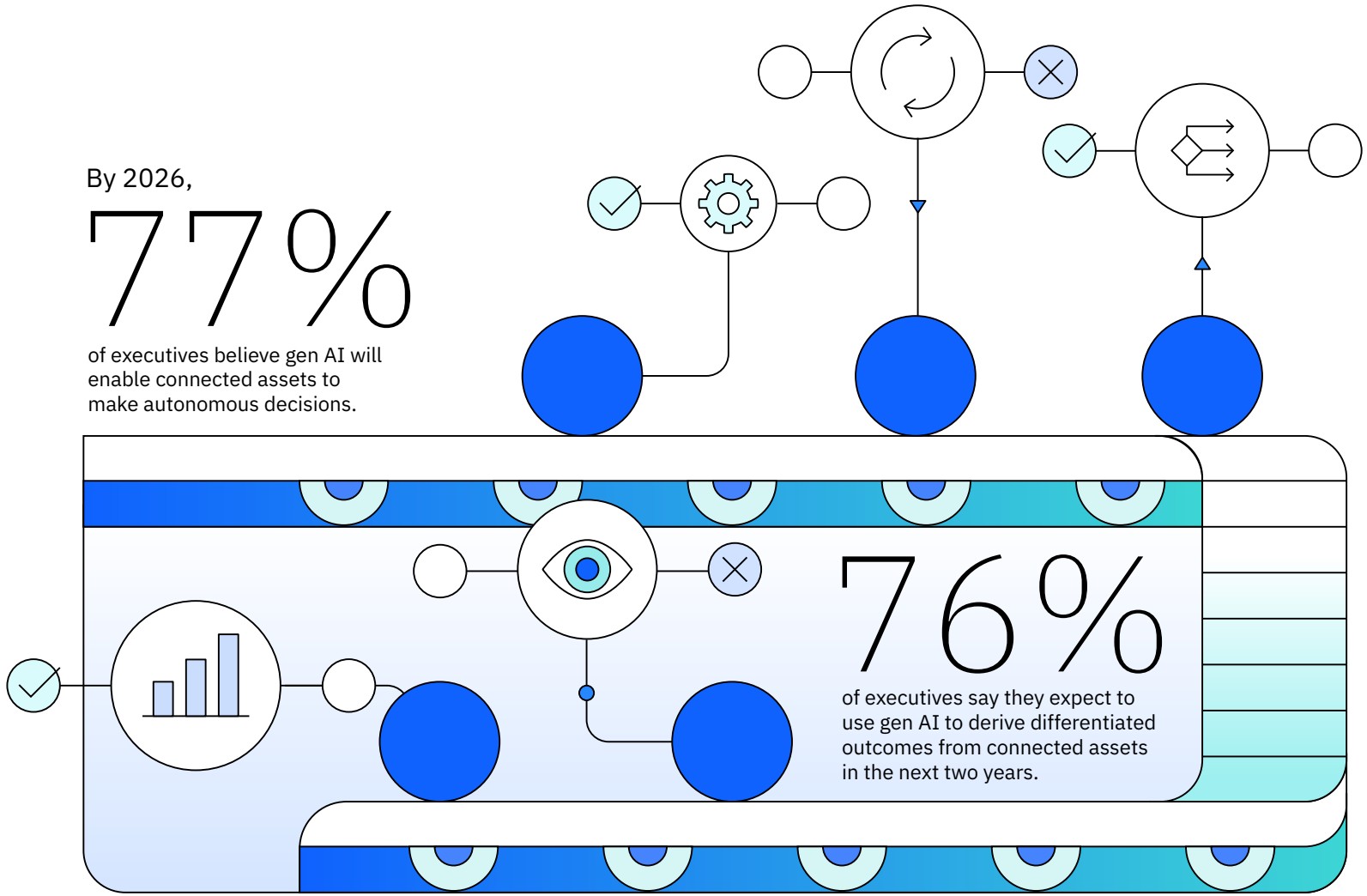


By using supply chain data to fuel gen AI-powered virtual models, companies can unlock a new level of operational efficiency and resilience.

Supply chain leaders have long imagined a future where real-time data flows seamlessly between IT and operational technology (OT) systems, enabling a more agile approach that reacts to constant change. And their dream is finally becoming reality.

Think of a manufacturing facility, where operations teams already use AI sensors to detect changes in vibration patterns, temperatures, power consumption, and even sound patterns. While traditional AI can alert teams to signals as they appear—and even predict when breakdowns are about to occur—employees must manage necessary adjustments or repairs based on this information.

With generative AI, that's no longer the case. When paired with vision sensors, gen AI lets connected machines self-predict and self-adjust in a harmonious fashion, unlocking unprecedented levels of productivity and efficiency.



In fact, by 2026, 77% of executives expect gen AI will enable connected assets to make autonomous decisions. And when complex asset ecosystems work in harmony, they can help businesses achieve results that weren't previously possible. Executives recognize this potential, with 76% saying they expect to use gen AI to derive differentiated outcomes from connected assets in the next two years.[7]

But boosting efficiency is just the first step. Businesses can derive much deeper value from interconnected data when they use it to visualize the end-to-end supply chain—and simulate how disruption could impact operations each step of the way.

It works like this: First, data from drones, robots, cameras, and other connected assets flow into a unified platform with a geospatial layer, an information layer, and an orchestration layer. Time-lapsed visualizations then let supply chain teams see how specific changes have impacted the ecosystem in the past—and make real-time decisions as situations unfold in the present.

Gen AI-enabled virtual models can then help teams simulate how future events could affect supply chain operations. They use real-world data and algorithmic techniques to visualize how the dominos will fall in response to different disruptions to help teams plan accordingly. They support "what-if" risk analysis by predicting potential problems—from raw material shortages to multiple supplier plant closings simultaneously—and recommending respective contingency plans.

These simulations can also inform product development by helping teams identify where waste and inefficiencies can be removed from the process. This is a key concern for executives, who say visibility of full product lifecycle management and environmentally sustainable products and services are two of their top automation priorities for their operations functions over the next three years.

With the right perspective, supply chain leaders can look beyond productivity plays to pull the levers that drive growth. By using gen AI to orchestrate multiple data sources, systems, and tools, they can inspire innovation across the ecosystem—and inform the strategic decisions that set their organization apart.

Look beyond productivity plays to pull the levers that drive growth.

Improving pharma supply chain visibility for patient safety[8]

Amid the increasing proliferation of counterfeit, falsified, or substandard prescription medications, the US government passed the Drug Supply Chain Security Act (DSCSA) with the aim of protecting patients. It's rooted in the idea that transparency—the ability to accurately trace prescription meds throughout the pharmaceutical supply chain—is essential to preserving its integrity.

Just as important is the idea that all the major players in the pharmaceutical ecosystem—manufacturers, wholesalers, dispensaries, and regulators—need a way to share information collaboratively to make it happen. Prompted by the challenge of multiple industry segments needing to cooperate to address DSCSA, the National Association of Boards of Pharmacy (NABP) sought to create a digital platform that would bridge the interoperability gaps between systems, making compliance with DSCSA faster and easier.

Seeking safety through transparency

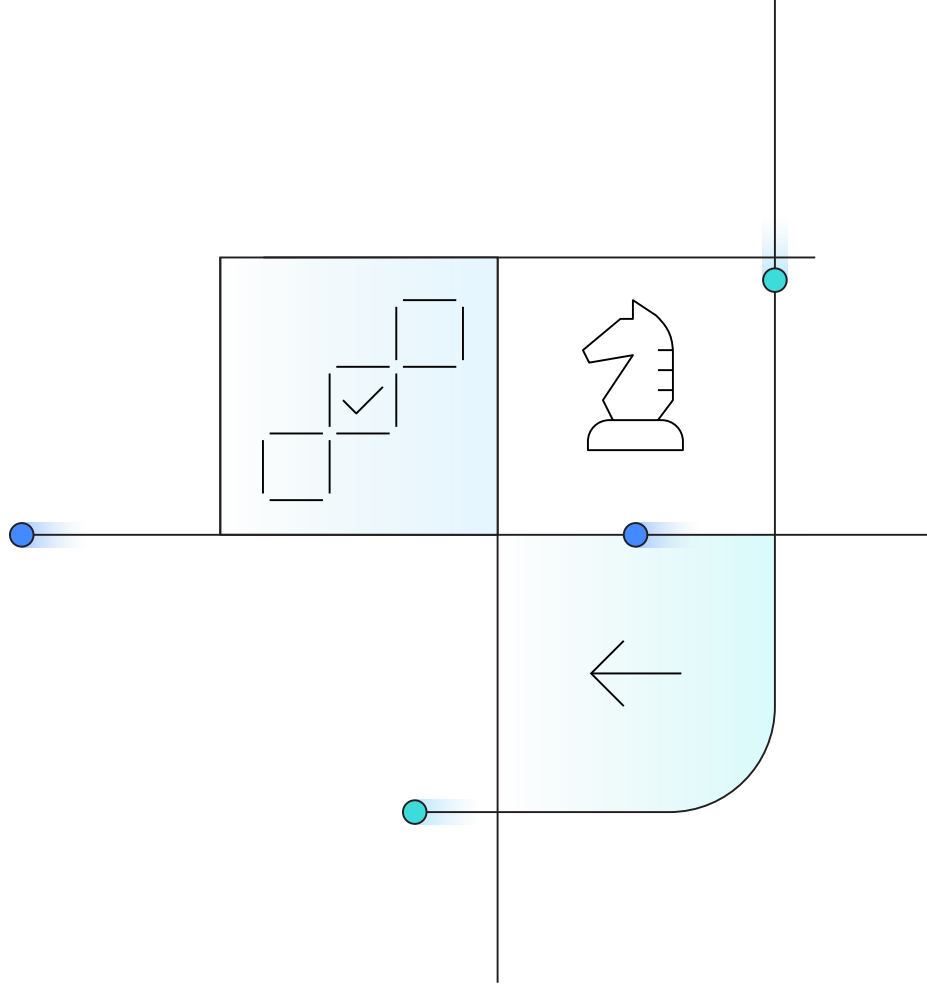
Working with IBM Consulting and AWS, NABP built a new digital platform called Pulse that lets its member users track and share each prescription drug's ownership transaction records, providing increased supply chain visibility.

One key design aspect of the platform—which runs on the AWS cloud—is the integration of APIs from providers of the "point" tracking solutions used by most players in the prescription drug supply chain. By connecting through these APIs, Pulse users can search for trading partners, verify trading partner status, exchange digital credentials, and perform electronic tracing.

The platform enables visibility and collaboration, eliminates tedious administrative work, and, most importantly, creates a more secure supply chain to protect patients.

Action Guide

Make every move count

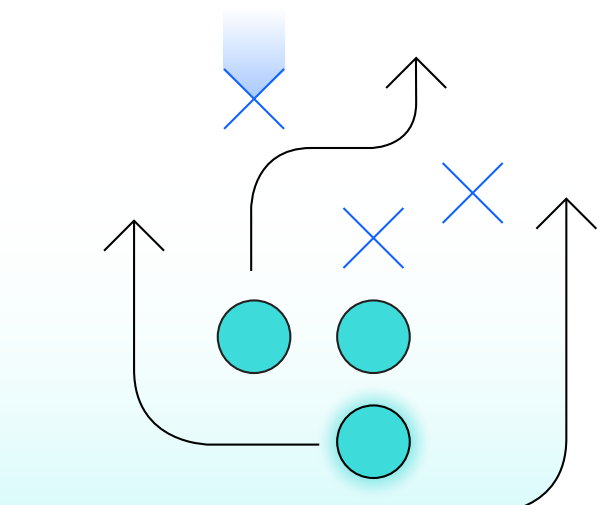


In the complex game of supply chain chess, executives must always think several steps ahead. Modernizing supply chains isn't just about adopting new technologies or processes—it's about embracing a new way of thinking, one that's rooted in scientific inquiry, experimentation, and a relentless pursuit of progress.

By applying the scientific method at scale, enterprises can tap into the vast potential of data and gen AI to drive critical improvements in business strategy, product development, and global supply chain operations. In fact, 62% of CSCOs say gen AI will accelerate the pace of discovery, leading to new sources of product and service innovation.[9]

With the promise of discovery as their guiding light, companies can unlock the full potential of their supply chains, power ecosystem partnerships, and drive sustainable profitability and growth. Here's what leaders across the supply chain ecosystem should do to predict and plan for endless disruption—and profit from the opportunities volatility can create.

1. Plan



Identify benefits you want to deliver.

Investigate the key drop-out points between analysis and action, identifying how improvements could flow through into financial and operational performance. Outline the productivity KPIs that will be targeted for improvement and define success criteria.

Define your employee experience vision.

Provide easy access to relevant AI analytics, recommendations based on role, and intelligent transactional workflows in the employee portal. Find ways to integrate supply chain processes into the employee experience framework, such as streamlining logistics and inventory management to improve decision-making efficiency and speed-to-action. Invest to bring the vision to life and facilitate a seamless and fulfilling experience across the entire supply chain.

Know the specific functionality and systems architecture you need.

Identify the solutions that will provide every feature. Then use an orchestration engine as a process conductor, issuing precise commands to multiple agents based on user prompts. Leverage synthesized data from the integration layer to create dynamic, intelligent workflows that deliver the desired outcomes.

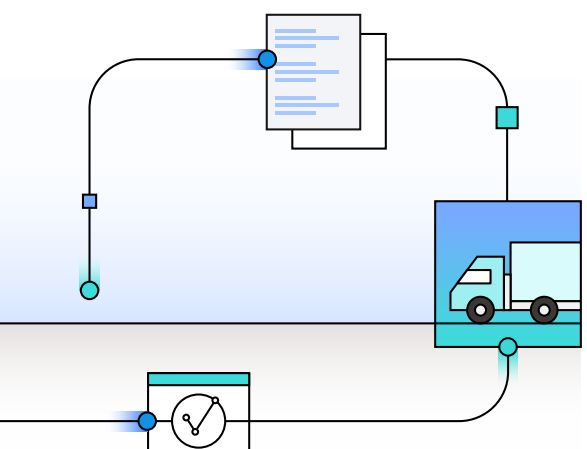
Understand skills requirements and gaps.

Create user personas across the range of supply chain workflows. Outline how digital assistants will help create new workflows and enhance existing ones. Identify the gaps in skills between these personas and the current state, then define training and upskilling plans.

Keep your eyes on the prize.

Align supply chain innovation to your market offering and the capabilities needed to deliver it. Prioritize these areas and be confident in delivering them.

2. Prioritize



Define supply chain workflows that have the greatest potential for automation.

Map the key points across the workflow that cause rework and manual analysis. Be honest about the true nature of your processes, not the idealized version that may be documented somewhere.

Stop looking for a silver bullet.

Be honest about where investment is needed within your current technology landscape. Set specific timelines for upgrades or the deployment of new solutions. Don’t let time and effort that have been invested in previous solutions become an anchor that prevents you from achieving future success.

Don’t try to cut your way to growth.

Make the investments needed to fundamentally transform ways of working. Focus spending on the areas that can make your supply chain more agile and resilient.

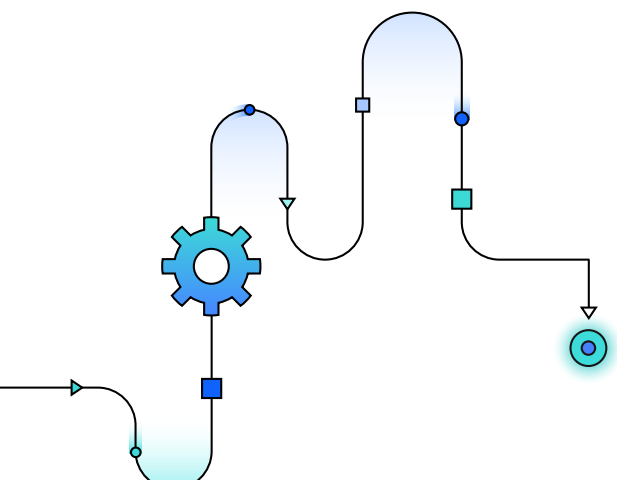
Prioritize getting to scale.

Invest in initiatives that can quickly transition from pilot to deployment at scale. Use success in specific areas to build momentum for the wider transformation.

Define rules of engagement.

Be clear about who is accountable and responsible for specific workflows—and who gets a say. Set ground rules for using digital assistants and make sure everyone knows how they’re expected to evolve.

3. Perform



Feed generative AI data that supports supply chain productivity.

Map the full range of data initiatives needed to connect people and technology. Upskill employees and train tools to speed decisions. Identify the key touchpoints to use gen AI to boost productivity.

Put trust in data.

Don’t let people tinker with the workflow outputs from the system. Where processes are automated and tested, let the system run and do its job. Don’t allow competing forms of analysis designed to suit individual agendas interfere. Instead, encourage employees to engage in advanced analysis, using their assistants to innovate and address the complexities of interconnected operations and systems.

Review and align to changing conditions.

Cultivate a supply chain that can sway with the winds of change to deliver a competitive advantage. Adopt a technology architecture that allows new capabilities to be plugged in without disrupting the user experience.

Keep score.

Track benefits as they’re delivered to build momentum and confidence in new technologies. Demonstrate ROI to secure continued investment. Make data-driven decisions that can fuel growth and performance improvements.

Authors

Amar Sanghera

AWS Supply Chain Solutions Global Leader, Digital Supply Chains Go-to-Market Strategy

Michael Mowat

Supply Chain Strategy and Operations Leader, Finance and Supply Chain Transformation, IBM Consulting

Karen Butner

Global Research Leader, AI and Automation; Supply Chain Operations, IBM Institute for Business Value, IBM Consulting

Contributors

IBM Consulting

Chris Moose, Lead Client Partner NABP, Public Sector

Jonathan Wright, General Manager, NCE Europe

IBM Institute for Business Value

Sara Aboulhosn, Associate Creative Director

Nathan Boudreaux, Visual Designer

Tegan Jones, Executive Editor

Research methodology

The IBM Institute for Business Value (IBM IBV), in conjunction with Oxford Economics, interviewed and surveyed more than 2,000 executives with equivalent roles and titles, including Chief Supply Chain Officer (CSCO), Chief Operations Officer (COO), Chief Automation Officer (CAO), Chief Information Officer (CIO), and Chief Financial Officer (CFO).

In 2024, CSCOs, COOs, and automation executives were also polled about their investments, priorities, and use cases to assess the current impact of generative AI initiatives, as well as the results they expect to see in the next two to three years. The goal of these surveys was to understand how global executives view the impact of gen AI on their organizations' performance and competitive advantage across the supply chain.

Respondents spanned 21 countries, as well as 10 industry sectors, including energy and utilities, petroleum, industrial products, electronics, telecommunications, government, healthcare/life sciences, consumer products, retail, and transportation/logistics, each comprising 5% to 15% of our total respondent sample. The size of organizations surveyed, in terms of revenue, ranged from $500 million to $500 billion, with a mean of $26 billion.

The IBM IBV ran a series of contrast analyses, including pairwise comparisons, highlighting results and differences as shown in this report. Statistical significance for all pairwise comparison contrasts was set at the ($p = .05$) level, meaning there is only a 5% chance that the observed differences or relationships between the groups are due to random variation.

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IBM Corporation
New Orchard Road
Armonk, NY 10504

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