



The disruption dilemma in supply chain

By prioritizing planning and integrating AI, supply chain
leaders can be better prepared for disruption



Supply chains are navigating during a period of unprecedented disruption. From geopolitical tensions to climate-induced events, bottlenecks are causing delayed shipments, missed deadlines, and incomplete inventories.

In particular, supply chains have been impacted by the Baltimore Bridge collapse, low water levels in the Panama Canal, and automotive labor strikes, with every disruption bringing a level of complexity that demands a unique response. The Panama Canal disruption, for example, involves multiple incidents driven by a spectrum of root causes in multiple geographies, including the Red Sea. Incidents such as these put a more significant strain on supply chains, prompting the need for more sophisticated planning to ensure continuity.

In 2023, supply chain disruptions contributed significantly to inflationary pressures, affecting both demand and supply factors.ⁱ In the near term, disruptions could potentially reduce industrial production by 4 percent to 5 percent.ⁱⁱ If the status quo is maintained, economic losses due to these disruptions could range between \$3.75 trillion and \$24.7 trillion by 2060.ⁱⁱⁱ

The shift toward nearshoring and reshoring



Supply chains are abandoning [certain] countries because they just can't get the transparency needed to satisfy compliance requirements in the US and Europe."

—Jon Lang

Head of Practice for Trade and Supply Chains at Eurasia Group

Due to higher costs at ports and terminals, as well as tariffs, supply chain management is having to make tough decisions about suppliers and the countries with which they do business. For example, some countries are shifting supply sourcing from China and India to countries like Mexico and Vietnam. They are also seeking to better manage tariffs, since, in 2023, the average tariff impact on supply chains was estimated at 2.5 percent. They are also exploring reshoring in order to bring manufacturing and distribution/sales closer together.



The criticality of advance planning



Traditional planning methods have proven inadequate in handling the new wave of supply chain complexities. To effectively navigate the web of global disruptions, advance planning has become critical. Shifting from reactive to proactive strategies and adopting scenario planning and contingency planning can help avert disruptions and related risks. Chief supply chain officers and other senior supply chain leaders must adopt planning techniques that allow for quick adaptation and responsiveness to changing conditions. This often involves detailed scenario planning where different potential disruptions are anticipated, and strategic responses and contingency plans are crafted in advance. Resources are allocated in a manner that balances risk and efficiency. A prime example is sales and operations planning: if a manufacturer has a solid foundation of trust with trading partners, forecasting that can impact warehousing, distribution, and logistics with more accuracy.



The need for transparency and trust



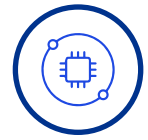
Planning must be underpinned by trust, as mentioned, as well as transparency. These ideals ensure the ability to not only proactively identify and mitigate potential risks, but also promote ethical sourcing and production, while adhering to sustainability goals.

Manufacturers often have supply chains that span many corners of the globe. Therefore, it is essential to work toward transparency across all supply tiers (Tiers 1, 2, and 3). At present, 43 percent of companies have limited or no visibility into Tier 1 suppliers,^{iv} which can lead to lack of preparation when it comes to contingencies that could cause shipping delays.

By having visibility into the supply chain, companies can identify internal risks and vulnerabilities as well. This can include identifying potential disruptions, such as natural disasters or political instability, and taking proactive measures to mitigate them. The result is better monitoring and maintenance of product quality by minimizing production issues or defects in the supply chain.

Further, manufacturers that are able to achieve sufficient transparency with suppliers will likely have more accurate data on emissions, putting them in a better position to pursue clean supply management, the practice of ensuring the entire supply chain operates in an environmentally friendly and sustainable manner. Transparency can also help ensure that products are sourced and produced ethically, without exploiting labor or violating human rights.

Next-level planning with AI



Supply chains focused on navigating disruption through advance planning can accelerate the process by integrating artificial intelligence (AI) into every link of the supply chain. Scenario planning enabled by AI can help supply teams assign risk percentages to different scenarios so they can prioritize contingency plans and alternative sourcing.

This capability is supported by technologies such as digital twins, which create virtual models of the supply chain to simulate and test different strategies without disrupting actual operations. AI-driven tools like digital twins provide a virtual representation of the supply chain, allowing for testing and optimization before implementing changes in the real world. This capability not only helps in identifying potential bottlenecks before they cause disruptions but also enhances the overall agility of the supply chain. The supply chain digital twin market is projected to be valued at \$8.7 billion in 2033, with a compound annual growth rate of 12 percent expected from 2024 to 2033.^v

AI technologies, including discriminative, generative (GenAI), and prescriptive AI, enable detailed analyses of large data sets, which can be used to improve forecasting accuracy and enable more sophisticated decision-making. With GenAI in particular, leaders can incorporate external market data into scenario planning to determine potential impacts on supply chain networks.

Once supply chains become adept at scenario planning with AI and GenAI, they can step up to cognitive demand planning, which utilizes advanced analytics and machine learning to monitor stock levels, automate production and inventory processes, enhance collaboration between sales and operations, and drive operational efficiencies.

Referred to as the AI portfolio, using AI across the end-to-end global supply chain takes visibility to a whole new level. And related data empowers low touch planning that improves predictability and enhances return on equity by 2 to 4 percentage points, adding 1 percent to 3 percent to gross margins across revenue, costs, and assets.^{vi}

By 2028, you can expect two transformative shifts to supply chain operations: (1) 25 percent of key performance indicator reporting will be powered by GenAI models; (2) smart robots will outnumber frontline workers in manufacturing, retail, and logistics.^{vii}



The data quality imperative



The success of AI in the supply chain hinges on the quality of data—both internal and external, structured and unstructured. GenAI, for example, utilizes large language models that are trained on large data sets. High-quality, well-governed data ensures that these models learn from reliable and representative examples, leading to better scenario analyses, forecasting, and, ultimately, inventory levels that ensure the right products are available in the right quantities at the right time. The opposite, poor data quality, can lead to stockouts, excess inventory, or increased carrying costs.

A few considerations in regard to data hygiene:

- It is critical to ensure that training data is free from biases, or else outcomes could be discriminatory or inaccurate.
- Lower-quality data can introduce noise that negatively impacts the model's ability to learn and generate accurate results.
- Robustness refers to the ability of training models to handle different scenarios, variations, and edge case, resulting in reliable and consistent results across various inputs.

Data quality is also imperative for traceability and compliance with regulations. At the same time, as supply chains rely more on data, the risk of cyberattacks increases. It is, therefore, wise to review controls and policies for suppliers handling sensitive data and collect attestations for data protection. Oversight of suppliers may include regular assessments and special terms around data handling and breach notification requirements. In the interest of transparency, threat intelligence can be shared from company to key suppliers. Shoring up a vulnerability is easier and less damaging than responding to a cyberattack. Some supply chains offer cybersecurity assistance to their Tier 1 suppliers, as most cyber breaches are introduced via third parties or vendors.



Ensuring data quality should start with a foundational data readiness test to determine the quality level of the data currently generated across manufacturing and distribution sites. Based on these results, a plan can be formulated to improve the quality of the data, so supply chains can get the most possible value from AI and related technologies.

AI benefits across the supply chain



Benefits of integrated AI planning in the supply chain include the following:

1 Planning

AI discriminate algorithms can be trained to discover correlations between shipments and market behavior for predicting orders. The algorithm can also be used to analyze demand patterns, lead times, and supplier performance, in turn generating output that enables supply chains to optimize inventory levels. Machine learning algorithms improve predictability and enable low-touch planning.

2 Scheduling

GenAI can help devise ways to manage unexpected equipment failures.

3 Forecasting

AI enables transparency into supplier production, current consumption patterns, and evolving customer expectations.

4 Logistics

AI algorithms can determine optimal shipping partners to minimize costs and maximize service.

5 Back office

AI improves operational workflows, enhances visibility, and provides real-time information for better decision-making and process automation. GenAI models help automate network monitoring and market analysis to free up resources to focus on more value-added activities.

6 Product labeling

A highly manual process due to product changes and regulatory requirements, GenAI analyzes unstructured content and rationalized data sources in its training to create label attributes and symbols that take regulatory requirements and the need for translation into account.

Leveraging AI for operational enhancement

Beyond planning and forecasting, AI and digital technologies can be used to enhance various aspects of supply chain operations, including procurement, manufacturing, and customer service. By integrating technology into these areas, supply chains can reduce costs, improve service levels, and respond more effectively to market demands. Comprehensive network analysis, coupled with AI, identifies optimization opportunities across warehouse management, transportation logistics, order-to-cash processes, and customer demand. Integrating finance and planning further accelerates decision-making, allowing supply chains to respond swiftly to dynamic market conditions.

First steps in AI adoption



Adopting AI and other digital technologies requires a transformation not only in technology, but also in workforce capabilities. Creating a digitally enabled workforce involves training and upskilling employees and fostering a culture that embraces innovation and continuous improvement. By empowering employees with the tools and knowledge to leverage AI effectively, supply chains can enhance their operational efficiency and adaptability.

As an emerging technology, AI has some members of the workforce concerned about their jobs. Education and training can help build a groundswell of support for AI's breakthrough uses. GenAI pilots and use cases should illustrate how

the technology improves employee productivity, aids inventory management, and provides better control of assets.

It can be overwhelming at first to understand where AI fits in the supply chain and how it can add value. With an incremental approach to deployment, companies can achieve value within a shorter timeframe. Incremental AI that follows an agile approach can be deployed with partial data, a subset of algorithms, and gradual levels of automation. This approach is more likely to take hold and stick in the supply chain world versus the large-scale digital transformation initiatives popular in other functions.

Conclusion



The integration of AI into supply chain operations is not just a technological upgrade but a strategic necessity in today's complex global environment. As supply chains continue to face a barrage of challenges, the adoption of AI-driven planning techniques will be key to navigating complexities from disruptions to the transition to nearshoring to the need for greater transparency. By doing so, manufacturers can enhance their resilience, improve visibility, and transform their operations to be more agile and efficient. The future of supply chain management lies in the ability to adapt and innovate, leveraging the power of AI to meet the evolving demands of the global market.



How KPMG can help



KPMG is at the forefront of supply chain transformation, offering a suite of algorithms and technology solutions that support every aspect of supply chain operations. Our experienced teams guide clients through complex technology-enabled planning transformations to unlock the supply chain's full potential. Our technology-enabled planning transformation journey is supported by a tested six-layer operating model that comprises

segmentation analysis, a thorough demand plan, and a current-state data assessment. We offer a proprietary set of supply chain algorithms, assets, and accelerators comprising models that help with everything from planning and production to scheduling and logistics, all while optimizing costs, making inventory management more efficient, and assisting with regulatory compliance. Together, we can make the difference.

ⁱ Matthew V. Gordon and Todd E. Clark, "The Impacts of Supply Chain Disruptions on Inflation," Federal Reserve of Chicago, May 10, 2023.

ⁱⁱ Peter Iglinski-Rochester, "Why are supply chains facing disruptions, and how long will they last?," World Economic Forum, July 5, 2022.

ⁱⁱⁱ "Supply chain disruptions will further exacerbate economic losses from climate change, finds study," University College of London, March 13, 2024.

^{iv} "The future of supply chain," KPMG LLP, September 2023.

^v "Supply Chain Digital Twin Market," market.us, <https://market.us/report/supply-chain-digital-twin-market/>, December 2024.

^{vi} "Supply chain trends 2024: The digital shakeup," KPMG LLP, 2024.

^{vii} "Supply Chain AI: Smarter Decisions, Automation and Success," Gartner, 2024

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