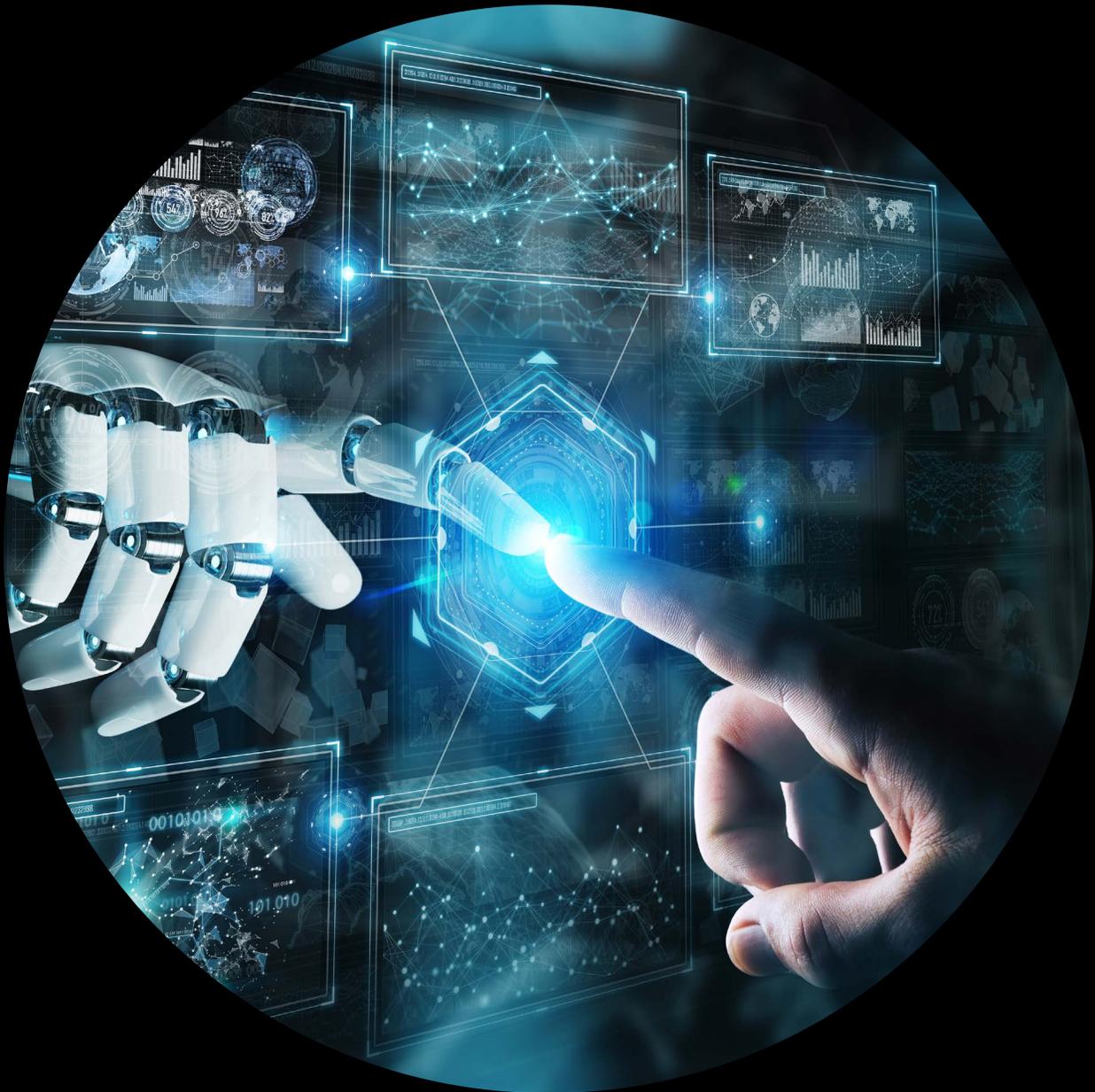
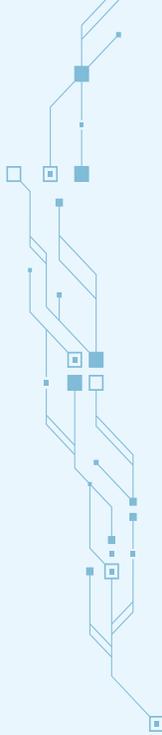


**Deloitte.**



Managing a modern supply chain:  
Utilizing AI to combat complexity



We live in an era where supply chain disruptions are increasingly common, global, and complex. Advancements in artificial intelligence (AI) present a unique opportunity to enhance margins and provide companies with a competitive edge. AI facilitates a proactive and predictive supply chain management approach, impacting not only service level and cost, but also safety and quality. In addition to improving traditional supply chain functions, we envision a future in which AI allows managers to anticipate, and in many cases altogether circumvent, quality issues and inventory deficits, overcoming challenges before they impact profitability. **AI's ability to preempt disruptions and optimize operations positions it as a transformative technology for today's supply chain managers.**

Entropy is defined as “a measure of change, the decline from order to disorder of a system.” The famous playwright Anton Chekhov once said that “only entropy comes easy.” In today's world of the global supply chain, entropy can not only come easily, it can result in major disruptions to goods being moved around the world. The companies that are thriving in today's complex and chaotic supply chain environment are those that are experts at managing entropy. They're also those looking to artificial intelligence (AI) to keep successfully managing supply chain disorder. And they're up against numerous challenges.

Recent **monumental events** have delivered enormous complexity—the Russia-Ukraine war and COVID-19, to name two, triggered fundamental shifts in demand and supply, price volatility, and labor shortages. The Russia-Ukraine war has been described as the greatest supply chain challenge today. That's how *Forbes* framed it—in 2022.<sup>1</sup> And still the conflict goes on.

Shifting policy and power in the geopolitical arena is also a significant challenge. Companies are ramping up efforts to reshore their manufacturing, although labor availability currently is an obstacle. They're also navigating stricter regulations, such as UFLPA (Uyghur Forced Labor Prevention Act), for fair labor practices and immigration.<sup>2</sup>

**Natural disasters and other impacts from climate change** are not only affecting human liveability, they're affecting corporations that are working on energy transition and greenhouse gas emissions, partly due to new regulation and partly due to pressure from stakeholders.

Finally, there's the **future of work** in a world in which there will be greater collaboration between humans and machines. Tens of millions of people are apt to hold jobs where their roles will be *augmented* by AI, leading to a rise of “purpose,” new hybrid work models, upskilling for better opportunities, increases in productivity, and a more satisfying employment relationship.

Companies that embrace and execute new AI capabilities will likely have a leg up on their competitors by realizing greater customization, improved service levels, and greater economies of scale. Adoption happens faster when supply chain managers *identify and develop strong use cases* for AI and co-develop the AI strategy with their organization's technology professionals. It's a true strategic management approach rather than a technology approach. AI has the potential to significantly transform supply chain operations.

How does AI do all of this?

**AI: A critical tool to combat supply chain entropy**

Supply chain processes can benefit from many different types of AI, one of which is generative AI. AI capabilities can help bring order to an increasingly dynamic environment, allowing leading firms to operate more complex supply chains and positively affect organizations across functions (e.g., [planning](#), [sourcing](#)).<sup>3</sup> For example, AI can also use computer vision to detect defects on the manufacturing floor, provide interactive virtual assistants for exception management for supply chain planners, use intelligent automation for order management workflow, develop simulation models of supply chain network designs, and use analytics to perform predictive maintenance. Generative AI, which creates original content, can evaluate supplier capabilities and performance—a must for managing today's globe-spanning suppliers. Companies delivering AI solutions to help automate processes or solve problems are seeing transformative results.

Supply chain organizations across industries are benefitting from AI applications.

 <p><b>Global transportation leader</b>  <i>Predictive maintenance</i> program leveraging AI and Internet of Things (IoT)  <b>\$110M+</b> annual benefits across 160+ locations</p>	 <p><b>Global automotive OEM</b>  <i>Natural language processing</i> and AI models for investigation of issues                  Avoidance of <b>\$46M</b> in penalties</p>	 <p><b>Global appliances leader</b>  <i>Supply Chain AI simulations</i> to optimize inbound logistics, manufacturing, efficiency and inventory                  Delivered benefits worth <b>\$97M - \$150M</b></p>
 <p><b>Food and beverage company</b>  <i>AI optimization tool</i> for sourcing and procurement to enable savings                  Annualized benefits of <b>\$75M</b></p>	 <p><b>Industrial conglomerate</b>  <i>Predictive aftermarket inventory</i> solution by analyzing 80+ data sources                  Unlocked <b>\$38M</b> of Inventory reduction and <b>\$13M</b> profits on operating margin</p>	 <p><b>Major airline</b>                  Root-cause analysis, for <i>material cost reduction</i> (effective Sourcing) and Performance Management                  Enabled <b>\$1B</b> inventory reduction opportunity</p>
 <p><b>Global automotive OEM</b>  <i>Scenario simulations</i> for <i>inventory</i> (part segmentation and target setting)  <b>\$200M+</b> cost-saving opportunity</p>	 <p><b>Aerospace manufacturer</b>                  Real-time resource tracking in plant and optimized scheduling                  Enabled <b>\$228M</b> in benefits in production and <b>12%</b> improvement in throughput</p>	 <p><b>Global medical devices leader</b>                  Advanced analytics tool for <i>driving inventory reduction</i>                  Unlocked <b>\$550M+</b> in short-term reduction opportunities</p>

In the last three years, we have helped **25+** companies across sectors deliver **\$3B+** in benefits by deploying enterprise-scale supply chain AI solutions.

What if AI could automatically and proactively identify potential quality issues in manufactured goods? It can. A major automobile manufacturer's challenge was trying to use a high volume of raw data in a manual review process to sort out customer feedback on potentially hazardous maintenance issues. The company's silos across functions added to its inability to collect and address these issues quickly. Let's say customer feedback reported faulty fuel pumps that caused engine stalling, leading to a loss of power. Or that warped brake rotors reduced braking performance. Early alerts in both these situations would be mission critical for the safety of customers. Using a new AI solution, the company was able to develop an "alert" system to identify issues like these, which led to multimillion-dollar savings. For companies that want to add to the benefits, a generative AI assistant could prompt ideas for fixing the issues quickly in production before more cars come off the line with the same required fix.

Now what if AI could make the manufacturing workspace safer for all the manufacturer's employees?

A leading industrial products manufacturer had the bold ambition to have zero serious incidents and fatalities across the global plants. The traditional approaches for managing safety through safety briefings and post-incident actions were not going to get them to their goal, especially with significant shifts in the workforce. Many safety incidents stemmed from process noncompliance from operators, and this was especially true at plants with a high turnover. The reliance on routine processes and manual safety reporting, in addition to the disparate systems across manufacturing facilities meant the company had limited visibility to the real risk profile of its plants or predictive insights on the safety actions that would best help it achieve its ambition. A safety control powered by computer vision was the step change in generating predictive insights and shaping targeted safety campaigns to drive safety incidents to zero. The solution begins by running a computer vision model on the edge—integrated into each manufacturing facility's existing surveillance infrastructure. As noncompliance events are detected by the model, these feed into the control tower—a web-based, one-stop shop for all safety insights, incidents, and corrective actions. The control tower not only provides detailed information about incidents and noncompliance events, but also generates a risk profile by shift, by manufacturing area, and other configurable dimensions. Inputs from multiple other safety solutions such as anti-collision equipment on forklifts are seamlessly integrated into the control tower to further augment the safety insights. AI and computer vision are not only providing “visibility” to potential problems, they are making the workplace safer for everyone.

Finally, a company that delivers millions of packages a day can only do all those things in facilities that run like clockwork. But machines occasionally break down—the key is knowing when they will and how much their needed maintenance will impact capacity and delivery service levels. In the case of this company, its facility volume had increased by almost 30% and with that came a shrinking maintenance window because of its 24/7 operations. Required maintenance resulted in both loss of capacity and lower delivery service levels. The solution? Installing Internet of Things (IoT) technologies such as ultrasonic inspection devices and vibration and temperature sensors that pair with an AI/machine learning model to predict and prevent imminent maintenance failures. The company had more than 30 predictive maintenance use cases—gearbox failure and belt damage, for example—that are expected to result in an almost 5% capacity unlock and a potential 20% to 30% reduction in equipment downtime. Bonus: The solution was designed to serve as a broader platform for new IoT and AI/big data initiatives.

All of these examples rested on a clear use case from supply chain management—those who know the critical role an orderly supply chain plays in an organization's success.

### How should supply chain organizations develop an AI strategy?

The first, most important strategic step is to *avoid* common pitfalls that can arise during your desired AI transformation. If you tie your AI solution to a core business issue it will likely add meaningful value to your company. It's also important to avoid underestimating the “lift” needed to prepare data to use in data science modeling, which can result in data engineers being stretched too thin. Forming multidisciplinary teams to co-create solutions will help ensure supply chain stakeholders embrace and use the technology. Your AI shouldn't be a black box, tech-led design—end users who know and understand the reality of day-to-day operations must be included in design and testing processes. Doing so helps ensure adoption by the organization. Company leadership should demonstrate commitment to AI so that it's applied consistently across departments and aligned with the company's strategic mission. Finally, when it comes to pitfalls, remember that AI transformation depends on people, not technology—if employees don't understand its use or aren't trained on its usefulness, it won't be adopted well.

### Five critical steps can facilitate a comprehensive approach to supply chain AI:

- 
**1. Strategy and road map:**  
 As with any major initiative, a clear strategy and detailed road map is key. Sound strategic choices can make or break the implementation of AI for your supply chain.
- 
**2. Change management and adoption/value tracking:**  
 Employee trust and adoption are essential to realize value. Encourage adoption of AI solutions, and promote a robust and continuous system of tracking, reporting, and communication of adoption and value metrics.
- 
**3. Tech stack enablement:**  
 Put in place a scalable, flexible architecture that supports data collection, modeling, and workflow integration. Poor tech stack development is more common than not and has long-term implications.
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**4. Data preparation:**  
 Identify, capture, clean, and provide context for data to use in priority use cases. Data is typically segmented, incomplete, and inconsistent. The true value of raw data can only be extracted by AI if it is prepared correctly.



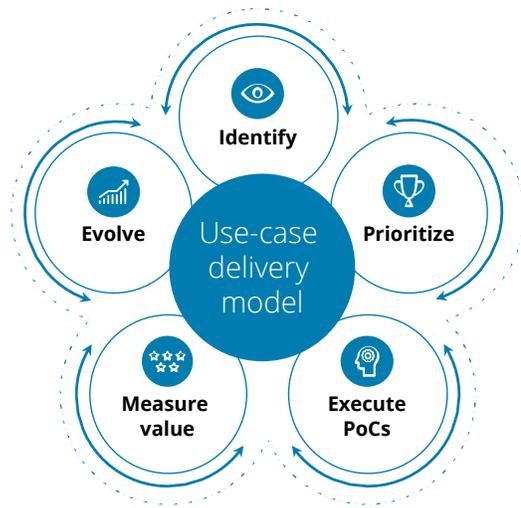
## 5. Use case activation:

Develop and activate priority use cases that are business-minded and enable a self-funded AI program that can grow in impact. Use cases built solely for technology's sake typically flop. Use cases that are co-created with supply chain executives to better processes and performance are better staged for success. Use cases should be developed in an agile, self-funded manner. Below are a few ideas of how AI can add value along the supply chain:

Use cases should be activated in an agile, self-funding manner.



Savings generated from early use-case activation can be reinvested to enable further use-case implementations.



### Illustrative supply chain AI use cases from our library

	Design	Plan	Source	Make	Deliver	Maintain
Increasing AI complexity	Testing design simulations*	AI-powered demand forecasting	<b>Auto-supplier disruption risk response*</b>	<b>Dynamic production rescheduling</b>	<b>Dynamic lead time visibility and auto-update</b>	<b>Dynamic available to promise</b>
	Automated build preparations*	Inventory optimization and dynamic stock rebalancing*	Category market insights and trend analysis	Predictive maintenance analytics	Predictive logistics disruptions	Predictive order-at-risk visibility
	Bespoke product development	Training digital twins	Tier-N supplier illumination and risk sensing	Constraints management for scheduling	Route optimization	Customer and order prioritization
	Product portfolio optimization	Scenario modeling based on external events	Pro-active and collaborative supplier management	Manufacturing quality sensing and detection	Predictive analytics for return trends	Customer segmentation
	Product complexity reduction	Near-term demand sensing	Contract adherence and anomaly detection	Auto-generated audit and MES reports*	Warehouse automation	Order backlog visibility and root-cause analysis
	Product data quality visibility and root-cause analysis	E2E order-to-delivery visibility and exception management	AI-assisted auto-emailers for AP and AR teams	Smart conveyance	AI chatbots for order tracking	On time in full performance visibility and root-cause analysis

**\*Use case has high potential to be accelerated by new generative AI capabilities**

Obviously, the highest benefits to your company will be those truly transformational—uses cases with high effort and high value—but don't overlook the low effort and high value "quick wins."

**How to win employee trust and adoption**

AI should always be considered in the context of being a tool for human empowerment, not a replacement for humans. But humans may be worried when they read that 80% of the US workforce could see their jobs impacted by AI in some way.<sup>4</sup> There's more to the story—at its best, generative AI is not about replacement or substitution; it's about *augmentation*. AI can enhance human knowledge and experience, resulting in even greater creativity, innovation, and productivity.

Supply chain AI must be deployed in a responsible and empathetic manner to address employees' concerns and fears, some of which may be based on misinformation or a lack of understanding about how AI can *help employees add more value* to the organization.<sup>5</sup> Consider these "lessons from the trenches" about how to make adoption of supply chain AI a success:

**Show, don't just describe.**

Demonstrations go a long way with end users, especially early in the process.

**Get user feedback early and often.**

Identify enthusiastic adopters among end users and actively involve them in design and testing.

**Communicate, communicate, communicate.**

Continuously monitor and track adoption and savings metrics—and broadcast "wins" far and wide.

When employees start to see that AI can help bring clarity because supply chain management has become so complex, they'll not only embrace it, but also find it a critical tool to combat supply chain entropy. Entropy has numerous sub-definitions and even its own symbol ("S"). But an easy and concise way to think about entropy and the supply chain is that *an ordered system has low entropy*. Today, AI is helping to bring better order to supply chains, whose singular goal is to deliver products to consumers and businesses around the world. It's time to explore how AI can transform your supply chain management.



## Get in touch

Want to revolutionize your supply chain with AI strategies that combat disruptions and drive seamless operations? Reach out to us to learn more about how we can tailor AI solutions to optimize your supply chain to combat supply chain entropy and boost efficiency.

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The authors would like to thank Kelsey Carvell, Monika Lanno, Kreeti Mahajan, Rohini Prasad, and Andrew Waldman of Deloitte Consulting LLP for their contributions to this report.

## Endnotes

1. Paul J. Noble, "[The Ukraine-Russia war's impact on the supply chain: Why MRO optimization is a top priority](#)," *Forbes*, May 12, 2022.
2. From [US Customs and Border Protection](#): "The Uyghur Forced Labor Prevention Act (Public Law No. 117-78), also known as the UFLPA, directs the Forced Labor Enforcement Task Force to develop a strategy for supporting enforcement of the prohibition on the importation of goods into the United States manufactured wholly or in part with forced labor in the People's Republic of China, especially from the Xinjiang Uyghur Autonomous Region, or Xinjiang." Accessed October 2023.
3. Vinay Rajani and Mike Deng, "[How generative AI will transform sourcing and procurement operations](#)," *Deloitte Business Operations Room Blog*, June 27, 2023.
4. Tyna Eloundou et al., "[GPTs are GPTs: An early look at the labor market impact potential of large language models](#)," arXiv, August 22, 2023.
5. Deloitte AI Institute, "[Proactive risk management in generative AI](#)," 2023.

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