



EBOOK

Your Guide to AI in Supply Chain Planning

Driving Real, Practical Value from
AI/ML in Supply Chains

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Artificial Intelligence (AI) is getting a lot of buzz lately, particularly since the introduction of consumer-facing generative AI (GenAI).

The reality is, AI in supply chain is so much more. For example, well-designed, comprehensive supply chain planning software utilizes embedded AI techniques to transform data into insights that intelligently shape decision making. And new capabilities and uses of AI are being added all the time.

Many AI capabilities are often unknown to users, or not utilized to their full potential. To help shed some light, we've developed this guide to provide insights into some of the ways AI is at work in common supply chain planning use cases across industries.

Understanding how AI delivers business value can help you prioritize ways to more effectively use AI today. This understanding can also help you build trust in AI across your user base, discern the differences between vendor offerings, and plan your own roadmap for leveraging new AI functionality as you climb the supply chain planning maturity ladder.

AI delivers powerful analytics that are intuitive, efficient and transparent, with advanced prescriptive and predictive features, to help guide, augment and automate processes to quickly solve real-world problems. To some, this may sound futuristic and complicated. At John Galt Solutions, we ensure companies have access to a set of easily accessible practical techniques, so anyone regardless of their role or skill level can apply them and quickly gain value. Through our [Pathways to Evolve](#) program, as companies advance in their AI journey, they begin to apply more advanced capabilities building off early learnings.

No matter where you are in your AI journey, this guide is designed to make AI more accessible. Read through this and then connect with your colleagues to understand what is available to you today, what your next step should be and what you need to drive forward.

The AI Umbrella

To start, let's describe AI as technology that enables computers and machines to simulate human learning, comprehension, problem solving, decision making, creativity, and autonomy. Simply put, AI applies advanced analysis and logic-based techniques to interpret events, support and automate decisions, and take actions. There are several subsets of AI, such as computer vision, neural networks, and of course, GenAI, which is capable of generating text, images, videos, or other data using generative models, often in response to prompts. Machine learning, another subset of AI, enables machines to develop problem-solving models by identifying patterns in data—learning— instead of leveraging explicit programming.

Supply chain teams can harness many of the different types of AI in a given application in order to address specific challenges and outcomes.

Here are just a few of the ways AI is at work across the supply chain:

- 1 **Multi-echelon Inventory Optimization (MEIO)**
- 2 **Demand Sensing**
- 3 **New Product Forecasting**
- 4 **Purchase Order Optimization**
- 5 **Improved Supply Chain Model Quality**
- 6 **Shifting to Probabilistic Forecasting**
- 7 **Experiment-Driven Planning**

1 Multi-echelon Inventory Optimization (MEIO)

Role of AI: MEIO enables companies to leverage their inventory much more effectively, optimizing the full network of inventory across the end-to-end supply chain and across both form and function. AI enables robust network risk pooling, to aggregate demand across locations and fulfillment paths, across products and bills of material to reduce variability and uncertainty.

AI is used to quickly identify different data patterns and attributes to help predict demand across time horizons, derive statistical distributions and cleanse data, to augment and automate inventory optimization. AI also segments product/location combinations through optimized safety stock cost, product profit margin, required service level, and more.

MEIO combines cost optimization and inventory optimization to minimize safety stock while guaranteeing demand at each endpoint at specified service levels, providing a holistic optimization of inventory.



Case in Point: Spicing Up Inventory

A spice manufacturer uses AI to help determine which and how much of each flavor ingredient and packaging to hold as raw materials, semi-finished goods, and finished goods by accounting for demand for blends, demand location, facility capabilities, and considering product shelf life. The result has led to better utilization of raw materials, stronger collaboration with suppliers and customers all leading to improved service levels and margins.

How AI Helps You improve Inventory Optimization:

- ▶ Optimization that considers the form and function of inventory across multiple echelons to meet the desired service level, while traditional safety stock approaches focus on maintaining a buffer at each location
- ▶ Model your supply chain as a holistic network and find relationships via Graph Analytics
- ▶ AI-driven data-cleansing and statistical distributions
- ▶ Dynamic programming to solve an NP-hard problem (some of the most challenging problems to solve)

Benefits of AI in Inventory Optimization:

-  Free up working capital
-  Improved fill rates
-  Reduced product waste
-  Operational efficiency



Case In Point: Predicting Consumption

A bulk gas storage and distribution company with daily deliveries has more than 200,000 customer locations across different regions, building ages, types and efficiencies, and more. This has led to historical challenges predicting heat usage and therefore gas consumption. Using AI, the company automated pattern recognition algorithms driven by machine learning to look across demand, syndicated weather data, and consumption to predict demand.

2 Demand Sensing

Role of AI: AI in demand sensing finds relationships in large sets of data combined with predictive analytics to create a more active and short-term granular demand forecast to help improve customer service and enrich inventory deployment and allocation decisions. AI enables organizations to quickly connect disparate data to extract insights, prescribe recommendations for next steps, and automate where applicable.

Demand sensing can be combined with post-hoc analysis to identify leading indicators of change much earlier. This enables a more proactive approach helping industry leaders shift course while their competitors are still pulling or analyzing data.

How AI Transforms Demand Sensing:

- ▶ Identify leading indicators of change, sensing changes faster
- ▶ Enrich data and models to find unseen connections between demand and market indicators that would otherwise go undiscovered (non-linear, change rates, etc.)
- ▶ Modify and boost predictors for greater strength and accuracy or removing bad predictor (eliminate noise from the signal)
- ▶ Separate the impact of pricing and promotions from demand level changes
- ▶ Automate algorithmic parameters initialization and feature selection
- ▶ Data Mining via supervised learning to uncover hidden dynamics
- ▶ Data Cleansing (for example, identify and correct missing/wrong data)

Benefits of AI in Demand Sensing:



Improved visibility to future demand allows efficient distribution routings



Reduced 'emergency' and 'ad hoc' deliveries improve profitability and service levels



Ability to deliver continuous learning based on the actions of the system



Reduced emergency deliveries and more efficient routing to significantly drive down costs



Dramatically improved customer service levels





Case in Point: Staying Ahead of Fast Fashion

A fast fashion and home living brand with a focus on innovation spanning multiple product segments began leveraging AI in new product and lifecycle forecasting. Much of their business is 'fast fashion' products, which are a struggle for most organizations to model as there is no sales history and no direct 1:1 mapping of how an item will perform.

Utilizing Atlas AI, this brand is able to thrive in a highly competitive environment by forecasting short life cycle products, as well as separating the impacts of prices and promotions in longer lifecycle products in its 'Permanent Assortment'.

Now the company can more quickly and accurately forecast short lifecycle products, even with a demand history that is heavily impacted by promotions, events, and pricing.

3 New Product Forecasting

Role of AI: In New Product Forecasting, we combine multiple AI approaches to model several components at the same time. First, use AI to identify product lifecycles across a range of product and sales characteristics. Second, embrace AI to identify demand volume by analyzing market potential and trends, and product affinity by comparing to prior product launches.

How AI Transforms New Product Forecasting

Combining multiple AI approaches to model several components to understand demand. This can be particularly impactful in fast fashion and industries that frequently deliver innovative products to the market.

Benefits of AI in New Product Forecasting:



Increased ability to predict customer purchase behavior or events which have a big impact on inventory



Delivers insights into price elasticity by separating out the impact of pricing and promotions from regular sales lifecycle



Improved lifecycle planning



Reduced out-of-stocks



Drives continuous learning utilizing look-back analysis

4 Purchase Order Optimization

Role of AI: AI automates daily and weekly purchase orders optimization by establishing an optimization framework, analyzing purchase orders by vendor, and ensuring purchases meet minimums and need by dates. Rather than a static optimization, AI enables the continuous replanning and optimization across a series of considerations that impact costs, lead-times, bulk discounts, and order sizes for dynamic purchase order optimization.

How AI Helps Transform Purchase Order Optimization:

- ▶ Quickly and effortlessly identifies opportunities through price analysis to determine the right-sized replenishment strategies
- ▶ AI-driven Optimization Framework translates bulk discount structure, vendor lead-times and inventory flow for dynamic purchase quantities and vendor selection
- ▶ Optimize profit with probabilistic elements to perform functions such as reducing safety stock using endpoint-driven service level factors

Benefits of AI in Purchase Order Optimization:



Profit optimization across pricing and discount structures



Quickly assess vendor sourcing impacts across the end-to-end supply chain



Ensures bulk discounts / order size matches service levels / pricing to demand



Improves service levels while dealing with demand volatility



Recommends safety stock



Case In Point: Improving Service Levels

An aftermarket parts brand that sells direct as well as via resellers carries a broad portfolio of fast-moving and slow-moving items through their distribution network.

The brand leverages AI-enabled purchase order optimization to maximize profitability while ensuring inventory is in-stock, enabling them to offer high service levels when and where a customer needs the item. This drives greater margin contribution and enables more holistic and strategic use of inventory.



Case In Point: Transforming Data

A global baby gear manufacturer utilizes Atlas Planning Platform's native AI to take advantage of the scale of their new, vertical integration from manufacturing to distribution to numerous regional warehouses and direct to customer.

Previously, each of the many regional business units suffered from poor data quality on lead-times, product categories, and product sizes. This prevented accurate planning across multiple levels including: when to ship material from a global manufacturing facility, order minimums, and how much product could ship on containers and be stored in global and regional warehouses.

5 Improved Supply Chain Model Quality

Role of AI: AI enhances and automates the mining, enrichment, and cleansing of data used to optimize supply chain plans. Missing fields (lead-time, size, product category) can be inferred by relationships to other series. For example, using clustering and segmentation together with machine learning algorithms we can establish relationships and find contextual information to infer lead-time and attributes based on relationships to create the appropriate strategies.

Historical relationships, outliers and events are improved by combining statistical measures with supervised and unsupervised learning methods. AI allows us to find unseen relationships between causal features, while also capturing and classifying outliers and events.

How to Enhance the Supply Chain Model with AI:

- ▶ Utilize unsupervised learning to segment products or locations by key parameters
- ▶ Drive data cleansing through the use of unsupervised learning while considering segments
- ▶ Predict data values through supervised learning, considering segments
- ▶ Fresh, accurate lead-times that reflect the real-world, by dynamically calculating, applying causal analysis and model probabilistic ranges

Benefits of AI in Improving The Supply Chain Model:



Improves service levels



Better warehouse and container utilization



Increases inventory turns



Enhances data quality

6 Shifting to Probabilistic Forecasting

Role of AI: Traditional notions of forecasting and analytics focus on accuracy from single-point, deterministic forecasts. In today's complex and uncertain world, the pursuit of perfect accuracy is no longer sufficient. Instead, we should focus on providing decision-makers with the insights needed to navigate uncertainty.

There are several reasons why leading companies are starting to shift their thinking away from an accuracy-oriented mindset:

- 1. Misleading Precision:** A fixation on achieving high accuracy can lead to overconfidence in point estimates, neglecting the inherent uncertainty and variability of the real-world which can leave supply chains caught off-guard when situations change.
- 2. Lack of Robustness:** Single-point forecasts are not designed to handle uncertainty, unexpected events or outliers, which have significant impacts on business decisions.
- 3. Narrow View of Reality:** Traditional forecasting neglects the real-world's complex and nuanced relationships between variables and the interdependencies that shape them.

Utilizing AI, we can quantify uncertainty by providing decision-makers with a deeper understanding of the range of possible outcomes; incorporating nuanced relationships between variables and interdependencies that shape the real-world and provide insights tailored to specific business decisions and scenarios.



Case In Point: Going Beyond Traditional Scenarios

A global leader in plastic compounds and PVCs needed to understand capacity needs and when new business opportunities could be pursued. Uncertainty continued to increase as end-market demand drivers changed more rapidly than ever while supply chain complexity increased, vendor flexibility decreased, and lead times grew. Predicting what markets would do by looking at past volumes resulted in missed sales, higher inventories and profit margin compression. By moving beyond traditional what-if scenarios to probabilistic ranges, the company fueled profitable growth. For example, they invested earlier in new capacity on one set of products while hedging investment in another product group through the use of overtime resources. Traditional what-if scenarios identify when demand requires additional capacity independently, as one-off occurrences. Through probabilistic, this company is able to consider the full range of likely demand.



How AI Transforms Probabilistic Forecasting:

- ▶ **Capture Complexity:** Incorporate nuanced relationships between variables and interdependencies that shape the real-world.
- ▶ **Emphasize Decision-Focused Insights:** Move beyond traditional approaches to provide insights that are tailored to specific business decisions and scenarios. It's not a one size fits all world!
- ▶ **AI-powered Q-learning,** a type of learning algorithm, enables the software to dynamically learn and adapt to changing environments.
- ▶ **Quantify Uncertainty:** Provide decision-makers with a deeper understanding of the range of possible outcomes, allowing for more informed decision-making.

Benefits of AI in Probabilistic Forecasting:



Probabilistic forecasts fuel dynamic, responsive supply chains that consider the range and density of likely demand



Empowers organizations to adapt to changing circumstances, mitigate risks, and seize opportunities



By recognizing and quantifying uncertainty, the use of AI promotes a culture of informed risk-taking and reduces overconfidence in a single outcome

7 Experiment-Driven Planning

Role of AI: End-to-end experiment-based planning uses AI to model all nodes and constraints across the supply chain to better represent real-world complexity. Planners can use these simulations to observe the behavior of supply chain designs, planning choices, and policies to measure their impact within a virtual world without risk to the physical supply chain.

Traditional probabilistic and simulation approaches focus on varying just demand or supply or inventory – a single lever in a very complex supply chain. AI-based experiment-driven planning connects data points both inside and outside the four walls to account for volatility and variability of demand, supply, financial drivers, and more. By modeling supply chain behavior across both uncertainty (demand ranges) and disruptions (hurricanes, transportation, labor, etc.) we can provide insights tailored to specific business decisions and scenarios.

How AI-powered Experiment-based Plans Transform Your Supply Chain:

- ▶ Leverages experimentation and analysis of different supply chain designs and policies
- ▶ Enables planners to integrate any data source and analyze the data to create base scenarios and easy-to-configure, flexible policies and what-if capabilities
- ▶ Simulation environment enables planners to test drive the supply chain model and observe “real-world” behavior to adjust and fine-tune before it’s put into production
- ▶ AI-powered Q-learning, a type of learning algorithm, enables the software to dynamically learn and adapt to changing environments
- ▶ Markov Decision Process (MDP), another type of model, allows the system to model sequential decision-making, considering the impact of each step in the next decision and each of that decision’s impact.



Case In Point: Simulating Disruptions and Uncertainty

A manufacturer of indoor and outdoor furniture and accessories faces high demand seasonality impacting both sales, manufacturing capacity, and warehouse capacity. This is compounded by their products including bulky furniture that takes up significant space in their warehouses, trucks, and customer warehouses.

They rolled out experiment-based planning to support the launch of a new outdoor product that was a mix of internally manufactured and sourced parts. This AI-enabled process allows the manufacturer to simulate any disruption or change, such as shifts in supply, demand, costs, or combination of changes, across the entire network to see the impact and fine-tune their go-to-market strategy.

Experimentation highlighted that a mechanical part from a 3rd party supplier was the greatest source of risk, both in supporting upside demand and in supporting a resilient supply chain. This critical part was single sourced with long lead-times, while internally manufactured components had a much higher degree of flexibility to reschedule or increase production levels. While an alternate supplier could not be on-boarded in time, additional safety stock was purchased, ahead of the initial build requirements. The product launched successfully and sold above initial expectations, supported by the additional safety stock on this component. As this component was relatively small and less than 2% of the overall cost of the finished product, a very small investment in cost and warehouse space provided significant additional profit.

Planning Your AI-Empowered Future

These Are Exciting Times For AI.

Innovations will continue to transform supply chain planning and GenAI is poised to be a force multiplier for other AI elements. GenAI goes beyond analyzing vast amounts of data to deliver insights and recommendations that can inform critical business decisions. In particular, the ability to both suggest and automatically create scenarios, create synthetic data and empower any user to populate advanced models without the need for a data scientist are just few of the areas where GenAI is transforming supply chain planning. Companies can deploy GenAI to simulate scenarios, analyze outcomes, and provide actionable advice—all which will become increasingly vital to a company's success. It's important to understand how AI drives value in supply chain planning now and in the future, and how you can increase the benefits you gain from AI.

Aligning with a supply chain planning software vendor with expertise in AI is one of the most impactful ways to set up your organization for success. John Galt Solutions' powerful Atlas Planning Platform leverages advanced AI, ML and GenAI to bring more intelligence to your decisions, and we're constantly bringing new features and innovations to elevate, supercharge and streamline your planning processes to help drive your growth strategies.

AI Empowers You To:



Run thousands of simulations while simultaneously testing multiple data points to determine the best course of action



Greater visibility into more granular aspects of the supply chain and understanding of the impact across every node



Enable “look back” analysis to identify the leading indicators of change and uncertainty, to pivot before competitors sense changes



Focus decision-makers on making informed choices on key decision-points across the end-to-end ecosystem



John Galt Solutions' Atlas Planning Platform provides a comprehensive end-to-end supply chain planning solution with advanced analytics and machine learning to automate planning, break down business silos and deliver greater visibility. Atlas Planning, a SaaS-based platform, transforms S&OP processes; demand, replenishment; supply and inventory optimization; manufacturing planning and scheduling; and transportation optimization.

Partner with John Galt Solutions

to take the next step into new AI-enabled features and empower your organization to take full advantage of what AI has to offer.

