INFRASTRUCTURE RUNS THE WORLD.

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NO MORE BLACK SWANS

WHITE PAPER

How AI is changing the game to drive supply chain visibility, agility and profit

Next generation AI technologies can help you tackle supply chain disruptions, improve forecasting and make smarter, faster decisions. And they're already here.

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What we learned from the pandemic

For the supply chain sector, the pandemic appeared like an unforeseen "Black Swan" event. From port workers to Chief Supply Chain Officers, many saw the unpredictability of the crisis as an unavoidable risk. The truth is not that simple.

Could AI have made the difference?

The pandemic was unpredictable, but even then, there were technologies that could have better protected vulnerable value chains.

Transformative supply chain technology models uncertainty and manages risk through AI applications rooted in reinforcement and unsupervised learning, stochasticity (randomness) and knowledge graphs.

What happened

During the pandemic, companies around the world were correctly focusing on simply keeping their supply chain afloat. They had for years viewed supply chain technology as a tactical execution engine for existing plans. But in this upended world, lead times were longer, suppliers were unavailable, routes were disrupted, shipping costs were high and critical inventory was missing. Old plans became unworkable.

New opportunities

Managing supply chain risk demands not only learning from history to address known uncertainties, but also tapping unsupervised learning to navigate scenarios that haven't yet happened.

AI and related technologies are just beginning to make waves in the supply chain planning and operations process. The future offers not just unprecedented actionable insights and agility, but also AI-powered prescriptive solutions and more autonomous operations. This paper explores some of those opportunities.

Generative AI
The new supply chain visibility

Simple questions

Ongoing supply chain disruption, including the ongoing uncertainty of global tariffs, will increase adoption of AI in the supply chain.

Ask yourself: How much inventory do you have right now, and where is it coming from? Will it be just the right amount at the right time to meet demand, or will you have costly excess inventory on your hands?

These are simple questions, but they're tough for many supply chain leaders to answer with total confidence, every week and every month.

The answer: data visibility

Companies need visibility to their entire value chain to manage their day-to-day operations, identify and avert risk, and make the best decisions for future growth. But companies don't always have the time or resources to realize this visibility when it's needed the most. While many supply chain decisions have an immediate benefit, rash logistics decisions can lead to unforeseen downstream challenges. AI serves as a fail-safe, preventing operators from taking actions without considering all the value chain implications.

With generative AI, it's comparatively easy to get quick answers on inventory levels, suppliers, disruptions and more. Too much inventory? Use AI in combination with other AI and science-based models to see what happened, why and how to prevent it in future.

AI-based exception management: Get the signal, not the noise

Your supply chain is vast, and you don't need to know when every single thing is going right. Traditional alerts, even those based on intelligent thresholds, can lead to data overload.

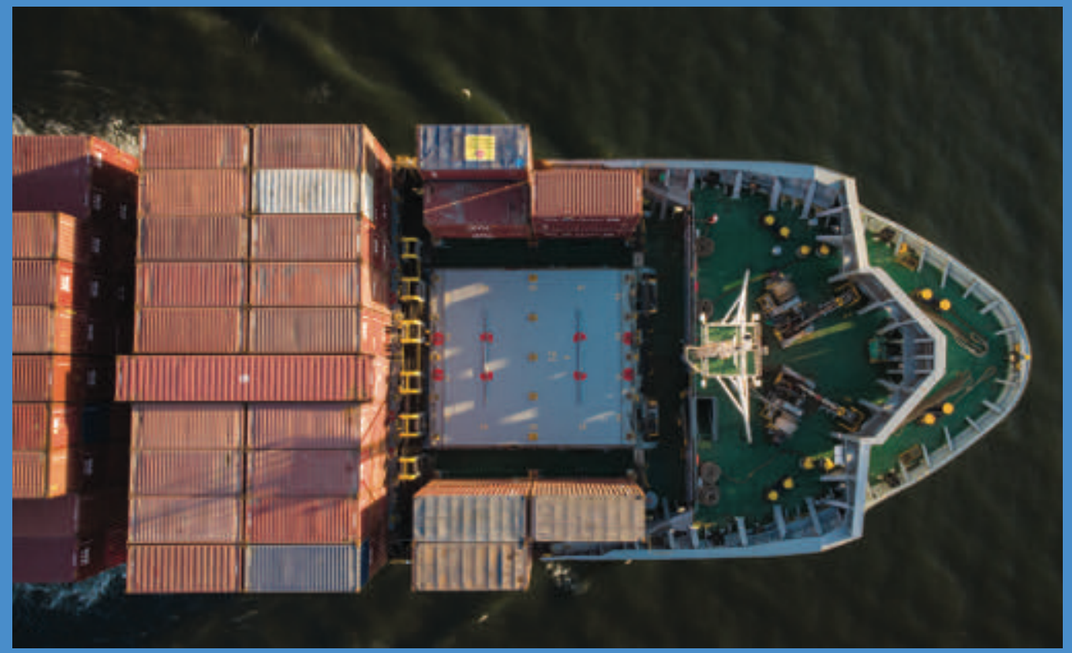
You just need to know what's wrong, how to prioritize the most important challenges based on impact, and the steps to fix the most pressing issues. AI and machine learning can help by spotlighting the most important supply chain exceptions, including those that have downstream impact.

AI can scientifically analyze historical data to generate thresholds for operational metrics, coupling that insight with inputs from users who capture domain knowledge through configurable business rules, to create robust exception parameters. This ensures your team doesn't get bogged down in minutiae, suffer from alert fatigue and fail to respond to a critical alarm.

"Exception-al" agility

Exception management often leads to logistics rerouting. Generative AI helps operators plan how to route the movement of products from pickup locations to destinations with minimum cost, while considering pickup and delivery time windows, as well as the availability and constraints of different resources. Imagine this large exception: due to political changes, you suddenly need to source product from a supplier in a more tariff-friendly location. With AI, such midstream recalculations become easier. From port strikes to weather disruptions, AI can help you nimbly adapt manufacturing schedules, shipments, orders and other functions across your supply chain.

The best exception management engines help you manage your supply chain more holistically, using AI graphs based on data associations to identify how change in one part of the supply chain affects another. How will a shortage of component *A* impact the maintenance of critical asset *B*, which in turn has implications for planned manufacturing months in the future, which could lead to a steep decline in customer orders for product *C*? Those answers are now much easier to calculate.



AI in transportation

Fleet-wide vessel scheduling, routing and port optimization is highly complex and error prone. Industrial AI enables the largest shippers in the world to unify scheduling and operations into a single view of the business while automating and optimizing the logistics planning and routing of assets.

For example, an oil and gas supermajor is currently using the Avathon Industrial AI Platform to orchestrate daily maritime shipments, saving the organization millions of dollars by streamlining loading and routing for almost 50% of its daily capacity.

The shipper has achieved single-click schedule optimization across its maritime fleet to transport crude oil with minimal shipping costs and maximum fleet utilization. The software has also enhanced employee productivity, accelerating decision making time 40x. Other benefits include improved planning and handling of changing market and operational conditions; scenario planning; increased utilization of time charter vessels; and up to 13% monthly operation cost reduction.

The industrial AI opportunity doesn't stop at the vessel. You can use it to optimize an entire shipping value chain from terminal and bunkering locations, costs, and qualities to weather and piracy risk mitigation.

AI in demand planning: It's all about the forecast

Demand is volatile. Even the best forecasts have huge blind spots. That means planning can't be a static activity.

AI-based stochasticity models allow decisions for each product to be based on the latest supply chain data instead of static policies like product demand-velocity metrics. The decision for each product is based on data specific to that product, in near real time. This helps automate manual processes and policies. Companies no longer have to agonize over how much they'll sell or how to plan sourcing activities months in advance.

Build where they buy

Regional forecasting also plays a part. When you source products close to where customers will need them, those customers save time and money. With traditional solutions, operators are weighing information that either has no consideration for regions or is flawed, showing you demand fulfillment location instead of where customer orders originate. That introduces bias into the forecasting equation.

Instead of manual interventions and rules, the new wave of AI applications help you weather uncertainty by factoring in multiple business use cases (e.g., manufacturing, maintenance, new and end-of-life products), causal analysis and revenue projections, as well as scenario planning and inventory optimization. Users can interact with these tools by using natural language. This allows them to access specific data for a supply chain deep dive without having to navigate endless screens or build a custom report.

The agility to succeed

When you use AI for demand planning, you can model the impact of a product's lifecycle to its forecast. Where traditional demand planning solutions require you to manually map and upload different versions/releases of their products, AI-powered tools can identify different versions of products and automatically associate them and adjacent products. For example, when demand for the new iPhone spikes, so will demand for phone cases that fit the new model. AI will also help you anticipate the impact of demand fluctuation due to changes in price, marketing campaigns and other events.

Most powerfully, AI will help you recover from—and *before*—disruptions occur, diagnosing issues and prescribing alternatives to balance speed and cost constraints to improve revenue and profit.

AI in compliance

Penalties and customs clearance delays for product misclassification can be severe. To succeed in a shifting regulatory environment, companies need the ability to navigate complex policies and rapidly shifting trade rules.

Avathon's Industrial AI Platform delivers that agility, reducing duty and tax processing costs while ensuring companies stay ahead of new tariffs. Optimized HTS classification compliance eliminates unnecessary rework and potential penalties. You can also realize significant labor savings by reducing manual classification.

By automating compliance checks, duty calculations and workforce forecasting, AI reduces operational bottlenecks while helping brokerages, importers and other customers avoid penalties and ensure timely deliveries.

Brokers also benefit from centralized data repositories, real-time dashboards and advanced data visualization, enabling informed decision-making and seamless integration with customs and regulatory databases.

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A holistic approach

To succeed in the new supply chain world, companies must tap into AI demand planning with exception management and visibility, adopting a three-pronged approach to optimize process and guard against logistics uncertainty.

Intelligent digital twin

Incorporating real-time operational and sensor data, including sight, sound, vibration and even smell

Agentic AI

Accelerating explainable, human-centric decision support and task automation

Health & safety

Protecting workers and critical assets through computer vision and anomaly detection

Supply chain planning & logistics

Enabling intelligent planning and sourcing for optimal production and maintenance

The Avathon Industrial AI Platform helps businesses maximize the lifetime of critical assets using AI to predict and prevent failures before they cause disruption. It uses AI to upskill and protect workers with tools that improve productivity, minimize downtime and ensure health and safety protocols. And critically, it enhances supply chain agility, reliability and resilience.

These three focus areas are interconnected. Avathon empowers companies with supply chain tools as part of its mission to extend the life of critical infrastructure while advancing the journey toward full autonomy. Avathon is on a mission to help the world address the $100 trillion of aging infrastructure currently under stress due to supply disruptions, labor shortages and changing security threats. An industrial AI pioneer for over a decade, Avathon is a trusted partner to leading organizations across many industrial sectors, including manufacturing, defense, aerospace, energy, retail and consumer packaged goods.

Infrastructure may run the world, but Avathon keeps infrastructure running.

Scalable applications to keep infrastructure running

AI-enabled supply chain orchestration

Autonomous planning

- AI demand predictions
- Increased supply reliability and efficient inventory at echelons
- Reduced exception risk, increased customer responsiveness and delivery reliability

Dynamic sourcing

- Suppliers risk and performance
- Network sourcing intelligence
- Dynamic supplier selection and performance collaboration
- AI-enabled part quality inspections

Smart factories

- Normal behavior prediction for machinery reducing downtime
- Optimized process
- Smart AR-enabled quality inspections

Intelligent logistics

- AI demand predictions
- Increased supply reliability and efficient inventory at echelons
- Reduced exception risk, increased customer responsiveness and delivery reliability

AI core services

Generative AI | **Natural language processing** | **Machine, deep & reinforcement learning** | **Knowledge representation** | **Computer vision**

Data model services

Data integration management | **Horizontal scaling** | **Container management** | **Machine learning operations**

Structured data | Unstructured data | Quality data | Transactional data | External data

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