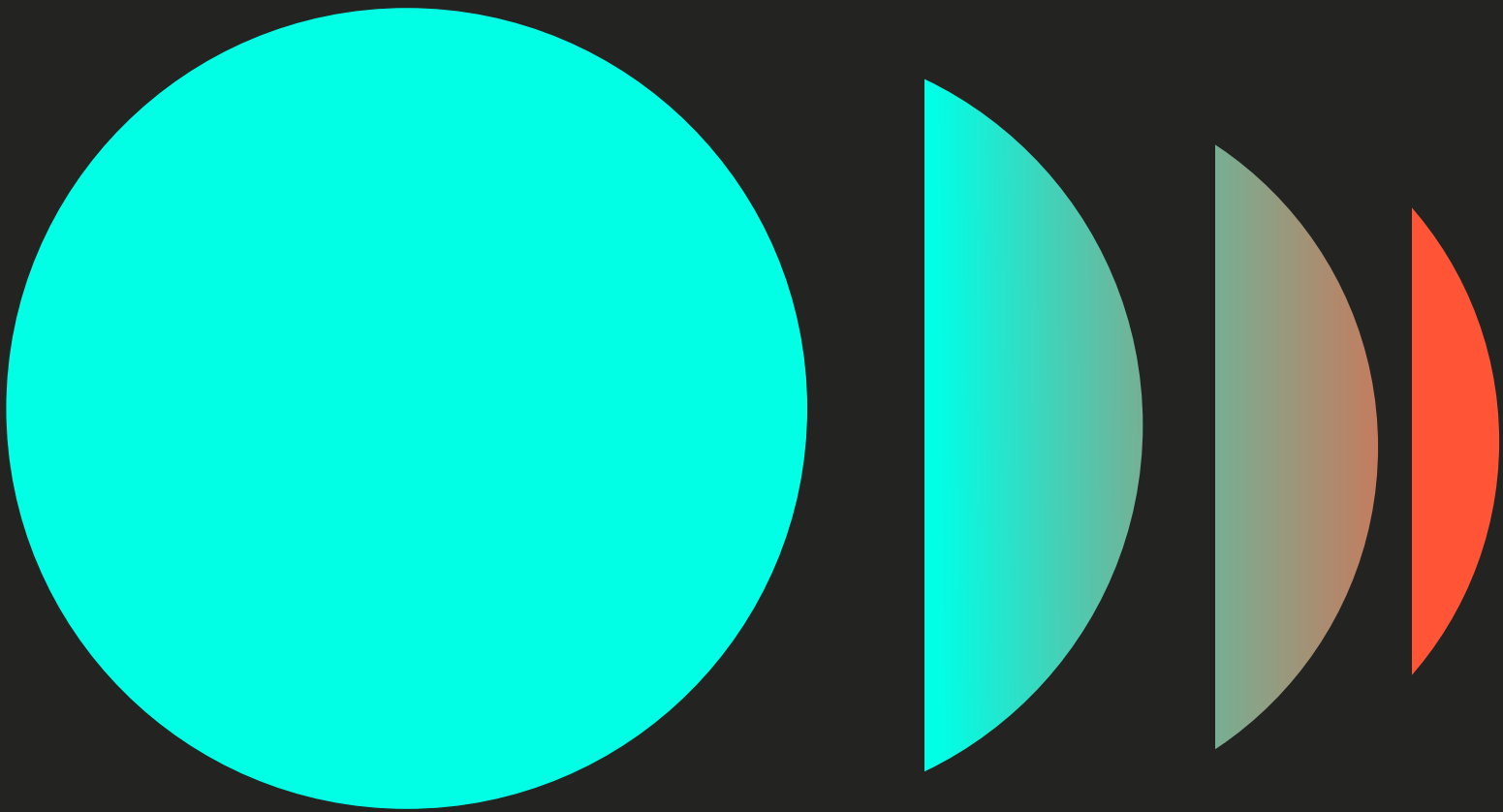


From Sensing to Orchestration

Building a supply chain that
can act on what it sees



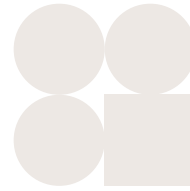
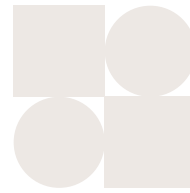


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Executive Summary



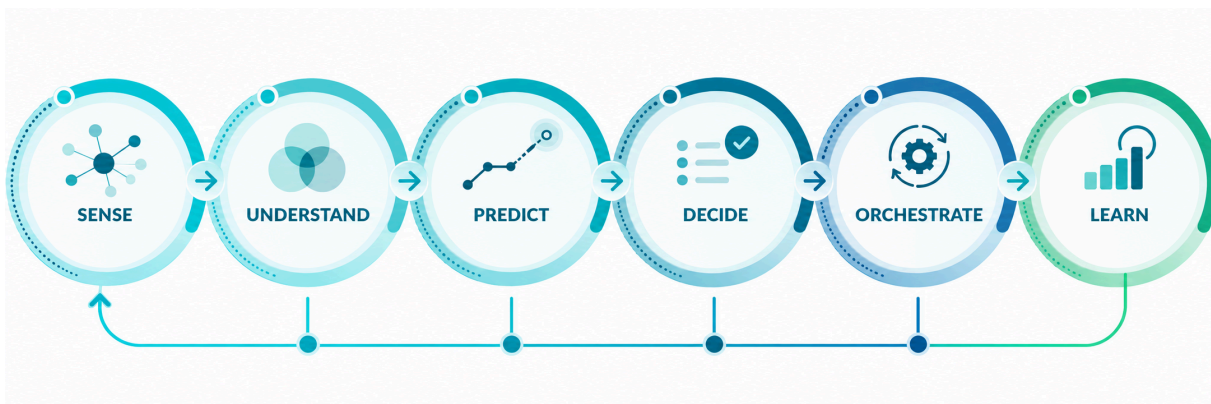
Over the last decade, supply chains have become far more visible. Companies are investing in control towers, planning platforms, predictive models, data platforms and analytics, and they can now see more of the network, forecast more variables and flag more exceptions than ever before.

Better visibility hasn't automatically led to better decisions, though. A demand forecast can show that demand is likely to shift. A supplier system can flag a late purchase order. A control tower can surface an inventory exception, and a planning system can recommend a response. But someone still has to connect those signals across systems, work out which ones matter and coordinate what happens next.

That manual work of connecting signals and coordinating a response is the gap between prediction and orchestration.

Closing that gap takes more than adding AI models or automation. It means building an environment where signals can be connected, understood in business context, turned into decisions and, more and more often, acted on by intelligent systems.

Sense → Understand → Predict → Decide → Orchestrate → Learn



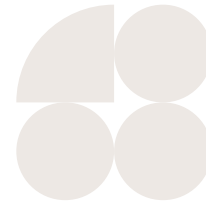
This paper uses that progression as a practical way to think about the intelligent supply chain. Sensing tells you what's happening.

Understanding explains why it matters and how it relates to the rest of the business. Prediction estimates what's likely to happen next. Deciding works out what should be done. Orchestration coordinates the response across functions and systems, and learning closes the loop by feeding outcomes back into the next decision.

The question worth asking is whether the organization can connect what it expects to happen with what its supply network can deliver, what's happening right now, and what it should do next. Another prediction on its own doesn't get you there.

Doing that well takes three things working together: trusted data, business context and intelligence. With all three in place, a supply chain can do more than report exceptions. It can understand how things are related, anticipate consequences, and help coordinate the response.

The Supply Chain Is Moving from Prediction to Orchestration



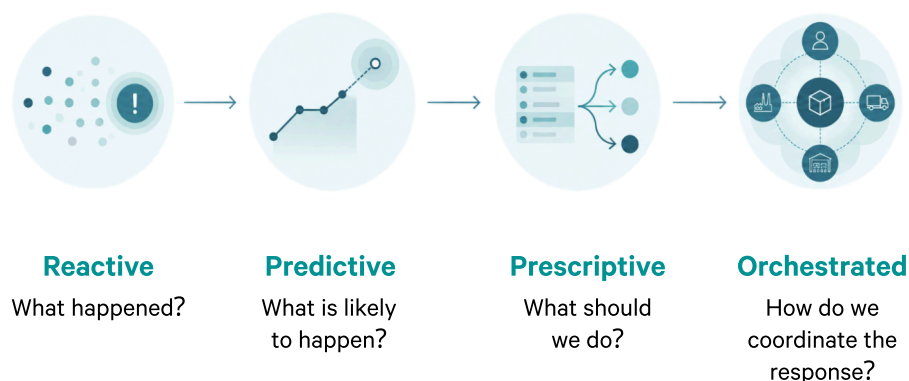
For years, the main goal of supply chain digital transformation was visibility. Companies wanted to know where their inventory was, what suppliers were doing, how orders were progressing and whether demand was shifting.

Then the goal became prediction. Forecasting models, machine learning and optimization helped teams anticipate demand, supplier risk, transportation disruptions, inventory shortages and other events before they happened.

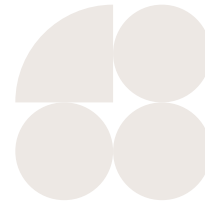
The challenge now is different. Knowing what's likely to happen only helps if the organization can turn that knowledge into coordinated action.

You can see this shift in the industry's growing interest in agentic AI, intelligent planning, autonomous operations, predictive intervention and the idea of planners becoming orchestrators. The movement is away from isolated pockets of intelligence and toward systems that take part in decisions and execution.

Making individual decisions smarter is no longer enough. The harder problem is connecting decisions across the supply chain.



The Missing Link: From Data and Insights to Decisions



Most large enterprises already have plenty of supply chain data. ERP systems hold purchase orders, inventory, supplier, material and transaction data. Planning systems hold forecasts, plans and scenarios. WMS and TMS platforms capture execution, CRM and commerce systems carry customer demand signals, and supplier portals hold updates, confirmations and documents.

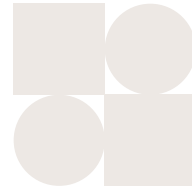
So the issue is rarely a lack of information. **It's that the information sits in different operational contexts, owned by different teams.**

A planner sees a change in demand. Procurement sees a supplier delay. A plant sees a production constraint. Finance sees the working capital impact, and the commercial team sees what's been promised to customers. Each of them may be right, but the decision depends on understanding how those observations connect.

Take what looks like a simple situation: the forecast for a product family jumps significantly. The obvious response is to increase supply, but that decision depends on a lot more than the forecast.

- Is the required material available?
- Which suppliers provide it, and are any purchase orders already delayed?
- Which plants depend on those materials?
- Is there enough inventory in the right locations?
- Which customer commitments are exposed?
- Can production capacity absorb the increase?
- Would expediting one supplier create a constraint somewhere else?
- Would extra inventory create excess exposure if the forecast drops later?

The Context Gap



The context gap is the distance between a single signal and the broader business decision it should inform.

Take a late supplier milestone. On its own, it's just a signal. What it means for the business depends on what that supplier provides, which purchase order is affected, which plant needs the material, what inventory is on hand, what production is scheduled, which customer demand depends on that production and what happens if the material shows up late.

Without those relationships, AI can produce more and more sophisticated predictions while people are still left to do the most important reasoning by hand.

Before an organization can automate decisions, it needs to trust both the data and what the data means. Intelligent supply chains have to be built on that foundation.

The Intelligent Supply Chain

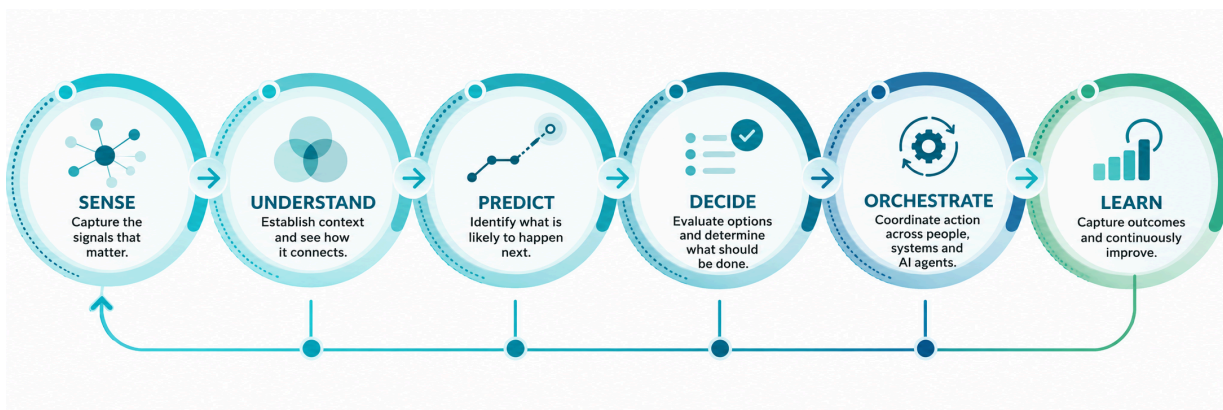


It helps to think of the intelligent supply chain as a continuous decision loop. Each stage is distinct, but the value comes from how they connect.

Sense

The first requirement is capturing the signals that matter: changes in customer demand, forecast movements, inventory positions, supplier milestones, purchase order changes, production constraints, transportation and quality events, customer commitments and external market signals.

Sensing gives you a reliable picture of what's happening across the network. The next step is to identify which signals need attention and understand their implications. A supply chain can generate thousands of alerts and still struggle to tell which one deserves attention.



Understand

Next comes context. A signal only becomes meaningful once you understand how it relates to everything else.

A supplier delay matters because of the purchase orders it affects. Those purchase orders matter because of the materials on them, the materials matter because of the plants and products that depend on them, and the products matter because of the customers and demand they serve.

Business context turns a set of disconnected events into a connected business situation. An enterprise ontology, or business model, can represent the relationships between business entities, properties, rules and metrics, along with the governed data behind them. The goal is to give data business meaning, rather than to build yet another data model.

Predict

Once signals are connected and understood, prediction becomes much more useful. The question shifts from 'What's happening?' to 'What's likely to happen next?'

Demand forecasting is one example and supplier risk prediction is another. Inventory risk, transportation risk, production constraints and customer service exposure can all be handled the same way. Modern has applied predictive intelligence to demand forecasting, inventory optimization and supplier risk and delay intelligence, where predictions become inputs to downstream planning and procurement decisions.

Predictions shouldn't sit on their own. A forecast should be able to shape supply decisions. A supplier risk prediction should shape procurement and production decisions, and an inventory risk prediction should shape replenishment and allocation.

Decide

Prediction tells you what might happen. Decision intelligence is about what should happen, and that's where business objectives, constraints, policies and tradeoffs come in.

A single supply risk might have several possible responses: expedite the supplier, reallocate inventory, change the production sequence, prioritize certain customers, adjust the plan or accept the risk. Which one is right depends on the context.

Orchestrate

Orchestration means coordinating action across the supply chain. It links decisions across planning, procurement, suppliers, manufacturing, logistics and commercial teams.

That doesn't mean taking people out of the process. In many cases the planner, buyer or supply chain leader becomes more important, because they're now managing a larger set of interconnected decisions.

AI can recognize the situation, pull together the relevant context, weigh the options and recommend or start an action. People bring judgment where it counts.

Learn

Every action has an outcome. Did the supplier recover? Did the expedited shipment arrive? Did the demand materialize? Did inventory improve? Did the customer get the order? Did the intervention cause problems somewhere else?

Those outcomes should feed the next cycle. Over time, an intelligent supply chain should get better informed by its own decisions and results, rather than simply more automated.

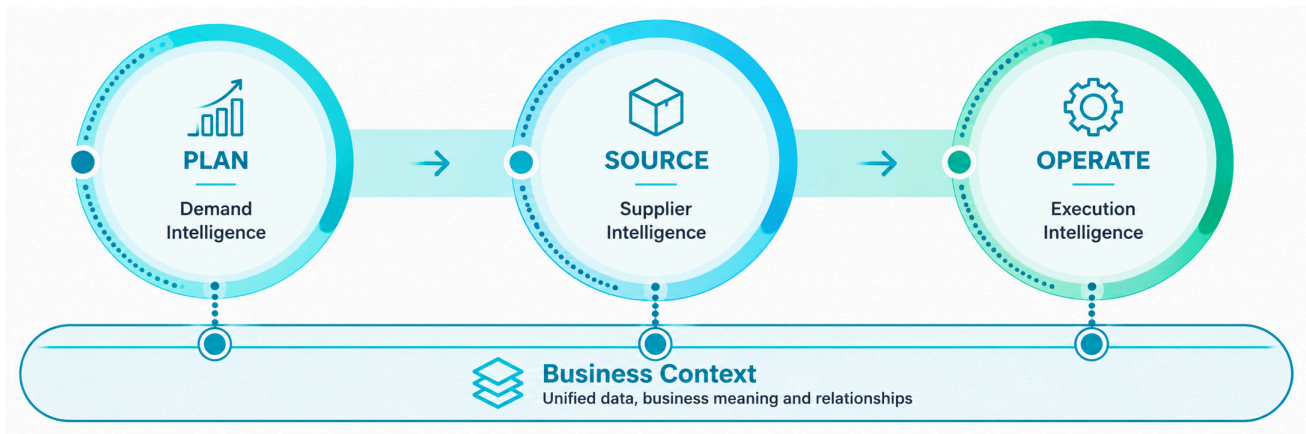
Connecting Plan, Source and Operate



The model gets more useful when you apply it to how a supply chain runs day to day. Three questions sit at the center of supply chain execution, with a fourth that ties them together:

- **Plan:** What is likely to happen?
- **Source:** Can our supply network deliver on it?
- **Operate:** Is the plan unfolding the way we expected?
- **Business context:** How do demand, supply and execution affect each other?

Each one is a different lens on the same supply chain. The sections that follow look at each in turn, starting with demand.



PLAN: Understanding What Is Likely to Happen

Planning starts with demand, and demand is rarely a single number. It's shaped by customers, products, channels, promotions, seasonality, market conditions and operational constraints.

That means demand forecasting has to become more responsive and more closely tied to the decisions that follow. The growing use of agentic approaches in forecasting points in this direction, with AI systems increasingly expected to run the forecasting process rather than just produce a number.

The bigger opportunity is making demand intelligence part of an ongoing decision process. A promotion can change demand. A change in demand can change inventory requirements, which can affect procurement. Procurement needs can expose supplier constraints, supplier constraints can affect production, and production constraints can affect customer service.

So the forecast is where a chain of decisions starts, not where it ends. In Modern's planning and forecasting work, sales, stock, demand signals, inventory positions, promotions and supply capacity are brought together to support baseline and demand forecasting, multi-tier forecasting and inventory optimization across channels and geographies. That work reinforces the same point: a forecast is worth more when it's connected to the decisions that follow.

A mature demand intelligence capability should help answer:

- What is changing?
- Where is it changing?
- Why is it changing?
- What confidence do we have in the signal?
- What downstream supply implications does it create?
- Which decisions need to change as a result?

The goal is to make forecasts more useful for decision making, while continuing to improve their accuracy.

SOURCE: Understanding Whether the Supply Network Can Execute

A plan is only as good as the network's ability to deliver on it, which makes supplier management part of the supply chain decision loop rather than a separate procurement reporting exercise.

Supplier data typically includes order confirmations, milestones, delays, quality information, communications, documents and historical performance. The hard part is connecting those signals to the business consequences they create.

Modern's SupplierIQ is built for this problem. It connects supplier data to the plans, orders and operations it affects, so teams can see which supplier issues matter and act on them early. It brings together the relationships across the supplier execution chain:

Supplier → PO → PO Line → Item → Plant → Buyer
→ Milestones → Supplier Updates → Attachments

The value comes from seeing it all connected. A delayed milestone can be read in the context of its purchase order, the purchase order in relation to the item, the item traced to the plant and the plant connected to the wider operating plan.

That context is what lets teams move from supplier reporting to supplier intelligence.

Instead of asking “Which suppliers are late?,” the organization can ask “Which supplier risks are likely to affect the supply plan, where will the impact show up and what should we do about it now?”

AI can summarize what's happening with suppliers, flag emerging risks, explain relationships and recommend actions. **Rather than adding another supplier dashboard, this gives procurement and supply chain teams a decision layer that shows where supplier events matter to the business.** SupplierIQ extends this into the broader procurement decision loop with collaboration, real-time order and line-item tracking, predictive delay intelligence, supplier risk assessment and an AI-assisted buying interface. The aim is to give buyers the context to act on supplier risk before it turns into a wider supply chain problem.

OPERATE: Knowing What Is Happening and Where Intervention Matters

Planning and sourcing set expectations, and execution shows whether they hold up.

A control tower gives you the operational view to see whether the plan is unfolding as expected. But the next generation of control towers has to do more than display exceptions.

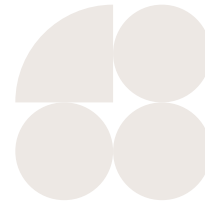
A dashboard can tell a planner that inventory is below target. Intelligence should help explain why. Is demand higher than expected? Was a supplier late? Did a production constraint come up? Did another priority consume the inventory? Is this an isolated issue or part of a broader pattern? What happens if nobody acts, and what are the options?

This is where control tower capabilities plug into the broader intelligence architecture. The control tower becomes the place where signals come together and decisions get prioritized.

**Visibility → Exception Management → Decision Intelligence
→ Orchestration**

Instead of being just a window into the supply chain, the control tower becomes part of how the supply chain responds. Modern's supply chain work also covers logistics visibility, shipment tracking, warehouse intelligence and control tower capabilities. In an orchestrated model, these act as the operational feedback loop that shows whether the plan is on track and where someone needs to step in.

Business Context: Linking Demand, Supply and Execution



If demand, supplier and execution intelligence are different lenses on the supply chain, business context is what connects them.

Take a set of core entities: Customer, Product, Order, Supplier, Inventory, Plant, Manufacturing, Quality, Warranty, Service and Finance. In most enterprises, these live in different systems and belong to different teams. The business itself doesn't experience them separately, though.

A customer order depends on product availability, which depends on inventory and production. Production depends on materials, and materials depend on suppliers. Quality issues can affect available inventory, service events can influence demand, and all of it eventually shows up in financial results.

An enterprise ontology makes those relationships explicit. Modern and DataOS approach this through business context and ontology that connect entities, relationships, metrics, rules and governed data. In supply chain, that creates a connected view across Customer, Product, Order, Supplier, Inventory, Plant, Quality, Service and Finance, so cross-domain questions can be answered from a common context:

- Which suppliers are connected to products with increasing demand?
- Which delayed purchase orders could affect production?
- Which inventory shortages threaten high-value customer commitments?
- Where is a quality issue likely to create downstream financial exposure?
- Which operational events are linked to a decline in customer service?

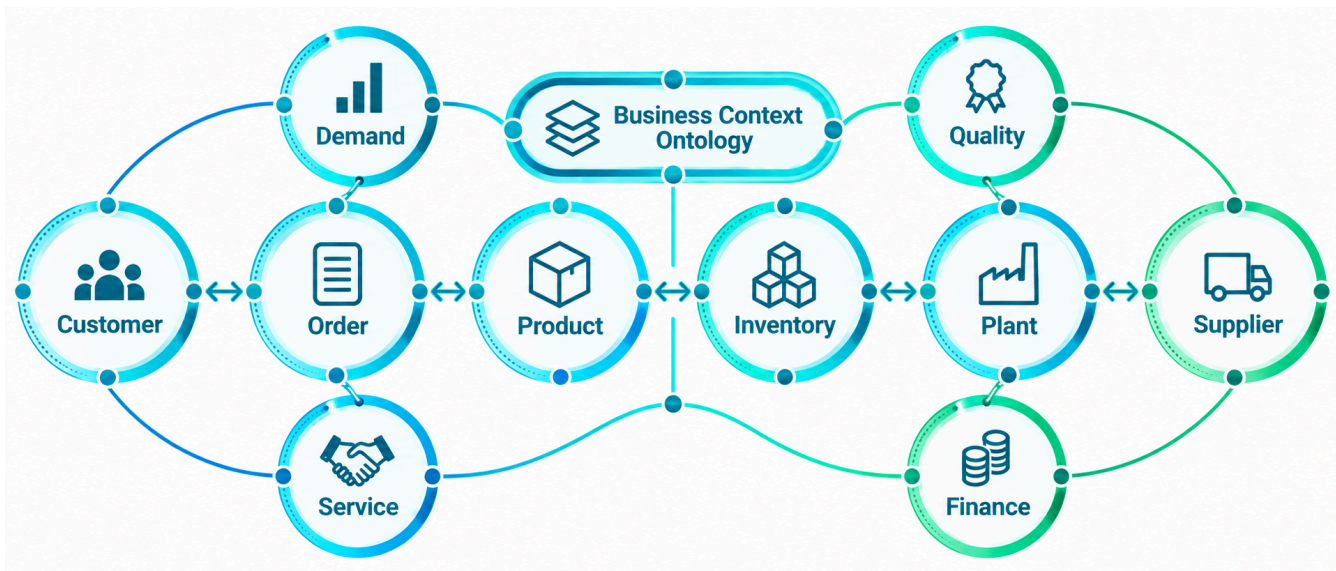
What matters is being able to answer questions that cross organizational and system boundaries, which is hard to do when each system only knows its own piece.

Traditional data architectures tend to organize information around systems. Intelligent supply chains need it organized around business concepts and the relationships between them.

How the Pieces Connect

Here's what that looks like in practice. Each entity below usually sits in its own system, owned by its own team. The business context layer links them, so a change in one place can be traced to everything it touches.

Follow a single change through the map. A spike in demand pulls on orders and product availability, which pulls on inventory. Inventory depends on plant output, and plant output depends on suppliers. Quality issues and service events feed back in along the way, and the cost of all of it lands in finance.



With these relationships in place, the questions on the previous page can be answered directly instead of being pieced together across systems.

From Prediction to Action: What an Orchestrated Supply Chain Looks Like



Here's a simplified scenario. Demand for a product family starts rising faster than expected.

STEP 1: Sense

The demand intelligence layer picks up a meaningful change in demand. Instead of treating it as an isolated forecast movement, it connects the signal to the relevant products, channels, customers and promotions.

STEP 2: Understand

The system maps the supply dependencies behind those products. Several critical components come from a small group of suppliers, and business context shows which plants rely on those components and which customer commitments could be affected.

STEP 3: Predict

The supplier intelligence layer sees that one of those suppliers is already showing elevated execution risk. A milestone has slipped, and recent updates point to a possible delay. So the risk is bigger than one late supplier: demand is rising, supply depends on a few sources and one of those sources is starting to struggle.

STEP 4: Decide

The system evaluates the likely consequences. Options might include expediting the supplier, reallocating available inventory, changing production priorities, adjusting customer allocation, switching to an alternate source or accepting the risk because the financial impact is small. The right call depends on business priorities and constraints.

Step 5: Orchestrate

The chosen action is coordinated across the relevant teams and systems. The buyer gets the supplier intervention. The planner gets the planning implications. The plant gets the revised priority. The control tower tracks the resulting exception, and leadership gets a short explanation of the risk and the response.

Step 6: Learn

The system tracks what happens next. Did the supplier recover? Did the production plan hold? Did the customer impact materialize? Did the intervention work? That outcome feeds into future decisions.

Orchestration comes from a connected decision process rather than a single AI model. Modern and DataOS bring these pieces together in practice: planning and forecasting intelligence can surface the change, business context can expose the dependencies, SupplierIQ can surface supplier risk and execution intelligence can track the response.

What Changes for the Planner?



As systems get more intelligent, a natural question comes up: what happens to the people who run the supply chain today? The more useful question is how their work changes.

Planners traditionally spend a lot of time gathering information, reconciling systems, investigating exceptions and coordinating responses. As systems get smarter, some of that work can be automated.

That frees planners to spend more time on:

- Understanding tradeoffs
- Managing business priorities
- Challenging recommendations
- Handling unusual situations
- Coordinating cross-functional decisions
- Managing risk
- Designing scenarios
- Improving the decision process itself

This is the shift from planner to orchestrator. **The role changes from managing every step to managing a system of decisions.**

The more authority an AI system has to act, the more important it is to know what data it's using, what that data means, which relationships matter, which policies apply, how much confidence is required and when the system should check with a person.

So agentic AI makes the underlying decision architecture more important, not less.

Building the Foundation for Orchestration



It's tempting to start with the final stage, but deploying autonomous agents before you have trusted data, business context and clear decision processes just automates uncertainty. **Modern's DataOS approach builds governed data products and business context first, then layers intelligence and agents on top.** A practical maturity path looks like this:

Maturity Stage	What It Enables
1. Connect	Bring together the data needed to understand the relevant supply chain processes.
2. Govern	Establish consistent definitions, quality controls, ownership, and access.
3. Understand	Create business context across entities, relationships, metrics, and processes.
4. Predict	Apply forecasting, risk models and other intelligence to identify what's likely to happen.
5. Decide	Connect predictions to business rules, constraints, priorities, and potential actions.
6. Orchestrate	Coordinate decisions and actions across functions, applications, and agents.
7. Learn	Capture outcomes and continuously improve the decision process.

You don't have to finish one stage before starting the next. What matters is that each layer is solid enough to support the one above it.

Measuring Intelligence by Business Outcomes

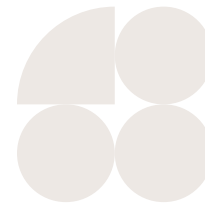


An intelligent supply chain should be evaluated by the quality of its decisions, how quickly those decisions are made, and how effectively they translate into business outcomes.

Outcome Area	Illustrative Measures
Demand	Forecast performance; Forecast Value Add; responsiveness to demand changes; inventory exposure
Supply	Supplier performance; risk identification; recovery time; material availability
Operations	Exception resolution time; production stability; service levels; inventory availability
Financial	Working capital; cost of intervention; revenue protected; cash flow impact
People	Planner productivity; time spent investigating exceptions; decision cycle time; cross-functional coordination

Autonomy is valuable only when it improves an outcome that matters. The goal is better supply chain performance, and autonomous AI is one way to get there.

The Architecture of an Intelligent Supply Chain



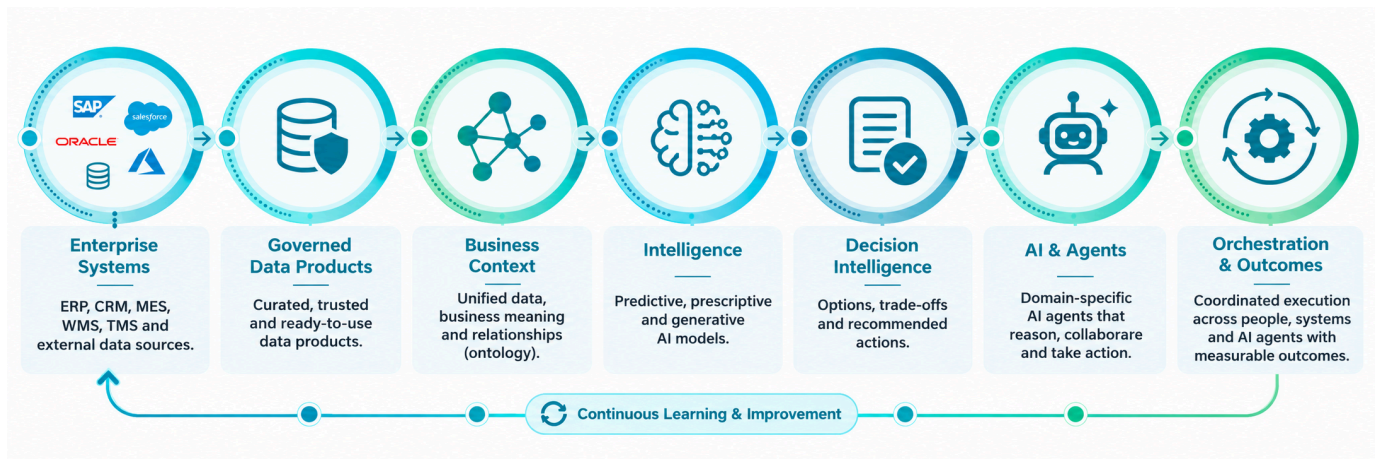
Supporting this model doesn't require replacing the enterprise systems you already have. ERP, planning, WMS, TMS, CRM, supplier systems and other operational platforms can keep doing what they do.

The opportunity is to connect them through a common layer of trusted data, business context and intelligence. That's the DataOS approach: existing enterprise systems stay in place while governed data products, business context and intelligence connect them.

	Role
Enterprise Systems	ERP Planning WMS TMS CRM Supplier Systems External Data
Governed Data Products	Trusted, reusable representations of business and operational data
Business Context	Ontology Semantic Model Relationships Metrics Rules Quality Lineage
Supply Chain Intelligence	Demand Supplier Inventory Execution Risk
Decision Intelligence	Scenarios Recommendations Prioritization Policies Tradeoffs
AI & Agents	Assist Recommend Coordinate Act
Orchestration & Outcomes	Planning Procurement Manufacturing Logistics Customer Response Learning

This lets organizations evolve step by step. Existing systems stay authoritative for their own domains while an intelligence layer connects information, context and decisions across the enterprise.

Rather than another monolithic supply chain platform, the result is an intelligence and orchestration layer that works across what's already there.



The Real Opportunity: Connecting the Supply Chain's Decisions



Supply chains have traditionally been organized around functions: demand planning, procurement, supplier management, inventory, manufacturing, logistics and customer service. Each function built its own systems, processes and metrics.

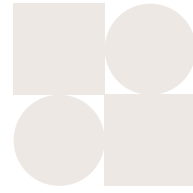
Digital transformation made those functions more visible, and AI can now make each one smarter. The next big step forward will come from connecting them.

- A demand signal should be able to influence supply decisions.
- A supplier at risk should be able to influence planning.
- An inventory constraint should be able to influence customer allocation.
- A production issue should be able to influence customer commitments.
- A customer priority should be able to influence procurement and logistics.
- A financial constraint should be able to influence the entire decision chain.

That's the difference between intelligent applications and an intelligent supply chain. Intelligent applications make individual processes smarter.

An intelligent supply chain connects decisions across the network.

Conclusion



The next generation of supply chain transformation won't be defined only by better forecasts, more accurate predictions or more sophisticated dashboards. Those still matter, but they're pieces of a bigger opportunity.

That opportunity is a supply chain that can continuously sense what's changing, understand why it matters, predict what's likely to happen, decide what to do, coordinate the response and learn from the outcome.

Getting there takes a different foundation. Data has to be trusted and business concepts connected. Predictions need to link to decisions, and decisions need to link to execution. Autonomous action has to operate within clear business context and boundaries.

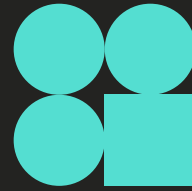
Sense → Understand → Predict → Decide → Orchestrate → Learn

The goal is to give people the support they need to understand more of the network, anticipate more of what matters and coordinate more of the response.

As AI agents get better at sensing, deciding and acting, the organizations that benefit most will be the ones that have already built the context, trust and operating model to put them to work.

In the end, the intelligent supply chain is less about making machines autonomous and more about making the whole supply chain able to act intelligently.

Contact Us



About The Modern Data Company

The Modern Data Company works with enterprises to build a governed, contextual, AI-ready foundation for data-driven decisions.

Its DataOS platform connects enterprise data, business context and intelligence across complex operating environments, so organizations can build reusable data products, establish semantic context and support analytics, AI and intelligent applications.

In supply chain, that foundation connects demand, suppliers, inventory, planning and execution into a more coherent decision layer. Modern has built and applied capabilities across planning and forecasting, SupplierIQ, execution and control tower intelligence, and supply chain ontology and business context.

With DataOS, enterprises get measurable value from their existing data stack, delivering up to **80% faster delivery cycles, 1.5X productivity gains for data engineering, and 50% lower data operational costs**. With a focused use case, organizations can validate this value and move from data foundation to measurable business outcomes in **as little as 6–8 weeks**.

To schedule a demo or learn more about DataOS: info@tmdc.io

www.themoderndatacompany.com

Reference

- World Economic Forum. "Global Value Chains Outlook 2026: Orchestrating Corporate and National Agility," 2026.
- World Economic Forum. "Intelligent Industrial Operations Outlook 2026." 2026.
- McKinsey & Company. "The winning recipe for transforming advanced planning systems." 2023.
- MIT Center for Transportation & Logistics. "Agentic intelligence for procurement decision support." Deep Knowledge Lab for Supply Chain and Logistics, 2026.
- National Institute of Standards and Technology. "Artificial Intelligence Risk Management Framework (AI RMF 1.0)." 2023.

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Rajesh is a supply chain and decisioning technology leader with more than 20 years of experience at the intersection of business, data and software. He has built decisioning solutions across trading, supply chain, pricing and promotions, digital commerce and customer domains, working with major CPG and retail brands around the world through McKinsey, Thoughtworks and Mindtree.

At The Modern Data Company, Rajesh helps enterprises apply data, business context and AI to complex supply chain decisions across planning, procurement, supplier intelligence and execution. His work brings together demand and forecasting intelligence, SupplierIQ, execution and control tower intelligence, and business context and ontology to connect supply chain signals to decisions and coordinated action.

His perspective is shaped by how supply chains have evolved from fragmented visibility and prediction toward connected decision making and orchestration. He's especially interested in how connected data, business context and AI can change the work of supply chain teams, shifting their time from assembling information and chasing exceptions to managing tradeoffs, decisions and outcomes.

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