



The 8 Keys to Achieving Success with Artificial Intelligence in Supply Chain

Artificial Intelligence can offer a huge benefit to supply chain managers, but only if it is based on solid fundamentals that take into account the diverse and dynamic nature of today's modern supply chains.

Achieving Success with Artificial Intelligence in Supply Chain

How supply chain managers can ensure optimal success when implementing AI in supply chain

Artificial Intelligence (AI) can offer a huge benefit to supply chain managers, but only if it is based on solid fundamentals that take into account the diverse and dynamic nature of today's modern supply chains. More importantly, the efficacy of AI is heavily dependent on the availability of the timely and accurate data that is needed to make smart decisions. This paper looks at the fundamentals that supply chains need in place in order to achieve real results from AI implementations.

WHAT IS ARTIFICIAL INTELLIGENCE?

In the simplest terms, AI is intelligence exhibited by machines particularly in the context of reasoning, making decisions and taking actions. Jonathan Kaftzan puts it well:

Artificial Intelligence AI can be about simulating human intelligence, incorporating traits such as reasoning, perception, problem solving and forward planning. At its crux, though, AI is about the development and enactment of methods of transforming vast amounts of complex, often unstructured data into intelligent insights. The key elements of artificial intelligence – machine learning, cognitive computing, natural language processing, and sentiment analysis, combined with more effective real-time data management – make this possible.¹

In essence, AI is machines making smart decisions whether that is deciding which chess piece to move where, or how to adjust an order forecast based on changing demand.

1. Jonathan Kaftzan, [Artificial Intelligence Transforming the Enterprise](#) in Information Age.

It's important to understand the importance that data plays in AI. Data is foundational. It is only from good data that AI can deliver useful insights, and from there make effective decisions. By continuously monitoring data, insights, decisions, and outcomes, the system learns and improves. But it all begins with data.

Despite its benefits, when looked at through the lens of a supply chain executive, AI is relatively useless unless it's able to add value to support better decision-making in the supply chain.

AI IN SUPPLY CHAIN TODAY

Due to the interest around AI, many companies are eager to apply the "AI" label to their products and solutions. Some demand planning vendors claim that the automated selection of the lowest forecast error algorithm to use in generating a forecast ("Best Fit") is AI. Several vendors claim that running analytics on historical data and understanding root cause is a form of AI.

Then there is the claim that the new, freshly funded start ups in the market are going to revolutionize supply chain based on real-time access to streaming internet data, and a new AI engine that will seamlessly run the supply chain.

But where are the real-world, practical results that a supply chain executive can take to the bank?

There are precious few. While the market is awash with talk about sophisticated algorithms, such as "deep neural

The problem is that most of today's systems are missing key pieces of the puzzle that AI needs in order to deliver value.

networks," "random forest," there is little to no serious discussion of any breakthrough results achieved in practice.

Perhaps the only area where new algorithms have shown some promise has been in special cases of demand forecasting. This is hardly encouraging.

WHY AI HAS HAD LIMITED SUCCESS IN SCM

In the race to use AI, many companies have made attempts to implement it, but the results have been disappointing. This is due to the context in which the AI is being applied. Typical SCM systems today:

- Are enterprise-focused
- Require armies of expensive planners
- Run complex engines at each step in the process and at each node in the supply network
- Are usually in conflict with other functions and/or partners
- Miss huge opportunities hidden in the network because they are locally sub-optimized
- Work on stale data and thus recommend bad decisions
- Use dumbed-down, over-simplified problem models that do not relate to the real world

These limitations have severely suppressed return on AI investments.

How are companies performing today? For example, typical Retail/CPG supply chains still carry 60-75 days of inventory. The average service level in the store is about 96 percent, with promoted item service levels much lower at the 80 percent range. The Casual Dining segment carries around 12 – 15 days of inventory with relatively high waste and high cost-of-goods-sold.

So, unless AI can make a significant impact on these metrics, it's simply not delivering.

The problem is that most of today's systems are missing key pieces of the puzzle that AI needs in order to deliver value.

THE KEY REQUIREMENTS FOR AI IN SUPPLY CHAIN MANAGEMENT

Having worked with hundreds of supply chain executives, on dozens of software implementations, I've studied the AI issue a lot. What I have found is there are eight criteria that are required for a successful AI implementation. Miss one of these and you'll be lucky to achieve mediocre outcomes, but when you meet them all, you can indeed achieve world class results. For the AI solution to offer optimal value in supply chain, it is important to ensure the following:

1. Access to Real-Time Data

To improve on traditional enterprise systems with older batch planning systems, new AI systems must eliminate the stale data problem. Most supply chains today attempt to execute plans using data that is days old, but this results in

Unless the AI tool can see the forward-most demand and downstream supply, and all relevant constraints and capacities in the supply chain, the results will be no better than that of a traditional planning system.

poor decision-making that sub-optimizes the supply chain, or requires manual user intervention to address. Without real-time information, an AI tool is just making bad decisions faster.

2. Access to Community (Multi-Party) Data

The ability to access data outside of the enterprise or, more importantly, receive permission to see the data that is relevant to your trading community, must be made available to any type of AI, Deep Learning or Machine Learning algorithms.

Unless the AI tool can see the forward-most demand and downstream supply, and all relevant constraints and capacities in the supply chain, the results will be no better than that of a traditional planning system. Unfortunately, this lack of visibility and access to real-time, community data is the norm in over 99 percent of all supply chains. Needless to say, this must change for an AI tool to be successful.

3. Support for Network-Wide Objective Functions

The objective function, or primary goal, of the AI engine must be consumer service level at lowest possible cost. This is because the end-consumer is the only consumer of true finished goods products. If we ignore this fact, trading partners will not get the full value that comes from optimizing service levels and cost to serve, which is obviously important as increased consumer sell-through drives value for everyone. A further enrichment of the decision algorithm should

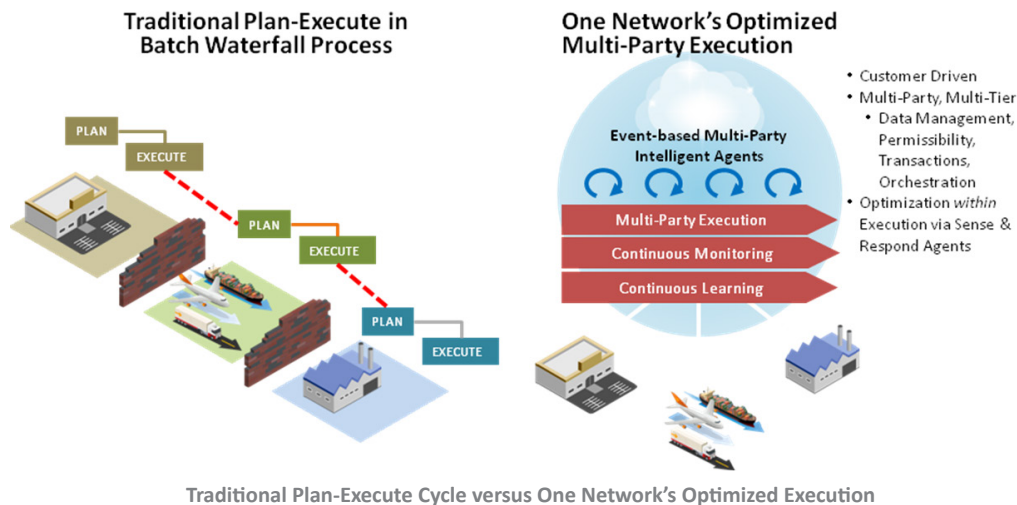
support enterprise level cross-customer allocation to address product scarcity issues and individual enterprise business policies. Thus, AI solutions must support global consumer-driven objectives even when faced with constraints within the supply chain.

4. Decision Process Must Be Incremental and Consider the Cost of Change

Re-planning and changing execution plans across a networked community in real time can create nervousness in the community. Constant change without weighing the cost of the change creates more costs than savings and reduces the ability to effectively execute. An AI tool must consider trade-offs in terms of cost of change against incremental benefits when making decisions.

5. Decision Process Must Be Continuous, Self-Learning and Self-Monitoring

Data in a multi-party, real-time network is always changing. Variability and latency is a recurring problem, and execution efficiency varies constantly. The AI system must be looking at the problem continuously, not just periodically, and should learn as it goes on how to best set its own policies to fine tune its abilities. Part of the learning process is to measure the effectiveness “analytics,” then apply what it has learned.



6. AI Engines Must Be Autonomous Decision-Making Engines

Significant value can only be achieved if the algorithm can not only make intelligent decisions but can also execute them. Furthermore, they need to execute not just within the enterprise but where appropriate, across trading partners. This requires your AI system and the underlying execution system to support multi-party execution workflows.

7. AI Engines Must Be Highly Scalable

For the supply chain to be optimized across an entire networked community of consumers to suppliers, the system must be able to process huge volumes of data very quickly. Large community supply chains can have millions if not hundreds of millions of stocking locations. AI solutions must be able to make smart decisions, fast, and on a massive scale.

8. Must Have a Way for Users to Engage with the System

AI should not operate in a “black box.” The UI must give users visibility to decision criteria, propagation impact, and enable them to understand issues that the AI system cannot solve. The users, regardless of type, must be able to monitor and provide additional input to override AI decisions when necessary. However, the AI system must drive the system itself and only engage the user on an exception basis, or allow the user to add new information the AI may not know at the request of the user.

There is a significant opportunity here. But a different approach is needed in order to meet all these requirements.

A NEW MODEL FOR A NEW WORLD

One Network has pioneered, real-time, multi-party networks that connect all trading partners on a single platform in real time.

Instead of sequential batch processing between trading partners, these real-time network connect all parties to a single platform, sharing a single version of the truth (SVOT). This means all (properly permissioned) parties can see what's relevant to them, instantly and in near real time. This removes virtually all latency from the system.

Furthermore, the platform closes the chasm between traditional planning and execution, making it possible for companies to optimize while they execute, and do it across all parties and all tiers in the supply chain.

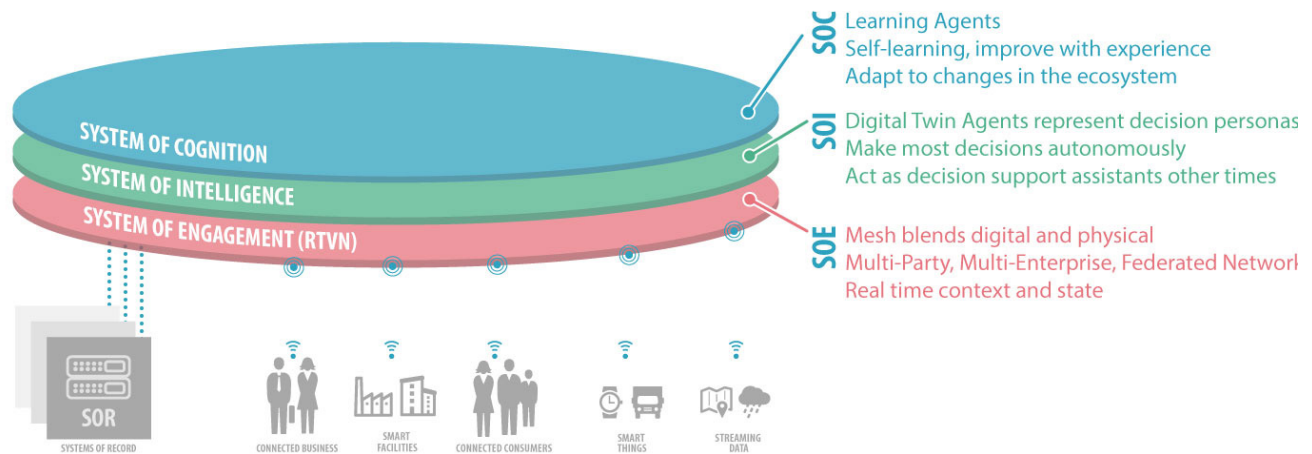
THE FUNCTIONAL ARCHITECTURE OF THE ONE PLATFORM

AI in SCM: The functional architecture flows from Engagement up to Intelligence and Cognition

Let's take a closer look at the architecture underlying the ONE Platform. There are three layers that enable the intelligent network:

1. The System of Engagement

This is the fundamental layer that connects systems and people to the network. You can think of this as the nervous system connecting all the parts of a biological organism, into a single ecosystem. The System of Engagement:



- Mesh blends digital (e.g. data flows, and legacy systems) and physical (people, factories, vehicles)
- Spans across companies, people and things
- Tracks and manages the real-time context and state

2. The System of Intelligence

This layer performs the basic functions on the network, similarly to how the reptilian brain regulates the automatic functions of an organism, like breathing, the heart rate, and balance. The System of Intelligence:

- Employs Digital Twin Agents / Assistants representing decision rules and smart algorithms
- Makes most decisions autonomously
- Acts as decision-support assistants other times

3. The System of Cognition

The System of Cognition is the higher order functions, equivalent to the neo-cortex of the brain where sophisticated functions such as learning occurs. The System of Cognition:

- Uses Learning Agents
- Is Self-learning; improves with experience
- Adapts to changes in the ecosystem

What about the actual decision-making? This is carried out by Agents.

Intelligent Agents

Agents are One Network's decision-making technology. They not only plan, they make decisions and execute.

Whereas batch processing engines run periodically, and then replan the "world" every time they run; Agents are always active, continually monitoring the supply chain in real time, and make decisions incrementally as conditions change.

Because Agents are continually harvesting information, they have all the real-time data on demand, supply and logistics events from the transactional execution processes running on the Platform. They are able to decide on how those execution processes should proceed, given the current state of events and constraints.

Furthermore, Agents do not "reboil the ocean". Re-planning or re-optimizing the "world" on every event is neither feasible nor desirable. Instead, Agents partition "the world" into subnets that make sense for that particular agent. Each agent can partition the world differently.

Agents analyze within in the context of subnets, they take into account the cost of change, and then intelligently decide when it makes sense to initiate a change. They can also rollback changes when it makes sense to do so.

Thus Agents are able to continually optimize execution, in near real time. We call this **optimized execution**.

Scalability is a critical factor, as today's complex supply chains consist of millions of item/locations and thus use and process vast amounts of data.

This ability of Agents to continually monitor the supply chain and respond with the most effective resolution to optimize execution, enables a new level of precision and automation in supply chain operations.

It enables a critical differentiator for today's companies: agility. Because Agents operate in real time, both monitoring and responding, they are extremely agile. The supply chain is continually optimized and can run with near theoretical minimum inventory yet still maintain high service levels.

TRANSACTIONAL GRID

The Transactional Grid is a Platform component that manages and coordinates the Agents as they run. At any given point in time there could be millions of agents 'in flight'.

The Transactional Grid can:

- Schedule agents and enforce relationships between agents (eg. Agent 1 can only run after Agent 2 is done)
- Rollback and retry agent reactions
- Scale horizontally and economically

Scalability is a critical factor, as today's complex supply chains consist of millions of item/locations and thus use and process vast amounts of data. With the Transactional Grid, as nodes and transactions increase, it is simply a matter of adding more servers to support the growth.

This is in stark contrast to traditional planning engines which use vertical scaling, i.e. require increased processing power, and thus are extremely costly to scale.

AI RESULTS ON INTELLIGENT NETWORKS

What are the results of applying the eight criteria on an intelligent network?

Let's take a look at a particularly challenging example, the Casual Dining industry, where one of the major problems is anticipating and meeting demand in the restaurants. This is particularly challenging.

This is especially important during Limited Time Offers (LTOs). Using the eight criteria outlined above, a global, casual dining company connected to a real-time, multi-party network, and was able to rapidly achieve their objective function - excellent customer service at the lowest cost.

The company constantly monitors Point-of-Sale (POS) data, and is using AI agents to recognize and predict consumption patterns of consumers. In addition, intelligent AI agents create the demand forecast and then compare it to the actual demand in real-time. When there is significant deviation, the agents make the decision to adjust the forecast, and additional agents adjust replenishments. They then propagate those adjustments across the supply chain to trading partners in real time at all times considering the cost of change and the propagation impact.



This drove a remarkable improvement in forecast accuracy. During promotions, the company achieved over **85 percent forecast accuracy** at the store level and even higher at the DC level. This represents at least a **25 percent improvement over traditional approaches**.

Intelligent agents also optimize restaurant orders autonomously by recognizing the impact of projected restaurant traffic trends and impact on LTOs and therefore the orders.

The system runs on an exception basis but allows the managers to review the decision criteria and override orders where the managers may have local information such as inventory issues or local store traffic issues. This has resulted in much faster order placement and **order accuracy of over 82 percent**, which reduces both inventory and waste dramatically while increasing service levels to the consumer. This is a significant improvement to all other known implementations in the marketplace.

Because the algorithms are highly scalable, they are able to process over 15 million stocking locations continuously throughout the day.

Prior to the AI-based, multi-party execution system, restaurant managers had to interact with nine different ordering systems and manually create their own orders based on general guidelines, rules of thumb, and spreadsheet-based or manual calculations.

With AI implemented on a sound foundation, this company can now anticipate, manage, and serve demand at the lowest possible cost. During LTO's, when demand fluctuations would overwhelm a restaurant manager, intelligent agents monitor demand in real time, and autonomously orchestrate the supply chain to align supply with demand. Thus, the company can meet its goal and maintain high service levels while reducing cost to serve.

Inbound Supply and Logistics in Automotive

In the Automotive industry, Dana, a power train manufacturer, has seen dramatic improvements in its supply chain. Since implementing an intelligent network, the company has:

- **Achieved global visibility**
- **Reduced inventory 31%**
- **Improved on-time delivery**
- **Reduced shortages, expedites and operating expenditures**
- **Synchronized multiple ERP systems**
- **Reduced supply and demand variability**

Dana has also reduced transportation costs because better supply chain visibility allows better and more efficient planning.

“Our team is not manually entering and executing transactions. We want them to be strategic thinkers, decision makers, and negotiators, and ultimately advocates of the customer experience.”

VICE PRESIDENT SUPPLY CHAIN, ECOMMERCE COMPANY

Achieving Perfect Order Performance in Ecommerce

Finally, a retailer in the high tech ecommerce business has implemented an intelligent network to provide end-to-end supply chain visibility and “touchless” execution. Intelligent agents monitor and optimize fulfillment during execution, and people only get involved when there’s a problem.

The vice president of supply chain, explained the impact this had:

“Our team is not manually entering and executing transactions. We want them to be strategic thinkers, decision makers, and negotiators, and ultimately advocates of the customer experience.”²

Despite explosive growth, they have maintained the same level of resources and achieved and maintained:

- **+99.5%** on time delivery
- **+95%** Perfect Order

By using intelligent agents on a network, the company has automated significant part of the supply chain, maintained excellent customer satisfaction, and freed up team members to focus on more important tasks. The company can now grow without burdening the resources or comprising service.

HOW TO REALIZE THE BENEFITS OF AI TODAY

AI is changing the world as we know it, and it can have a significant impact on supply chain operations today. In order to realize the full value of AI, executives should focus on ensuring the fundamentals are laid to maximize the return on their AI investment now, and in future.

A multi-party network that connects all trading partners with a real-time, single version of the truth, is critical. This is the System of Engagement, the “nervous system,” which connects all trading partners with each other, and with the Systems of Intelligence and Cognition. The System of Intelligence receives the data, and adds significant value by identifying insights, making, relaying and executing decisions. The System of Cognition magnifies this advantage by using machine learning to monitor results and adapt its algorithms as necessary.

Simply by taking the first step, and connecting to a real-time network, companies can prepare for AI, digitize their supply chains, and realize significant benefits. But exploiting all levels from Engagement, Intelligence to Cognition, they can realize results that are truly transformative.

2. Wireless Disruptor Distinguishes Itself with Supply Chain Innovation, Gary Hilson, EBN

For more information contact One Network at:

Tel: +1-866-302-1936 (toll free)

Email: inquiries@onenetwork.com



Corporate Headquarters US

One Network Enterprises
4055 Valley View Ln, Suite 1000

Dallas, TX 75244

Tel: +1-866-302-1936 (toll free)

+1 972-385-8630

Email: inquiries@onenetwork.com

Web: www.onenetwork.com

International Headquarters

One Network Enterprises (Europe)

PO Box 59383

London NW8 1HH, UK

Tel: +44 (0) 203-28-66-901

Email: europe@onenetwork.com

Web: www.onenetwork.com