

Using Artificial Intelligence to reduce waste in your supply chain

This is not your grandfather's supply chain

Effective Supply Chain Optimization is one of the toughest tasks in modern supply chain management. To delight your customers and keep your company growing, it's important to get the three W's correct: you must know **what** to produce, **when** to produce it, and **where** to deliver it - and you must be confident that your supply chain is able to deliver on all of these goals.

It's extremely difficult to do this well.

What happens when your Supply Chain Optimization efforts fall short?

Waste. Lots of it.

There are many sources of risk that can make your supply chain fail to deliver on the three W's, causing plenty of waste as a result.

Material supply risk can derail your entire production process. In an ideal world, you'd be able to rely on your suppliers to always deliver what you need, when you need it. Unfortunately, things don't always work this way. A supplier might be unable to deliver due to a natural disaster, labor unrest, bankruptcy, or supply problems of its own. Supply disruptions waste money, because you must still cover your fixed costs in production, logistics, and warehousing, whether or not you're able to fully utilize them.

Even if you don't encounter supply disruptions, you must still account for production delays. These can be caused by events both internal and external - from equipment malfunction, to power outage, to safety violations, and many more. The ways in which waste can occur during production are nearly endless. For example, valuable raw materials may be destroyed or used inefficiently by faulty equipment, or a production line breakdown could result in having to pay idle workers. Production delays can cause

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you to incur additional warehousing costs for raw materials you ordered but were not able to use, or late fees to customers who were expecting to receive their order on time.

Logistics delays are another source of risk. If you can't get your product to where it needs to be, when it needs to be there, you may incur excessive warehousing costs as inventory piles up waiting to be shipped. If your product has a limited shelf life, delays may make it worthless before it reaches your customers.

Finally, consider the risk in incorrectly forecasting demand. If you over forecast demand, you'll order too many raw materials, produce too much of your product, and end up having to keep it sitting in inventory, destroy it, or sell it off at a steep discount. Not only will you have to deal with excess inventory, the money spent on materials, labor, shipping, and warehousing represent a huge opportunity cost. Instead of spending money on product that didn't sell, you could have reinvested it into R&D, spent it on production of a higher margin product, held onto it to serve as a buffer to get through tough economic times, or distributed it as dividends to shareholders.

Underproduction is just as serious. Real demand for your product that you didn't predict and failed to meet is going to translate directly to lost sales, lower revenue, and a potentially damaged reputation.

It's important to remember that demand forecasting requires you to not only predict how much you'll need to produce, but also where you'll need to ship it. What happens if you forecast global demand correctly and produce the correct amount of product, but ship too much of it to some locations, and too little to others? Excessive waste. You've wasted fuel shipping product to places where it isn't wanted. You've wasted the time and labor of your valued employees. Above all, you've wasted money that could have been put to better use. You've given your competitors an opportunity to grab market share that should have rightfully been yours.

The important takeaway is that effective supply chain optimization requires you to predict and minimize risk across the *entire* supply chain. AI can help.

Supply Chain Optimization, the intelligent way

Using technology to tackle supply chain challenges isn't exactly a new idea. History is littered with stories of poorly implemented digital and automation initiatives - even before the dawn of artificial intelligence and the recent trend toward digital transformation.

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Recently, many companies have tried to use 'Big Data' solutions to improve the efficiency of their supply chains. This is an alluring proposition: you've been gathering large amounts of data for decades, so why not use it to improve your processes? And indeed, many companies have had great success in using historical data to drive decision making. It's much more accurate than guessing based on intuition. But historical data alone still won't come close to what artificial intelligence, data, and data science together can help you accomplish.

The catch is that traditional Big Data tools are not intelligent. They can sort and filter huge amounts of historical data, but it can be difficult to know what to look for. It definitely isn't easy to separate the signal from the noise. To use these tools effectively, a company must have deep domain knowledge of the problem it is trying to solve *and* deep knowledge of the Big Data toolset it is using. The result is that most companies realize quick gains when they start using traditional Big Data tools, but they then hit a wall. There's only so much that domain experts can accomplish when they're trying to pick actionable data points out of a nearly infinite data set. This is one area where Artificial Intelligence (AI) can provide a huge boost. AI and machine learning can find trends and important correlations across a huge number of variables continuously, without manual intervention.

Traditional Big Data approaches are also both inward looking and backward looking. Companies typically only have easy access to one set of data - their own. This data is very valuable and taking historical trends into account plays an important role in intelligent supply chain management. However, the risk in only using internal, historical data is that it does not come close to capturing all of the variables that affect the supply chain. External factors play a critical role as well - there's just too much data in the world to analyze it all manually. **Without AI, Big Data is Dumb Data.**

As you'll see, adding AI to your supply chain means you'll no longer be limited to only looking at internal data. By incorporating data about the rest of the world, AI apps can give you a holistic view of what is happening to your supply chain.

Bad weather, flat tires, natural disasters, and demographics

Supply Chain management must work in the Real World, and it can get messy out there. In order to do this correctly you need to be able to incorporate real-time data from multiple sources.

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Take weather, for example: events like heat waves, hurricanes, and blizzards can have a huge impact on demand and logistics across a wide geographical area. Similarly, something as simple as damage to roads or rail lines can drastically impact your ability to ship a product. Internal historical data would have recorded the impact of these events in the past, but it's unlikely they would have captured information about what caused the changes. So, when analyzing internal data, it's possible to see supply disruptions, production slowdowns, shipping delays, and demand shifts without being able to determine *why* the changes occurred.

Knowing *what* happened without understanding *why* it happened makes data virtually useless - or even worse than useless - as a supply chain analysis and prediction tool. If an analyst looks at the data and comes to an incorrect conclusion about why changes occurred in the past, this faulty conclusion will cause the company to get all three W's wrong: it won't know **what** to produce, **when** to produce it, or **where** to ship in. Even worse, a company might get the three W's right but fail to anticipate a supply disruption and fail to meet its goals as a result. Either way, it will upset employees, shareholders, and customers by failing to deliver what is needed where it is needed.

In contrast, AI-based solutions like Noodle.ai's applications can look at a company's historical data, compare it against external data from the same time period, realize that the supply chain disruptions were caused by weather, and use this intelligence to recommend courses of action.

Real world data can also uncover emerging social patterns and trends that are going to impact your supply chain. Demographic patterns like immigration, emigration, and aging populations can have a dramatic impact on the entire supply chain. If the demographic makeup of a region changes, demand for your product in that region may also change. If a region that you must ship your product to or through is growing rapidly, traffic is going to get much heavier, and you'll have to take the resulting delays into account to avoid delivery delays.

It is flat-out impossible for busy supply chain management professionals to constantly monitor data about everything that's changing in the world and manually assess the impact of these changes throughout the supply chain. An AI-based solution, however, can do this easily. It can analyze your historical data to infer the impact of weather events, changing social patterns, and demographic shifts on your supply chain.

Since AI never sleeps, it can use this data to proactively monitor the world for events that are going to cause waste and disruption in your supply chain. This means you

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won't waste time, money, labor, and fuel making products and shipping them to regions that won't want them or won't be able to use them.

Using Artificial Intelligence to see the entire picture

As the previous examples have demonstrated, combining AI with internal *and* external data can provide a huge boost over inward-looking analysis. A smart AI-based solution can look back at your internal historical data and combine it with historical external data to drive greater insight into *all* of the factors that have affected demand for your product - and others like it. Perhaps warmer-than-normal temperatures have dramatically increased demand for your product in the past - or dramatically decreased it. Or perhaps a hurricane hitting a region unexpectedly *increases* the demand for your product in that region. If you discover this ahead of time (or in some cases, in near-real time) - assisted by AI - you'll be able to adjust your entire supply chain in the region by shipping product in proactively and storing it in a sturdy warehouse. Trying to do it after the fact won't help if roads are washed out or blocked by fallen trees.

Sometimes, correlations like this are obvious. If you produce generators, for example, it would come as no great surprise to find increased demand in hurricane impacted areas, and you'd likely already take steps to ensure minimal disruption to your supply chain. The correlation isn't always this obvious, however. Using AI, a producer of ceramic tableware might be advised to redirect additional supply to a region several weeks after an earthquake occurred. The need for this might not be obvious; the replacement of things like tableware is often a second-order effect that doesn't happen until victims of a disaster have taken care of immediate needs like repairing structural damage to their houses.

On the supply side, if one of your suppliers is in an area that's impacted by an earthquake, or one of their suppliers is affected by an earthquake, it can cause a supply disruption in your supply chain that won't be felt until weeks later. These kinds of delayed correlations are easy for AI-based systems to infer but can be difficult to spot manually when there's a world full of data to keep up with.

Beyond just analyzing internal and external data to understand what has happened and predict what will happen, intelligent AI apps can monitor what is happening in real time, surface critical data points that require immediate action. Even better, AI systems will learn from your decisions and responses to ensure that it does an even better job in the future.

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A solution built around Noodle.ai's apps help you take care of fill rate optimization, inventory risk, inventory optimization, production at risk, delay predictions, ATP perfect order, target setting, and material risk. These apps will be able to fully leverage your internal data by analyzing it in a global context. Your internal data alone will tell you *what* happened to your supply chain in the past. Combining it with worldwide data enables Noodle.ai's Sensory Engine to determine *why* it happened, which enables Noodle.ai's Prediction Engine to determine what will happen in the future.

Putting it all together

Now that we've examined how AI can help reduce supply chain waste, let's take a look at a few examples of real-world supply chain optimization results Noodle.ai helped solve for its customers. For some customers, Noodle.ai apps achieved as much as 10% in lost sales recovery. By making AI powered apps available to managers along the entire supply chain, clients have been able to ensure that the right SKUs reach the distribution centers where they are needed, preventing lost sales due to stock outs.

In other cases, Noodle.ai saw up to 20% inventory reduction. Noodle's AI powered apps have helped planners more accurately predict what will be needed, and where it will be needed. This reduces the need to keep extra inventory on hand at central warehouses and regional distribution centers. Add this to the 10% reduction in transportation costs some clients have experiences. Using Noodle.ai's apps to improve visibility along the supply chain, clients have been able to significantly reduce the user of freight expeditors by ensuring that their normal supply chain processes deliver product where it is needed, when it is needed with few exceptions.

As we've seen, AI applications enable a level of supply chain optimization that just isn't possible with traditional technology. AI is revolutionizing the entire supply chain: from procurement, to production, to shipment, to warehousing and delivery, companies large and small are evolving toward lean, cost effective, AI enabled supply chain management.

Coming full circle, AI enables your supply chain deliver on the three W's - delivering what is needed, where it is needed, when it is needed - by understanding what has happened, what is happening, what will happen throughout your supply chain. With AI on your side you'll decrease risk, reduce waste, and be ready for anything.

If you're ready to embrace AI, Noodle.ai is here for you.

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