CSCMP hottopics

MAY | 2021

Don't Start a Supply Chain Machine Learning Project Before Reading This

By Rob Kaufholz, VP of Product Innovation, ToolsGroup

CSCMP

Educating and Connecting the World's Supply Chain Professionals.™

Nowadays, machine learning seems to be everywhere you look, from television commercials and supply chain conferences to university degrees. But despite its buzzword status and the fact that it's been around since the late 1950s, this technology is still shrouded in mystery for many supply chain practitioners. According to Gartner, "While machine learning promises transformational benefits in the supply chain, current expectations of short-term readiness and benefits remain unrealistic."[1] In this hyped-up stage in technology maturity, it's crucial to be well informed so you can see beyond the headlines and apply the technology correctly to solve business problems and deliver real value.

This article will share:

- Crucial advice for how to prepare and set expectations for machine learning projects to ensure you don't get burned
- Business challenges that are the best fit for machine learning solutions
- What's coming next for machine learning in supply chain

THINGS TO KNOW BEFORE YOU DIVE INTO A MACHINE LEARNING PROJECT

While supply chain planning and machine learning may go together like peanut butter and jelly, successfully harnessing this technology requires careful consideration and preparation.

Set clear objectives from the start

With all the buzz about machine learning, it's tempting to dive right in. Unfortunately, the transition requires a more moderated approach to achieve success. Without baseline metrics on what you want to improve on and why, how can you be confident your strategy is working? Having a solid charter of what you want to accomplish and why is essential before charging down the machine learning path.

Gathering the necessary data to formulate an accurate comparison between previous results and those provided by machine learning is an excellent way to establish confidence in your results. And because machine learning systems get smarter over time, having a consistent method of measurement is even more important to ensure you can accurately track how outcomes and ROI are improving against established metrics.

Establish a foundation and layer on complexity

After you've established your project objectives, it's time to build a solid baseline/foundation for a successful and sustainable initiative. We've found that the best approach is to leverage both probability-based forecasting and machine learning technologies, which work together seamlessly and automatically, giving users the ability to forecast at the most granular level, on different time horizons. This walk, then run approach begins with establishing an adaptive, probability-based model for demand forecasting using existing historical data, then layering in more sophisticated machine learning using external data sources. A reliable demand forecast is critical to success with advanced machine learning and yields significant benefits on its own.

[1] Hype Cycle for Supply Chain Planning Technologies, 2020. Published: 12 November 2020. Analyst(s): Tim Payne, Amber Salley, Pia Orup Lund

In this hyped-up stage in technology maturity, it's crucial to be well informed so you can see beyond the headlines and apply the technology correctly to solve business problems and deliver real value.

Carefully consider multiple data dimensions

Data volume
Big data plays right into the strengths of machine learning. Not only is it important to have the right amount of data to draw upon, but it's equally important to have enough data to derive "statistical significance" from the model. But let's not overlook "small data". Often the big data isn't as valuable as people would like, and they may not even have it. In the meantime, every business has small data related to historic demand readily available.

Data granularity
Machine learning thrives on granularity. Unlike many approaches from the past where data was often aggregated to weed out noise from the model, machine learning examines that noise and uses it to find correlations that help to train the model and make it more powerful.

Data quality
You know the saying: garbage in, garbage out. Unfortunately, while machine learning can determine if a specific data stream has a correlative significance, it can't tell if that data is reliable or not. Machine learning projects usually include governance programs to clean, filter and maintain information quality through the data lifecycle.

Data variety
Variety of your data is also a key factor. The more different types of data sources you factor in (e.g. promotions, advertising, new product introductions, social media, weather, economic indicators, and others), the more robust and accurate the planning outcomes can be.

Determine how you'll operationalize your machine learning solution

Often businesses will build a machine learning solution to tackle a one-off business challenge, without considering long-term sustainability. For sustainable business value you need to operationalize your results for continued success.

To achieve the stability and adaptability required for operational use, it's important to use models that are self-adaptive and do not require continuous tuning by experts, otherwise changing business environments will make them unreliable. This is common with traditional demand planning processes that use multiple forecasting algorithms that are assigned to each item/location according to its demand behavior. The forecast generated by these algorithms degrades as the demand patterns evolve over time. This discrete selection and tuning of the algorithms require human skills that most businesses cannot afford.

One-off science projects create "black boxes" that only the developer understands and can support. Business users remain skeptical, and if the developer leaves the company, these models are shelved or discarded altogether. These isolated machine learning projects also require continual manual work to refresh the model when business needs change. The better method uses a self-adaptive model as part of a fully integrated business solution, with models updated automatically on a frequent basis to react to changes in the business.

People are the most important part

Part of planners' strategic work is applying their domain knowledge. Machine learning can only do so much; business knowledge and process expertise is required to properly tune machine learning models and evaluate results. With AI-augmented planning, the system gets smarter over time by factoring in human input and the humans get smarter by learning from the success rate of the probability forecasts. This frees up planners to focus on service, work on strategic projects and add their business insights to the system.

In a primer on developing future supply chain professionals in the digital age, Gartner identifies business acumen, adaptability, political savvy, and the ability to collaborate as keys to improving digital dexterity[2]. This underscores how important it is for digital supply chain organizations to focus on the 'human' side of supply chain planning as more of demand

[2] https://www.gartner.com/en/supply-chain/trends/developing-the-supply-chain-professional-2025

CSCMP™
Educating and Connecting the World's Supply Chain Professionals.™

Machine learning can only do so much; business knowledge and process expertise is required to properly tune machine learning models and evaluate results.

forecasting is automated through machine learning. In the coming years, professionals who can communicate business priorities, simplify complex data, and contribute to negotiations will be increasingly valuable in the digitization of the global logistics industry.

WHEN SHOULD YOU USE MACHINE LEARNING IN SUPPLY CHAIN PLANNING?

Business problems that leverage demand planning, including those related to demand forecasting, sensing and shaping are prime candidates for using artificial intelligence to help automate supply chain processes. And for good reason: increasing forecasting complexity and rapidly shifting consumer demand are often exacerbated by seasonality, new product introductions, promotions, and myriad causal factors (e.g. weather, social media), making demand planning extremely complex. According to Gartner, more businesses are using machine learning to address these processes than any other area of supply chain planning.[3]

Here are some of the top supply chain planning machine learning use cases. Machine learning models various demand effects as layers on top of your baseline forecasts.

Seasonality
Clustering and classification of multiple seasonality patterns (day-in-week, week-in-month, month-in-year)

Promotion Management
Clustering of past promotions, classification of new promotions based on attributes and uplift calculation

New Product Introduction
Clustering of past launch profiles, classification of new items based on their attributes and regression for baseline forecast generation

POS Demand Sensing
Advanced techniques to improve sell-in forecast using sell-out demand data

External Demand Causals
Weather, social media, IoT, market trends, indicators and other external data

Product Lifecycle Management
Algorithms weigh up attributes and sales of similar items to estimate the shape and duration of the product life cycle

WHAT'S COMING NEXT FOR MACHINE LEARNING IN THE SUPPLY CHAIN?

The use of machine learning in supply chain planning is in constant flux: use cases are expanding, and the technology is maturing. Here are a few exciting developments coming to the field.

Today there is a big opportunity for businesses to make better use of external data to better understand demand drivers. This is the next evolution in demand sensing, one of the machine learning use cases I mentioned earlier. Companies are adding/sensing more demand drivers and external casuals to help them even better understand the factors influencing demand. Curated libraries of this external data will improve the efficiency and precision of demand sensing and short-term forecasting.

Another interesting application for machine learning in the supply chain is moving beyond predictive to prescriptive analytics, i.e. the system tells a planner not only what will happen, e.g. a demand spike, but also suggests what actions to take, e.g. increase stock levels in certain locations. We're particularly excited about this one because it's pushing planning automation to the next level—reducing planner workload and the latency of reaction time, and speeding up decision making.

[3] Gartner: Current Use Cases for Machine Learning in Supply Chain Planning Solutions. Published: 19 May 2018. Analyst(s): Tim Payne

Today, machine learning supply chain use cases are primarily focused on demand planning. But there are also great opportunities for machine learning in supply planning. This is getting a lot of attention in the post-COVID world as planners navigate wild fluctuations in supply, out-of-stocks, and late shipments. Machine learning can predict changes in lead time, for example, to help planners get out in front of supplier risk.

There are many more examples of how machine learning is pushing the boundaries of supply chain planning automation, efficiency, and speed of decision making. Don't be among the crowd chasing machine learning projects for technology's sake: it's important to choose the right use case, plan carefully, and know what to expect to deliver the business value executives are seeking from digital planning transformations.

ABOUT THE AUTHOR

Robert Kaufholz is Vice President of Product Innovation at ToolsGroup, where he is responsible for product strategy, R&D, and product development. Robert previously served as Director of Solution Design, developing advanced analytics, solution development, and data engineering services for customers. Prior to his role at ToolsGroup, Robert held various analytics, supply chain, and solution development leadership positions with Crocs, Convergys, IBM, PwC Consulting, and ArcelorMittal. Robert holds a B.S. in Industrial Engineering, and is actively pursuing a M.S. in Computer Science at Georgia Institute of Technology with a specialization in machine learning.

ABOUT TOOLSGROUP

ToolsGroup is how organizations achieve their target service levels while optimizing inventory, no matter how complex their supply chain is or how much demand changes. In a world that never follows the rules, organizations have to be ready for anything—from the challenges of multi-echelon inventory optimization to the endless surprises of sporadic demand. To do this, they have to predict more behaviors, protect against surprises, and perform more efficiently. www.ToolsGroup.com

eBook: Machine Learning for Supply Chain Planning 101

About CSCMP Hot Topics

Issues of *CSCMP Hot Topics* may include early results from ongoing research being conducted for CSCMP or other organizations; new supply chain practices, thought-provoking ideas, or emerging trends; discussions of changes in the broader business and regulatory environment that may impact the supply chain and logistics field.

CSCMP™

Educating and Connecting the World's Supply Chain Professionals.™