LEGION

AI-Powered Demand Forecasting

A BUYER'S GUIDE

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Introduction

Demand forecasting is critical to maximizing labor efficiency and can have a direct impact on the employee experience. There have been tremendous technological advancements in demand forecasting with the rise of AI (Artificial Intelligence). The goal of this guide is to provide some basic explanations and key questions that those evaluating demand forecasting products and solutions should ask.

What is Demand Forecasting?

Demand forecasting is the process of making future estimations of customer demand for a particular item or type of items, often referred to as demand drivers. Demand forecasting is a foundational element in creating optimized labor plans and schedules.

What is a Demand Driver?

Demand drivers are transactions, sales, items for sale, and traffic. Demand drivers, like items for sale, can be highly granular, like packs of gum sold every 15 minutes, or grouped at a higher level, such as the amount of jewelry sold every hour.

What is a Demand Influencer?

Weather, local events, and custom events such as in-store promotions can all significantly impact demand. Failure to incorporate these influencers into demand forecasting can lead to sub-optimal forecasts.

How has Demand Forecasting Evolved?

Historically, demand forecasts were created using year-over-year models built with simple spreadsheets. They often required tremendous manual effort. Retail store managers often used the previous week's demand to predict what would happen in the following weeks. This process is called "random walk." More advanced store managers use statistical techniques, such as moving averages, e.g., next Monday's traffic will be the average of the last six weeks of traffic on Mondays. Other store managers use a more complex process and advanced techniques like ARIMA (Auto Regressive Integrated Moving Average) or SARIMA (Seasonal ARIMA), which uses a linear combination of historical data to forecast the future.

How has the Rise of Omnichannel Impacted Demand Forecasting?

The pandemic has also changed customers' buying behavior. A survey by McKinsey & Company found that during the pandemic, 75% of U.S. consumers tried a new shopping behavior, such as buying products online that they previously bought in-store. Of these consumers, 60% said they planned to continue the new behavior after the pandemic. Today, retailers may have numerous channels for purchasing items, including in-store, online pick up in store, drive-through, online, and phone orders, all of which need to be staffed appropriately. According to Gartner, the physical store has become multifaceted and, in many cases, a fulfillment hub for online ordering. Increased in-store activity has led to a significantly increased focus on improving store productivity while decreasing overall costs.

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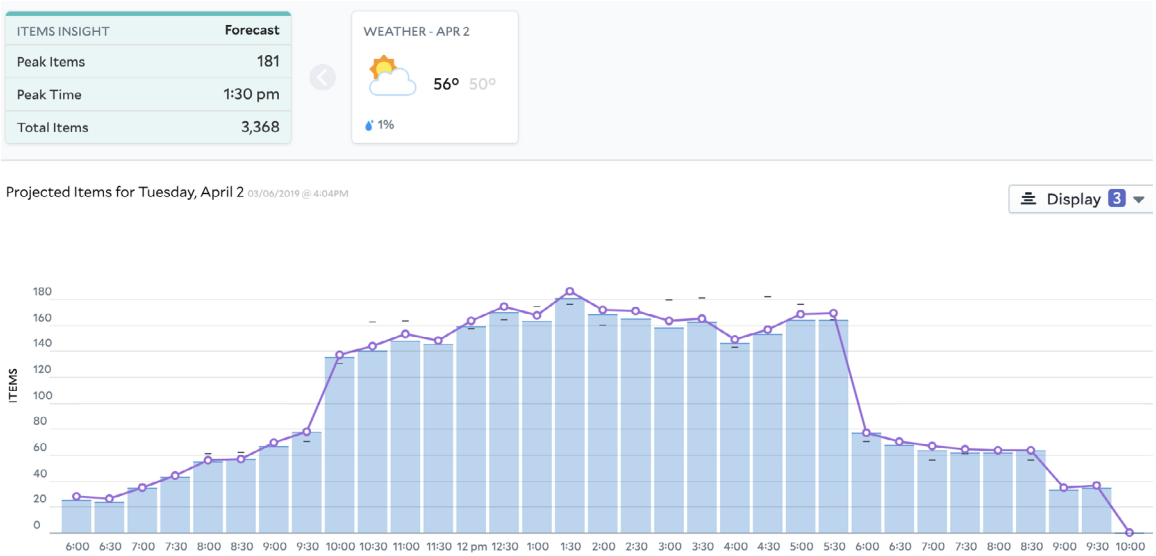
The Limitations of Traditional Methods of Demand Forecasting

Traditional year-over-year models and simple analysis of historical averages are no longer sufficient to forecast demand accurately and ensure retailers schedule the right people at the right place at the right time. These simple methods cannot handle the scale and complexity of most modern retailers. And traditional methods make it nearly impossible to incorporate external data, such as weather and local events, that significantly impact demand. Traditional models often rely on a "one size fits all" approach and fail to consider critical factors that can influence demand, for example, whether a location is on the street or in a mall, the impact of weather, or a local event at a specific location.



The Rise of AI-Powered Demand Forecasting

The most advanced demand forecasting solutions utilize mature data science and advanced AI to precisely predict demand by location and item at 15-minute increments. AI-powered demand forecasting can capture more complex patterns over extended periods and automatically synthesizes thousands of internal and external data points, such as local events and weather, to precisely predict demand by item and channel every 15 minutes. It continuously learns from new data, so forecasts continue to improve and adapt to changing business conditions.

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Why AI-Powered Demand Forecasting Matters

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Optimize Labor Efficiency and Improve the Frontline Employee Experience

Harsh economic realities have driven retailers to search for ways to cut costs. However, the ongoing labor shortage means retailers can't afford to reduce frontline resources or benefits. Retailers must find a way to maximize labor efficiency and employee engagement simultaneously.

In the Gartner Market Guide for Retail Workforce Management Applications, Gartner advised retailers to identify and invest in transformational capabilities that have the potential for the most significant positive impact on costs and store employee experiences, such as AI-enabled labor forecasting to increase scheduling productivity and accuracy. For retailers, AI-enabled labor forecasting means having the capability/functionality to provision labor to match expected demand and generate schedules that optimize costs and work efficiencies connected to revenue-generating activities. According to Gartner, retailers who fail to capitalize on AI and automation capabilities to optimize their workforce will face higher operational efforts and costs. "Conversely, however, when driven by AI, labor planning can consider a variety of data to allow retailers to be more specific and strategic."

Appropriately Plan for Peak Periods

AI-powered demand forecasting enables retailers to create optimized labor plans and schedules for peak periods such as holidays, back to school, and high traffic during the day. It can also predict the impact of local events such as high school football games, concerts, or other events that generate store traffic spikes.

Weather conditions also impact forecasting. A rainy day may lead to increased traffic in the drive-through and lower foot traffic in the store. A severe winter storm could also impact demand at locations near the winter resorts or for particular types of items.

Proper staffing directly drives conversions and impacts revenue. One study by the National Retail Federation found that long checkout lines are a significant source of frustration for customers, with 42% of respondents saying they would abandon a purchase if they had to wait in line for more than five minutes. If a store is understaffed, customers may skip the long line and leave without making a purchase, which results in lower sales for the store.

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In addition to impacting sales, understaffing can also impact customer satisfaction, which can have long-term financial consequences. For example, a study by Oracle found that 81% of customers are willing to pay more for a better customer experience. In comparison, 89% will stop doing business with a company after a bad experience. If a store consistently understaffs and fails to provide a good customer experience, it may lose customers in the long run.

Another way to look at the financial impact of understaffing is to consider the cost of employee turnover. If a store is consistently understaffed, it may lead to burnout and turnover among existing employees, who may become overworked and unhappy with their job. According to the Society for Human Resource Management, the cost of replacing a single employee can range from 50% to 200% of that employee's salary. If a store is understaffed and experiences high turnover it may incur high costs in terms of recruiting, hiring, and training new employees.

Optimize Resources with Workforce Sharing

Precisely predicting demand enables retailers to identify where they may have staffing gaps. Retailers could share employees across their locations to meet that demand. For employees, this means greater earnings potential and location flexibility.

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What to Look for in a Demand Forecasting Solution

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AI-Powered Demand Forecasting

It is important for retailers to select a product that utilizes mature data science to achieve the most accurate demand forecasting results. The most advanced solutions use patent-pending techniques for deep learning for Time Series Forecasting such as RNN, LSTM and transformers, reinforcement, and active learning to react proactively to data changes.

Questions to Ask

- What AI techniques does the solution use?
- How are machine learning techniques applied to the data set?
- How are the machine learning (ML) models optimized?
- How often are they optimized?
- Do they have the following types of ML models?
    - Rapid response: learn from the most recent data
    - Short ML: learn emerging trends and project forward
    - Short ML with seasonal learning: learn emerging trends and combine them with the previous year's seasonal results
    - Full ML: with seasonal learning
    - Full ML with seasonal adjustment: prevent this year's uncharacteristic data from affecting next year's forecast
- Does your solution support unique data models for each location and driver?
- Do they have a dedicated data science team? If so, how big is it, and what is their background?
- How to get the support of the data science team?
- Has their AI been recognized in any awards?

Accuracy of Demand Forecasting Results

The demand forecasting solution's accuracy can significantly impact labor costs, frontline engagement, and overall store performance. According to Forrester Research and other benchmark data, a 1% improvement in demand forecast accuracy can lead to a .5% reduction in labor costs, 4% higher sales conversion for conversion-based businesses, and a 5% increase in customer satisfaction based on having the best employees with the right skills and knowledge in the right place at the right time.

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How to Measure Demand Forecasting Accuracy

Numerous methods exist to manage demand forecasting accuracy. A common way to measure accuracy is to compute the difference between forecast value and actual value, expressed as a percentage of actual value. Other methods of measuring accuracy include Mean Absolute Percentage Error (MAPE), Seasonal Mean Absolute Percentage Error (SMAPE), and Weighted Forecast Accuracy (WFA), which is a modified version of MAPE. Each technique depends on the absolute values of differences between the forecasts and the actuals.

Forecast accuracy should be compared to the overall predictability of the data. Some drivers are more predictable than others. For example, a retailer may be able to predict the number of cups of coffee they will sell per hour with 90% accuracy, while a different demand driver may only be predicted at 40% accuracy. The predictability of the data determines the upper bound of forecast accuracy. Forecast accuracy should be measured continuously through an automated process.

Over What Period of Time Should Forecast Accuracy be Measured?

Forecast accuracy can be measured daily, weekly, monthly, quarterly, or annually. A minimum of four months of data collection is ideal in considering the performance of a demand forecasting product.

Questions to Ask

- How do they measure forecast accuracy?
- Over what period of time do they measure accuracy?
- How do they compare the accuracy of those measures to other statistical analysis techniques?
- How does the system consider the predictability of the data?
- How often are results measured?
- Is there a built-in, automated monitoring process to ensure the ongoing accuracy of demand forecasts?
- Is there an automated mechanism for sending alerts if forecast accuracy drops?

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Demand Forecasting Automation

Automation is critical to ensuring efficient demand forecasting operations. Retailers may not have in-house data scientists or teams that can spend extended efforts on forecasting. The synthesis of operational and third-party data must be automated.

Questions to Ask

- What level of manual effort is required to generate a demand forecast?
- What manual effort is needed to create an optimal labor plan and schedule based on the demand forecast?
- What level of effort is required to tune or adjust a demand forecast?
- Can forecasts be created by items and by sales?

Synthesis of Third-Party Data into the Demand Forecast

Local events and weather can have a significant influence on demand. A demand forecasting product must be able to consider these events' impact. Manually collecting this information could be highly labor intensive and likely not capture all events.

Questions to Ask

- Is data about local events and weather automatically syndicated and incorporated into the forecasts?
- How is the third-party data integrated?

Granularity

Forecast granularity can have a significant impact on labor and schedule optimization. Forecasts must be created by location and channel versus a one size fits all approach for a specific type of retail outlet — like a flagship store versus a neighborhood location. Being able to predict demand by location, channel, or item every 15 minutes can significantly impact schedule optimization. It can help retailers automatically create shifts and break schedules that enable frontline employees to serve customers best.

Questions to Ask

- Can demand forecasts be created for each location?
- Can demand forecasts be created by channel?
- Can demand forecasts be created by item?
- Can demand forecasts be created in 15-minute increments?
- How often are forecasts updated?
- How far in advance are forecasts generated?

Self-Learning Demand Forecasting

Business dynamics are constantly changing, especially in challenging economic conditions. AI-powered demand forecasts continuously learn and automatically adapt to changing business conditions. The most sophisticated models rely on advanced techniques to select and train machine learning models.

Questions to Ask

- Is the demand forecasting engine self-learning?
- Can it automatically create unique forecasts for each data set?
- How often are the machine learning models trained?
- When and how would a new model get selected?

Demand Forecasting That Allows for Human Control

AI automates many repetitive tasks in the demand forecasting process; however, it should always allow for human intervention. AI-powered demand forecasting may miss unforeseen issues, such as an accident that caused a road closure or a health inspection that closed a store. The AI system must be designed to consume feedback and automatically apply it to improve the system. The AI engine should capture these events and learn how they impact the forecast to improve future estimates. Any AI engine working closely with a human operator must gather this feedback. When human intelligence enables artificial intelligence, forecasts are even more accurate.

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Questions to Ask

- Can manual edits be made to the automated forecasts?
- Does it enable managers to edit forecasts and tag events that led to the edit, such as road closures or health events?
- Will the system learn from the edits?

Demand Forecasting Data Sufficiency

Demand forecasting performs best when analyzing historical data, ongoing operational data, and synthesizing third-party data such as weather and local events. When opening a new location, there will not be historical data that can be used. In such cases, there must be a mechanism for creating and analyzing synthetic data. An AI-powered demand forecasting solution must have a sophisticated algorithm for synthetic data generation.

Questions to Ask

- How does the system handle locations that do not have historical data?
- If synthetic data is generated, how is this done?
- How is the quality of the synthetic data ensured?

Demand Forecasting Data Integrity

The integrity of the data is essential to predict demand precisely. Data must be consumed, structured, analyzed, and stored. The tampering of data, intentionally or unintentionally, through file corruption can significantly impact demand forecast accuracy. The demand forecasting system must also automatically monitor and remediate data integrity issues.

Questions to Ask

- How does the system ensure the integrity of the data?
- Is input data monitored to ensure accuracy and to confirm it hasn't been tampered with randomly or systematically? If yes, how is this done?

Infrastructure to Support Scaling and Speed of Processing

Forecasting demand across locations, channels, and items can entail analyzing hundreds of thousands of data points per customer. Demand Forecasting vendors must have a modern data pipeline capable of scaling up and down and processing massive amounts of data quickly and efficiently.

Questions to Ask

- What kind of infrastructure is in place to support automated demand forecasting?
- Describe the approach to system scalability.
- How do they ensure the optimal performance of the system?

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How to Evaluate Vendors

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Request a Proof of Concept or Pilot

A proof of concept or free pilot is the best way to assess demand forecasting solutions. It enables you to evaluate a solution using internal data. Key steps:

1. Select up to 10 demand drivers
2. Establish forecast accuracy targets

These targets can be based on the improvement in accuracy needed to achieve in order to gain internal approval to proceed with an automated solution for demand forecasting. Targets should also reflect the predictability of the demand drivers selected for the pilot. A demand driver with 90% predictability would be better for creating a labor demand than a demand driver with 40% predictability. Predictability is inversely related to variability. Higher variability makes the data less predictable.

For example, if the shipping of goods to a store happens at random intervals, it makes it hard to predict it. If through statistical measures, it's determined that the dataset can only be predicted to a low level of accuracy, then the specific demand driver may not be a good candidate for inclusion in the POC. Suppose the analysis indicates that the data can be predicted with 90% accuracy, which serves as the upper bound from what should be expected from an automated demand forecasting solution. Targets for variance should be based on the analysis of several weeks of data, and vendors should be able to report on a trailing variance so it can be compared to targets.

1. Select your demand drivers
2. Provide your data
3. Provide the vendor with your data - typically 18-36 months worth for 3-10 locations
4. Provide your baseline forecasting data

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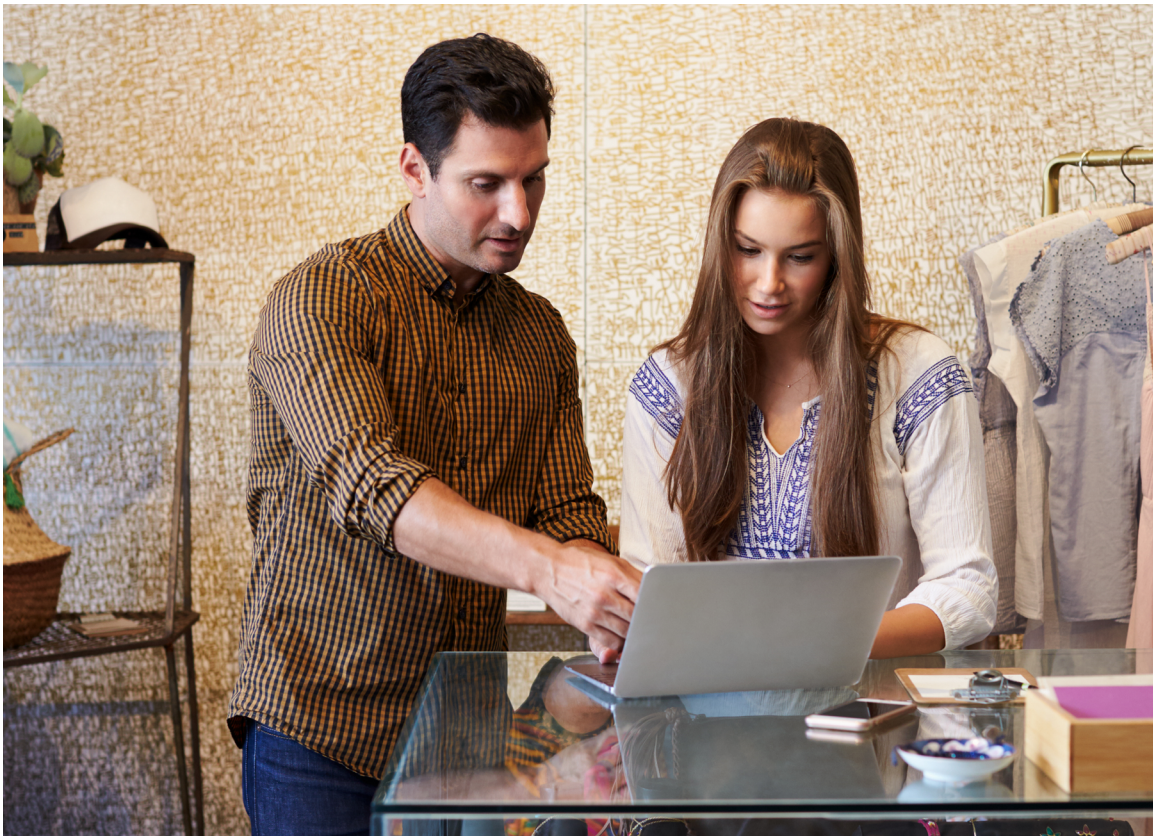
How to Sell Demand Forecasting to Leadership



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Here are some steps that can be taken to make a business case for implementing an automated demand forecasting system:

Define the Problem

Identify your organization's challenges in forecasting demand accurately. The issues could include manual data entry, difficulty analyzing trends, and the inability to granularly predict demand by location or driver.

Evaluate the Costs

Determine the cost of implementing an automated demand forecasting system, including software, services, and personnel costs. Also, consider the ongoing maintenance and training required.

Quantify the Benefits

Estimate the potential savings or revenue generated by implementing an automated demand forecasting system.

- **Increased accuracy:** According to a study by Aberdeen Group, companies that use automated demand forecasting achieve a 15% improvement in forecast accuracy compared to manual methods. According to Forrester Research and other benchmark data, a 1% improvement in demand forecast accuracy can lead to a .5% reduction in labor costs.
- **Increased revenue:** By improving forecast accuracy and reducing stockouts, businesses can increase revenue by ensuring they have the right products available when customers want them. A study by APICS found that companies with accurate demand forecasts saw a 15% increase in revenue.
- **Faster decision-making:** Automated demand forecasting provides real-time insights into demand trends, enabling businesses to make faster decisions about production, inventory, and supply chain management. According to a report by the Hackett Group, businesses using automated demand forecasting can make decisions 27% faster than those using manual methods.
- **Competitive advantage:** By using advanced analytics and machine learning algorithms to analyze demand data, businesses can gain a competitive edge over rivals who rely on manual forecasting methods. According to a survey by Deloitte, 63% of executives believe that analytics and artificial intelligence provide a competitive advantage.

By highlighting these data points in your business case for automated demand forecasting, you can demonstrate the potential benefits and return on investment to your organization.

About Legion

Legion Technologies delivers the industry's most innovative workforce management platform. It enables businesses to maximize labor efficiency and employee engagement simultaneously. The Legion WFM platform is intelligent, automated, and employee-centric. It's proven to deliver 13x ROI through schedule optimization, reduced attrition, increased productivity, and increased operational efficiency. Legion delivers cutting-edge technology in an easy-to-use platform and mobile app that employees love.

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