Demand Forecasting

Author: Nishant Sinha

Abstract:

Several owners of small-scale businesses maintain a sales book and an account one, wherein they record their customers’ names, sales volume, cash transactions, and so on, from a different store. Time-series forecasting is a machine learning technique used very often in the industry. One of the many real-life applications of Time-series forecasting is demand forecasting; Demand Forecasting is when historical sales data is used to estimate an expected forecast of customer demand. To businesses, Demand Forecasting estimates the number of goods and services that its customers will purchase in the foreseeable future. Critical business assumptions, such as turnover, profit margins, cash flow, capital expenditure, risk assessment, mitigation plans, capacity planning, etc., depend on Demand Forecasting.

Demand Forecasting is the critical business process around which strategic and operational plans of a company are devised. Based on the Demand Forecast, strategic and long-range plans of a business-like budgeting, financial planning, sales and marketing plans, capacity planning, risk assessment, and mitigation plans are formulated.

Short to medium-term tactical plans like pre-building, make-to-stock, make-to-order, contract manufacturing, supply planning, network balancing, etc., are execution-based. Demand Forecasting also facilitates important management activities like decision making, performance evaluation, reasonable allocation of resources in a constrained environment, and business expansion planning.

New businesses that don’t have much data about their own sales process may rely on industry averages or educated guesses. On the other hand, more established companies can use their historical data to model future performance. The use of past data to predict future sales has many business use cases.

Problem Statement:

Demand planning systems take a fixed, rule-based approach to forecast and replenishment order management for most retailers.

Such an approach works well enough for stable and predictable product categories but can show its limits regarding Inventory and Replenishment Optimization.

This potential optimization can reduce operational costs by:

* **Inventory Optimization:** matching store inventory with actual needs to reduce storage space needed **(Rental Costs).**
* **Replenishment Optimization:** optimizing replenishment quantity per order to minimize the number of replenishments between warehouse and stores **(Warehousing & Transportation Costs)**

Market/Customer/Business Need Assessment:

Running a business is hard. You never really know how it will all turn out, yet you need to be able to answer questions like these:

How many inventory units do you need to have on hand to be at full stock for each SKU? How often do you project to [replenish inventory](https://www.shipbob.com/blog/inventory-replenishm)? How will those projections change over time? Where do you expect to be a year from now?

Target Specification and Characterization:

This product has a significant application in the E-commerce industry. Without demand, there is no business. And without a thorough understanding of demand, companies cannot make the right marketing decisions spend, production, staffing, and more.

Demand forecasting will never be 100% accurate. Still, you can take steps to [improve production lead times](https://www.shipbob.com/blog/how-to-cut-costs-and-production-lead-times/), increase operational efficiencies, save money, launch new products, and provide a better customer experience.

Applicable patents:

<https://patents.google.com/patent/US8099320>

<https://patents.google.com/patent/EP1350199A4>

Applicable Constraints:

* Small businesses do not have extensive data records, which will continue to be a problem until a company grows to a point where they have enough data. This is even more of a problem for offline businesses because their data is likely not digitized to the capacity it would need to be for an AI solution to drive value for them. One approach is to leverage SaaS/PaaS services, such as the AWS.
* The second hurdle in making AI solutions accessible to small businesses is the user interface of the software or UI. AI software UIs today are complicated for someone who isn’t a data scientist to understand. As mentioned earlier, they are not user-friendly, so a business needs a data scientist to set up, integrate, and manage the software.

Business Opportunity:

A web/mobile application can be created to integrate the ML model. The website can take the data required to predict future sales, which will help the clients. The target clients would mainly be E-commerce businesses.

Concept Generation and Development:

We can use classic ML algorithms like xgboost, LightGBM, or Time-Series forecasting methods like Rolling Means and ARIMA. We can train an ML model, which we can deploy by creating a Flask API. We can integrate this model with a web/mobile application to help the clients.

The data required to train the model can be

* Name of the item
* Price of the item
* Date at which item was sold
* At what branch was the item sold.
* Total sales of the item (Target Variable)
* Use purpose for the item etc

The retailer can input the above-required data to the website; this data will be stored in a database that could be used for training the model.

Conclusion & Future Scope

While this guide provides a stepby2018 step process for identifying, prioritizing, and targeting your best current customer segments, simply following it does not guarantee success. To be effective, you must prepare and plan for the various challenges and hurdles that each step may present, and always make sure to adapt your process to any new information or fe edback that might change its output. Additionally, you cannot force feed this process on your business. If the key stakeholders that will be impacted by the best current customers segmentation process do not fully buyin, then the outputs produced from it will be relatively meaningless. If you properly manage the best current customer segmentation process, however, the impact it can have on every part of your organization — marketing, product development, customer service, etc. — sales, is immense. Your b usiness will possess stronger customer focus and market clarity, allowing it to scale in a far more predictable and efficient manner. Ultimately, that means no longer needing to take on every customer that is willing to pay for your product or service, wh ich will allow you to instead hone in on a specific subset of customers that present the most profitable opportunities and efficient use of resources. That is critical for every business, of course, but at the expansion stage, it can often be the differenc between incredible success and certain failure.