Forecast Enhanced Inventory Management: Utilizing Demand Sensing Techniques to Optimize Stocking

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BUSINESS PROBLEM FRAMING

Leading retail store chains, recognize that a superior shopping experience is key to business growth. Demand forecasting for their fresh food service helps streamline inventory and demand planning while reducing wastage of perishable items.

However, the effectiveness of existing inventory management system is limited by a manual recommendation of order quantity for the finished product in the Fresh Food Service. The inclusion of Digital Order Book (DOB) will improve demand planning.
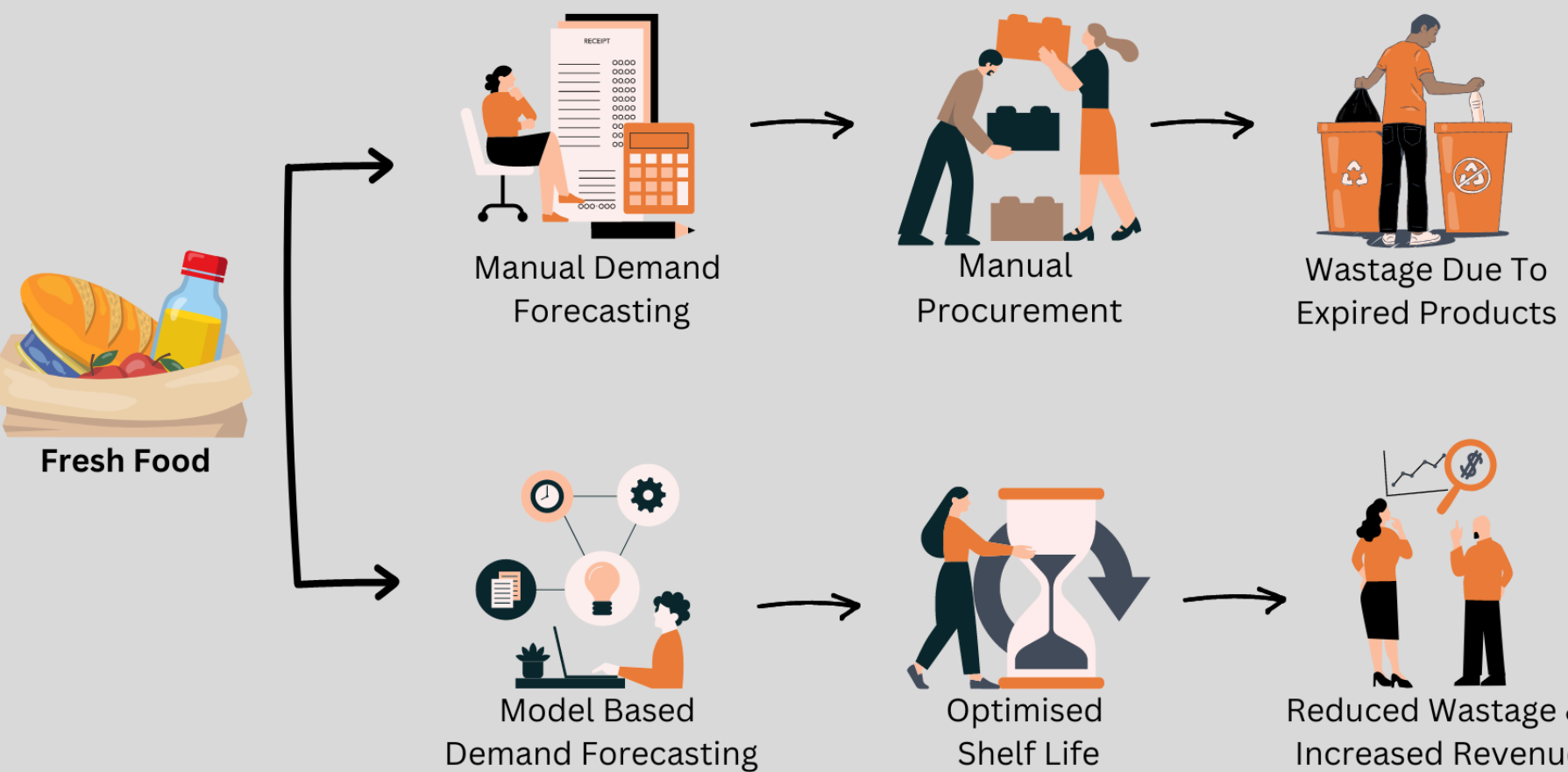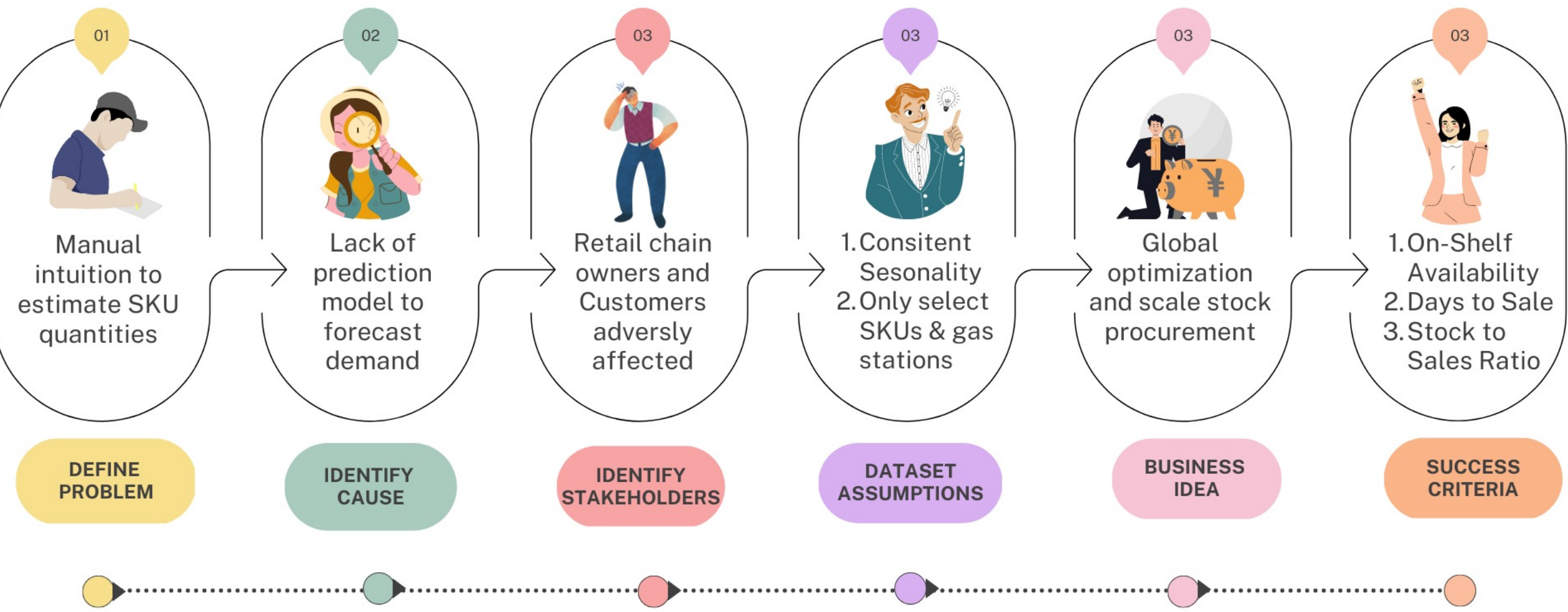

To address this challenge, this solution seeks to develop an innovative solution that leverages advanced analytics to incorporate product-level demand forecasting into the DOB. It will enable store teams to accurately plan their inventory and reduce financial losses resulting from overstocking and wastage.

By leveraging data-driven insights, this analytics tool-kit aims to optimize their operations and deliver a superior shopping experience to their customers.

ANALYTICS PROBLEM FRAMING

| 01 DEFINE PROBLEM	02 IDENTIFY CAUSE	03 IDENTIFY STAKEHOLDERS	03 DATASET ASSUMPTIONS	03 BUSINESS IDEA	03 SUCCESS CRITERIA
Manual intuition to estimate SKU quantities	Lack of prediction model to forecast demand	Retail chain owners and Customers adversly affected	1.Consistent Sesonality 2.Only select SKUs & gas stations	Global optimization and scale stock procurement	1.On-Shelf Availability 2.Days to Sale 3.Stock to Sales Ratio

Legacy processes for inventory management are often manual, time-consuming, and error-prone, resulting in suboptimal inventory levels and wasted resources in contrast to an automated system.

- **Sophisticated end-to-end analytics toolkit** – Data ETL, modelling and forecasting pipelines provide a one-stop solution that delivers fast and reliable inventory.

- **Leveraging advanced analytics and machine learning algorithms** - Ensures real-time insights into demand patterns, enabling store teams to make well-informed decisions and optimizes inventory.

- **Improved employee efficiency and consistent shelf availability** - Retailers can deliver a superior shopping experience, drive business growth and reduce shrinkage.

DATA
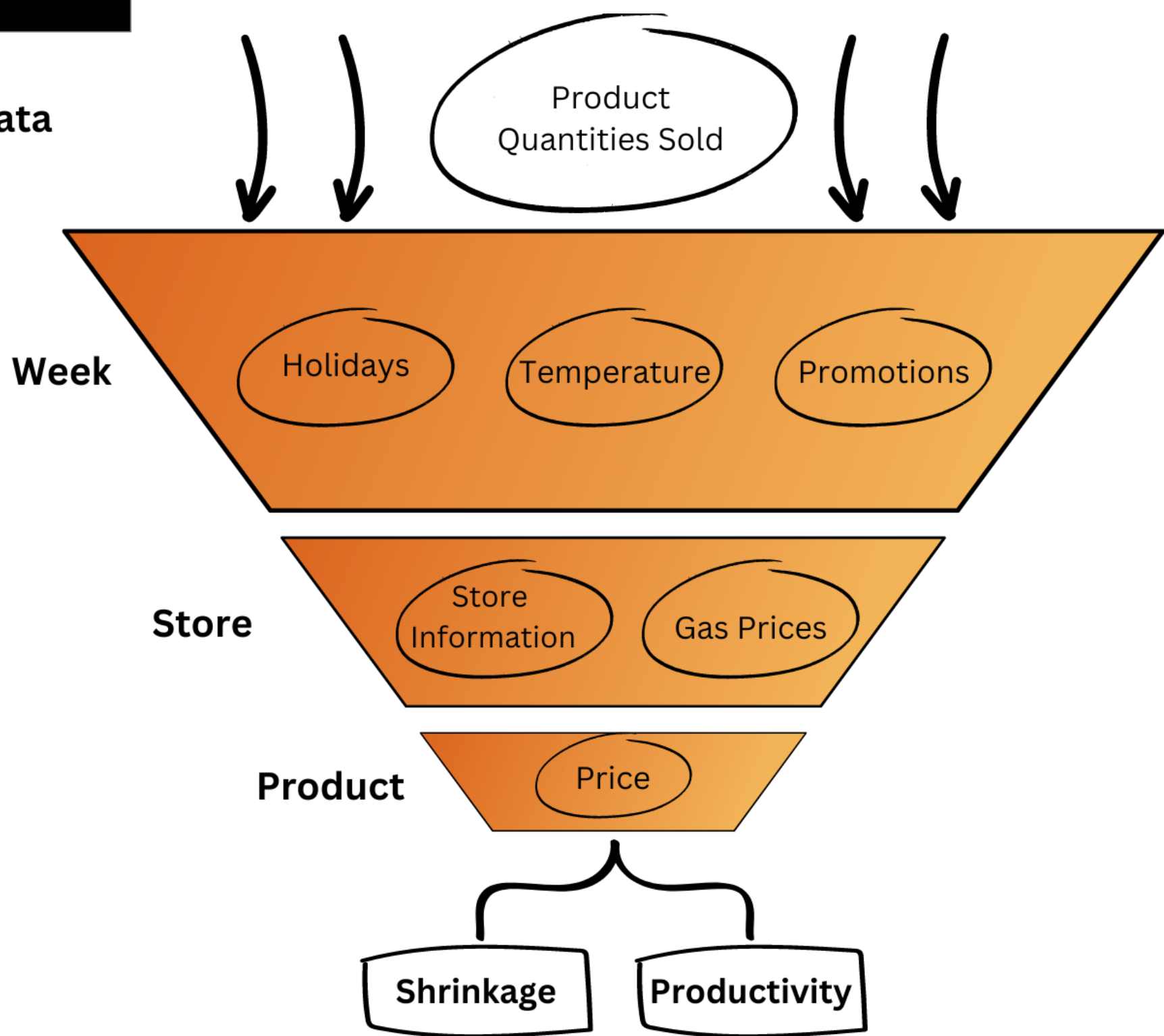
METHODOLOGY

MODEL BUILDING

Our cutting-edge model has evaluated across 200+ stores, for 50 specific perishable products. Model results showcased are for the top products in the most popular store.

- Best models was chosen for every store-product combination based on RMSE.
- Analysis shows that the SARIMAX and LSTM models as the best for the top products.
- With varying performance for other products, it provides the versatility and adaptability of our cutting-edge approach.

| Store	Product	SARIMAX	Holt-Winters	ARIMAX	LSTM
158	536565	1.315	28.651	26.317	1.143
158	536611	9.068	70.206	82.875	3.023
158	536904	3.411	36.787	32.251	1.135
158	537516	0.429	1.135	1.004	0.692
158	537690	17.780	674.676	262.655	12.235
158	537704	2.035	12.653	12.140	1.287
158	537800	7.911	34.496	33.215	4.727
158	538252	14.206	67.325	66.527	21.158

* Results for model simulation for the most popular store and top 10 frequently bought products

Areas of improvement

- Improve the iterations and epochs for better fit.
- Use exogenous variables such as daily footfall, shop size, promotional data, product assortment, vehicles visiting the gas station.
- Larger number of data points will lead to a more reliable forecast, alternatively explore oversampling methods to simulate the same.

DEPLOYMENT & LIFE CYCLE MANAGEMENT

Self Serve Demand Forecasting Toolkit
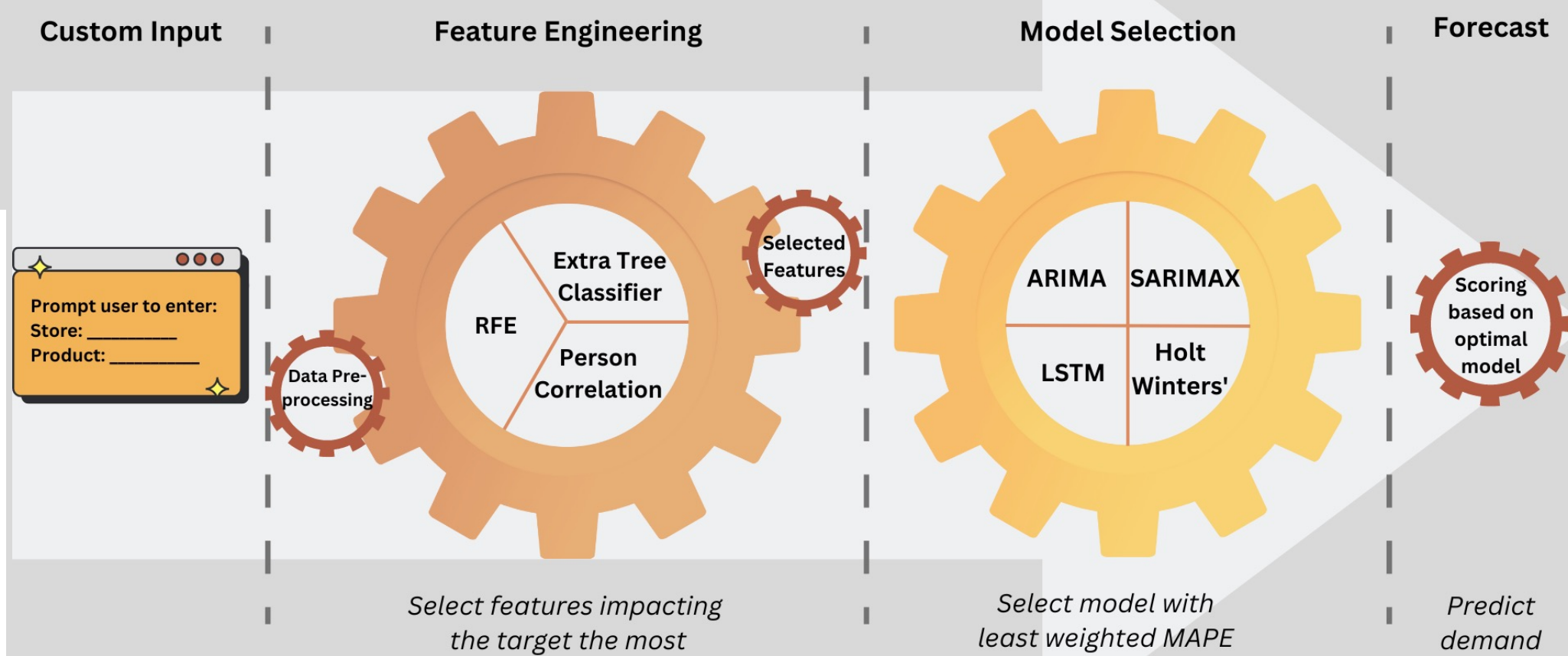
The purpose of this tool is to dynamically select important features for a given combination of product and store to forecast demand for future inventory to avoid wastage of perishable goods and ensure on-shelf availability.
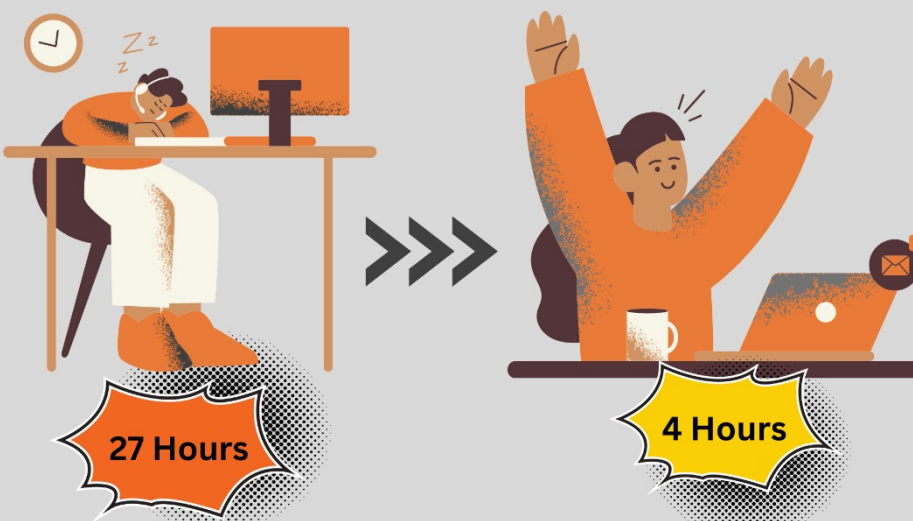
IMPACT

Optimized shrinkage:
- Percentage of inventory that is lost due to spoilage or expiration
- Value of spoiled inventory/the total value of inventory on hand

Average Shrinkage (%)
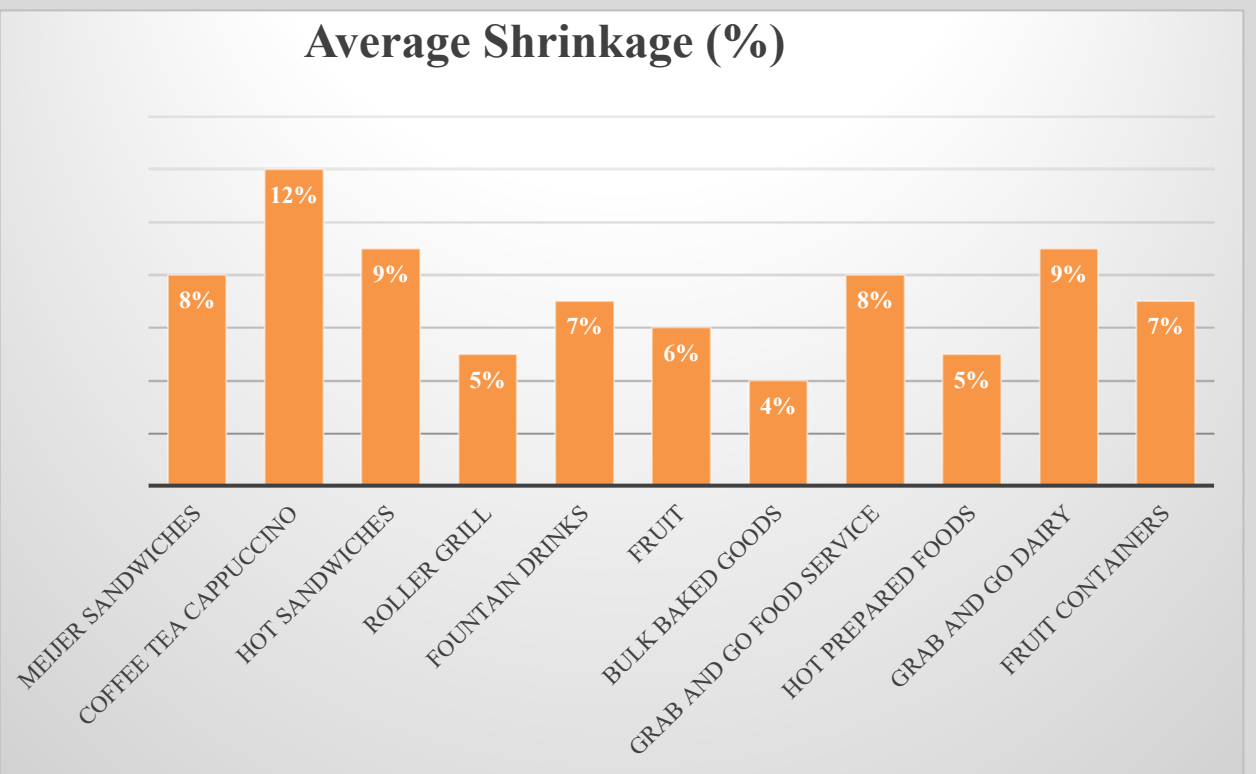
Improved Productivity:
- Reduced time spent on planning order placement
- Increase in availability of time spent for non-inventory processes.

ACKNOWLEDGEMENTS