Demand - Driven Supply Optimization for Noodles -- Leveraging Data Analytics to Enhance Inventory Management and Profitability for FMCG Company

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Business Scenario: A Fast Moving Consumer Goods (FMCG) company has entered into the instant noodles business two years back. Their higher management has notices that there is a miss match in the demand and supply. Where the demand is high, supply is low and vice-versa which as a result as a loss in inventory cost and ultimately loss to the company. Hence, the higher management wants to optimize the supply quantity in each warehouse in entire country.

Goal & Objective: The objective of this exercise is to build a model, using historical data that will determine demand pattern and optimum weight of the product to ship each time from the respective warehouse.

Market Research Phase: The Market Research Questionarise are as follows.

- ✓ Suggest the probable business impact of each independent feature on the target
- ✓ Suggest ways in which the organisation can benefit as a result of analysing the data
- ✓ Suggest missing features that can help with the analysis based on business logic
- ✓ What is the best way to collect data for the suggested features?

Dataset Information:

- ✓ Warehouse_Id: Unique Warehouse id where product is prepared for dispatch.
- ✓ WH_Manager_Id: Manager Id present in the warehouse
- ✓ Location_type: Location of the Warehouse
- ✓ WH_capacity_size: Capacity of the warehouse for production of product.
- ✓ Zone: Zone of the Warehouse
- ✓ WH_regional_Zone: Regional Zone of the warehouse
- ✓ Num_refill_req_l3m: Refilling request received by the warehouse in last 3 months
- ✓ Transport_issue_l1y: No. of transport issued for warehouse in last 1 year
- ✓ Competitor in market: No. of competitor inn the market
- ✓ Retail_shop_number: Number of retail shop who sell noodles produced by the warehouse
- ✓ Warehouse_owner_type: The warehouse is owned by the company or it is on rent
- ✓ Distuributer_num: No. of distributor who works between warehouse and retail shops
- ✓ Flood_impacted: Is warehouse is in flood-impacted area or not
- ✓ Flood_proof: Warehouse is having flood proof indicator
- ✓ Electric_supply: Does the warehouse having proper electric supply along with some power backup
- ✓ Dist_from_hub: distance from the warehouse to production hub
- ✓ Workers_num: no. workers in the warehouse
- ✓ Wh_est_year: warehouse establishment year
- ✓ Storage_issue_reported_l3m: storage issues reported by warehouse in last 3months.

- ✓ Temp_reg_mach: warehouse having temperature regulating machine indicator or not
- ✓ Approved_wh_govt_certificate: Type of approval warehouse having issued by government
- ✓ Wh_breakdown_l3m: Number of times warehouse faces the breakdown in last 3 months
- ✓ Product_wg_tons: Product weight

Research Phase:

- ✓ **Suggest the probable business impact of each independent feature on the target**

  The Dataset contains total 24 columns as mentioned in the dataset information. Out of which 'Product_wg_tons' acts as target column where as other 23 features are independent features. Impact of each independent variable on target column summarize are as follows..

- Warehouse_Id: This is unique identification number of warehouse where product is prepared for dispatch.
- WH_Manager_Id: This warehouse Manager_ID is entirely responsible for assessing demand and supply needs for different zones.
- Location_type: This feature column showed the location of the warehouse. This is very important part of meeting customer needs. It is very difficult to run production processes and transportation of products on time when warehouses are in remote places.
- WH_capacity_size: This feature column express capacity of the warehouse for production. Many corporations set up their manufacturing units depending on state tax, availability of resources, transportation network, suitable environmental considerations, ease of facilities such electricity connections and packaging, etc.

- Zone: This feature column will give us an idea about shipment of product w.r.t zones i.e. [North, South, West, East] etc..
- WH_regional_Zone: Regional Zone of the warehouse where product consignment supposed to shipped. The dataset divided this zones into six different categories such as Zone1, Zone2, Zone3, Zone4 and so on..
- Num_refill_req_l3m: Refilling request received by the warehouse in last three months. This feature column is more beneficial since we can able to track the demand patterns in order to fulfill customer requests.
- Transport_issue_l1y: No. of transport issued for warehouse in last one year. The transportation found to be very important component in order to meet supply and demand for satisfying customer needed. If the maximum transport issues noticed, it clearly indicates that mismatch in supply and demand of the product. The Model must be design in such a way that we can have minimum transport related issues w.r.t various zones and locations.
- Competitor in market: This feature column is highly impact on the target variable since, if number of competitors are more then we must design robust business model, So that business can survive in the competitive market. This can be achieve by using Advertising of the product, Awareness about the product and its benefits on health compared with the competitors food product, Market selling strategies such as giving some discount on product. Our aim over here to capture the market and try to reduce competitors in different Zones so that Organization must be in the profit in terms of operational performance and financial performance.
- Retail_shop_number: The maximum the retailers shop so we can able to reach maximum customers so that availability of the product in market must fulfill customer demands.
- Warehouse_owner_type: This feature column is also important column since depend upon the zone and location or capacity of the warehouse/retailer

business model we can increase company owned warehouse instead of rented warehouse.

- Distuributer_num: Maximum the number of distributors in the market more will be the availability of the product in market. Distribution number also found to be negatively impact on the price of the product. From various Supply chain based case study proves, higher the distribution network higher will be the product cost. So in order to balance this distribution model we need to focus more on the optimization technique so that we can reach to maximum customers with less cost.
- Flood_impacted and Flood_proof: This two features column explain about environmental aspect. i..e Whether the flood is really impact the warehouse product or not. If we design warehouse in flooded location obviously we will have to bare maximum loss. So this feature is very important to decide whether our product warehouse is setup in suitable location or not. Many of the times, it is observe that supply and demands are not matchup because of this reason.
- Electric_supply: This feature column gives an information about electricity connection with power backup facility. This is one of the crucial parameter in warehouse especially for Food products since the food products are stored with specific temperature mentioned as per FDA norms.
- Dist_from_hub: This feature column is equally important since it given an information about the distance from the warehouse to production hub. Higher the distance from warehouse to production hub it will result in increase of product cost per unit.
- Workers_num and Wh_est_year: This two column gives more information about the number of workers working in production plant and establishment year of the warehouse. Ideally maximum the product size more number of

workers required in warehouse in order to loading and unloading the product consignments.

- Storage_issue_reported_l3m: This feature column is extremely important since we can able to understand storage issues reported by warehouse in last three months. With the help of this information, we can able to balance the supply and demand of the product by selecting suitable strategies.
- Temp_reg_mach: [warehouse having temperature regulating machine indicator or not]. This is necessary in order to preserve the food product for longer shell life.
- Approved_wh_govt_certificate: Type of approval warehouse having issued by government
- Wh_breakdown_l3m: Number of times warehouse faces the breakdown in last three months. Lesser the warehouse breakdown, higher can be the chances of smooth product delivery to the customers.

Summary:

The above mentioned attributes cover various aspects of warehouse operations, including location, capacity, demand patterns, transportation, competition, retail presence, ownership, distribution, environmental considerations, electricity supply, workforce, storage issues, equipment, government approval, and breakdowns. Analyzing and optimizing these factors can help enhance operational performance and customer satisfaction in the warehouse management process.

✓ **Suggest ways in which the organisation can benefit as a result of analysing the data**

The product weight in Tonns, is a target variable that influenced by a variety of independent factors. Changing stock levels for factors such as seasonality, product kind, price, warehouse location relative to competitors, and sales history are among them. By considering these characteristics, businesses

may increase their capacity to meet customer requirements and prevent unnecessary hoarding.

We may derive a plethora of information from the dataset characteristics in line with the mandatory required certification for FMCG Companies, such as FDA, etc., from features like unique warehouse ids, positions relative to production facilities, and much more based on the analysis our business model can benefit the organization in terms of….

1. Optimized Operational Performance of the System
2. Improved Financial Performance of the System
3. Smooth Transportation Network to dispatch products to Customers/warehouse in less period.
4. Organization can be integrated with Innovative strategies to aware about the product in competitive market using concept of Digital marketing, Advertising promotional offers / discounts etc..

- ✓ **Suggest missing features that can help with the analysis based on business logic**

From the above analysis the missing features are listed below……

1. Price of the Product
2. Type of the Product selling in competitive market for example: Raw Noodles, Instant Noodles, Preservative Noodles Pack etc…
3. Transportation Network used
4. From above dataset we can easily able to find patterns of the product demand but we need information about the supply so that we can able to match up the predicted model w.r.t Supply
5. Chain of distribution network is not mention in the dataset as this problem belong to supply chain domain. Lesser the supply chain network lesser will be the cost of the product.

- ✓ **What is the best way to collect data for the suggested features?**

1. The Suggested features we may collect from the organization/ client person.
2. If the dataset available on website we may use web scrapping tool to scrap the maximum information.

THANK YOU