CNA Project Summary and Insights

Tables:

(E: Entity describing table)

1. Stores (E): This table lists down the stores in the database.
2. Regions (E): Gives us a list of regions in which stores are present.
3. Store_regions: Gives us a many to many relationship between the store and region entities (one store can operate in multiple regions).
4. Products (E): Gives us a list of products potentially sold.
5. Weather_conditions (E): Indexes weather types usually seen, to relate to weather on a particular day.
6. Seasonality (E): Indexes seasons of the year to relate to seasonality of products.
7. Promotions (E): Indexes promotions like sales wherever applicable to relate with its potential effect on sales.
8. Inventory_snapshots: Holds all actual data, accessing all entity tables above through a one to many relationship.
9. Price_history: This table gives the pricing history by region by accessing the product and region table through one to many relationship indexed by product, region and date.

Analysis Queries:

1. Current Stock Levels: The query returns the stock levels of all products in different stores and regions separately as of the latest update. This helps give an overall view of the distribution of products over stores.

2. Reorder point analysis: Each product-store-region combination is tested based on its current stock and historical statistics and returns the reorder point as “Out of stock”, “Below reorder point”, “Near

reorder point" or "Adequate stock" based on the necessity to restock. This facilitates more efficient restocking of items as and when necessary.

3. Seasonal reorder points: Functions the same as the above query, except the historical data against which stock levels are tested only holds data pertaining to the current season. The output given is one of "Out of stock", "Below seasonal reorder point", "Near seasonal reorder point" or "Adequate stock"

4. Monthly inventory turnover: The monthly inventory turnover, i.e. the number of units sold by the average inventory level, gives us a measure of efficiency of our method of stocking products. The final result lists the product-store-region combinations down by month as "High turnover", "Moderate turnover", "Low turnover" or "No sales" based on the above criteria.

5. Stockout risk analysis: The number of days where product inventory was less than its reorder point are counted to estimate the risk of running out of stock, which is an avoidable and highly undesirable circumstance. The product-store-region combinations are listed as "High risk", "Moderate risk", "Low risk" or "Safe" based on the risk factor.

Summary Reports:

1. Inventory age: This table gives us the age of inventory by product and store as the duration from the last day that stock was replenished to the present day.

2. Stockout rate: Helps us identify how often a product was out of stock in a store as a percentage of the total days.

3. Sell through rate: The number of products sold as a percentage of the weighted average of stock level is returned as the sell through rate, taken monthly by region and by store separately.

4. Average stock level: The average stock level of a given category of products is considered by region on a monthly basis.

5. Dead stock analysis: Products that do not sell much are checked and the number of zero sale days is returned as a percentage by store.

Analytics & Recommendations:

1. 3 month rolling inventory turnover and stock adjustment recommendations:
   Historical data is compared against, and this query can provide user with reorder points data and actively recommend stock management decisions (“Order more”, “Reduce stock” or “Hold steady”)

2. Supplier inconsistencies:
   To highlight issues on the suppliers side, historical data of product-store-region combinations are tracked to check for “Frequent stockouts”, “Erratic ordering” on the recipients side, “Erratic supply” on the suppliers side or just lets the user know the orders were “Consistent” with low variance.

3. Seasonal demand trends:
   The demand for products is checked by store through historical data to give the user an idea of whether demand is likely to go up, go down or remain stable for any given season.

Key Insights & Recommendations

The analysis queries can help to give an immediate overview for daily updates to stocking policies, such as decisions to order more stock on a given day. Moreover, the monthly turnover specifically can also be used to identify fast selling products, which would be ideal to store configuration and product placement decisions. This tool can be further developed to include credentials for store managers where they can access relevant information regarding their own stores.

Summary reports provide inputs to help with decisions involving long term implementation, such as identifying products which are frequently out of stock or those with low demand and so on. These tools can also have hierarchical based clearance to information as the analysis query tools do.

Analytics and recommendation tools consider the data and give the actual data crunching for the user, suggesting a path of action. Further, the supply inconsistency checking tool is critical to management decision and regulation of standards across the supplier-recipient interface. Seasonal trends can also be considered for products having high season dependent variability to give further insight into sales strategies when joined with the other tools.

Data Analysis

Monthly sell through rate: The monthly sell through rate remains stable at about 94%. For the month of January, 2024, we have only one day of data so the data is essentially inadmissible, since limited data availability would include day to day biases. This could be improved through automation methods or a better overview of data as provided above.

Sell through rate, units sold and inventory by region: Sell through rate by region shows similar characteristics to sell through rate by month, so we can conclude that it is uniform overall and a key feature currently used to update stock.
Inventory also seems stable, indicating that a constant, specified inventory level is maintained.
However the sales fluctuate much more, and these traits can be predicted through seasonal demand trends, for example sales in the west seem to dip towards the middle of the year. If we incorporate predictive stocking, we could optimize the inventory and sell through rate.

Product level stock heatmap: The heatmap shows a trend of inventory being below reorder point. This can be rectified by analysing the stockout risk to alter the criteria for reorder point by changing its boundary conditions, or increasing stock size which would affect sell through rate. Further, classifying products as those that can expire or not, and using the product lifetime to compare with inventory age can help in creating an adaptive reorder point query.

Monthly KPIs:

I. Average stock level: Consistent with minor fluctuation. May be affected by seasonal demand trends.
II. Stockout rate: Stable at 0.

III. Inventory turnover: Stable. Adaptive methods can be used to optimise this based on seasonal demand trends and 3 month rolling inventory turnover analysis.
IV. Sell through rate: Stable. Optimisation methods discussed above.

Seasonal demand trends: This shows us an overview of change in demand by category of products over seasons. With enough data, we can extend this to a trend analysis by product, and even to a monthly scale, however an analysis should also be conducted to check if this extension would be efficient.

Inventory status: The size of inventory is tracked by store, and must be proportional to store size. This is an important metric for other types of analysis.
It also provides us with a distribution of products based on their reorder points, and we can see all stores have adequate stock. This could be a result of overstocking, so to optimize the stock such that it is borderline adequate, we can use seasonal reorder points trends to estimate required stock.
While the heatmap showed us that most products are below reorder point, the overall inventory is of adequate stock as the required stock is not simply additive. To ensure adequate stock we must confirm its distribution as well as overall adequacy.