



Getting the right products on the right shelves in over 50,000 stores

SKU Optimization for a Saudi-based CPG company

EXECUTIVE SUMMARY

The customer is a Saudi Arabia-based fully managed consumer dairy and beverage manufacturing company serving primarily in the GCC.

With products in over 55,000 stores across the Middle East, the customer wanted to analyze sales across different stores and optimize the shelf space for each store to stock the right products on every shelf.

The Neal Analytics SKU Assortment Optimization solution was used to determine which products generate maximum revenue at each location and offer recommendations to optimize sales.

Neal Analytics used Microsoft Azure Analytics Services to build 9,000+ machine learning models for a combination of over 50 types of stores across 20 regions.

These models allowed the customer to enhance their SKU portfolio updates every 3 to 6 months, with over 172,000 individual recommendations implemented so far with a significant lift in group margin.



INTRODUCTION

Headquartered in Riyadh, Saudi Arabia, this customer is one of the world's largest vertically integrated dairy companies. They specialize in dairy products and are also known for their juices, foods, yogurts, poultry, baked goods and desserts. Having a diversified portfolio, they wanted to identify which products sell well and which don't across all their stores.

Due to high temperatures in the gulf region, coolers are a necessity and the space within an absolute premium, so optimizing the products inside is key. The customer specializes in the freshest products, which can expire in as little as 5 days. This leads to daily deliveries and constant stock management efforts – an environment ideally suited to regular SKU assortment adjustments.

By determining which products are trending, and changing assortments at a more granular level, they can maximize revenue. As a company, the goal was to increase sales by tuning the product portfolio for every store based on real data for what is performing well in each location.

Neal Analytics helped the customer achieve this goal with the SKU Assortment Optimization solution. This solution was used to build custom models, analyze sales across different-like stores, and provide custom recommendations for each location.



CHALLENGE

This customer supports many levels of trade/store types, with each type selling a different combination of products. They had numerous – But far from individually tailored – Planograms and inconsistent compliance, which limited personalization opportunities.

Comparing data across stores was complicated, as what was being sold and what consumers bought varied from store to store. Additionally, these stores were spread across various regions and have a range of small, medium, large and extra-large store sizes.

In order to create a successful solution, segmentation and clustering would be needed to create reasonable peer groups across these various locations.



SOLUTION

The Neal Analytics SKU Assortment Optimization solution is customizable and value-driven.

SKU Optimization looks across stores for segmentation characteristics, such as region, similar sales, store size and other characteristics, creating reasonable peer groups of similar stores. Assuming or accounting for other factors remaining equal, it then analyzes whether a store sells more or less than similar stores within the peer group that do not carry the product.

By analyzing this data, SKU Optimization can determine which products sell well overall and which don't. This helps identify the revenue-boosting products, which then become a recommendation for similar stores across the business.

Customizing the solution

Neal Analytics deployed a customized SKU Optimization solution for the customer. This involved a series of steps:

- Getting the company's historic sales data up to a modern Azure-based data estate
- Setting up an architecture to analyze and model the data
- Exploring and understanding sales data to derive business-facing insights such as:
 - What kind of products sell well and what kinds don't?
 - What regions perform better in sales?
 - Which business rules can be incorporated into the machine learning models?

Some of these business rules were, for example, that certain products could not be sold in certain regions due to distribution limitations. Conversely, some core products had to be available in stores irrespective of their sales history (good or bad), since they were a signature product of the company. Understanding these rules helped Neal determine what kind of products could and could not be recommended for each store.

Creating groups and categories

Neal's SKU Optimization solution was designed in a way that split the company's products based on various product groups. These product groups were created based on how differently they were stored inside a store.

The customer had four main product groups:

- Coolers (dairy and juice products)
- Poultry
- Baked goods
- Food (more durable items like canned and bagged snacks)

Neal's data scientists analyzed the sales data for each of these product groups and split it across the summer and winter seasons. They built eight SKU Optimization model groups – one model for each product category for the two seasons (summer and winter).

Special models were also created for the Ramadan period to account different consumption patterns during that time.

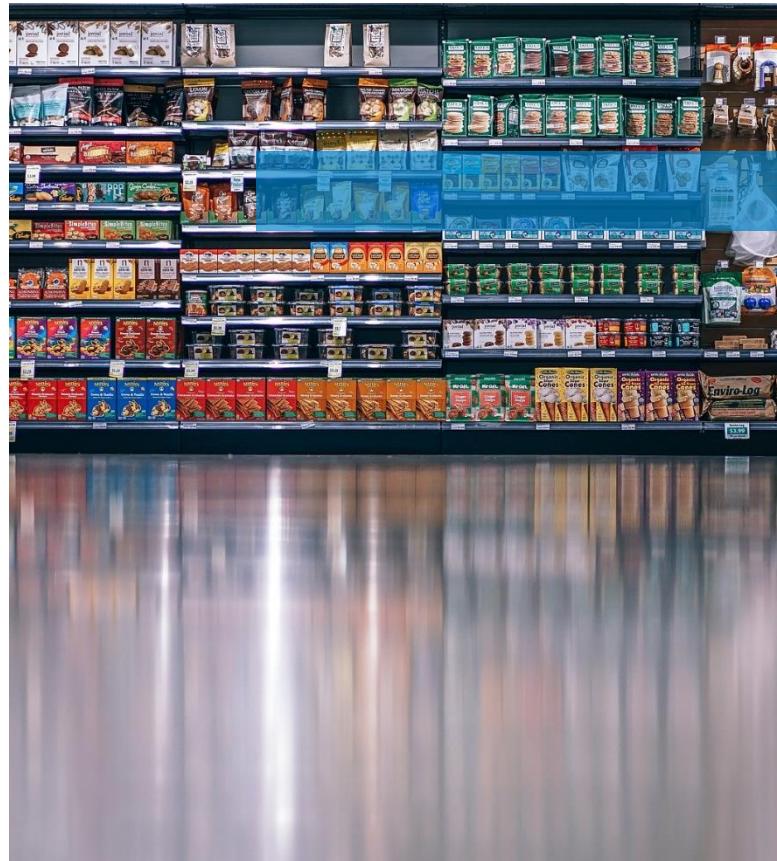
For each season, Neal data scientists picked a store category and analyzed data for the last 5 years. They looked at what type of products were sold, what consumers were buying, and then categorized them by:

- Region
- Store type
- Store size

After analyzing the sales data, Neal identified and compared stores of similar nature – similar not by what they offer, but by what consumers buy from these stores.

For example, a store can sell 50 products, but consumers may end up only buying 30 of those products on a regular basis.

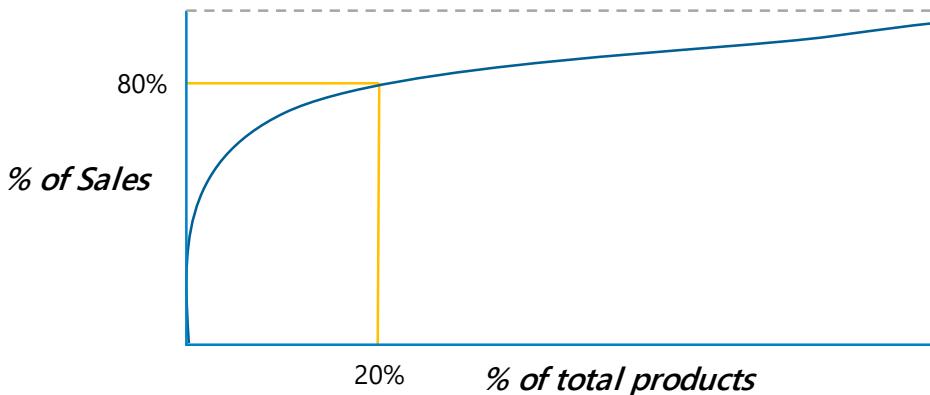
This information helped Neal identify a pattern and run a comparison across stores of many different varieties. Neal built more than 9,000 individual machine learning models to account for the summer and winter seasons, the 50 types of stores across 20 regions, and the various sizes of each store.



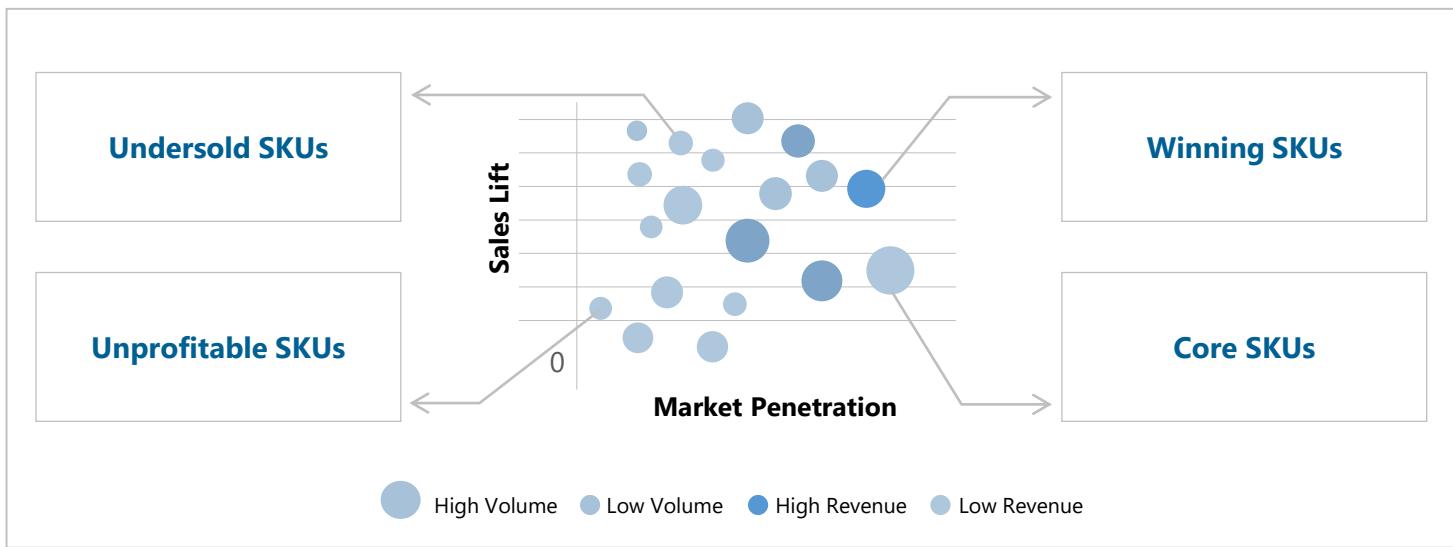
Identifying core SKUs and opportunities

By studying the sales of each store and applying business logic, Neal Analytics was able to provide custom recommendations for each store and shelf.

The driving factor behind the SKU Optimization solution for this customer is the notion that 80% of their sales comes from 20% or less of their products. These are the **core SKUs**.



A product is categorized as a core SKU if it sells well consistently through the years, and if the sales are consistent in volume. Identifying these core products helps businesses identify which products should be put on their shelves first. Neal Analytics also helped the customer identify where their core products were not being distributed and where these products would have a positive impact on sales.



Next up are **winning SKUs**, which are growing SKUs which have proven performance in some markets but are not well distributed. **Undersold SKUs** are the diamonds in the rough. These are performance outliers, that haven't been tested in broader markets yet, making them good candidates for market tests.

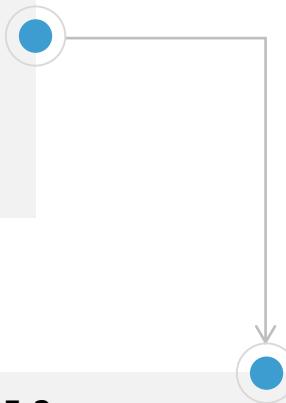
Finally, there are **unprofitable SKUs**, which, whether established or not, are not performing in a large portion of stores. These would be the first to go if the customer needed to make room for other products on the shelves or in the coolers.

Neal Analytics' modeling approach

Neal Analytics took a two-phased modeling approach.

PHASE 1

Phase 1 of the modeling approach was to define clusters. Each cluster was built using a variety of dimensions including store layout, size, revenue bracket, surrounding demographics, socioeconomics, and, of course, what products were sold.



PHASE 2

Once the segments were defined, the team ran the optimization algorithm for each store to compare sales with their clusters for Phase 2. Assortment recommendations were then pushed out to the handheld devices for each of their thousands of delivery associates by integrating with their existing solution.

Challenging factors

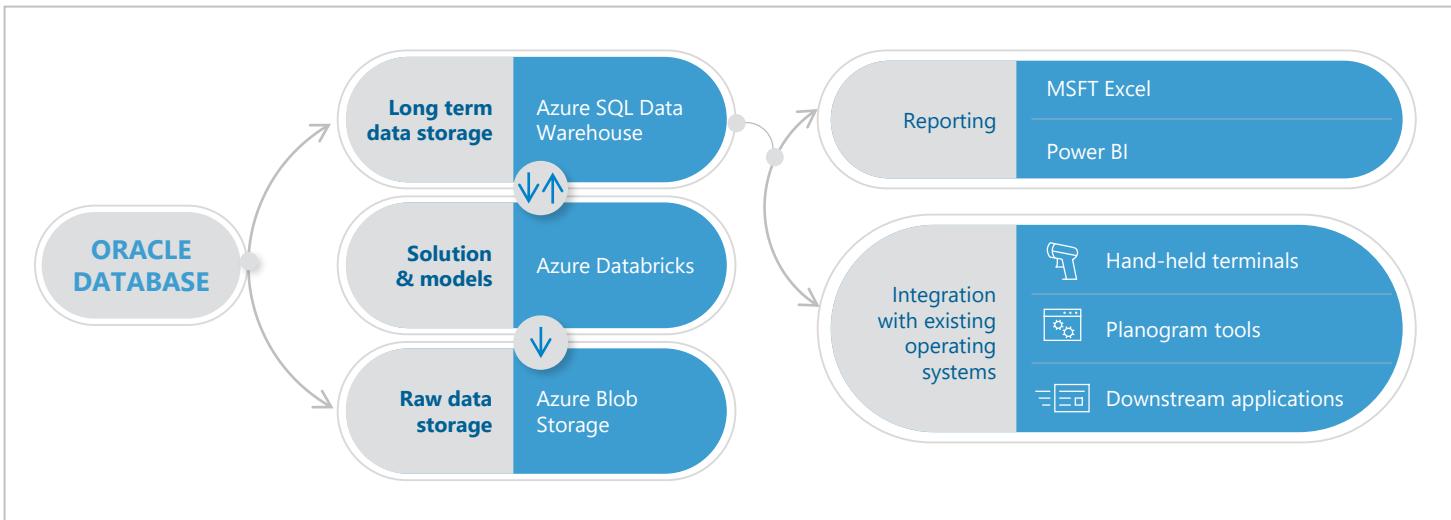
As it happens with most data-driven initiatives, a key challenge for this project was data. After categorizing each store by type and region, not every combination of store type and region had enough data.

For example, there may be no extra-large (size) grocery stores (type) in Rhode Island (region) and only two large stores, which may or may not be of the same type. For such scenarios, Neal built a logical hierarchy to prioritize for what was important to the customer and what could be dropped while comparing stores. Using this hierarchy, store size would be dropped first, then region and then store type.

In our example above, the models would first drop the store size (extra-large and large) and look only at the store type (grocery). If there was enough sales data for similar types of stores, then the model would still work and provide targeted recommendations for those stores.

These hierarchical rollups ensured that, while not all stores were able to get fully unique assortment recommendations, each store was still able to receive some level of optimization.

Functional architecture



Before any analysis could happen, it was critical to build a modern data platform for data scientists to build models that could be used effectively by the stores.

The customer's existing data lived in an [Oracle database](#). Neal Analytics created a two-pronged data storage architecture:

- Raw data is stored in [Azure Blob Storage](#) for archiving, providing the customer with a sales data cloud backup
- Long term data is stored in [Azure SQL Data Warehouse](#).

The solution and models were built on the [Azure Databricks](#) platform that uses the Azure SQL Data Warehouse as its data source. These models were archived in Azure Blob Storage, as well as the data warehouse that then served as a source for all reporting through everything from simple Microsoft Excel exports and advanced [Power BI](#) dashboards.

The data warehouse was then integrated with the customer's various existing operational systems that support their hand-held terminals, planogram tools, and other downstream applications.

RESULTS

Neal Analytics did an initial in-market test with the customer out of their office in Riyadh, Saudi Arabia, to check which sales increased or decreased after deploying their solution as a pilot.

The business found a 1-2% increase in overall sales receiving recommendations vs the control group for the pilot covering majority of the stores across Riyadh, an increase representing a potential increase of tens of millions of US dollars yearly revenues. Looking at this test results positive impact, the customer decided to broadly deploy the Neal Analytics SKU Optimization solution.

After successfully deploying the solution across all stores, all locations now receive store-level recommendations about the most profitable products to add on the shelves.

Neal Analytics has continued to support the solution in production to ensure that the portfolio continues to evolve as consumer preferences change and looks forward to an ongoing partnership with this customer as they continue to lead as innovators in their industry.

Learn more about SKU Optimization at <https://go.nealanalytics.com/appsource-skuopt>