# Redesigning Dry Grocery Category Adjacency

Walmart
Save money. Live better.

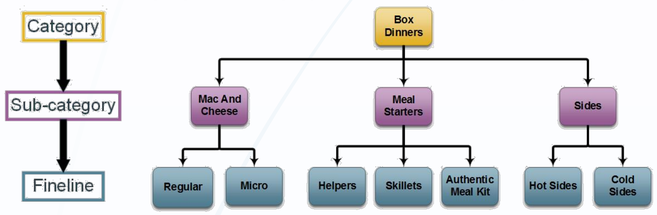
University of Arkansas
College of Engineering

## Intro

This project is centered around improving the Walmart shopping experience by rearranging the products in the Dry Grocery Department. Dry Grocery contains all pantry type food items such as pasta, cereal, and baking goods. The team used market basket analysis and modeling techniques to mathematically articulate how the current layout is performing. A new layout was created by utilizing transactional data to understand what categories are frequently bought together. In addition to this new layout, a decision support tool was developed so that Walmart can make similar decisions for layouts in the future.

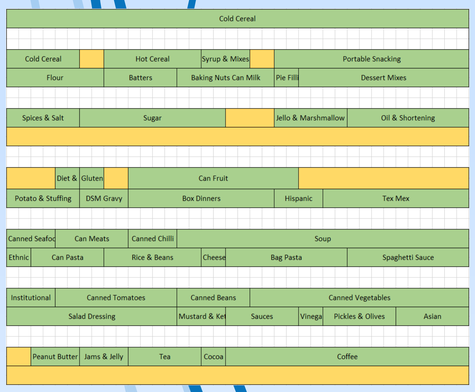
## Background

Walmart's grocery department is broken up into three levels; category, sub-category, and fineline. An example of this is shown below. This project is focused around arranging the category level within the dry grocery section.




This team was given transactional data on the fineline level from 12 stores across the country over a one year period. One thing that Walmart stakeholders expressed was the need to keep the layout logical for customers walking through the store.

## Objectives and Scope

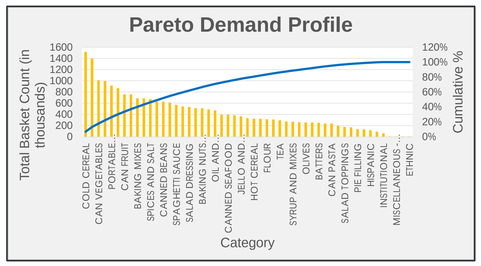



The primary objective is to develop category adjacencies that provide the customer with a more efficient shopping experience.

= Dry Grocery
= Other Departments

This project was constrained with making no changes to any department that was not Dry Grocery. In total, Dry grocery contains approximately 50 categories per store.

## Data Analysis



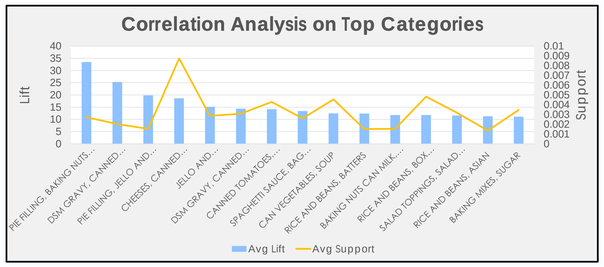

To understand the pairwise relationship between categories, the team performed a market basket analysis and calculated the following association metrics for each category pairing.

$$\textbf{Support} = \frac{Number\ of\ baskets\ containing\ items\ X\ and\ Y}{Total\ number\ of\ baskets}$$

$$\textbf{Confidence} = \frac{Number\ of\ baskets\ that\ contain\ item\ X\ and\ Y}{Number\ of\ baskets\ that\ contain\ item\ X}$$

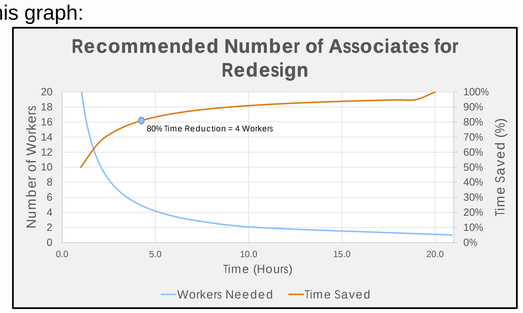
$$\textbf{Lift} = \frac{Confidence}{Support}$$

Lift is the most important part of affinity analysis and the higher the lift, the stronger the correlation is between those items.




## Cost Analysis

The main cost that can be quantified for this project is the time and workers needed to make these changes. Walmart provided a tool to calculate man-hours which resulted in this graph:

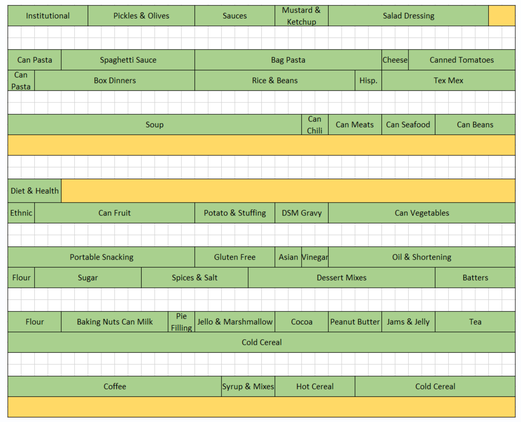



Broken down, This comes to roughly 21 man-hours or $260 per store. The goal of this project was to make Walmart's shopping experience more efficient and enjoyable for the customer. This value added to the Walmart experience is hard to quantify, but it certainly aligns with Walmart's goals.

## Modeling

It was important to model the store layout in Excel so that it was simple to create, update and understand. To model the actual distances between categories within the store layout the team created a matrix of distances based on every possible category centroid.


Then the max lift values were compiled for each pair and the team developed a greedy heuristic to determine which categories should be placed next to each other. Using this list, the team then placed these categories in the aisles, resulting in the new layout shown below.




Finally the team was able to use an activity relationship chart to calculate the efficiency of our proposed layout compared to the old one. The team defined a metric for the relationship value $\frac{lift}{distance}$ to include lift and distance. The new layout realized an improved efficiency from 70% to 77%.

## Decision Support

The decision support tool implemented with this allows the user to analyze data from any store number or proto number in their database. They then select which department and category within that department that they want to analyze and the tool gives the user a list of the top 10 highest correlated categories with the selected category.

| User Selections: | | | Highly Correlated Categories: | Lift |
|---|---|---|---|---|
| Store Number: | 1 | | DSM GRAVY | 12 |
| Department Number: | 92 | | JAMS AND JELLY | 13 |
| Category Name: | TEA | | INSTITUTIONAL | 26 |
| | | | SUGAR | 14 |
| | | | PEANUT BUTTER | 15 |
| | | | CAN FRUIT | 56 |
| | | | GLUTEN FREE | 9.9 |
| | | | COLD CEREAL | 9.4 |
| | | | CANNED SEAFOOD | 19 |
| | | | OIL AND SHORTENING | 10 |