

# Optimal Dynamic MVPs

## CCSWB - MIT, 2022 Collaboration

**AUGUST 15, 2022**

**BY: IVY ZHANG AND PEGGY WANG**



**ARCACONTINENTAL**

*Coca-Cola* **SOUTHWEST  
BEVERAGES**

# Problem Statement

## Current approach to MVP's



By Trade Channel



Updated yearly



Determined by business insights



## Opportunities

- What if 2 supermarkets have different demand?
- What if we want MVP's to adjust seasonally?
- How can we make use data to inform MVP's?



## Goal



### Customization

Multiple MVP portfolios per trade channel



### Dynamic

Can be updated monthly, quarterly, bi-annually, etc.



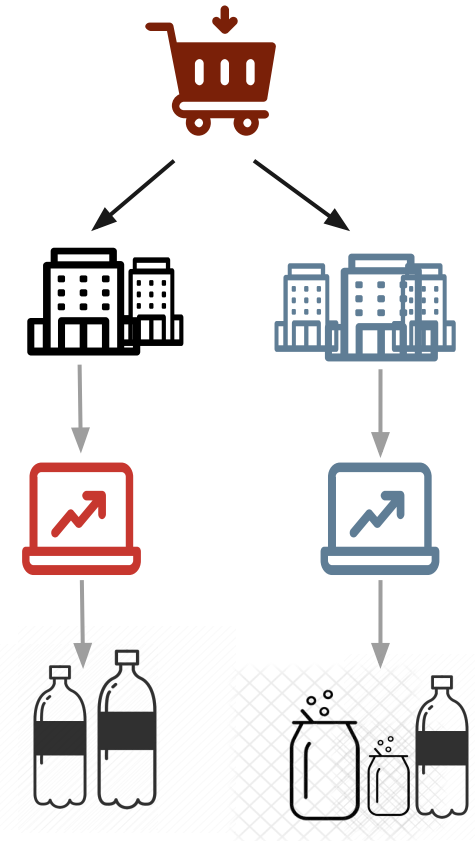
### Data-Driven

Determine with optimization, considering historical demand

# As a solution, our objective is to create dynamic customer-level MVP portfolio that secures optimal levels of Gross Profit in 3 steps: Customer Segmentation, Forecasting, and Optimization

## Methodology for each trade channel:

1. **Cluster** stores by **demographics** and **sales demand** in 2 steps
2. Predict gross profit and **purchase probability**, by product
3. **Assign** MVP's using Optimization
4. **Adjust** based on seasonality
  - Rerun the assignment algorithm at least two times a year to account for changing demand



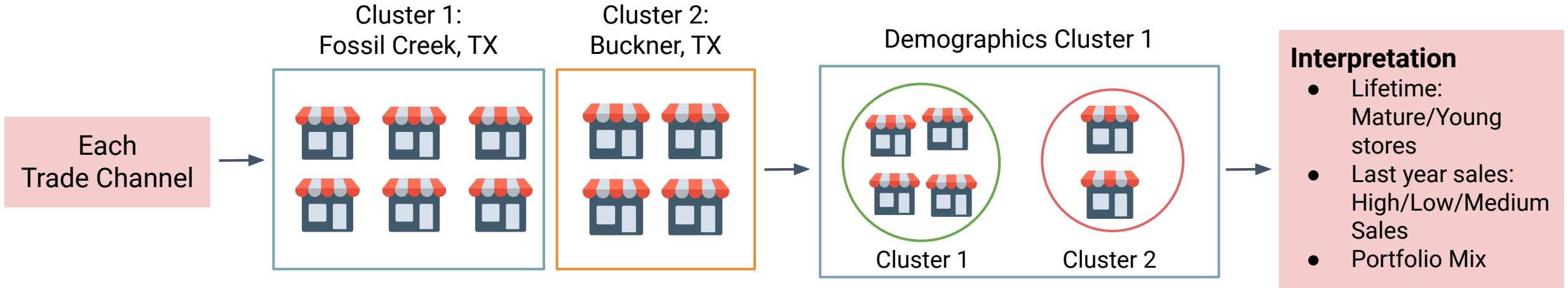
4200 Home Market Retailers  
in Dallas-Fort Worth

4 Trade Channels: Supermarket,  
Superette, Convenience, Drug

Transactions from  
past **24 months**



# Methodology Step 1 – Clustering



1. Clustering stores based on **demographics information:**
  - a. Sales Office, Population, Income, Age Distribution

2. For each area, cluster stores based on **past sales:**
  - a. Last year sales volume/gross profit
  - b. % of sales in each beverage category
  - c. % change in sales across years



# Example: Mature Customers – High Sales Supermarkets in Fossil Creek



**94**

Stores

**24**

Years Average  
Lifetime

**\$226k**

Average Yearly  
Revenue



# Methodology Step 2 – Prediction: Sales Propensity and Gross Profit

Average Out-of-sample AUC

**0.91**

Average Out-of-sample R<sup>2</sup>

**0.86**

Linear Regression  
Decision Tree  
Random Forest  
XGBoost

Machine Learning Models

Feature Selection

All Features  
LASSO Selection  
PCA

Ensemble Model

Evaluation

AUC  
R<sup>2</sup>

Best Model

Last 1, 3, 6,  
12, 24 Months  
Average Profit  
and Volume

Baselines:  
Average over  
past sales



# Methodology Step 3 – Optimization: MVP Product Assignment

## Input:

- Gross Profit, by product by customer
- Sales propensity: probability of a customer buying a product

**Objective:** Maximize the expected gross profit

$$\text{Expected Gross Profit} = \text{Predicted Gross Profit} \times \text{Predicted Propensity}$$

## Constraints:

- Same size as the current portfolio
- Portfolio variety based on market trends and past sales

**Output:** List of core products to be included in a store's portfolio (only suggest products, not volume)

- Eg. Coca-Cola, 12 oz., Glaceau Smartwater, 33.8 OZ



**Initial experiments have shown that updating the portfolio twice a year would have secured 4.3% more gross profit on average from June 2021 to May 2022.**

## Backtesting Process and Results

Average Incremental Gross Profit Secured

**+4.3%** per Channel

Run our models 2x to obtain optimal MVP portfolio for June and December



Use June portfolio from June 2021-November 2021;  
December portfolio: December 2021-May 2022



Compare profit captured between our solution and the current approach

Trade Channels	% of Actual Gross Profit Captured (Time period: June 2021 – May 2022)	
	Current static MVP Portfolio	Optimal Dynamic Portfolio (updated bi-annually)
Supermarket	87.6%	<b>92.7% (+5.1%)</b>
Superette	91.4%	<b>91.8% (+0.4%)</b>
Convenience	86.8%	<b>90.7% (+3.9%)</b>
Drug	83.1%	<b>90.9% (+7.8%)</b>





# The optimal portfolio would have secured 5.4% more gross profit for the High Sales Supermarkets in Fossil Creek in June 2021

Example: High Sales Supermarkets in Fossil Creek in June 2021

**62**

Products

**+5.4%**

Gross Profit Secured

**=**

**+\$102K**

Secured by Optimal MVPs  
in June 2021, USD

Overlap with the Current Portfolio

+

New Opportunities Captured by the Optimal Portfolio

**44**  
Products

8oz/6pk



12oz 12/20/24pk



2L



16.9oz/MP



15oz



2L



12oz/MP



16.9oz/6pk

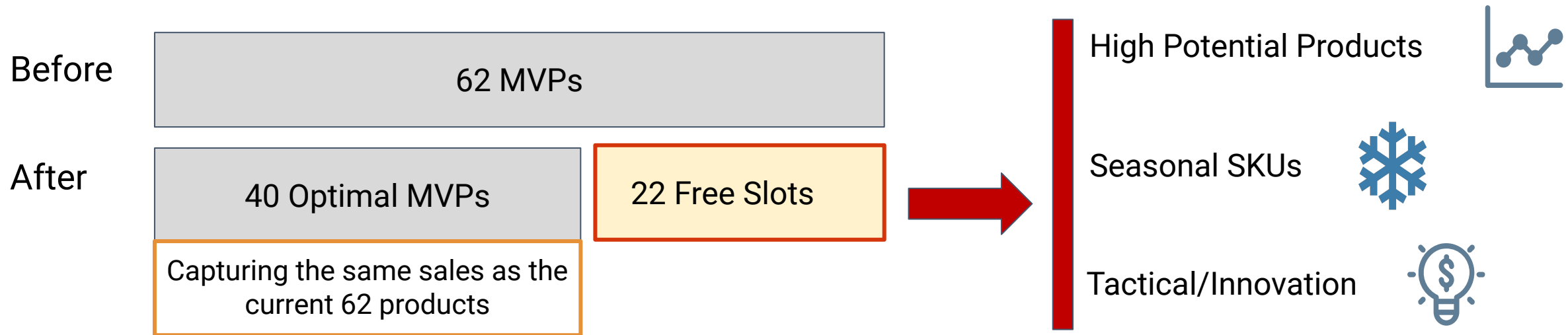


9.1%  
gross profit  
captured



Testing has shown that optimal portfolio can secure the same sales percentage with a smaller portfolio size, leaving room for products that the business wants to push.

**Example: High Sales Supermarkets in Fossil Creek**



High Potential Products: Products that have **high sales among a store's neighbors** (similar area, sales activity).  
Sales Potential = Average of neighbors' sales - store's sales



# Thank you!



**ARCACONTINENTAL**  
*Coca-Cola* SOUTHWEST BEVERAGES

**MIT**  
**MANAGEMENT**  
SLOAN SCHOOL