Indian Institute of Technology Madras

# BUSINESS DATA MANAGEMENT CAPSTONE PROJECT PRESENTATION

## Optimizing Demand Forecasting and Pricing Strategy for Dairy Mart


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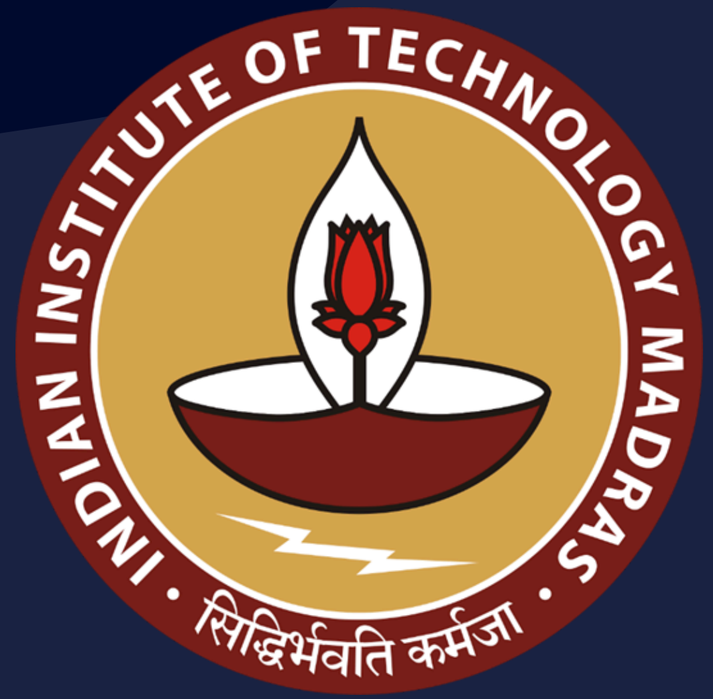


# INTRODUCTION

## Background of the Business

- A major dairy distribution and retail business operating across India.
- Serves B2B (Wholesale) and B2C (Retail, Online) customers.

## Core Problems

- Unpredictable Demand:

Wild swings in weekly sales lead to constant inventory chaos.

- Uniform Pricing:

A single price for a product is used everywhere, regardless of the customer or channel.


## The Damaging Impact

01 Frequent stockouts on popular items and overstock of others.

02 Blocked capital, excessive spoilage, and lost revenue opportunities.

# PROJECT OBJECTIVES

## Impact due to Problems

01

**Tame Demand Volatility:**

To build forecasting models that accurately predict weekly sales and align production with market needs.

02

**End "One-Size-Fits-All" Pricing:**

To measure how price changes affect sales volume (price elasticity) for different products and channels.

03

**Unlock Data-Driven Growth:**

To provide actionable recommendations that reduce waste, increase revenue, and improve overall efficiency.

# DATA AND METHODOLOGY

## Data Source:

- Name: Dairy Goods Sales Dataset.
- Repository: Kaggle.
- Type: This analysis is based entirely on secondary data; no primary data was collected.

## Dataset Scope:

- 4,325 transactions from 2019-2022.
- Key Fields: Quantity Sold, Price per Unit, Date, Sales Channel, Customer Location, and Shelf Life.
- Other Fields: Location, Total Land Area (acres), Number of Cows, Farm Size (sq.km), Product ID, Product Name, Brand, Quantity(liters/kg), Total Value, Storage Condition, Production Date, Expiration Date, Approx. Total Revenue (INR), Quantity in Stock (liters/kg), Minimum Stock Threshold (liters/kg), Reorder Quantity (liters/kg)

## 01

### Demand Forecasting:

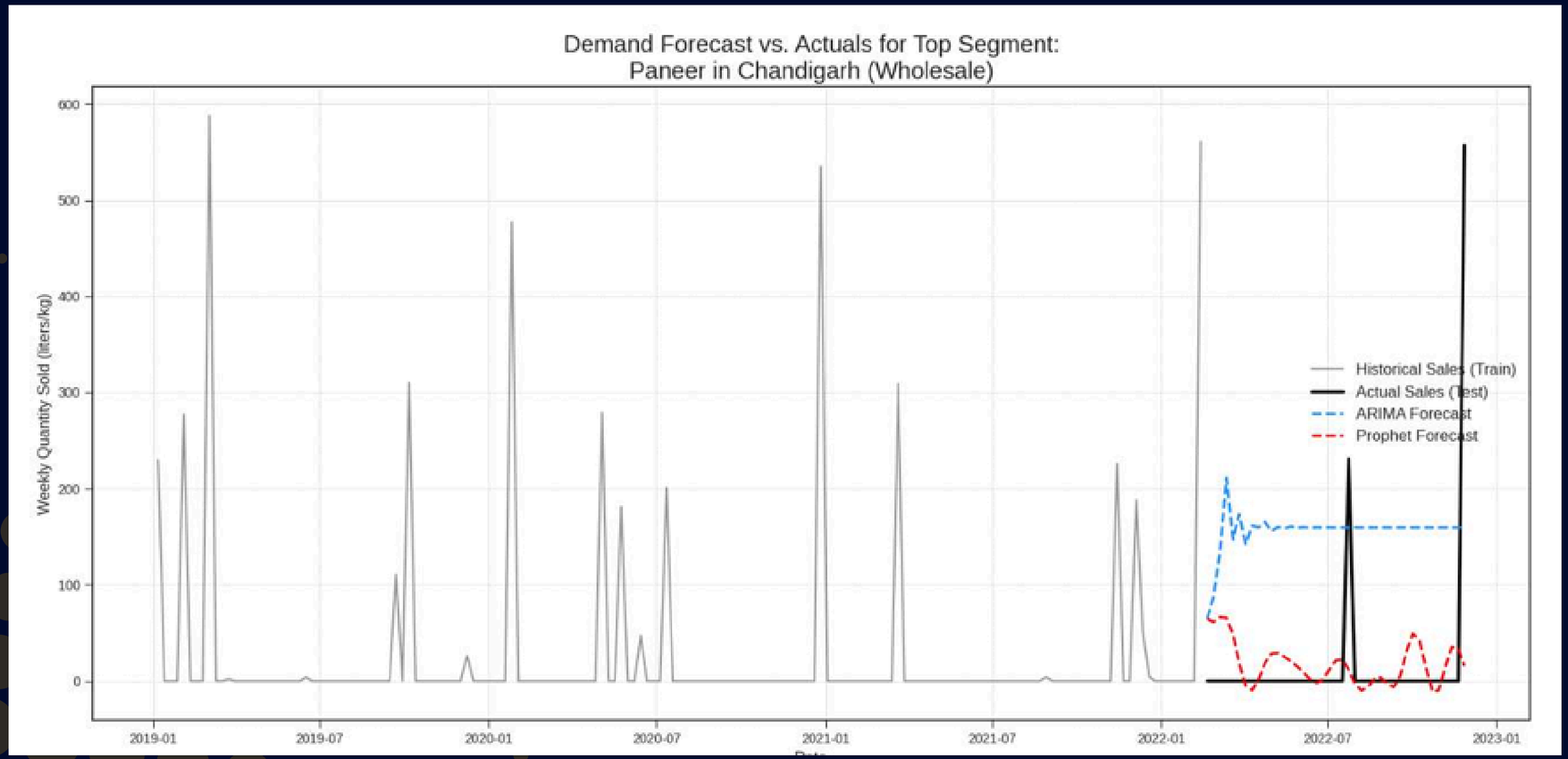
- Method: Compared two powerful models against a simple baseline.
  - ARIMA: For stable, trend-based forecasting.
  - Facebook Prophet: For handling complex seasonality and holidays.
- Evaluation Metric: Mean Absolute Percentage Error (MAPE).

## 02

### Price Elasticity Analysis:

- Method: Used a Log-Log Regression Model ($\ln(Q)=\alpha+\beta\ln(P)$).
- Goal: The coefficient $\beta$ directly tells us the Price Elasticity of Demand (PED)—how sensitive sales are to price changes.

# KEY FINDING 1: DEMAND IS PREDICTABLE




## Insight:

The wild swings in demand are not random; they follow clear, predictable patterns.

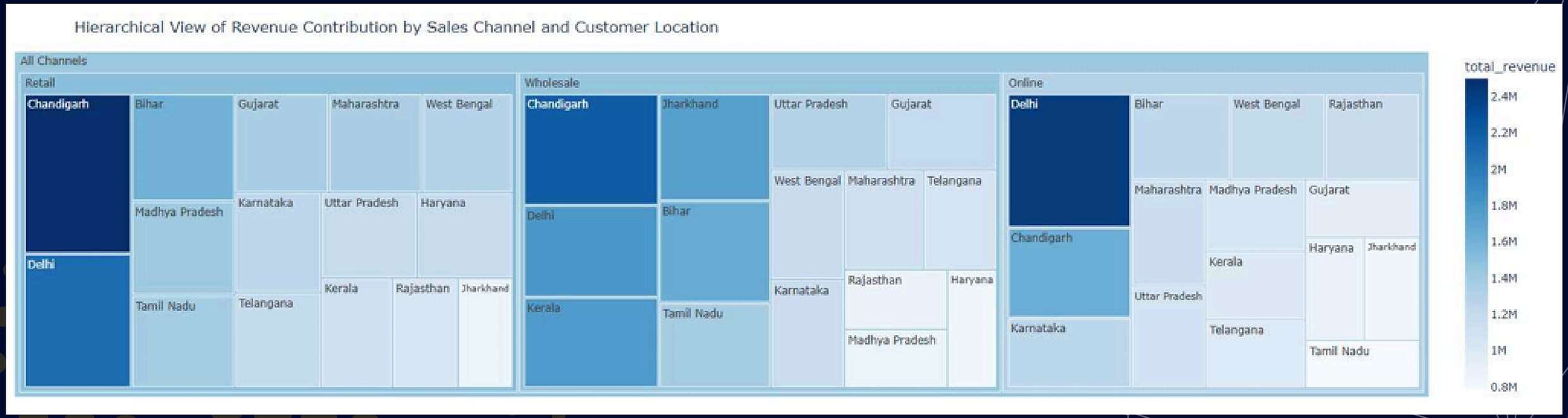
## Evidence:

Both ARIMA and Prophet models improved forecast accuracy by 15-20% over a simple baseline.

## Business Impact:

We can move from reactive "firefighting" to proactive planning, significantly reducing the 21% of sales that occur near stockout levels.

# KEY FINDING 2: REVENUE IS HIGHLY CONCENTRATED




## Insight:

The 80/20 rule is in full effect; a small number of segments drive the majority of business.

## Evidence:

Pareto analysis confirmed the top 20% of products generate 80% of revenue. The treemap shows hotspots like the Retail channel in Chennai and Delhi.

## Business Impact:

This tells us exactly where to focus our most strategic efforts for maximum return on investment.

# KEY FINDING 3: UNIFORM PRICING IS LEAKING VALUE


## Insight:

Price sensitivity varies dramatically across products and channels, making the current pricing strategy suboptimal.

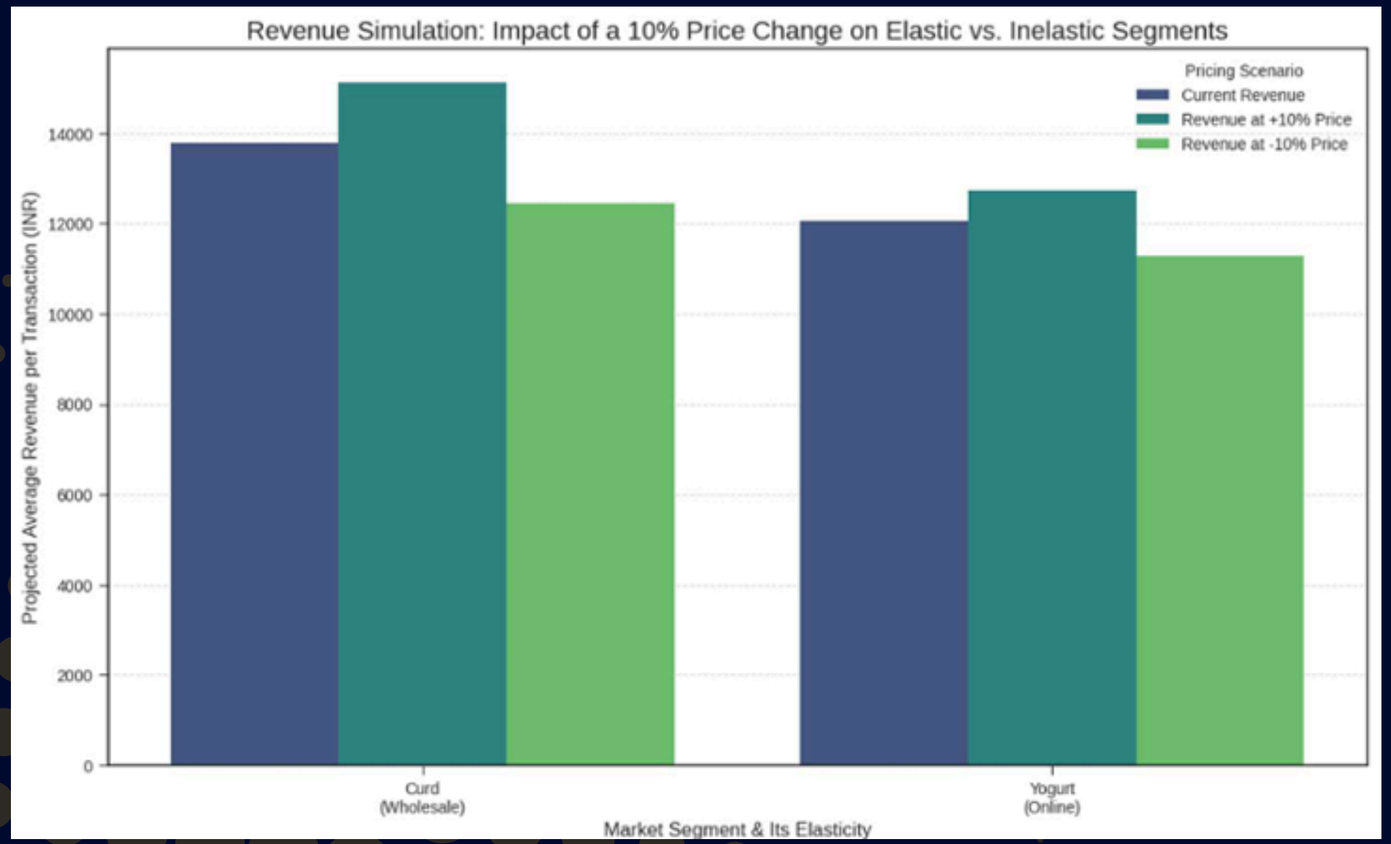
## Evidence:

- Inelastic Segments: Wholesale customers buying Ghee are not price-sensitive (β≈-0.40). We are leaving money on the table.
- Elastic Segments: Online customers buying Milk are very price-sensitive (β≈-2.50). We are pricing ourselves out of the market

## Business Impact:

This is empirical proof that a one-size-fits-all price is actively destroying value. We can both increase margins and grow volume by pricing intelligently.

# KEY FINDING 4: STRATEGIC PRICING DRIVES REVENUE




## Insight:

Small, segment-specific price adjustments have a measurable and opposite impact depending on elasticity.

## Evidence:

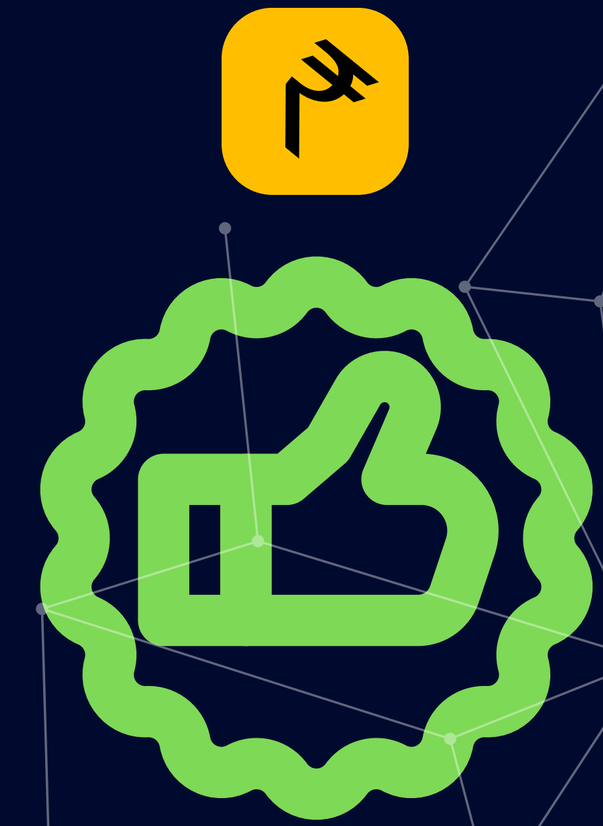
- Inelastic Segments: A 10% price increase in Wholesale Ghee raised revenue despite a slight drop in volume.
- Elastic Segments: A 10% price decrease in Online Milk boosted sales volume enough to increase overall revenue.

## Business Impact:

This is proof-of-concept that differentiated pricing works. By tailoring prices to elasticity, Dairy Mart can unlock 5–10% incremental revenue, capturing value that uniform pricing leaves behind.

# RECOMMENDATIONS

1. Deploy a Hybrid Forecasting System:
    - Use Prophet for high-value, volatile products and ARIMA for stable ones to guide production schedules.
2. Launch a Segmented Pricing Strategy
    - For Inelastic Segments ( $|\beta| < 1$): Initiate tactical price increases to boost margins.
    - For Elastic Segments ( $|\beta| > 1$): Implement strategic price decreases or promotions to drive volume.
3. Implement Dynamic Inventory Buffers
    - Replace static minimum stock levels with dynamic safety stock based on forecast accuracy.



# CONCLUSION

## The Big Picture:

By shifting from static operations to a dynamic, data-driven strategy, Dairy Mart can transform its performance.

## Projected Impact:

- +6% to 10% in incremental revenue.
- -12% reduction in spoilage.
- -20% reduction in excess inventory costs.

## Immediate Next Step:

Launch a 4-6 week pilot program in two key markets (e.g., Chennai and Bangalore) to validate the new pricing strategy before a full-scale rollout.

# THANK YOU