ANALYST PROJECT

DELIVERY PERFORMANCE

This report presents a data-driven analysis for Cybertruck, a company specializing in the distribution of finished goods such as dairy products, beverages, and other fast-moving consumer goods.

Outline

Cybertruck

1 Introduction

- Tools used: SQL, Python, Tableau
- **Schema design** for analysis
- **ETL process:** transform OLTP data into OLAP

2 Build Dashboard

- Build interactive dashboard
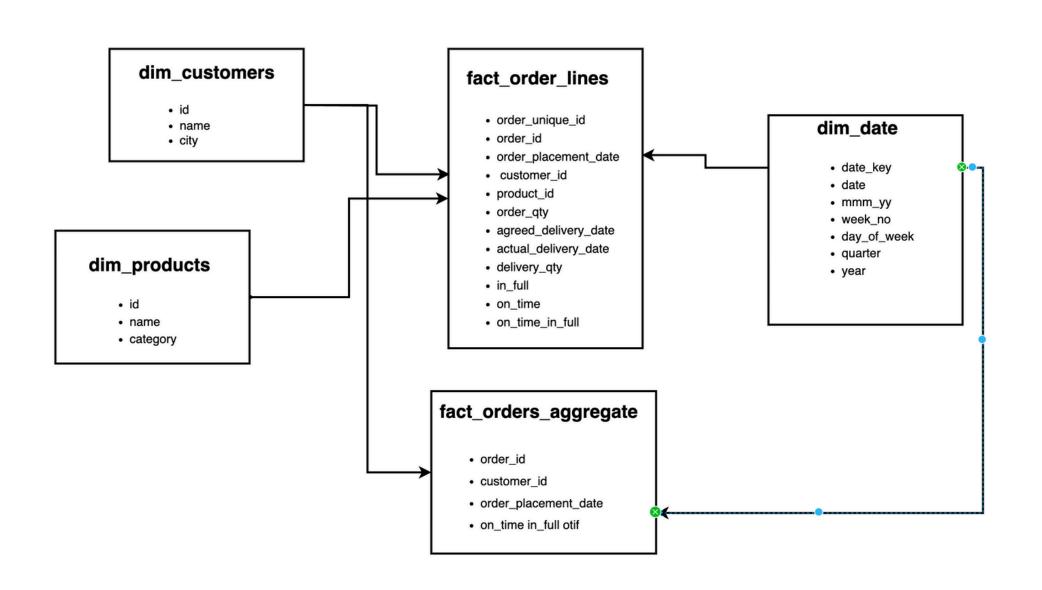- Monitor delivery time, order volume, and fulfillment rate

3 Detect and analyze Insights

- Identify delivery bottlenecks
- Compare performance across store locations
- Suggest data-driven improvements

Introduction

Cybertruck

Schema illustration

Shcema Design

Star Schema

Fact Tables

- **fact_order_lines:** detailed transaction data
- **fact_orders_aggregate**: summarized order data

Dimension Tables

- **dim_customers**: customer/store info
- **dim_date**: calendar attributes
- **dim_products**: product details
- **dim_targets_orders**: order target references

Design Goals

1. Enable time-series, customer, and product-based analysis
2. Support both granular and aggregated reporting
3. Improve performance with a clean OLAP structure

Introduction

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```python
# connect vào Mysql Sever (Local host)
connection = mysql.connector.connect(
    host = "localhost",
    user = "root",
    password = "123456789",
    database = "sp")



# Tạo hệ thống data model trong database (script không cần chạy định kì)
# Tạo bảng dim_customers
create_dim_cus = """
    CREATE TABLE dim_customers (
    id INT NOT NULL,
    name VARCHAR(255) NOT NULL,
    city VARCHAR(255),
    PRIMARY KEY (id)
)"""
```

Shcema Design

(Python, SQL)

Using DDL (Data Definition Language) and Python,

cover how to create tables using SQL, insert data into them, rename tables, and modify

columns such as changing names or data types, managing a well-structured database

ETL Process

```python
def main():

    # Connect vào sever SQL
    connection_engine = sc.create_engine("mysql+pymysql://root:123456789@localhost:3306/sp")

    # Connect bảng fact
    file_path_connect = "/Users/phamvantung/Downloads/supply chain project/summary_fact_tab.xlsx"
    sheet_name = "fact_order_lines"
    df = read_excel_to_df(file_path_connect, sheet_name)

    # Xử lý bảng data fact
    df_new = process_fact_table(df)
    df_copy = df.copy()

    # insert bảng fact vào database
    insert_new_records(df_new,"fact_order_lines", "order_unique_id", connection_engine )
```

- Retrieve data from sources
- Transform ID columns: Standardize, format, data type.
- Cleanse Data: Remove missing values, handle errors, and standardize data.
- Aggregate Information: Calculate and aggregate data into **fact_orders_aggregate**
- Insert the transformed data into dim and fact tables.
- Continuously update and load new data to keep tables up-to-date for analyzing
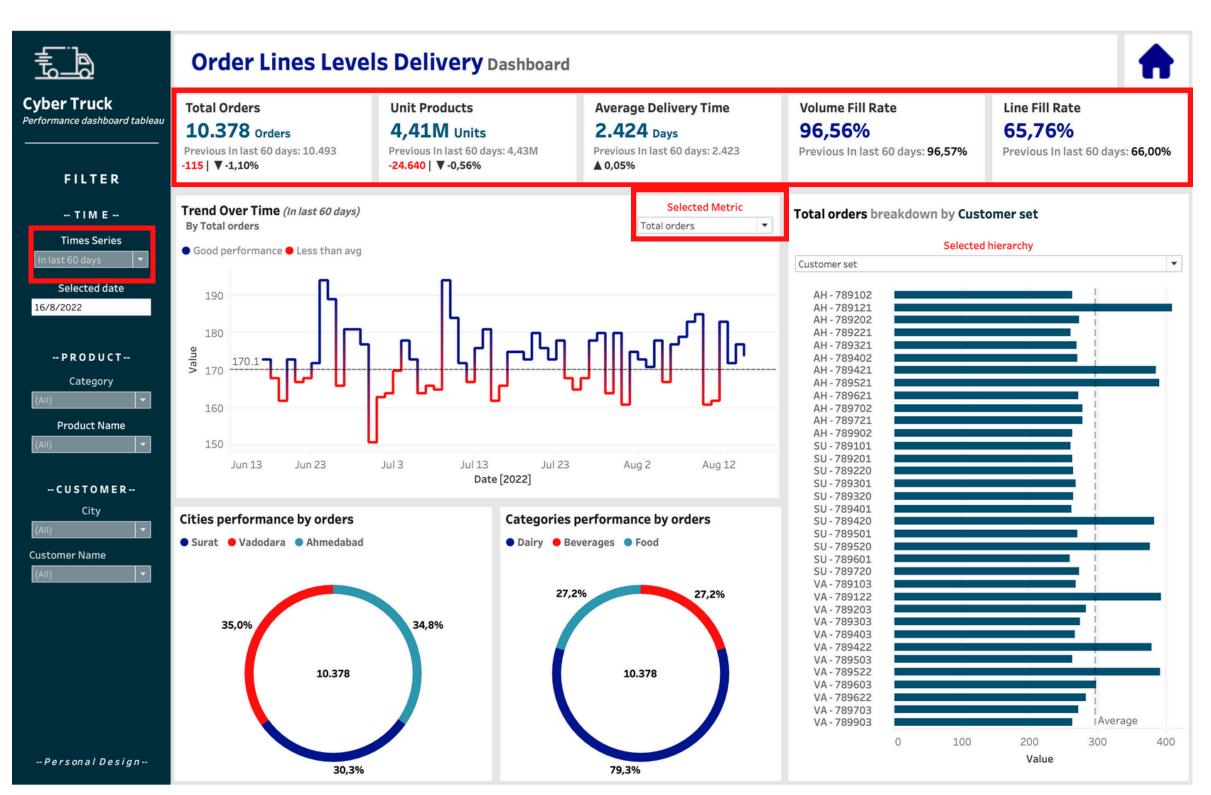
Build Dashboard

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Metric	Description	Calculation	Purpose / Insight
Total Orders	Total number of orders placed within the selected period	Count of order lines or order IDs	Tracks overall order volume and workload
On Time Rate (OT)	% of orders delivered on or before the promised delivery date	(On-time orders ÷ Total orders) × 100	Measures delivery punctuality
In Full Rate (IF)	% of orders delivered with complete quantities	(Fully delivered orders ÷ Total orders) × 100	Measures fulfillment completeness
OTIF Rate	% of orders delivered both on time and in full	(Orders on time & in full ÷ Total orders) × 100	Provides a comprehensive delivery quality indicator
Volume Fill Rate	% of total units delivered vs. ordered	(Total units delivered ÷ Total units ordered) × 100	Evaluates fulfillment efficiency at product level
Line Fill Rate	% of order lines fulfilled completely	(Completely filled lines ÷ Total lines) × 100	Measures fulfillment at line-item granularity
Average Delivery Time	Avg. time taken to deliver orders	Sum of delivery days ÷ Number of delivered orders	Assesses delivery speed

Orders Delivery Performance Dashboard

Selected Times Series: In last 60 days
Selected date: 16/8/2022

Total Orders
10.378 Orders
Previous In last 60 days: 10.493
-115 | ▼ **-1,10%**

On time Rate	In Full Rate	OTIF Rate
59,15%	**52,50%**	**29,12%**
Previous In last 60 days: **58,82%**	Previous In last 60 days: **53,21%**	Previous In last 60 days: **29,05%**

On time Rate Target	In Full Rate Target	OTIF Rate Target
(Less than **26,8%** compare to target)	(Less than **23,5%** compare to target)	(Less than **35,9%** compare to target)
59,2% | 86%	53,2% | 76%	29,1% | 65%

Cities performance by orders
● Surat ● Vadodara ● Ahmedabad

35,0%   34,8%
     10.378
       30,3%

Total Orders and On Time Rate By Time
● Total Order — On Time Rate
Selected Metrics Rate: On Time Rate

Cust..	Orders	OT Rate	IF Rate	OTIF Rate
Acclaime..	1,159	29,5%	51,7%	15,4%
Atlas Sto..	524	72,7%	59,2%	39,5%
Chiptec S..	533	71,9%	59,7%	39,2%
Coolblue	802	29,1%	46,6%	15,0%
Elite Mart	525	72,0%	37,9%	23,8%
Expert M..	554	70,8%	62,1%	39,7%
Expressio..	542	70,7%	57,9%	38,4%
Info Stores	557	70,2%	42,4%	25,9%
Logic Sto..	550	72,5%	57,1%	37,3%
Lotus Mart	1,148	27,7%	52,6%	15,4%
Propel M..	797	72,4%	58,5%	38,8%
Rel Fresh	816	74,1%	58,7%	40,4%
Sorefoz ..	549	72,5%	38,6%	26,4%
Vijay Stor..	790	73,4%	45,1%	29,0%
Viveks St..	532	71,2%	60,7%	40,4%

orders axis: 60, 80, 100, 120, 140, 160, 180, 200
Metrics Rate axis: 0%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%
Date axis: Jun 13, Jun 18, Jun 23, Jun 28, Jul 3, Jul 8, Jul 13, Jul 18, Jul 23, Jul 28, Aug 2, Aug 7, Aug 12, Aug 17

Date [2022]

Objective: Track and evaluate delivery performance more detail on line products of each orders by moving avg day

→ **Key Insights Provided**

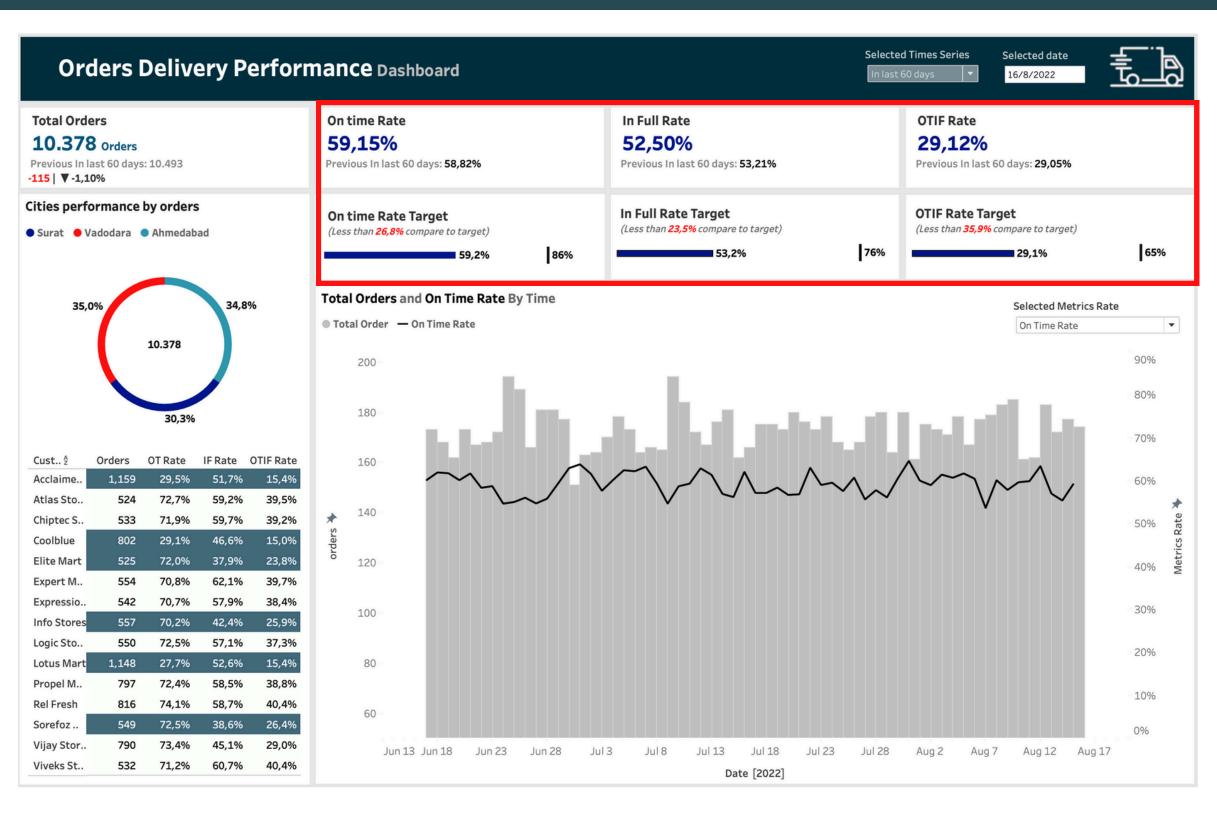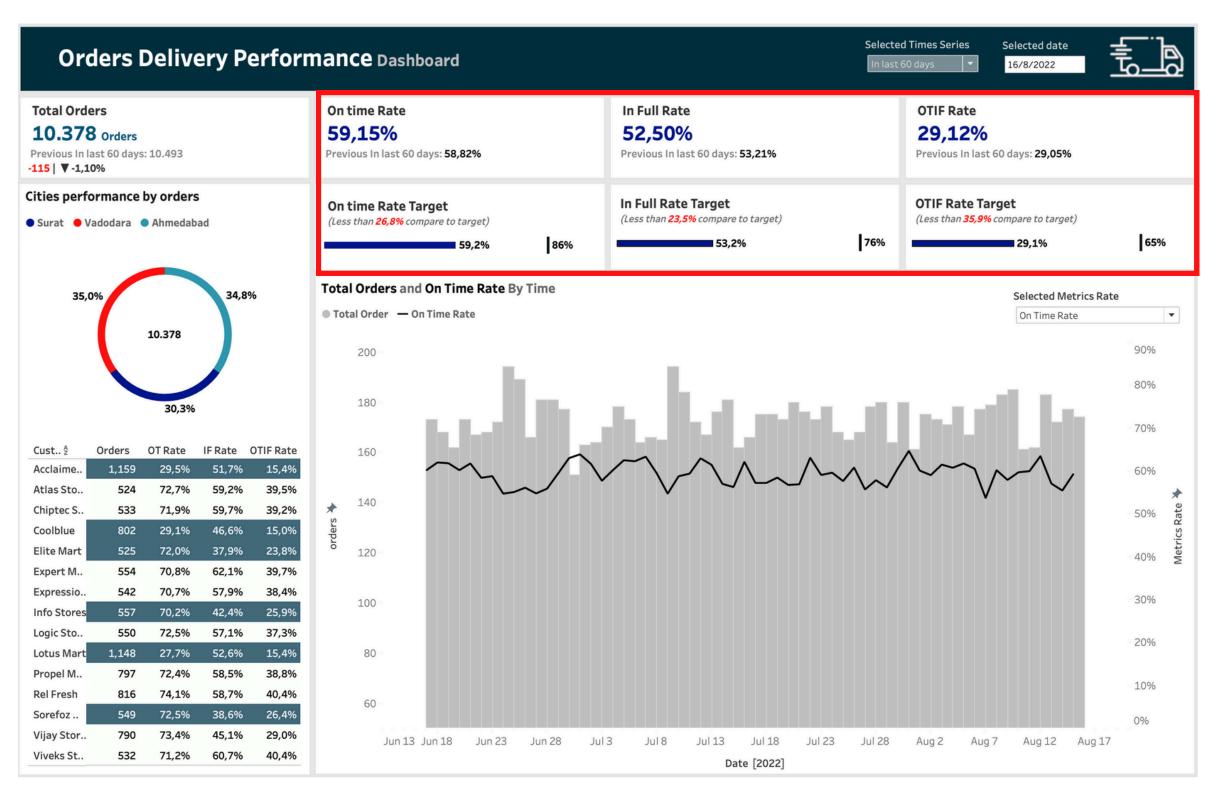- **On Time Rate (OT Rate):** Measures percentage of orders delivered on or before the expected time.
- **In Full Rate (IF Rate):** Measures completeness of deliveries based on order quantities.
- **OTIF Rate (On Time In Full):** Combines timeliness and completeness into one metric
- **Total Orders:** Monitors volume to correlate performance with load.

Performance Comparison:

- Benchmarks current values against previous periods
- Displays target gaps to highlight underperformance areas

Detect and analyze Insights

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(Chart: Date [2022], Jun 13 – Aug 17)

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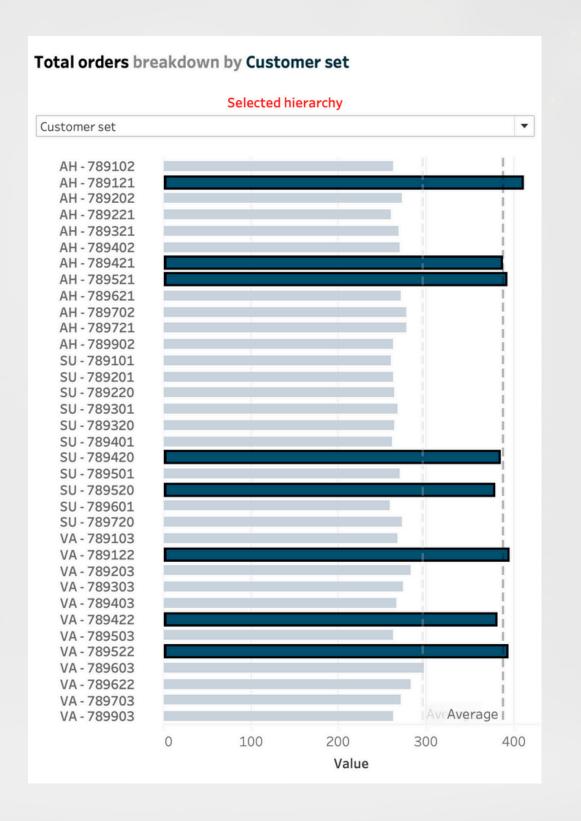
Performance Comparison:

- Benchmarks current values against previous periods
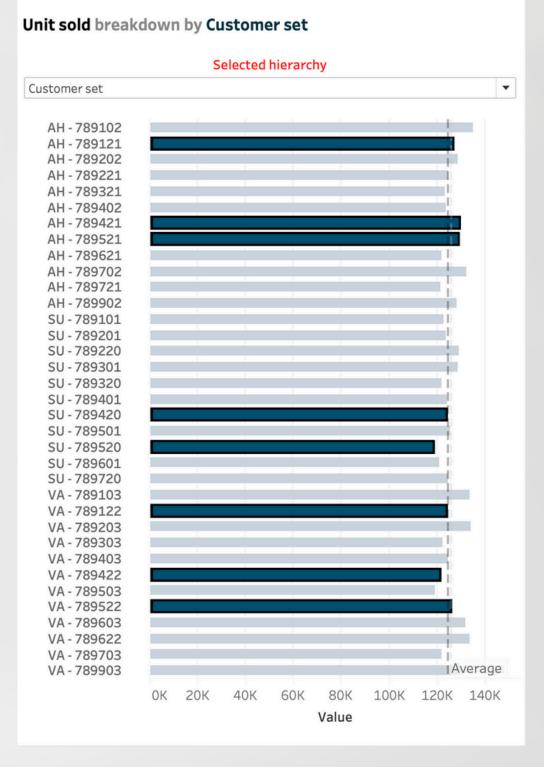- Displays target gaps to highlight underperformance areas

BUSINESS CASE

DETECT AND ANALYZE INSIGHTS

DETECT AND ANALYZE INSIGHTS

There are some stores that received a significantly higher volume of orders than the average. However, the total quantity of products purchased remains relatively stable.

1. It is important to explore the reasons behind this discrepancy.

2. Consider how this situation may impact overall business performance.
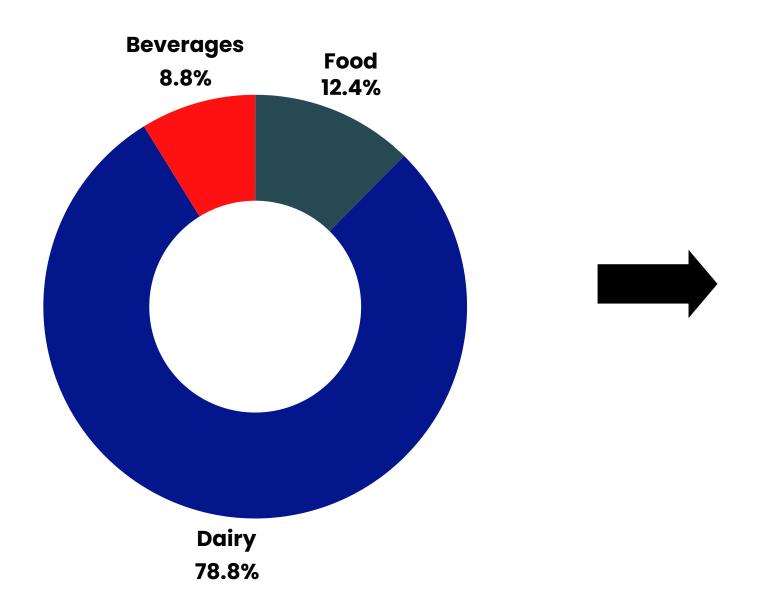

Total orders of stores

The number of products purchased"

A. Differences in the nature of the products

The proportion of product quantity by category of Target Group

Category-wise product distribution remains consistent across stores, with Dairy dominating at **~78.8%**, followed by **Food (12.4%)** and **Beverage (8.8%).**

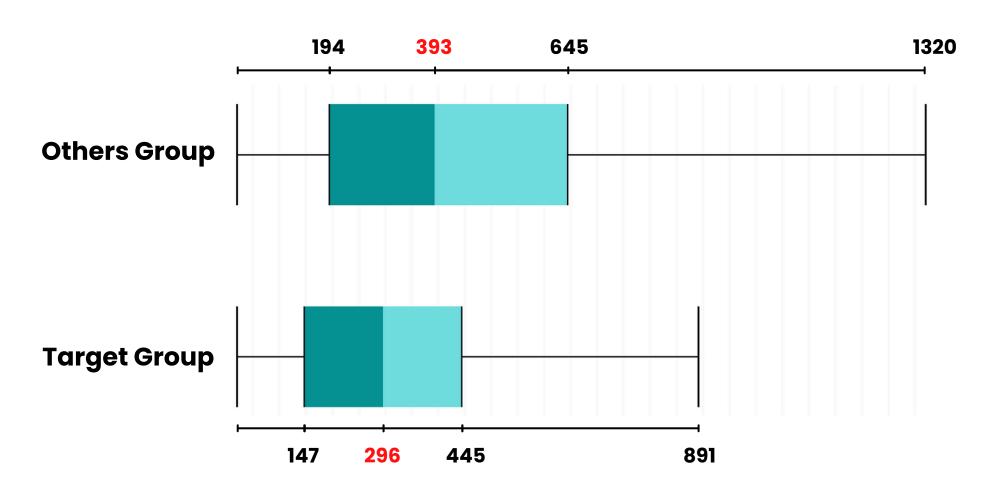| Product_name	Target Group	Others Group
AM Milk 500	9.65%	9.25%
AM Milk 250	9.43%	9.55%
AM Milk 100	9.70%	9.45%
AM Butter 100	7.15%	6.99%
AM Butter 250	6.61%	7.05%
AM Butter 500	7.24%	7.35%
AM Ghee 250	1.47%	1.41%
AM Ghee 150	1.44%	1.44%
AM Ghee 100	1.39%	1.39%
AM Curd 250	8.03%	8.23%
AM Curd 100	8.43%	8.17%
AM Curd 50	8.23%	8.37%
...		

Differences in product proportions across store groups

Product mix by category in the **Target Group (stores for obseve)** shows **no significant difference** from the rest, suggesting similar usage patterns and order volumes across categories.

Thus, the assumption that these stores's product differ significantly from others can be rejected.
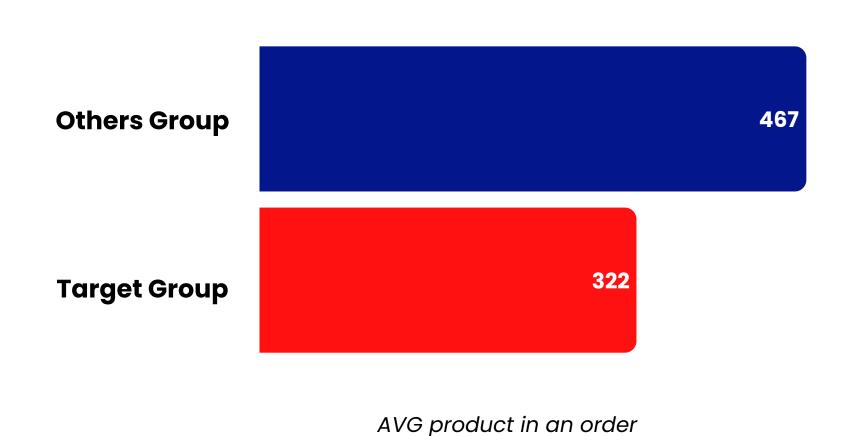
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B. Differences in the nature of the orders

Order Size Distribution

AVG product in an order

Others Group tends to place larger and more varied orders, while **Target Group** maintains a steadier, lower-volume order pattern (**lower median and IQR**)
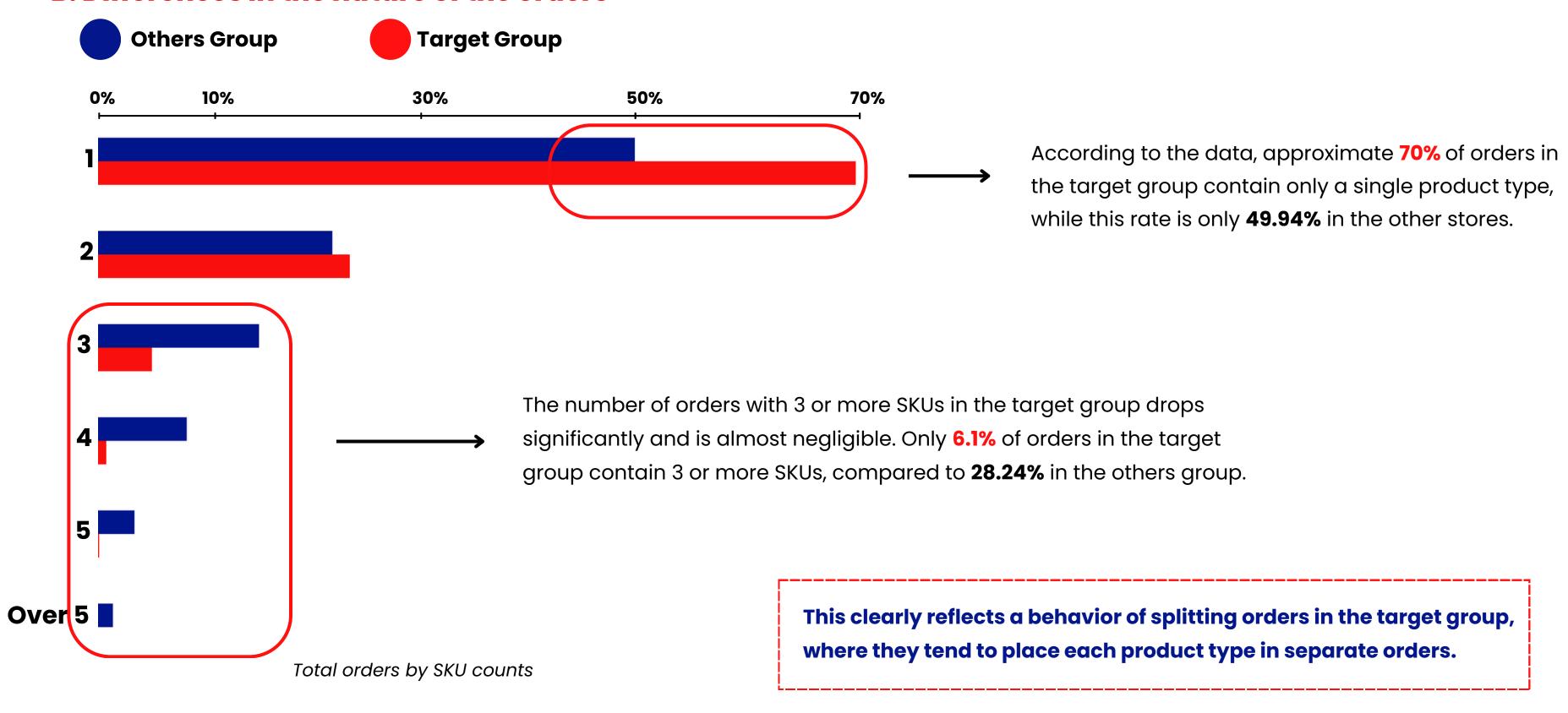
> **Possibly reflecting different in both order volume and frequency between the two groups, also operational models or demand patterns.**

The average number of items per order in the **Target Group** is **322**, which is approximately **6.88% lower** than the **467 observed** in the Others Group.
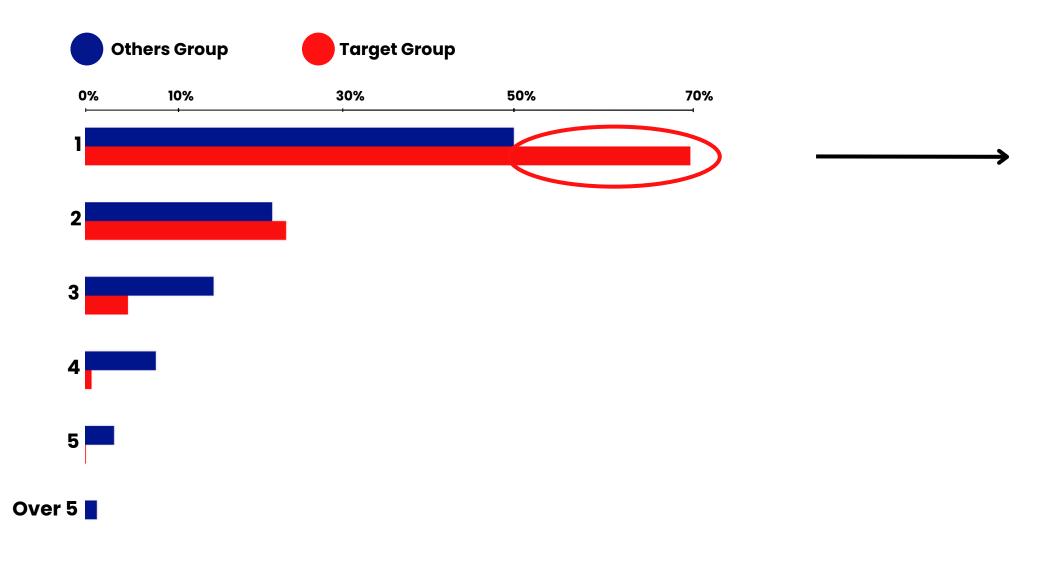
B. Differences in the nature of the orders

● **Others Group**   ● **Target Group**

Total orders by SKU counts

According to the data, approximate **70%** of orders in the target group contain only a single product type, while this rate is only **49.94%** in the other stores.

The number of orders with 3 or more SKUs in the target group drops significantly and is almost negligible. Only **6.1%** of orders in the target group contain 3 or more SKUs, compared to **28.24%** in the others group.

> **This clearly reflects a behavior of splitting orders in the target group, where they tend to place each product type in separate orders.**

An **SKU** is a unique identifier assigned to each distinct product or item in inventory

B. Differences in the nature of the orders

● Others Group ● Target Group

Total orders by SKU counts

Category	Product	Total orders	Propotion
Dairy	AM Milk 500	386	5.77%
Dairy	AM Milk 250	385	5.75%
Dairy	AM Milk 100	393	5.87%
Dairy	AM Butter 100	369	5.52%
Dairy	AM Butter 250	339	5.07%
Dairy	AM Butter 500	383	5.72%
Dairy	AM Ghee 250	366	5.47%
Dairy	AM Ghee 150	385	5.75%
Dairy	AM Ghee 100	371	5.55%
Dairy	AM Curd 250	363	5.43%
Dairy	AM Curd 100	382	5.71%
Dairy	AM Curd 50	376	5.62%
Food	AM Biscuits 750	362	5.41%
Food	AM Biscuits 500	348	5.20%
Food	AM Biscuits 250	357	5.34%
beverages	AM Tea 500	391	5.84%
beverages	AM Tea 250	353	5.28%
beverages	AM Tea 100	381	5.70%

*The nature of **1-SKU orders** in the target group*

The data shows that there are approximately **6,685 (1 SKU - orders)** in the target group. No individual product dominates in terms of share, with each accounting for only around **5.07% to 5.84%** of the total within its respective category.
,

Since the product distribution is similar to the Other group, it suggests that inventory planning and stock management in the Target group need improvement.

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Risk assessment and solution proposals

SHIPMENT	VFR %	OT %	IF %
Delivery quality, frequency, and timing	Quantity of items delivered	On-time delivery rate based on estimated delivery time	Percentage of orders delivered in full