

Supply chain Segmentation Analysis

DETAILED PROJECT REPORT



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PROJECT DETAIL

Project Title	US Pollution Analysis
Technology	Business Intelligence
Domain	Business Management
Project Difficulty level	Advance
Programming Language Used	Python
Tools Used	Jupyter Notebook, MS-Excel, Tableau

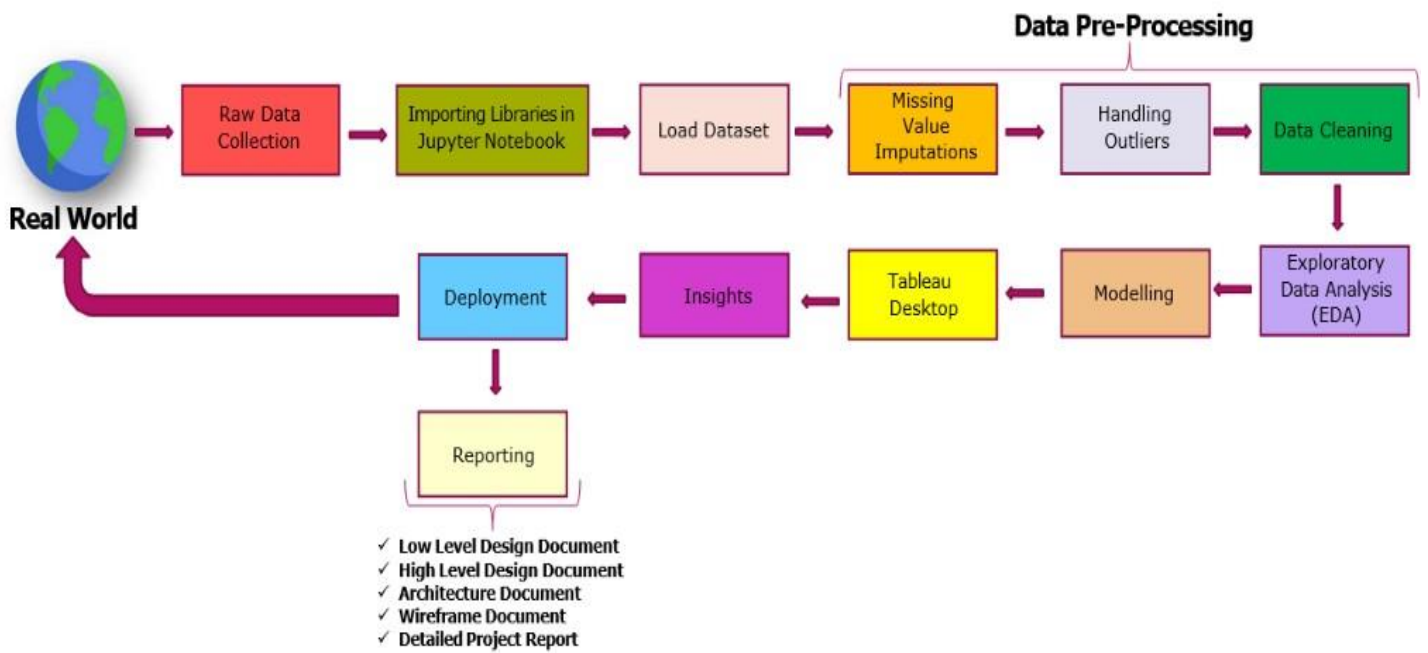
OBJECTIVE

- AtliQ Mart is a growing FMCG (fast moving consumer Good) manufacturer headquartered in Gujarat, India. It is currently operational in three cities Vadodara, Surat and Ahmedabad. They want to expand to other metro/tier1 cities in the next 2 years.

PROBLEM STATEMENT

- AtliQ Mart is currently facing a problem where a few key customers did not extend the annual contract due to service issues. It is speculated that some of the essential products were either not delivered on time or not delivered in full over a continued period, which could have resulted in bad customer service. Management wants to fix this issue before expanding to other cities and requested their supply chain analytics team to track the 'On time' and 'In Full' delivery service level for all the customers on a daily basis so that they can respond swiftly to these issues. The Supply Chain team decided to use a standard approach to measure the service level in which they will measure 'on-time delivery (OT) %', 'In-full delivery (IF) %' and OnTime in full (OTIF) % of the customer orders on a daily basis against the target service level set for each customer.

Architecture



DATASET INFORMATION

- Generally, an order contains information about the order. Who placed the order, what time they placed it, the shipping address associated, the billing address, payment method, when it was fulfilled, etc. It often does not contain any information about what was ordered.
- The order line generally contains information about what was ordered, this is done because a single order can have multiple items in it. So, the order line would specify the item ordered, the quantity ordered and the price charged, and there would be one line for each different item ordered.
- Example: Let's say you order 2 sweaters and 1 jogger from Ajio. A unique order ID is generated for all these items. Here Sweaters and Jogger is an order line.
- Line Fill Rate is an important metric for the supply planning team to understand how many lines they shipped out of the total lines ordered. This metric does not consider the delivery time of the order.
- Volume fill rate or case fill rate is a similar metric useful for the supply planning team to understand the total quantity they are able to ship for a customer per order or for a given period of time.
- On Time delivery %: OTD is a calculation of the number of shipments delivered on time to the customer in relation to the total number of orders shipped
- Full delivery %: This measure is measured at the order level. It determines if an order is delivered in full as per the requested quantity by the customer.
- OTIF%: OTIF or On-Time In-Full is a KPI used for measuring how many orders were delivered on time and in full. It helps to assess whether the business was able to deliver every item in the order on or before the expected date of delivery. This metric is mainly used as a delivery KPI, although it can also be applied throughout the supply chain.

This project contains these datasets:

- dim_customers.csv
- dim_products.csv
- dim_date
- dim_targets_orders
- fact_order_lines.csv
- fact_orders_aggregate.csv

Column Description for fact_order_lines: This table contains all information about orders and each item inside the orders.

1. order_id: Unique ID for each order the customer placed
2. order_placement_date: It is the date when the customer placed the order
3. customer_id: Unique ID that is given to each of the customers
4. product_id: Unique ID that is given to each of the products
5. order_qty: It is the number of products requested by the customer to be delivered
6. agreed_delivery_date: It is the date agreed between the customer and AtliQ Mart to deliver the products
7. actual_delivery_date: It is the actual date AtliQ Mart delivered the product to the customer
8. delivered_qty: It is the number of products that are actually delivered to the customer

Column Description for fact_orders_aggregate: This table contains information about OnTime, InFull and OnTime Infull information aggregated at the order level per customer

1. order_id: Unique ID for each order the customer placed
2. customer_id: Unique ID that is given to each of the customers
3. order_placement_date: It is the date when the customer placed the order
4. on_time: '1' denotes the order is delivered on time. '0' denotes the order

is not delivered on time.

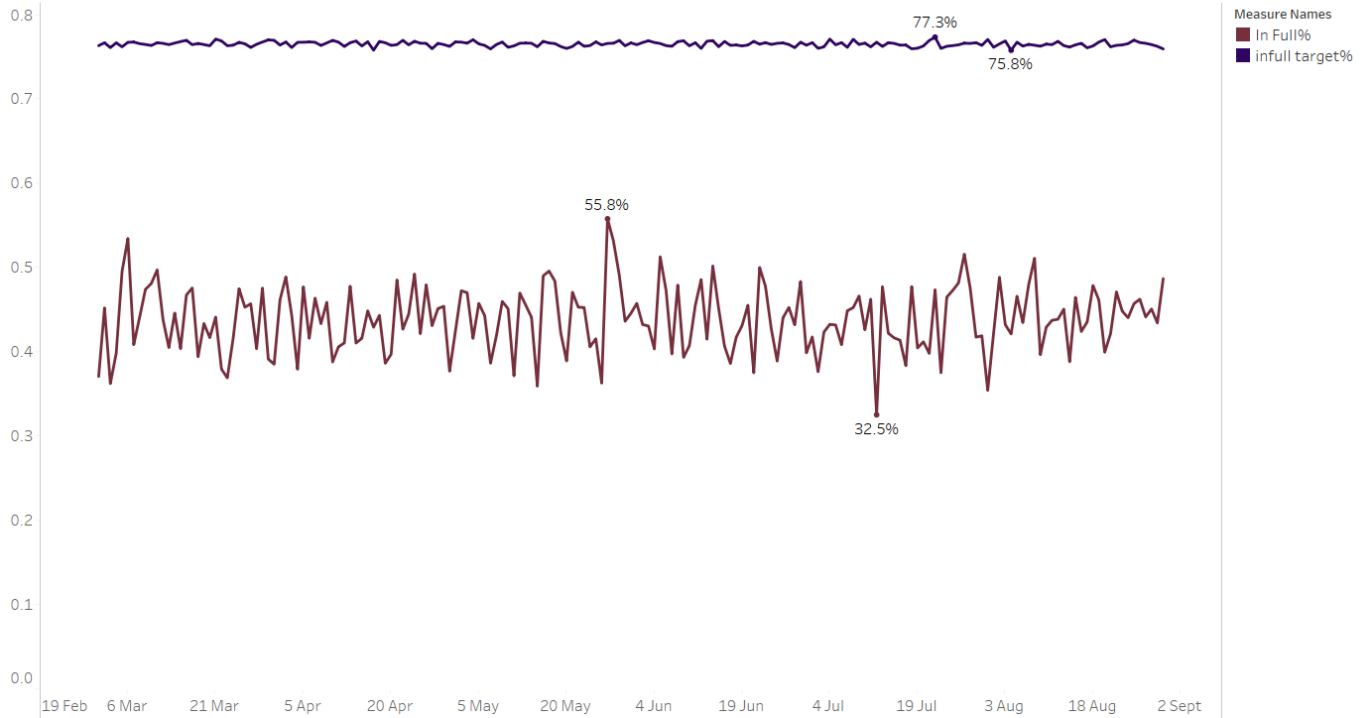
5. in_full: '1' denotes the order is delivered in full quantity. '0' denotes the order is not delivered in full quantity.

6: otif: '1' denotes the order is delivered both on time and in full quantity. '0' denotes the order is either not delivered on time or not in full quantity

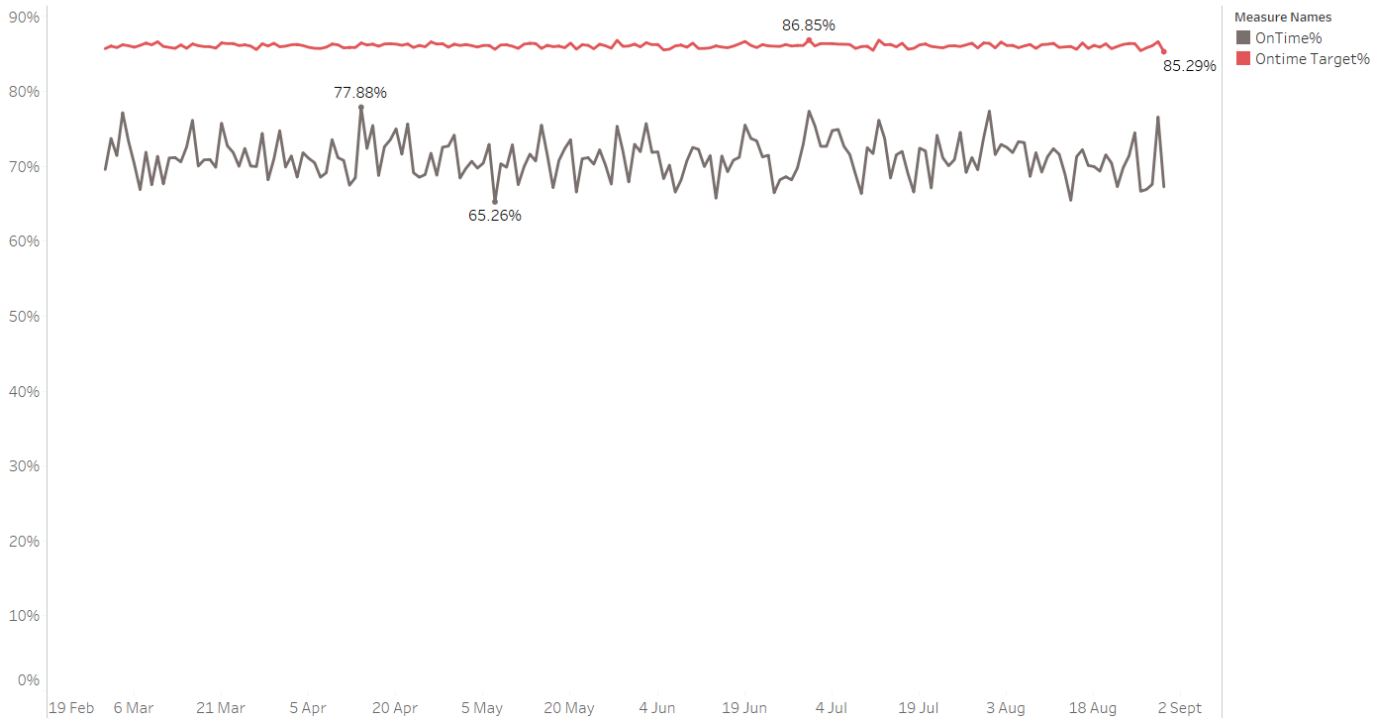
INSIGHTS

1. What is the daily ON Time, IN FULL, Otif% on Targets?

IN FULL% Campares to Target



ON TIME% Campares to Target





- The maximum number of In full Target% is 77.3% in the month of July and only 47.4% of target achieved and the rest is not fulfilled.
- The maximum number of In full % is 55.8% in the month of May and the rest 76.6% and they never reach the targets on time.
- The minimum number of In full Target% is 75.8% in the month of August Only 42.1% of target achieved and the rest is not fulfilled.
- The minimum number of In full % is 32.5% in the month of July and the 76.6% of target is not achieved.
- The maximum number of On Time Target% is 86.85% in the month of June only 77% of target achieved and the rest is not fulfilled.
- The maximum number of On Time % is 77.88% in the month of April and the rest 86.48% and they never reach the targets on time.
- The minimum number of On Time Target% is 62.26% in the month of may only 67% of target achieved and the rest is not fulfilled.
- The minimum number of On Time % is 85.29% in the month of August and the 85.61% of target is not achieved.
- The maximum number of Ofit Target% is 66.68% in the month of march and only 21% of target achieved and the rest is not fulfilled.

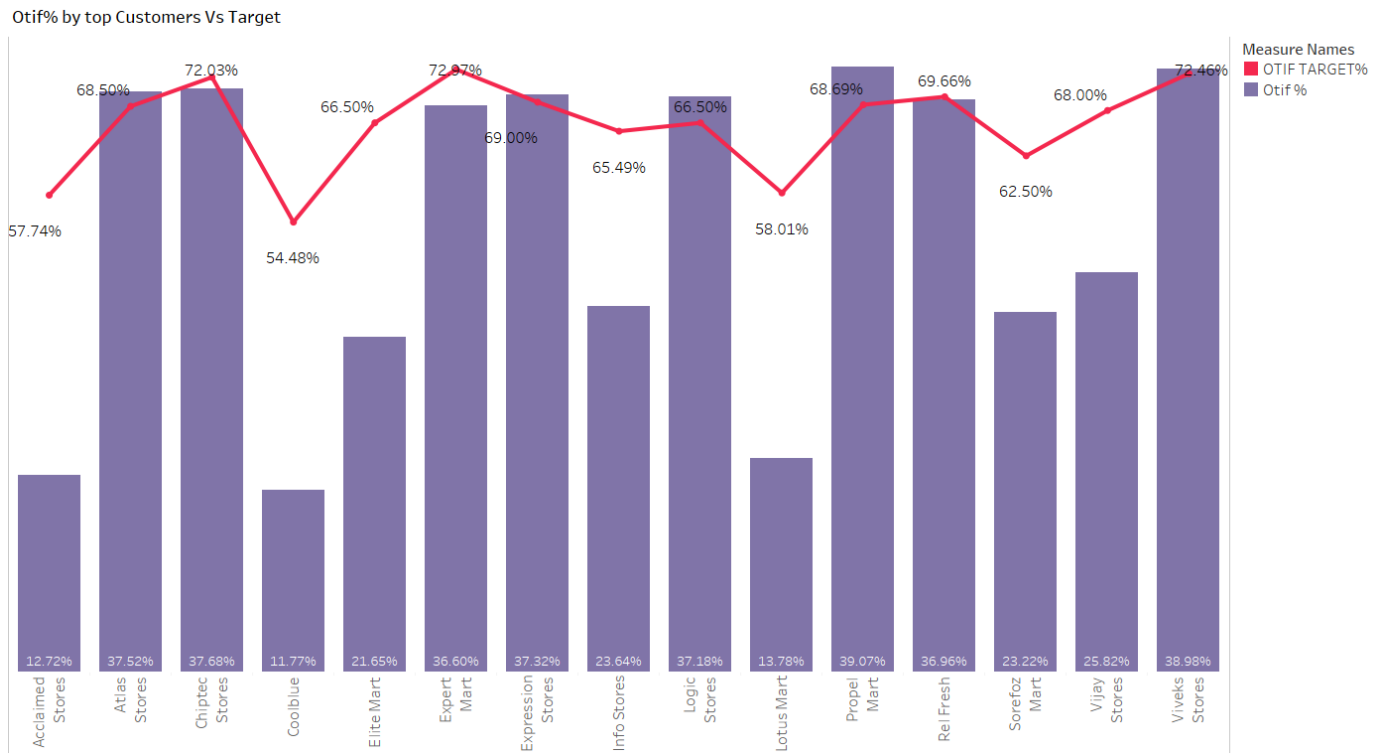
- The maximum number of Otif % is 38.38% in the month of May and achieved its target with 66.19% when all the targets are fulfilled.
- The minimum number of Otif Target% is 64.79% in the month of August only 27% of target achieved and the rest is not fulfilled.
- The minimum number of Otif % is 20.39% in the month of July and the 68.18% of target is not achieved.

2. What is the city level performance vs Targets ?



- We can see that some cities are performing well to achieve their target as compare to other thus we have the area of improvement.
- Surat City is Doing well as compare to others with 73% of on time delivery, completing 76% on in full target.

3. What is the customer level Otif% vs target for the top 15 customers by order count?



- We can see that some customers are consistently below their OTIF targets, while others are much closer or even exceeding them.

4. What is the calculated LIFR (Line fill Rate) and VOFR (Volume Fill Rate)?

Customer Name	In Full %	In Full Target %	On Time %	On Time Target %	On Time In Full %	On Time In Full Target %	Line Fill Rate %	Volume Fill Rate %
Acclaimed Stores	58.93%	75.41%	26.89%	76.35%	12.72%	57.74%	46.55%	95.85%
Atlas Stores	75.48%	78.00%	84.20%	88.00%	37.52%	68.50%	48.68%	97.58%
Chiptec Stores	75.61%	81.00%	83.76%	89.03%	37.68%	72.03%	49.64%	97.58%
Coolblue	51.53%	70.98%	26.81%	77.00%	11.77%	54.48%	39.84%	95.08%
Elite Mart	52.74%	73.00%	84.74%	91.00%	21.65%	66.50%	28.90%	95.29%
Expert Mart	75.48%	79.99%	84.62%	90.99%	36.60%	72.97%	47.93%	97.44%
Expression Stores	75.28%	78.00%	83.13%	88.51%	37.32%	69.00%	49.59%	97.54%
Info Stores	53.05%	70.98%	83.14%	92.00%	23.64%	65.49%	32.51%	95.24%
Logic Stores	74.39%	76.00%	83.39%	87.49%	37.18%	66.50%	49.03%	97.45%
Lotus Mart	60.08%	75.38%	25.73%	77.30%	13.78%	58.01%	48.15%	96.01%
Propel Mart	75.62%	79.34%	85.62%	86.69%	39.07%	68.69%	49.14%	97.70%
Rel Fresh	74.54%	79.36%	84.84%	87.95%	36.96%	69.66%	48.06%	97.43%
Sorefoz Mart	53.40%	72.01%	84.79%	87.00%	23.22%	62.50%	30.51%	95.33%
Vijay Stores	59.23%	75.97%	84.73%	89.36%	25.82%	68.00%	34.78%	95.87%
Viveks Stores	75.06%	81.02%	83.42%	88.93%	38.98%	72.46%	50.22%	97.57%

AGG(In Full Change %)

-0.500 0.500

AGG(On Time in Full Ch...)

-0.500 0.500

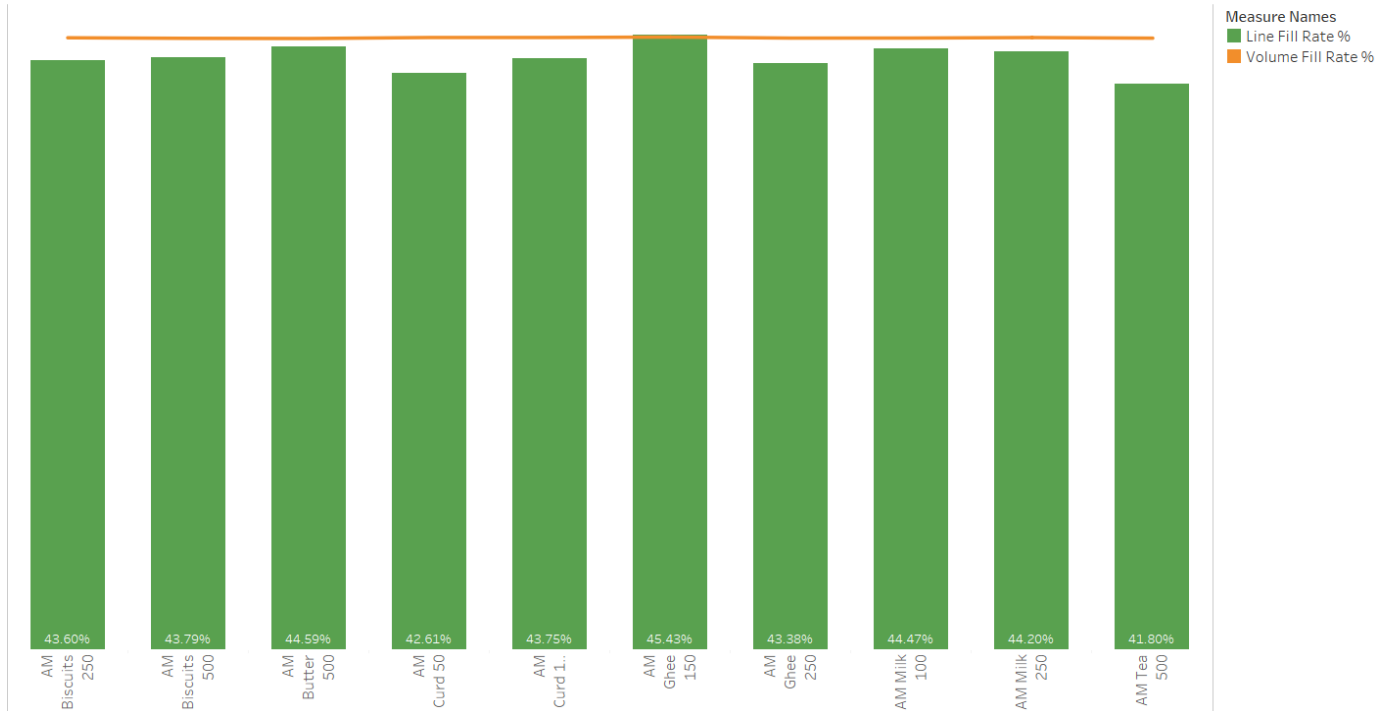
AGG(On Time Change %)

-50.00% 50.00%

- The overall LIFR is about 66%, meaning about two-thirds of order lines are delivered in full.
- The overall VOFR is about 97%, indicating that nearly all ordered volume is being delivered, even if some lines are not completely filled.
- This table shows that most products have a LIFR in the mid-60% range, but their VOFR is much higher, close to 97%.
- This suggests that while some lines are not fully delivered, the shortfall per line is relatively small.

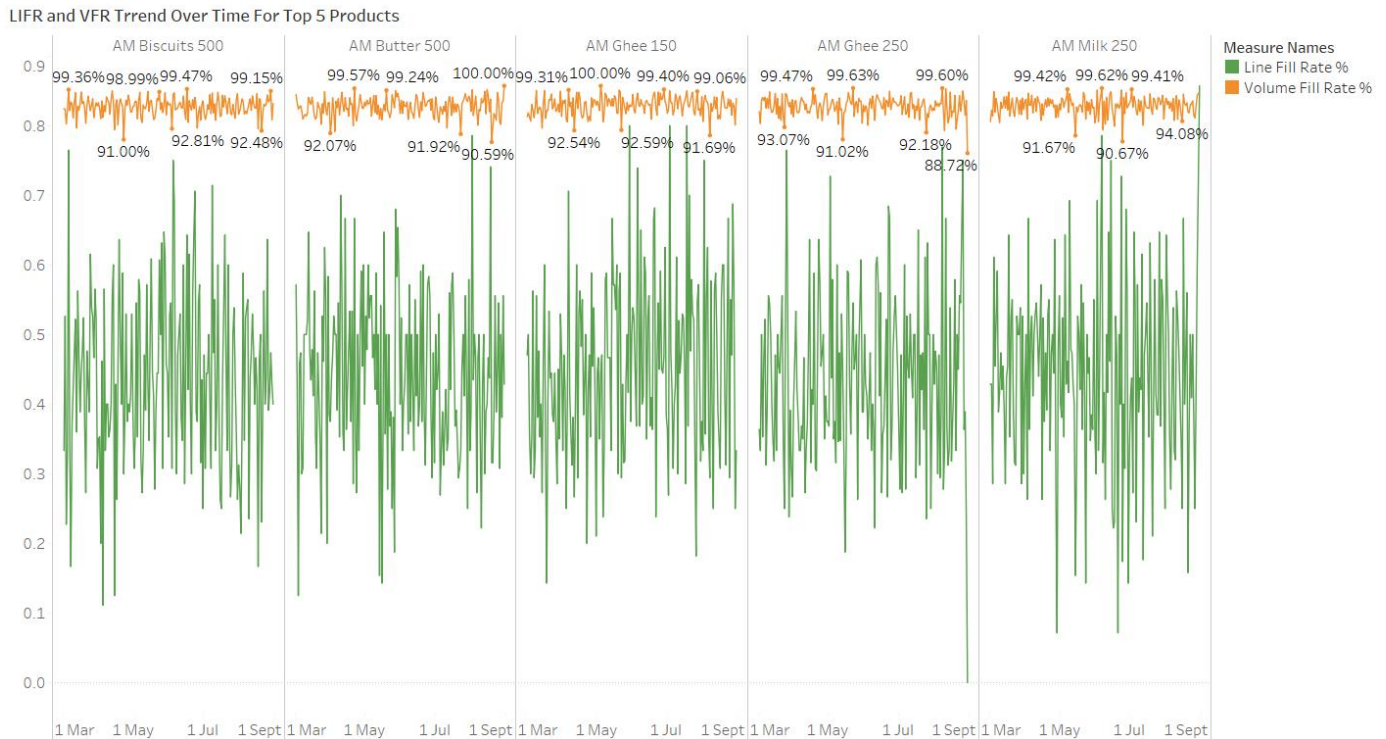
5. What is the LIFR and VOFR for top 10 product by order volume?

LIFR and VOFR for Top 10 Product by Order Volume



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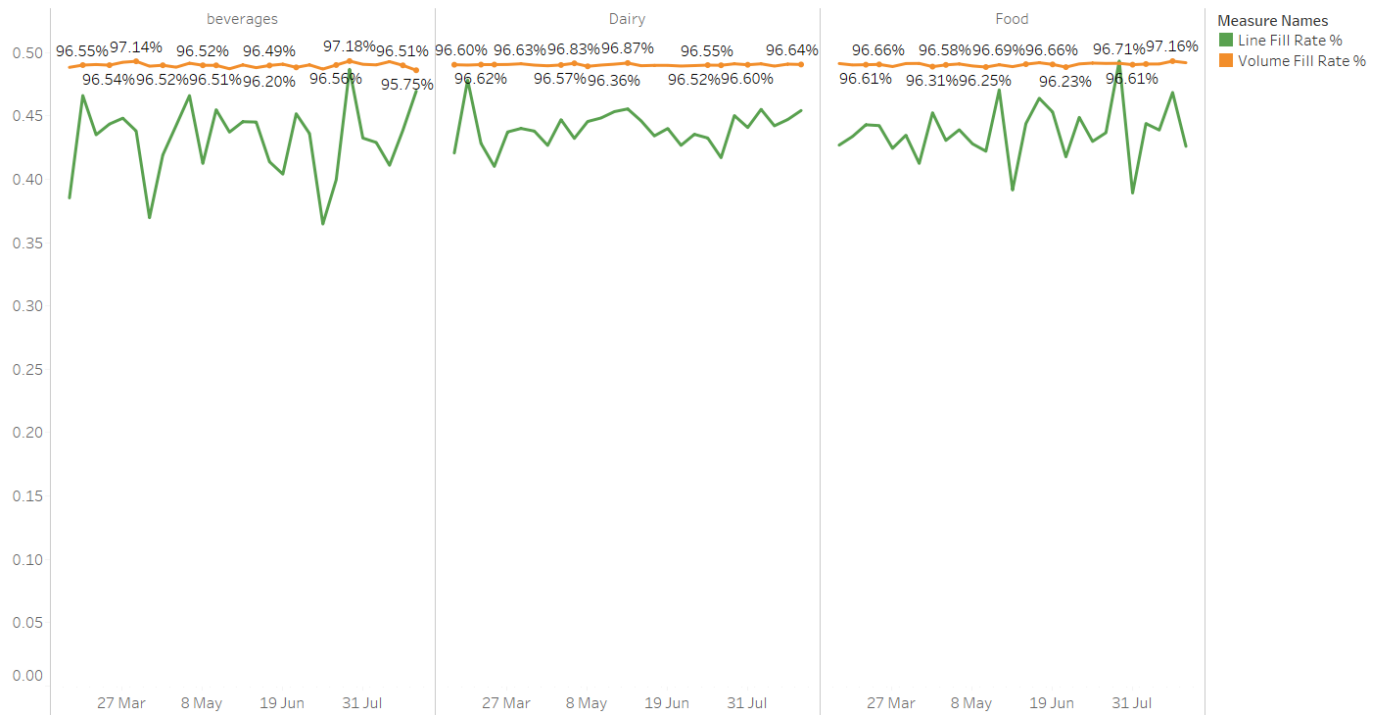
6. What is the LIFR and VOFR trends over time by top 5 products?



- LIFR patterns: Most products show fluctuating LIFR performance over time, with values typically ranging between 40-80%. You can see periods of better and worse line fill performance.
- VOFR patterns: Volume fill rates are much more stable and consistently high (80-100%), showing that even when lines aren't completely filled, the volume shortfall is minimal.
- Product comparison: AM Milk 500 appears to have the best overall LIFR performance among the top products, while AM Milk 100 shows more volatility.

7. What is weekly LIFR and VOFR trends for product category?

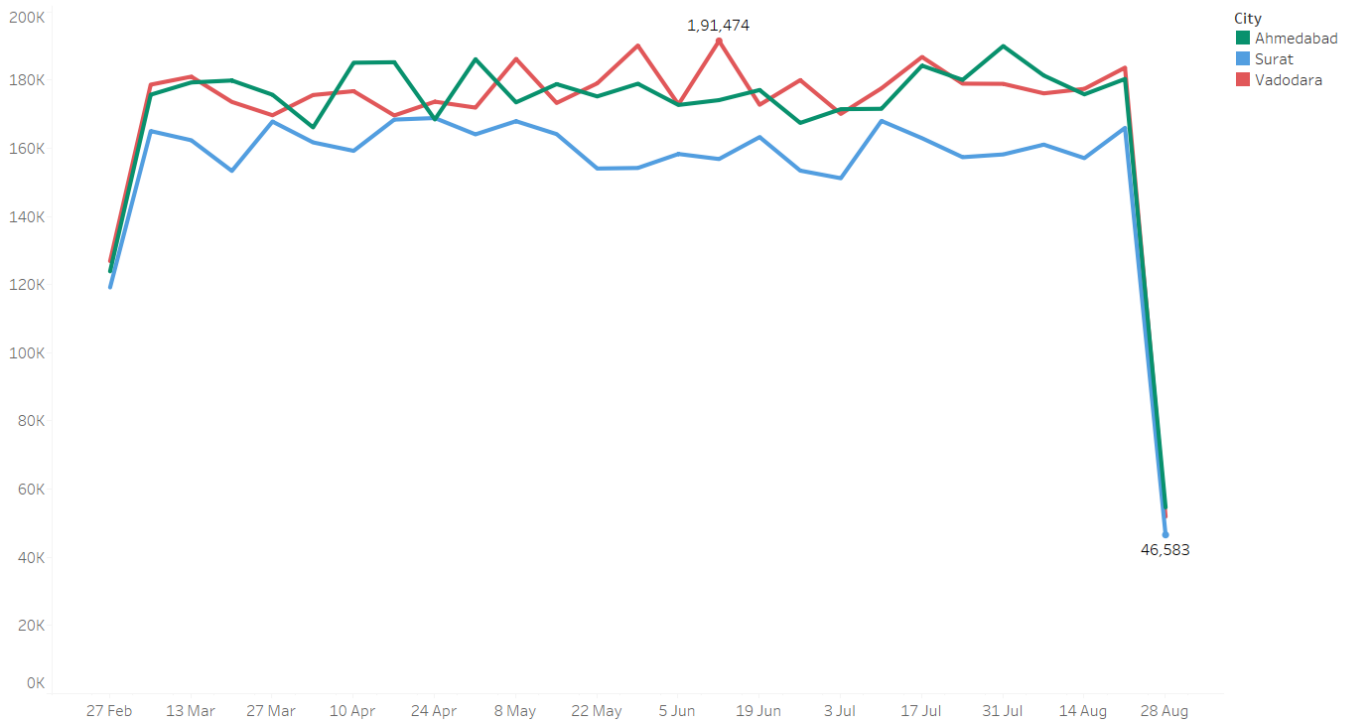
LIFR and VFR Weekly Trend Over Time For Products Category



- Food category has the highest LIFR at 66.4%, slightly outperforming Dairy and Beverages
- VOFR is consistent across all categories (96.5-96.6%), showing volume delivery is reliable regardless of category
- Trend patterns show that all categories follow similar weekly patterns, suggesting supply chain challenges affect all product types similarly.

8. What is the weekly order quantity for top 5 cities?

Weekly Order Quantity for Top 5 Cities



Regional Performance Summary

City	Avg Delivery	Avg order	Count of Orde..	Delivery Qty	Order Qty
Ahmedabad	227	234	19,676	4,462,984	4,612,298
Surat	227	235	17,842	4,050,082	4,190,467
Vadodara	228	236	19,578	4,456,091	4,624,171

- The city with maximum quantity of orders is Vadodara with 191474 orders placed in the month of June
- The city with least orders is Surat with barely 46583 orders placed.
- Overall Delivery Rate: 96.59%
- Total Units Ordered: 13,426,936
- Total Units Delivered: 12,969,157
- Total Delivery Shortfall: 457,779 units
- Worst Performing Cities (Delivery Rate):
- Vadodara: 96.37% (Shortfall: 168,080 units)
- Surat: 96.65% (Shortfall: 140,385 units)

- Ahmedabad: 96.76% (Shortfall: 149,314 units)
- the cities with the lowest delivery rates. Vadodara, Surat, and Ahmedabad have the lowest delivery rates, all just above 96%. This means that for every 100 units ordered, about 3–4 units are not delivered.

9.What is the delivery delay analysis?

Delivery Delay Analysis

Is delay	Avg. Delivery delay days	Count of Order Id	Delayed orders %
Delayed	2	16,491	1
	1.687	1.687	1.687
On-time/Early	0	40,605	0
	-0.089	-0.089	-0.089

- About 29% of all orders are delayed, with an average delay of 1.69 days for those that are late. The maximum observed delay is 3 days.

10.What is the metrics by customers, products?

Metrics by Product

Product Id	Product Name	Category	Line Fill Rate %	Volume Fill Rate %	Base
25891101	AM Milk 500	Dairy	44.89%	96.71%	3,139
25891102	AM Milk 250	Dairy	44.20%	96.61%	3,197
25891103	AM Milk 100	Dairy	44.47%	96.54%	3,184
25891201	AM Butter 100	Dairy	43.66%	96.59%	3,170
25891202	AM Butter 250	Dairy	42.46%	96.36%	3,125
25891203	AM Butter 500	Dairy	44.59%	96.46%	3,272
25891301	AM Ghee 250	Dairy	43.38%	96.53%	3,200
25891302	AM Ghee 150	Dairy	45.43%	96.69%	3,209
25891303	AM Ghee 100	Dairy	44.19%	96.59%	3,098
25891401	AM Curd 250	Dairy	44.10%	96.72%	3,138
25891402	AM Curd 100	Dairy	43.75%	96.62%	3,177
25891403	AM Curd 50	Dairy	42.61%	96.62%	3,187
25891501	AM Biscuits 750	Food	43.89%	96.85%	3,158
25891502	AM Biscuits 500	Food	43.79%	96.49%	3,195
25891503	AM Biscuits 250	Food	43.60%	96.58%	3,186
25891601	AM Tea 500	beverages	41.80%	96.52%	3,184
25891602	AM Tea 250	beverages	43.49%	96.52%	3,143
25891603	AM Tea 100	beverages	43.91%	96.59%	3,134

Metrics by Customer

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KEY PERFORMANCE INDICATOR(KPI)

1. In Full%, On Time%, Otif% compares to target
2. Otif% by City vs target
3. Metrics by customers, products
4. Otif% by top Customers vs target
5. LIFR and VOFR for top 10 Product by order volume
6. LIFR and VOFR trends over time for top 5 products
7. LIFR and VOFR trends over time for Products category
8. Weekly order Quantity for top 5 Cities
9. Regional Performance summary
10. Delivery delay analysis

CONCLUSION

- High VOFR (97%) shows strength in delivering overall volume, despite weaker LIFR (66%).
- Major cities like Vadodara and Surat need attention to improve shortfall rates and OTIF compliance.
- Order delays impact 29% of shipments, albeit with small average delay (1.69 days).
- Product-specific action should be considered (e.g., stabilize AM Milk 100 supply).
- Consistent weekly patterns across categories suggest shared systemic bottlenecks.

Q & A

Q1) What's the source of data?

Ans) The Dataset was taken from Kaggle

Q2) What was the type of data?

Ans) The data was a combination of numerical and Categorical values.

Q3) What's the complete flow you followed in this Project?

Ans) Refer slide 5th for better Understanding

Q4) What techniques were you using for data?

Ans) -Removing unwanted attributes

-Visualizing relation of independent variables with each other and output variables

-Removing outliers

-Cleaning data and imputing if null values are present.

-Converting Numerical data into Categorical values.

Q6) What were the libraries that you used in Python?

Ans) I used Pandas, NumPy, Matplotlib, and Seaborn libraries in Pandas.

THANK YOU