SUPPLY CHAIN MANAGEMENT

1. Project Overview and Objective

Project Overview

The Supply Chain Management Power BI project focuses on analyzing and visualizing end-to-end supply chain operations to improve decision-making and operational efficiency. The dashboard integrates data from procurement, logistics to provide real-time insights into supply chain performance.

Using Power BI, the project transforms raw transactional data into interactive visual reports that help stakeholders monitor key performance indicators (KPIs), identify bottlenecks, control costs, and improve service levels. The solution supports data-driven planning, demand forecasting, inventory optimization, and supplier performance evaluation.

Project Objectives

Monitor Supply Chain Performance

- Track key KPIs such as order fulfilment rate, lead time, on-time delivery, Early delivery and Late delivery.

Improve Demand and Supply Planning

- Analyze historical sales and demand trends to support accurate forecasting and better production planning.

Increase Visibility Across the Supply Chain

- Provide a centralized, real-time view of supply chain data for faster and more informed decision-making.

Support Strategic Decision-Making

- Enable management to identify risks, inefficiencies, and improvement areas through interactive

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2. Data Sources

- **Source Description and Timeline:** GitHub **and** 2019-2020.
- **Domain**: Supply Chain Management

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3. Problem Statement

- On-time in-full (OTIF) is a supply chain metric for measuring performance in the logistics industry. OTIF generally refers to a supplier's ability to deliver product within prescribed delivery windows and at full quantities ordered. To study crop production patterns across states and years for better agricultural planning.

- OTIF was designed to improve store operations within TCI itself and quickly led to a series of major changes as it was quickly adopted by other retailers and companies.
- The data about Orders, Salesperson, Customer and City is given. So, we have to find
    1. The OTIF Performance over Time
    2. The Order delivery status over Time?
    3. The Highest OTIF Performances
    4. Key Influencers

4. Attribute (Column /Features) Details:

Attribute Name	Data Type	Description
Order Date	Date	The date of order received by customer
Order ID	Numeric (Integer)	The ID of the order
Scheduled Delivery Date	Date	The order is planned to arrive at its destination.
e-BL_IssuedDate	Date	For tracking the order details
Actual Delivery Date	Date	The Order line was physically delivered to its final destination.
Salesperson ID	Numeric (Integer)	The ID representative associated with specific order or customer account.
Customer ID	Numeric (Integer)	The Customer ID in SCM is used to identify each individual customer account or entity within the system database.
Returns	Numeric (Integer)	Generally, refers to fields within a returns report.
Salesperson	String (Text)	It is used to find the salesperson name.
Team	String (Text)	It is used to find the salesperson comes under which team.
Customer	String (Text)	It is used to find the customer's name.
Service Channel	String (Text)	It refers to software platform for facilities management or choice of distribution path for service.
City ID	Numeric (Integer)	It refers unique identifier for a specific city.
City	String (Text)	It is used to find the city name.

5. Tools & Technologies

- **Excel:** Data cleaning, transformation
- **Power BI:** Data modelling, DAX calculations, visualization, and interactive dashboard creation.

6. Data Pre-Processing & Understanding the data (Excel / Power Query)

Tasks Performed:

- **Data Cleaning & Transformation:** Removed duplicates, handled missing values, standardized formats, and created calculated fields.
- **Filtering & Sorting:** Organized data to focus on relevant records.
- Convert the data into Fact and Dimension Table.
- We need to make a separate column for the status of delivery. Divide that column into three categories of status - In time or Early deliveries, On time deliveries and Late deliveries.
- Order date, Scheduled delivery date, Actual delivery date, Salesperson, Team, Customer, Service channel, City- these are important columns. So, we are going to analyze each of them.
- Only 0.44% percent of the data in column 'Actual delivery date' and 'City' is missing. From looking at the data, we can understand that these missing data indicates, 0.44% of the total deliveries are not happened or cancelled.
- In column 'Scheduled delivery date' only two values are missing. So, drop two rows

7. Data Modelling and DAX (Power BI)

- **Data Model:** Established relationships between tables, defined cardinality its come under snowflake schema.
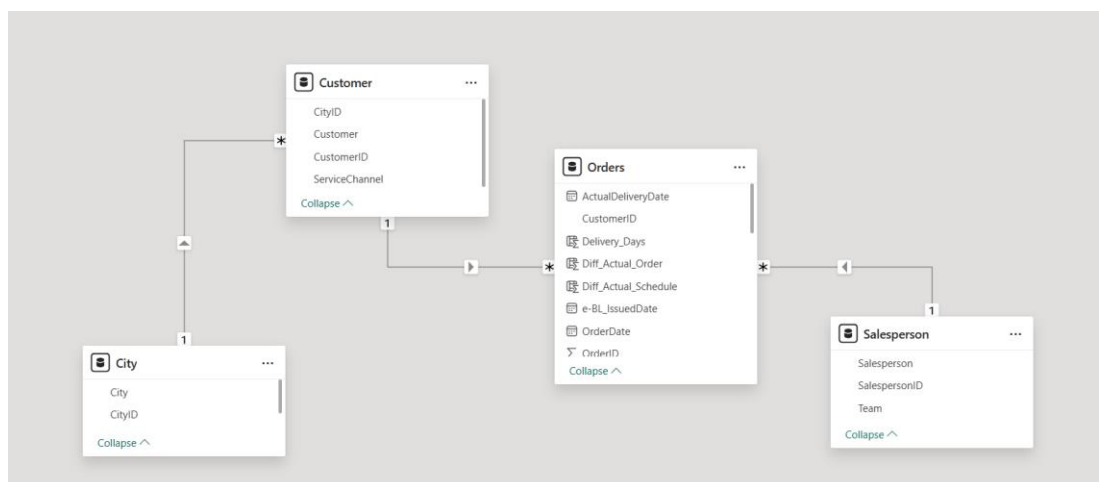
- **Calculated Columns:**

  Status

  if(Orders[ActualDeliveryDate]<Orders[ScheduledDeliveryDate],"Early",if(Orders[ActualDeliveryDate] =Orders[ScheduledDeliveryDate],"On Time","Late"))

  Diff_Actual_Schedule

  DATEDIFF(Orders[ActualDeliveryDate],Orders[ScheduledDeliveryDate],DAY)

- **DAX Measures:**

  Average_Delivery_Days = ROUND(AVERAGE(Orders[Delivery_Days]),0)

  Total_Count_Delivery = COUNTA(Orders[Status])

  %Status

  ((COUNTA(Orders[Status])/CALCULATE(COUNTA(Orders[Status]),ALL(Orders[Status]))))*100

  %Status

  FORMAT((COUNTA(Orders[Status])/CALCULATE(COUNTA(Orders[Status]),ALL(Orders[Status]))),"Percent")

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8. Analysis and Visualizations (Power BI)

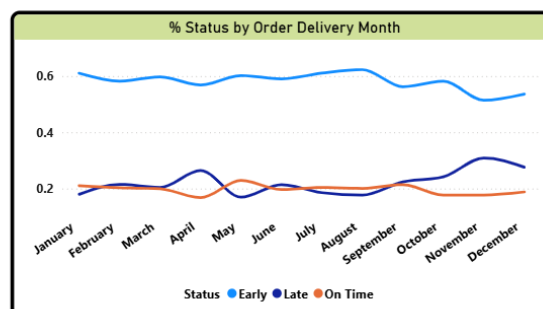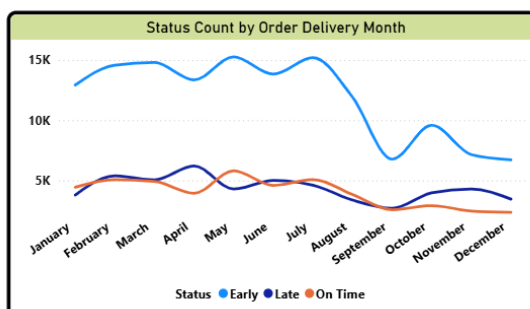**Analysis**

- Overall analysis
- In time or early deliveries
- On time deliveries
- Late deliveries

Visualizations based on problem statement:

<div align="center">

Months by Total successful deliveries

</div>

Insights:

Out of the total successful deliveries, 58.64% deliveries were Early deliveries, 19.84% were on time deliveries and remaining 21.53% were Late deliveries.

Salespersons by Total successful deliveries

Insights:

In figure, we can see top 10 salespersons whose customers received maximum no. of deliveries. Customers of salesperson 'BCA' gave highest no of orders (3.88%) followed by 'BCA-CMA' and 'ICR', respectively.
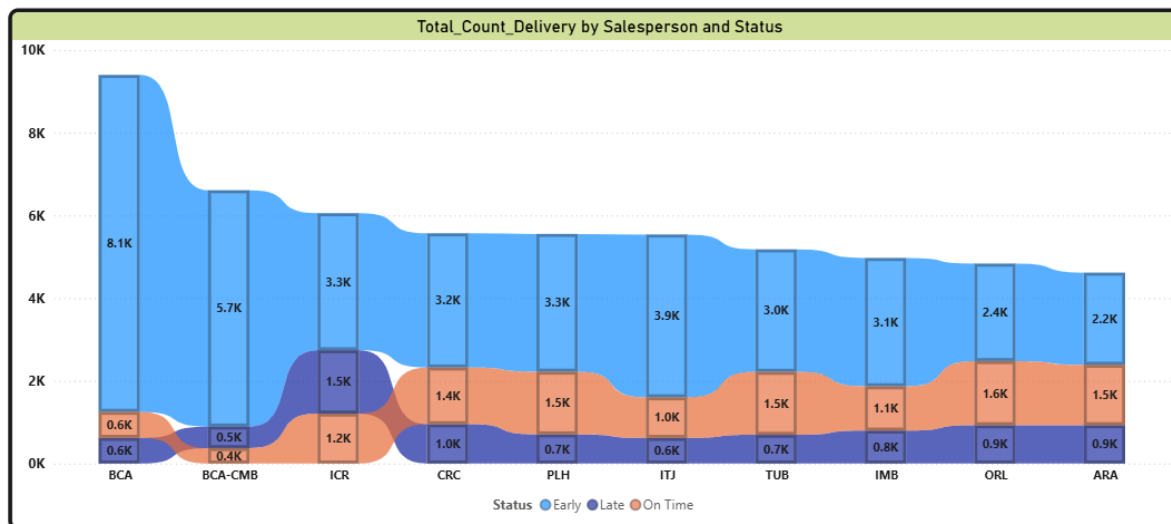
City vs Total no. of successful deliveries
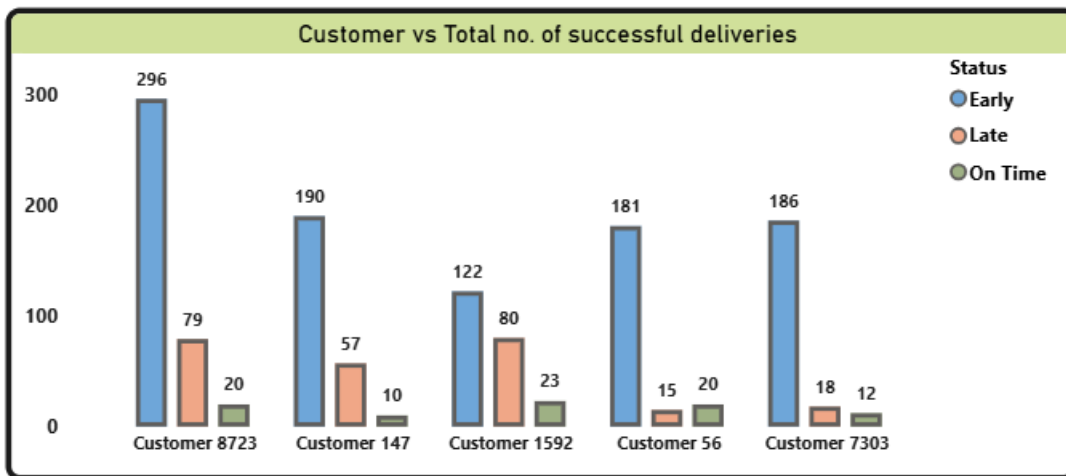
Insights:

From figure, we can see top 10 cities according to total no. deliveries. Maximum no. of deliveries happened in Oklahoma City, Cincinnati, Mesa respectively.
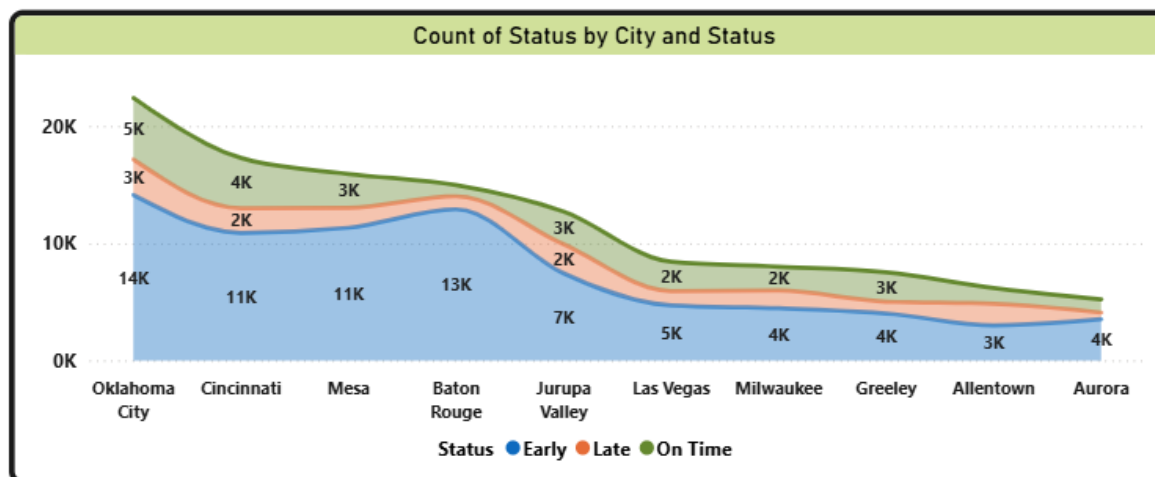
Customer vs Total no. of successful deliveries

Insights:

Customer 8723, customer 147, customer 1592, customer 56 and customer 7303 received maximum no. of deliveries so we can say that they are repetitive customers.

Service channel vs Total no. of successful deliveries

Insights:

Maximum no. of orders came from grocery store, SM From 02 to 04 check-out, convenience shop, confectionery/bakery respectively.
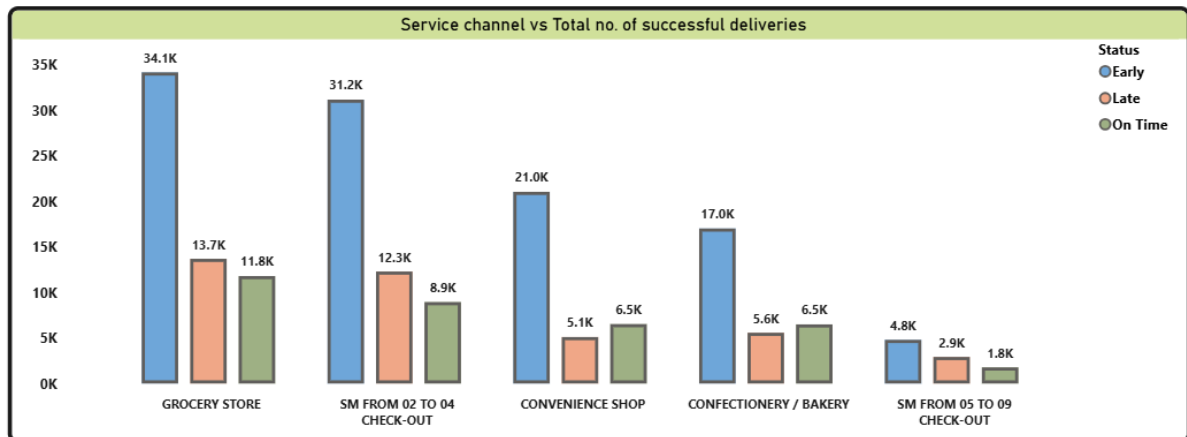
Early deliveries

In time or Early deliveries

Insights:

Maximum no. of Early deliveries happened in May, August and February respectively.

In time or Early deliveries by salesperson

Insights:

Customers of salespersons 'BCA', 'BCA-CMA' and 'ITJ' received maximum no. of Early deliveries.

Salesperson vs Early deliveries

3K (13.56%)

8K (33.33%)

3K (13.63%)

4K (16.1%)

6K (23.38%)

Salesperson ● BCA ● BCA-CMB ● ITJ ● PLH ● ICR

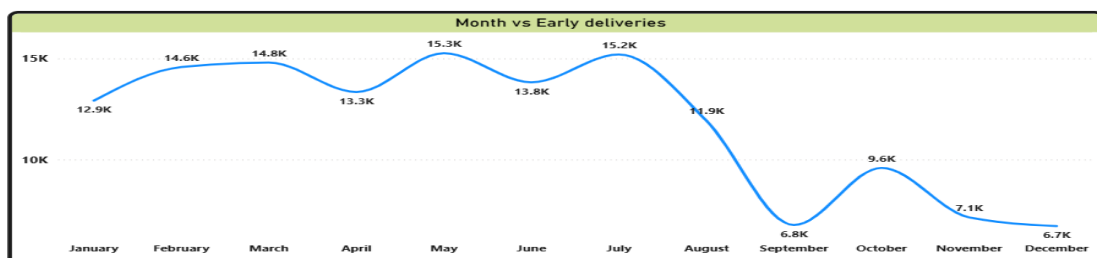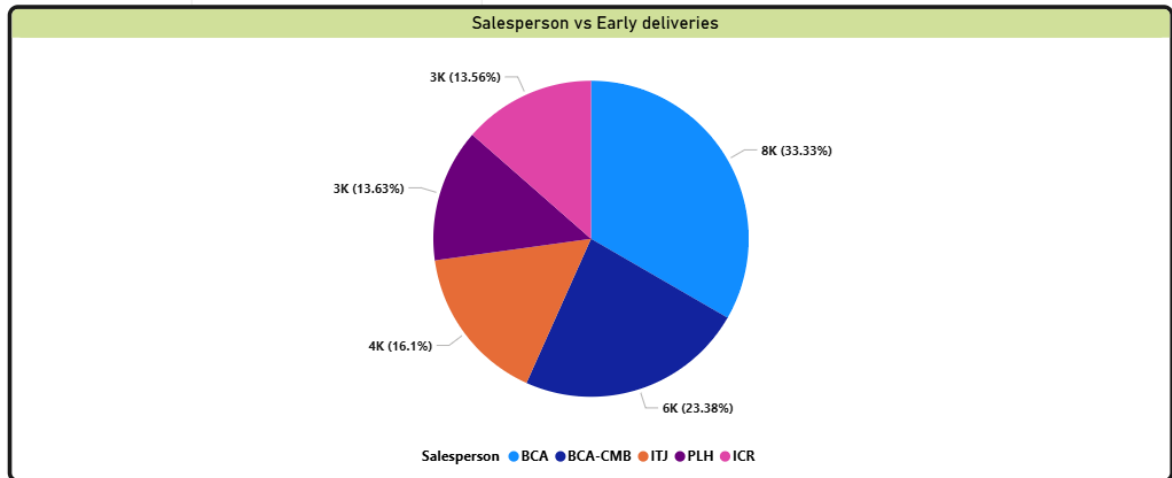# Customers by Early deliveries

Insights:

Customer 8723 received maximum no. of Early deliveries
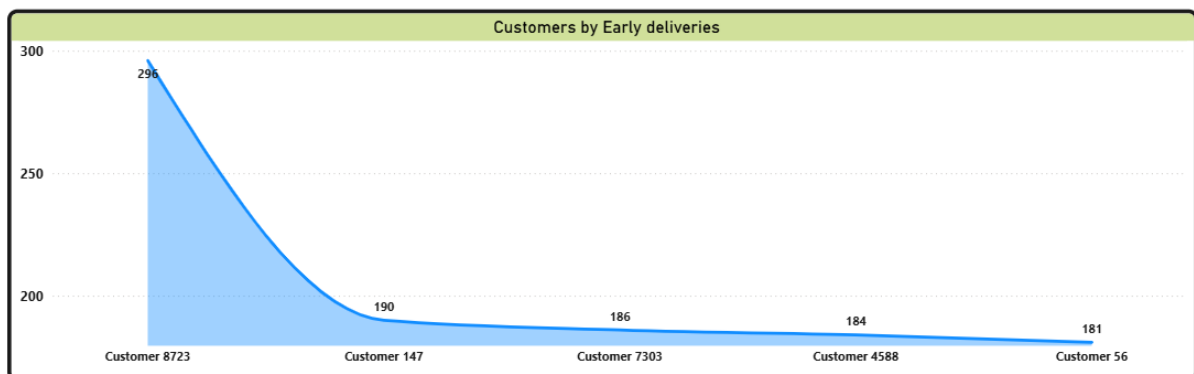
Customers by Early deliveries

296	190	186	184	181
Customer 8723	Customer 147	Customer 7303	Customer 4588	Customer 56

Cities by Early deliveries

Insights:

Maximum no. of Early deliveries happened in Oklahoma City, Baton Rouge, Mesa and Cincinnati respectively.

Cities by Early deliveries

City	Value
Oklahoma City	14.1K
Baton Rouge	12.9K
Mesa	11.3K
Cincinnati	10.9K
Jurupa Valley	7.4K
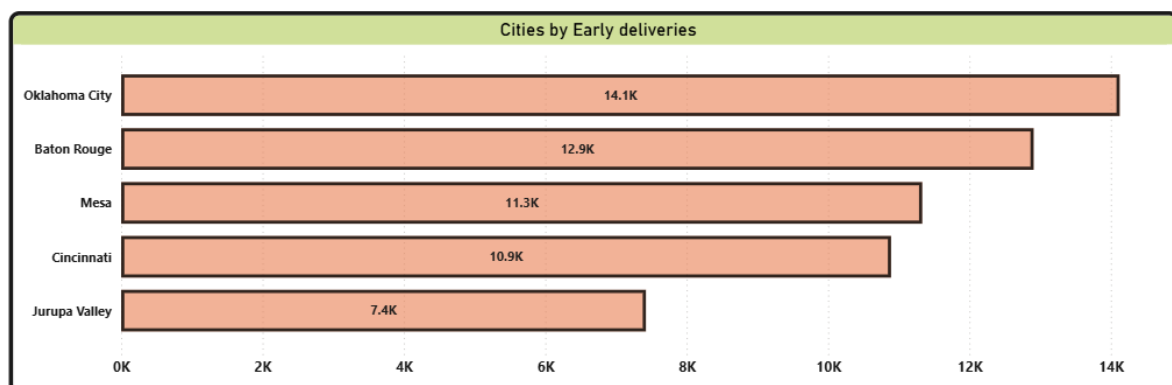
Teams by Early deliveries

Insights:

Orders from Team's-Coast, North, South received maximum no. of Early deliveries.

Teams by Early deliveries.

Team	Early deliveries
COAST	41K
NORTH	25K
SOUTH	24K
FLORIANOPOLIS	19K
VALLEY	13K

Service channel by Early deliveries

Insights:

Service Channels-Grocery store, Sm from 02 to 04 check out and Convenience shop received maximum no. of Early orders respectively.

Service channel by Early deliveries

- 34K (31.46%) — GROCERY STORE
- 31K (28.71%) — SM FROM 02 TO 04 CHECK-OUT
- 21K (19.38%) — CONVENIENCE SHOP
- 17K (15.67%) — CONFECTIONERY / BAKERY
- 5K (4.79%) — BARS
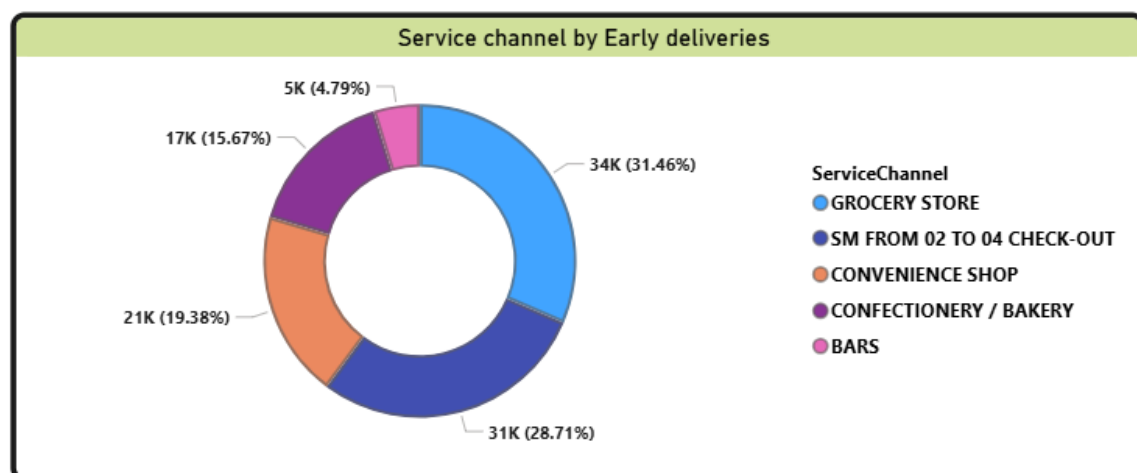
On time Deliveries

Month by on time deliveries

Insights:

Maximum no. of on time deliveries happened in May, July, February respectively.
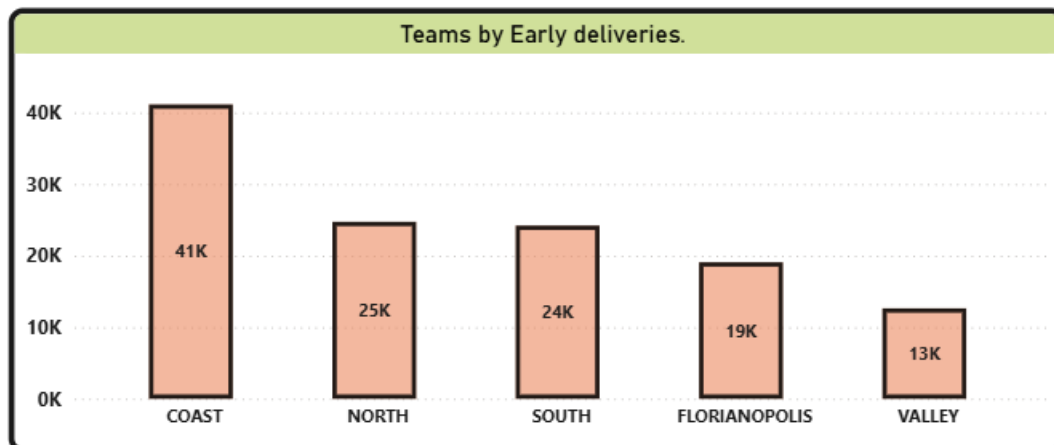
Month by On time deliveries

Month	On time deliveries
January	4.4K
February	5.1K
March	4.9K
April	3.9K
May	5.8K
June	4.6K
July	5.1K
August	3.8K
September	2.6K
October	2.9K
November	2.5K
December	2.4K

Salespersons by on time deliveries

Insights:

Customers of salespersons ORL, TUB and PLH received maximum no of on time deliveries.

Salespersons by on time deliveries

1K (18.48%)
2K (20.9%)
1K (19.67%)
2K (20.52%)
2K (20.43%)

Salesperson
- ORL
- TUB
- PLH
- ARA
- CRC

Customers by on time deliveries

Insights:

Customer 8782, Customer 676 and Customer 1624 received maximum no. of on time deliveries.
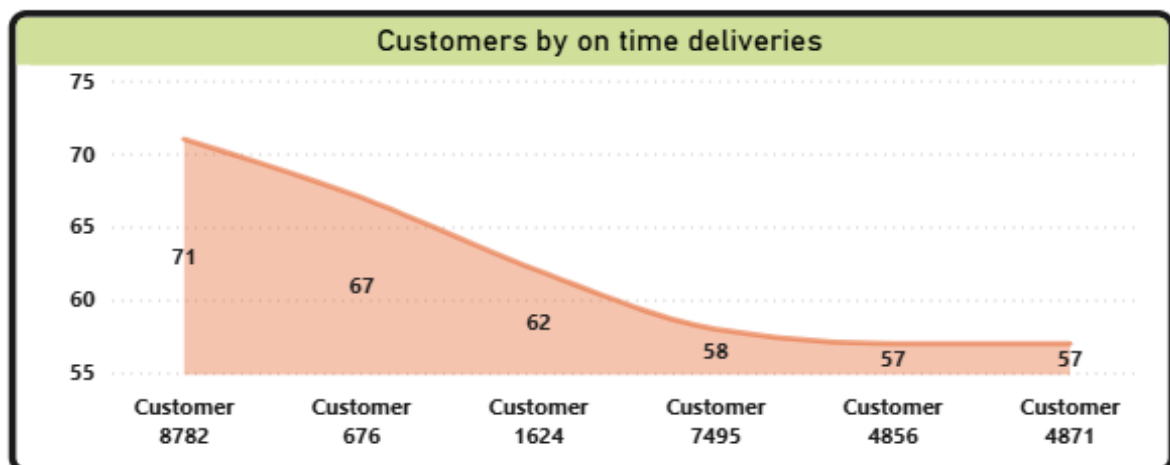
Customers by on time deliveries

Customer 8782	Customer 676	Customer 1624	Customer 7495	Customer 4856	Customer 4871
71	67	62	58	57	57

Cities by on time deliveries

Insights:

Maximum no. of on time deliveries happened in Oklahoma City and Cincinnati respectively.

Cities by On time deliveries

City	On time deliveries
Oklahoma City	5.2K
Cincinnati	4.3K
Mesa	2.9K
Jurupa Valley	2.8K
Greeley	2.5K

Teams by on time deliveries

Insights:

Orders from Team's- South, North and Florianopolis received maximum no of on time deliveries.

Service channel by on time deliveries

Insights:

Service Channels-Grocery store, Sm from 02 to 04 check out and Convenience shop received maximum no. of on time orders.
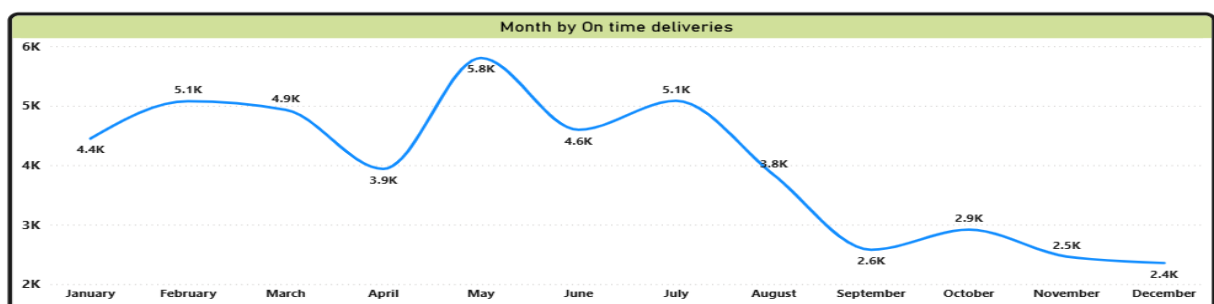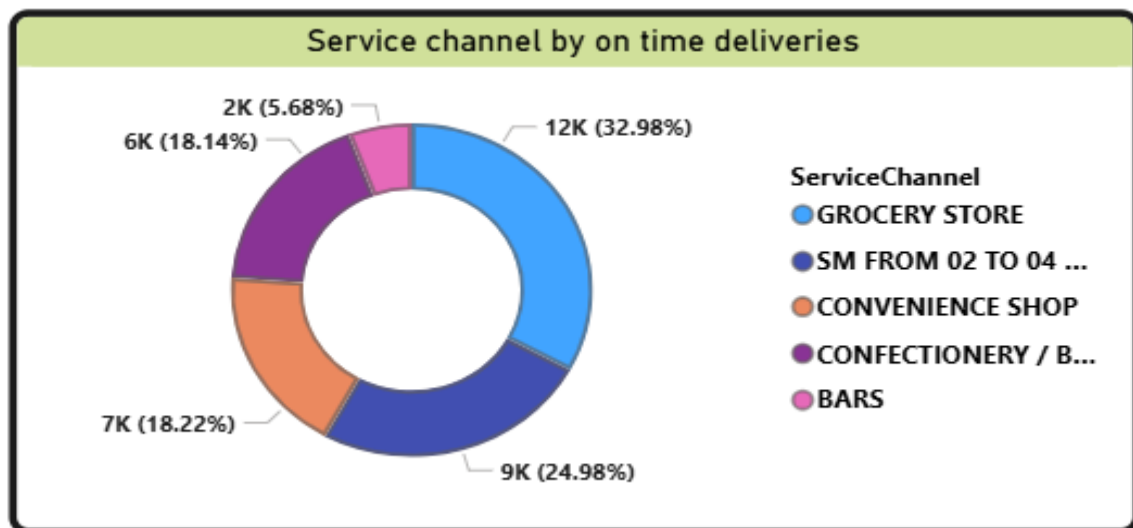
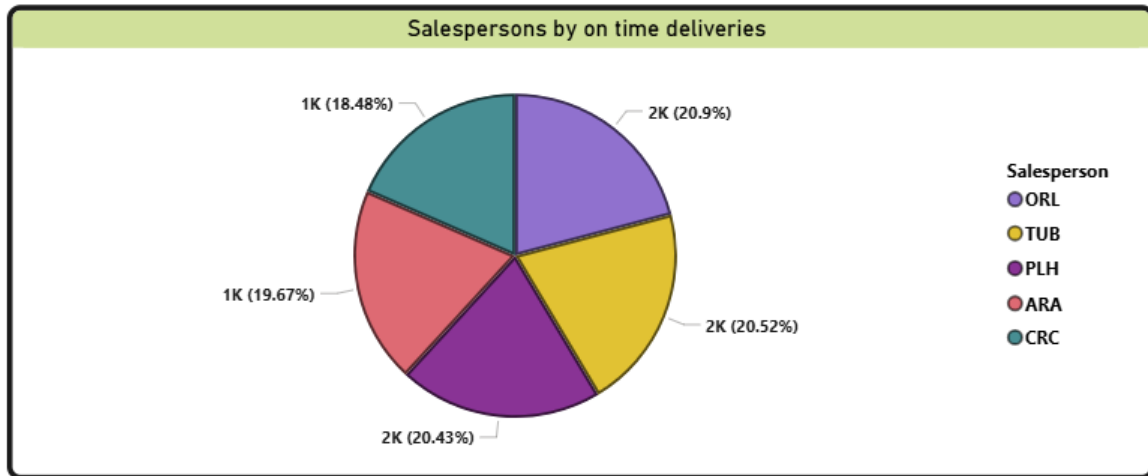# Late deliveries

Month by Late deliveries

Insights:

Maximum no. of Late deliveries happened in April, February and March respectively.

Salespersons by Late deliveries

Insights:

Customers of salespersons CAN, TAI and MAF received maximum no of Late deliveries.
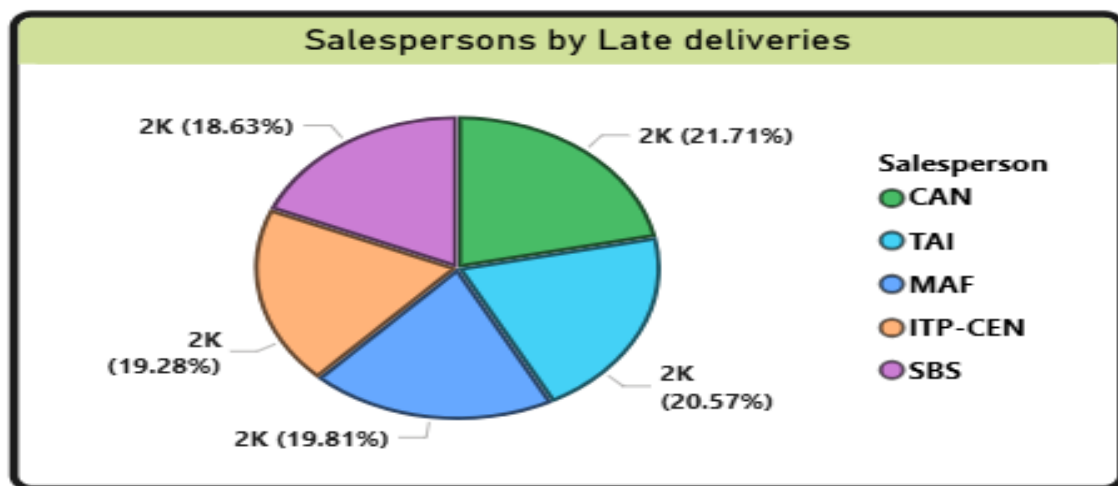
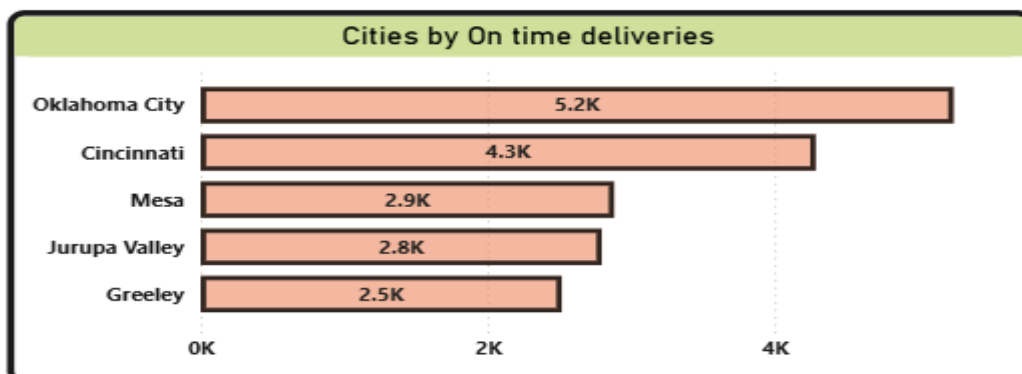## Customers by Late deliveries

Insights:

Customer 4499, Customer 8852 and Customer 196 received maximum no. of Late deliveries.
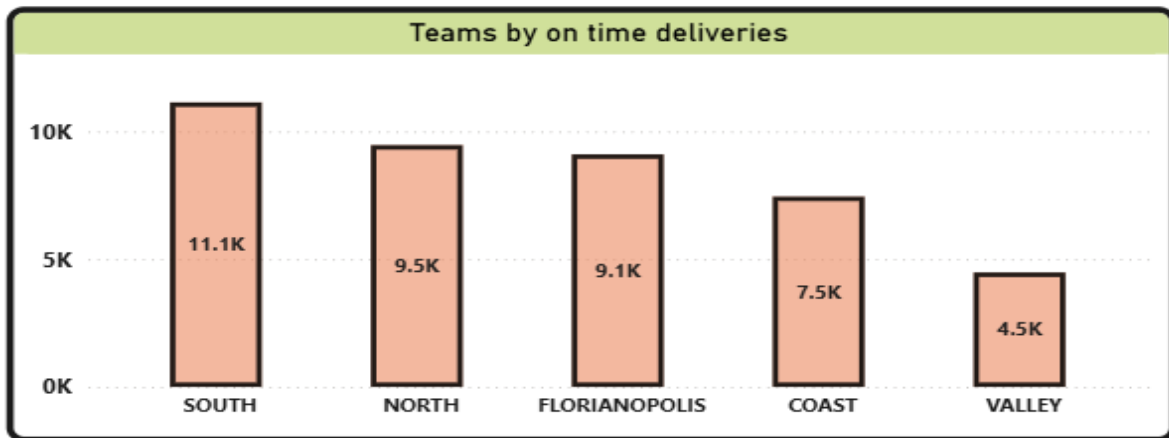
Cities by Late deliveries

Insights:

Maximum no. of Late deliveries happened in Oklahoma City, Jurupa valley and Cincinnati respectively.
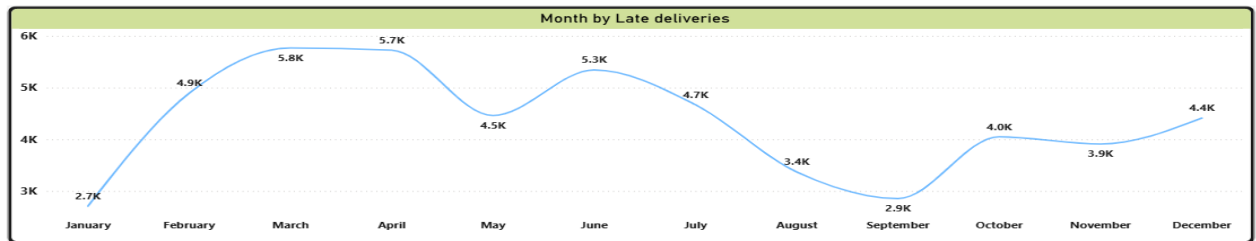

Cities by Late deliveries

City	Late deliveries
Oklahoma City	3.0K
Jurupa Valley	2.5K
Cincinnati	2.1K
Allentown	1.8K
Mesa	1.7K

Teams by Late deliveries

Insights:

Orders from Team's- North, Valley and South received maximum no of Late deliveries.

Teams by Late deliveries

Team	Late deliveries
NORTH	13.2K
VALLEY	9.5K
SOUTH	9.2K
COAST	5.9K
FLORIANOPOLIS	4.7K

Service channel by Late deliveries

Insights:

Service channels-Grocery store and Sm from 02 to 04 check out received maximum no. of Late orders.

Service channel by Late deliveries

- 3K (7.36%)
- 5K (12.88%)
- 14K (34.61%)
- 6K (14.08%)
- 12K (31.08%)

ServiceChannel
- GROCERY STORE
- SM FROM 02 TO 04 CHECK-OUT
- CONFECTIONERY / BAKERY
- CONVENIENCE SHOP
- SM FROM 05 TO 09 CHECK-OUT

9. Insights & Conclusions

Overview

Analysis

On Time Deliveries

Dashboard — On Time Deliveries

Filters: Year (All), Month (All), Status (All), Team (All), Salesperson (All), City (All)

Navigation: Overview | Analysis | On Time | Early | Late

On Time: 19.83%
Average Delivery Days: 4.00
Returns: 6879

Top Teams Acc. To Total On Time Deliveries
- SOUTH: 11138
- NORTH: 9467
- FLORIANOPOLIS: 9106
- COAST: 7450
- VALLEY: 4482

Top Customers Acc. To Total On Time Deliveries
- Custo... 8782, Custo... 676, Custo... 1624, Custo... 7495, Custo... 4856, Custo... 4871

Top Salespersons Acc. To Total On Time Deliveries
- ORL: 20.9%
- TUB: 20.52%
- PLH: 20.43%
- ARA: 19.67%
- CRC: 18.48%

Service channel by on time deliveries
- GROCERY STORE: 32.98%
- SM FROM 02 TO 04 C...: 24.98%
- CONVENIENCE SHOP: 18.22%
- CONFECTIONERY / B...: 18.14%
- BARS: 5.68%

Top Cities Acc. To Total On Time Deliveries
- Oklahoma City: 5247
- Cincinnati: 4286
- Mesa: 2881
- Jurupa Valley: 2795
- Greeley: 2516

Status	On Time	
Year	Count of Status	% Status
2019	28894	19.74%
2020	19140	19.95%
Total	48034	19.83%

Early Deliveries

Dashboard — Early Deliveries

Filters: Year (All), Month (All), Status (All), Team (All), Salesperson (All), City (All)

Navigation: Overview | Analysis | On Time | Early | Late

Early: 58.64%
Average Delivery Days: 2.00
Returns: 17996

Top Teams Acc. To Total Early Deliveries
- COAST: 41129
- FLORIANOPOLIS: 19074
- NORTH: 24726
- SOUTH: 24201
- VALLEY: 12633

Top Customers Acc. To Total Early Deliveries
- Custo... 1624, Custo... 4856, Custo... 7495, Custo... 676, Custo... 4871, Custo... 8782

Top Salespersons Acc. To Total Early Deliveries
- PLH: 23.59%
- CRC: 22.98%
- TUB: 20.97%
- ORL: 16.6...
- ARA: 15.77%

Top Service Channels Acc. To Total Early Deliveries
- GROCERY STORE: 31.46%
- SM FROM 02 TO 04 ...: 28.71%
- CONVENIENCE SHOP: 19.38%
- CONFECTIONERY / ...: 15.67%
- BARS: 4.79%

Top Cities Acc. To Total Early Deliveries
- Oklahoma City: 14125
- Mesa: 11332
- Cincinnati: 10891
- Jurupa Valley: 7423
- Greeley: 4015

Status	Early	
Year	Count of Status	% Status
2019	84764	57.92%
2020	57302	59.73%
Total	142066	58.64%

Late Deliveries

- **Key Findings:** Summarize trends, patterns, or anomalies identified in the data

Characters related to	Max. Early deliveries	Max. On time Deliveries	Max. Late Deliveries
Months	May, July, March	May, July, February	April, February, March
Salespersons	BCA, BCA-CMD, ITJ	ORL, TUB, PLH	CAN, TAI, MAF
Customers	Customer 8723	Customers-8782, 676, 1624	Customers-4499, 8852, 196
Cities	Oklahoma City, Baton Rouge	Oklahoma City, Cincinnati	Oklahoma City, Jurupa valley
Teams	Coast, North, South	South, North, Florianopolis	North, Valley, South
Service channels	Grocery store, SM from 02 to 04 check out	Grocery store, SM from 02 to 04 check out	Grocery store, SM from 02 to 04 check out

Analysis Insights

Descriptive:
This analysis summarizes delivery performance across key dimensions.

Early Deliveries

- Highest in May, July, and March

- Driven by salespersons BCA, BCA-CMD, ITJ

- Concentrated in Oklahoma City and Baton Rouge

- Strong contribution from Coast, North, and South teams

On-Time Deliveries

- Peaked during May, July, and February

- Best-performing salespersons: ORL, TUB, PLH

- Major customers: 8782, 676, 1624

- Cities with consistent performance: Oklahoma City and Cincinnati

Late Deliveries

- Most frequent in April, February, and March

- Linked to salespersons CAN, TAI, MAF

- Affected customers: 4499, 8852, 196

- Key problem locations: Jurupa Valley and Oklahoma City

Summary: Delivery performance varies significantly by month, salesperson, city, and team, with Oklahoma City appearing across all delivery outcomes.

Diagnosis:
This analysis explains the reasons behind delivery outcomes.

Seasonal Impact
- Q1–Q2 months show higher late deliveries due to demand spikes or capacity constraints

Salesperson Influence
- Certain salespersons repeatedly appear in late deliveries, indicating process inefficiencies or workload imbalance

Location-Based Issues

- Jurupa Valley shows consistent delays, suggesting route planning or last-mile challenges

Operational Bottleneck

- All delivery types occur within the same service channel (SM checkout 02–04), indicating a checkout or scheduling congestion

Team Variability

- North Team appears in both best and worst outcomes, pointing to inconsistent execution.

Root Cause: Delays are driven by seasonality, uneven resource allocation, and city-level logistics constraints.

Predictive:
Based on historical patterns, future outcomes can be anticipated.
Late deliveries are likely to increase in:

- February, March, and April

- Jurupa Valley and high-volume cities

Early and on-time deliveries are likely during:

- May and July

- When handled by high-performing salespersons and teams.

Risk Customers:

- Customers 4499, 8852, and 196 are more likely to face delays if current processes continue.

Team Performance Forecast:

- Teams with inconsistent performance may continue to fluctuate without intervention.

Prediction: Without operational changes, seasonal delays and location-based inefficiencies will persist.

Prescriptive:
This analysis recommends actions to improve delivery performance.

Operational Improvements:

- Reallocate resources during high-risk months (Feb–Apr)

- Optimize delivery routes for Jurupa Valley

- Reduce checkout congestion during 02–04 time slots

Performance Management:

- Provide targeted training to salespersons linked to late deliveries

- Replicate best practices from May & July operations

- Balance workload across North and Valley teams

Data & Monitoring:

Add alerts for:

- Repeated late deliveries by customer

- City-wise delay thresholds

- Use predictive flags for high-risk orders

Outcome: These actions will reduce late deliveries, stabilize team performance, and improve customer satisfaction.

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10. Conclusions

The integration of Excel and Power BI proved effective for end-to-end data analysis, from raw data to visual reporting for Supply Chain Management.

Overall, improving delivery efficiency will require:

- Replicating best practices from peak-performing months

- Strengthening resource planning during high-risk periods

- Addressing city-specific logistics challenges

- Enhancing salesperson and team accountability

Implementing these actions will lead to **reduced late deliveries, improved operational consistency, and higher customer satisfaction**, making the supply chain more reliable and scalable.