Global Logistics Delivery Delay Analysis

By : Sreepriya Meerel

Project Overview

This case study utilized a dataset related to Logistics Industry.

Exploratory Data Analysis (EDA) was performed to extract valuable insights related to On Time In Full delivery of products(OTIF) and the resultant conclusions are provided.

OTIF analysis provides valuable data that can be used to make informed decisions about supply chain strategies, resource allocation, and performance improvement initiatives.

Target Variable:

- "Delivery status" was considered as target variable

- Deliveries made before or on scheduled delivery date were considered "On-Time" or else was marked as "Delayed".

- Data is highly imbalanced with **OTD Vs Delayed delivery Ratio - 78.5 : 21.5**

- To understand target variable in more depth, both univariate and bivariate analysis was performed to get some useful insights about factors affecting customer churning, so as to help company to plan adequate future actions.
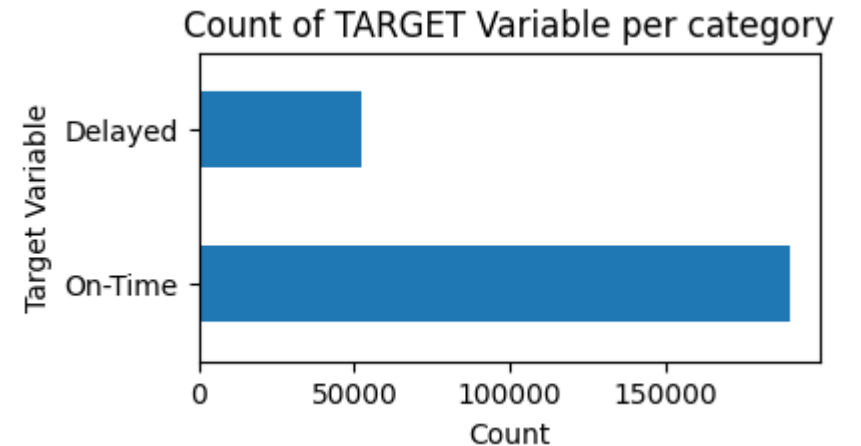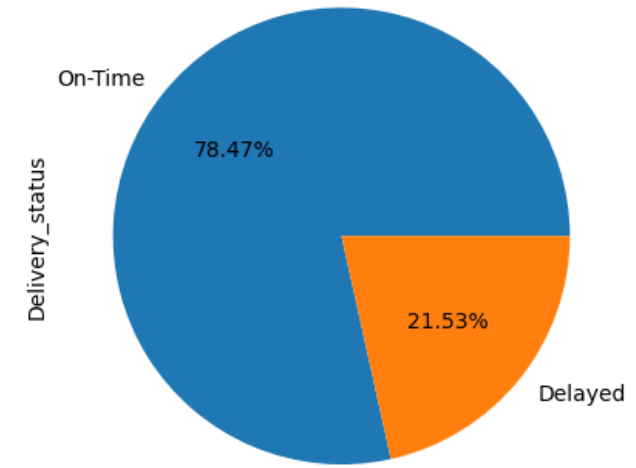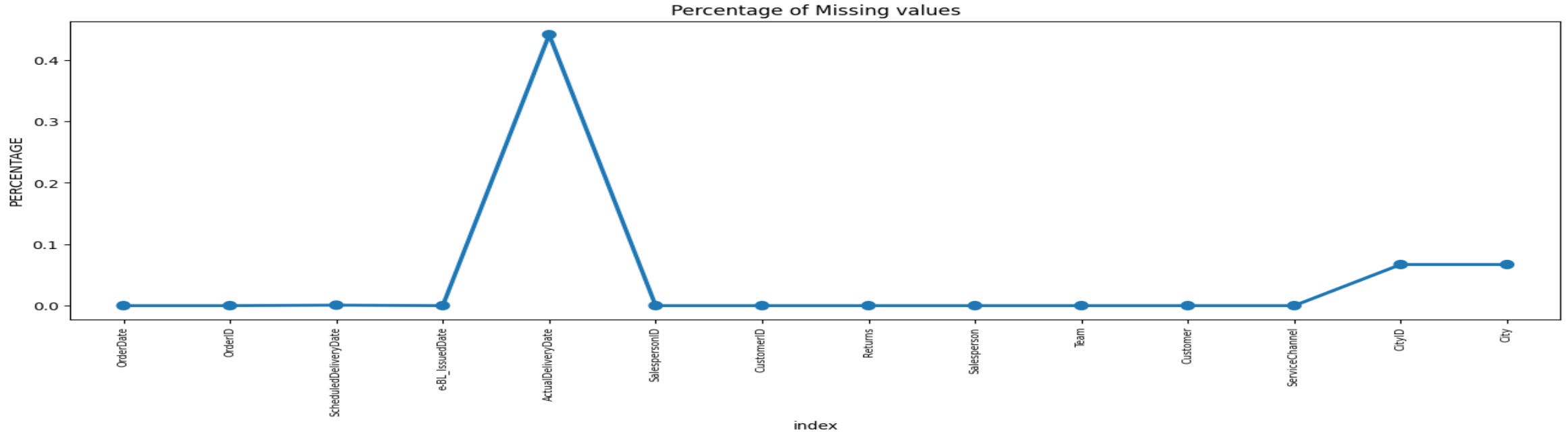
Data Cleaning

Missing Value Treatment

Percentage of Missing values

Findings:
- Actual Delivery Date column has 0.4% missing values which indicates some orders has not been delivered
- City ID & City are also having missing values, which might be a contributing factor for missed deliveries.

Dropped Columns

Columns not required for analysis were dropped:

- Customer

- Salesperson

- City ID

Derived Metrics:

- Days To Deliver: To calculate number of days taken to ship

- Delivery Status: To check if order was delivered on time or late

- Ordered Month: To find orders placed in which months has high delay

- Ordered Year: To analyse delay trend over years

Calculated KPI'S

- OTD Rate = 78.5 %

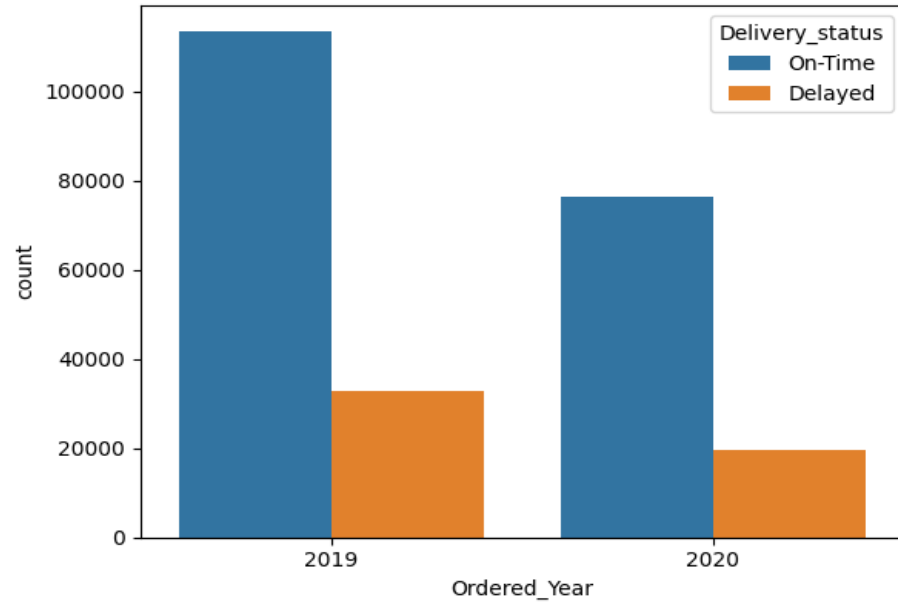- Fill Rate = 99.5 %

- OTIF Rate = 78%
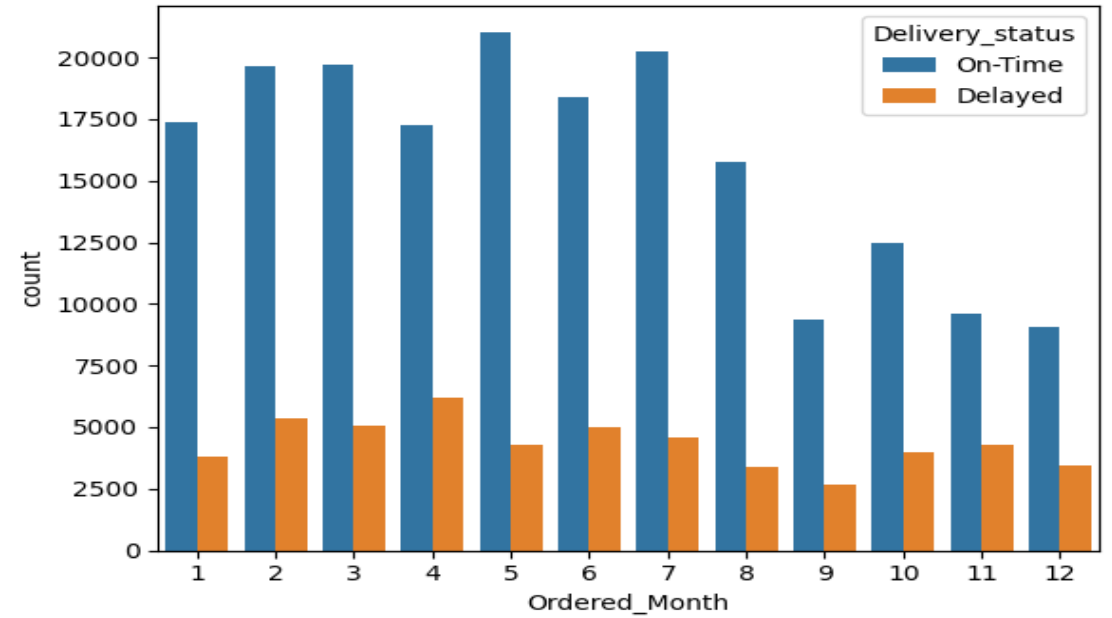
Univariate Analysis

- Analysis was done by plotting multiple distribution graphs of individual predictors (dependent variable) by "Deliver status" (target variable).

Findings:

Delivery Delay Rate :
- 2019 - 22.32%
- 2020 - 20.31%,

Delivery Delay Rate
- November -31% (highest)
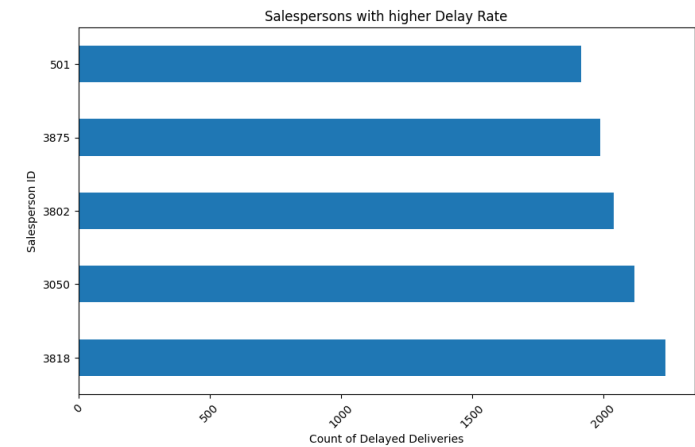- April - 27%
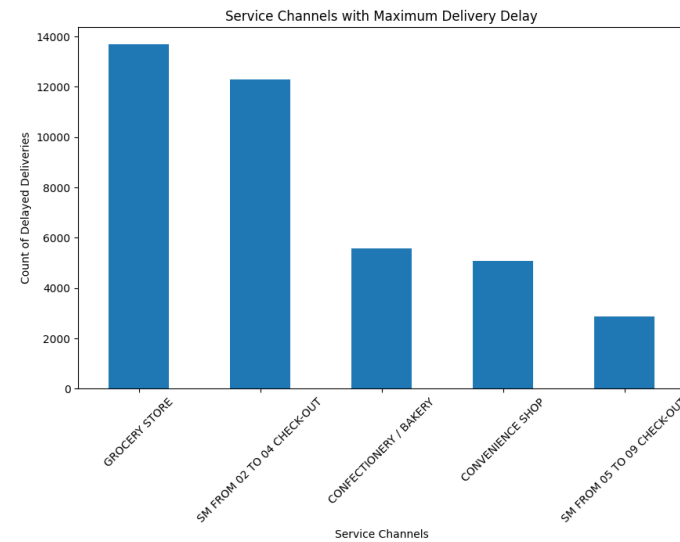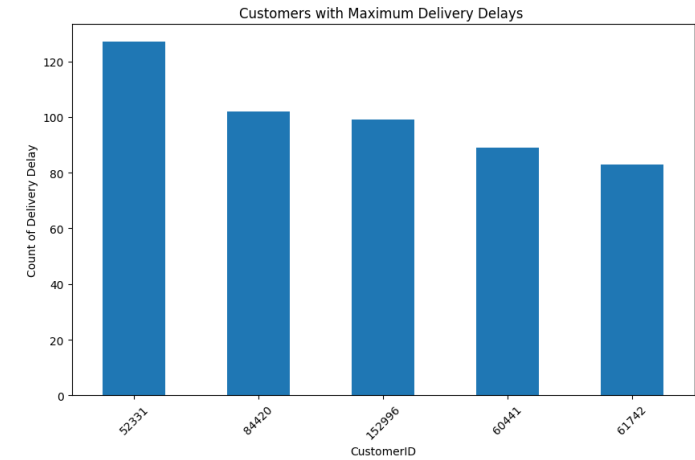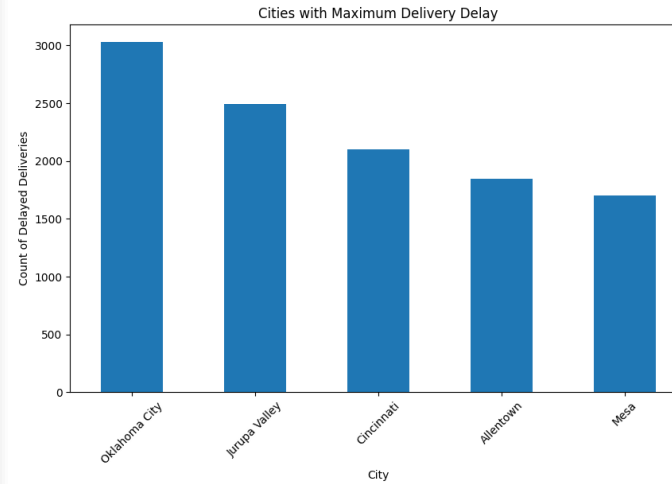- May and August- 17%(lowest)

Findings:

- 75% of orders have 0 returns or fewer

- A slight increase in return is seen with On-Time delivery
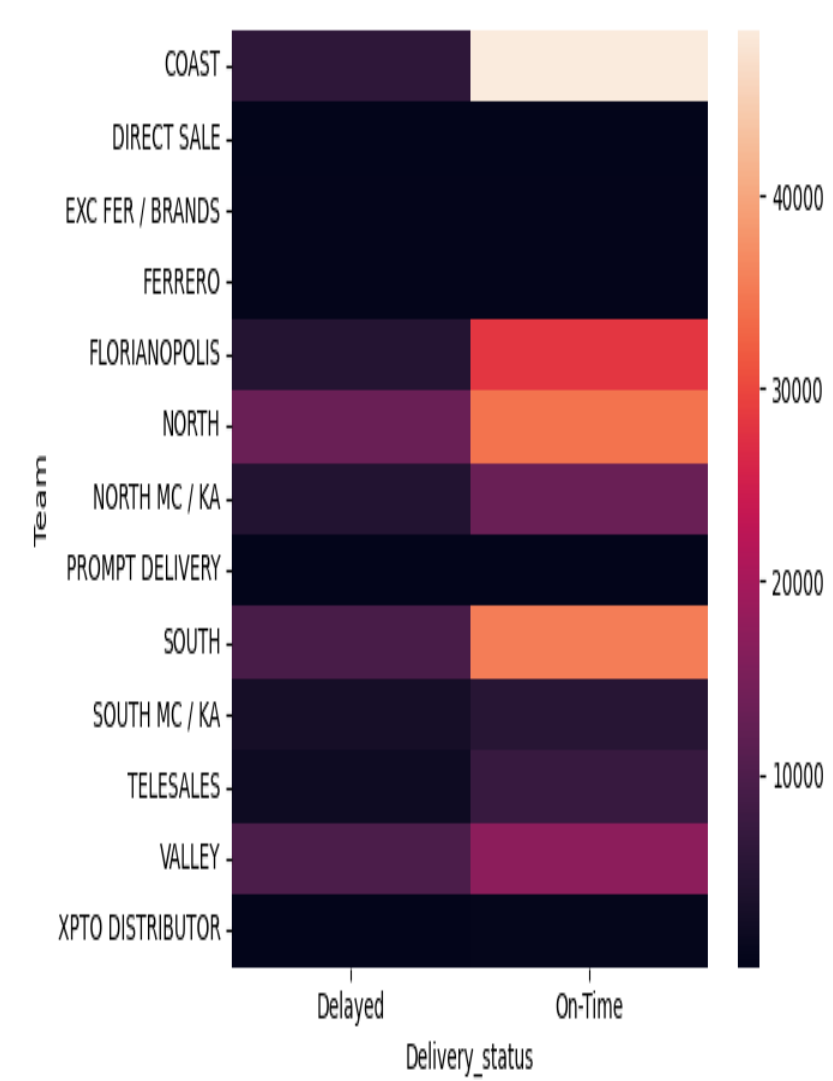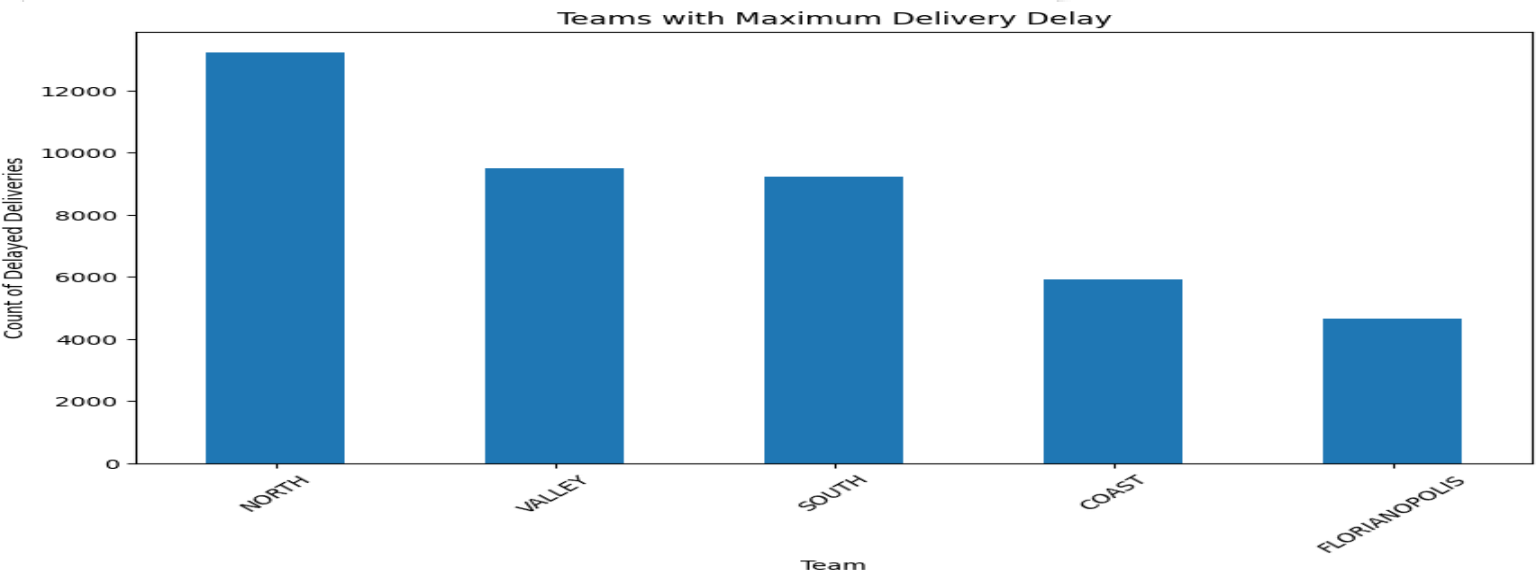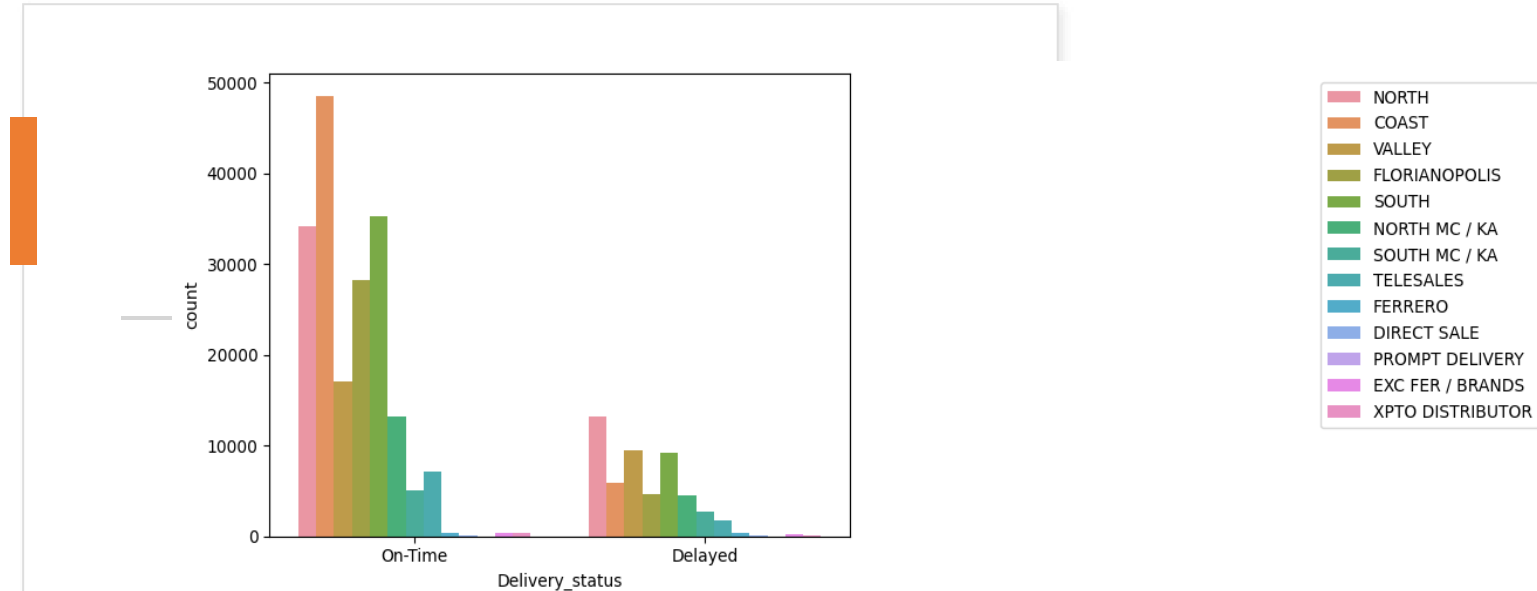
Max Delivery Delay seen in:

- Oklahoma City

- Customer ID 52331

- Salesperson 3181

- Grocery Store

Findings: Team North has Maximum delay in delivery

Univariate Analysis Findings:

- A high Fill Rate% of more than 99.5% shows efficiency in order processing

- OTD Rate is found to be 78.5% which is very low and indicates only 78.5% orders are delivered on time

- On-Time In-Full (OTIF) rate is 78.1%, it means that approximately 78% of orders are being delivered both on time and in full

- Delivery delays decreased from 22.32% in 2019 to 20.31% in 2020, which suggests a reduction in delay rates.

- The highest delivery delay occurs in the month of November at 31% followed by April at 27%. On the other hand, delays are less frequent in the months of May and August, where the delay rate is as low as 17%.

- Team North has Maximum delay in delivery, followed by Valley, South, Coast and Florianopolis

- A slight increase in returns is evident with On-Time deliveries

- Oklahoma City stands out as the city with the most pronounced delivery delays followed by Jurupa Valley, Cincinnati, Allentown and Mesa.

- Among Service channels, Grocery Store exhibits the highest incidence of delivery delays followed by Check-out(02 to 04), Confectionery/Bakery, Convenience Shop, and Check-out(05 to 09)

- Salesperson with ID# 201 has a strong track record of delivering goods on time, while Salesperson 3818 has a high rate of delayed deliveries.

- Customer identified by the ID number 52331 has encountered the highest number of delivery delays

Predicting Correlation:
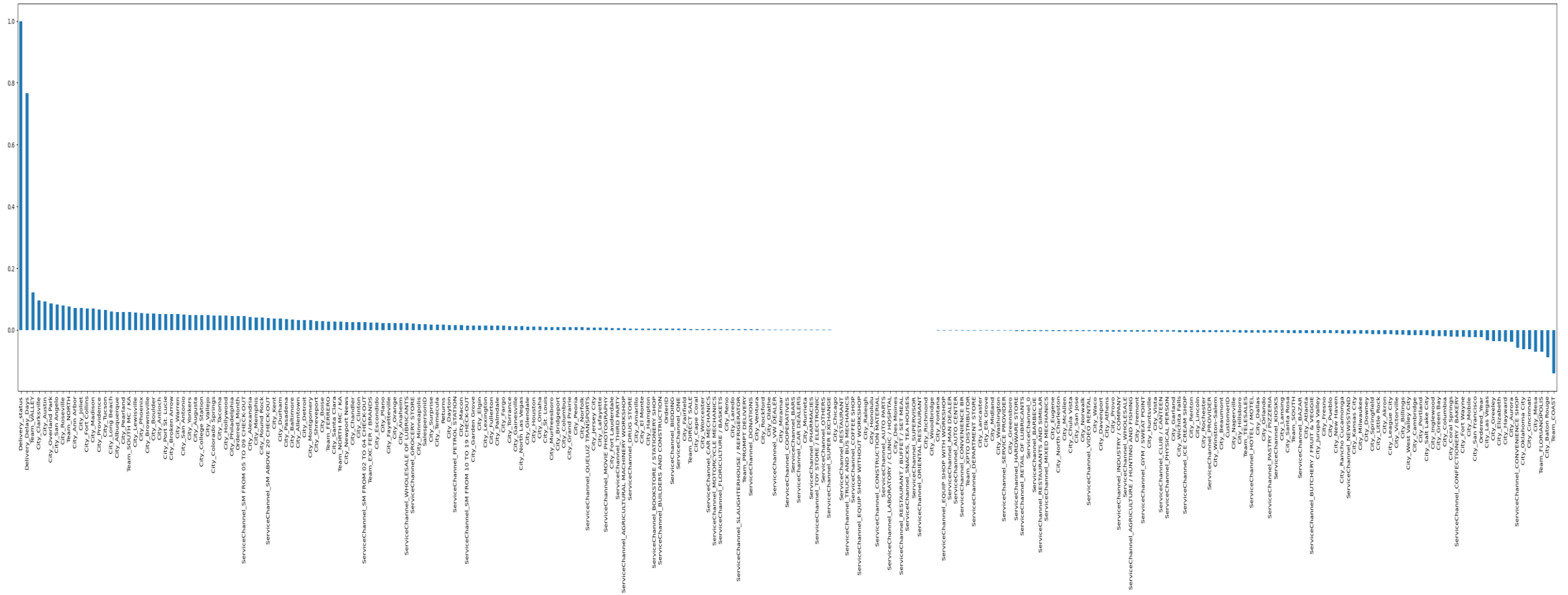
Finding: Crucial factors influencing timely delivery are Team, Service channel and City.

Bivariate Analysis

- Analysis was done by comparing two variables to understand their relationship better.
- Distribution graphs were plotted for all dependent factors to examine relationship between dependent and independent factors.

Findings:

All teams excluding Team Ferrero are making diligent efforts to reduce delivery delays, leading to a noticeable improvement in 2020 as compared to 2019

Distribution of Team over Year
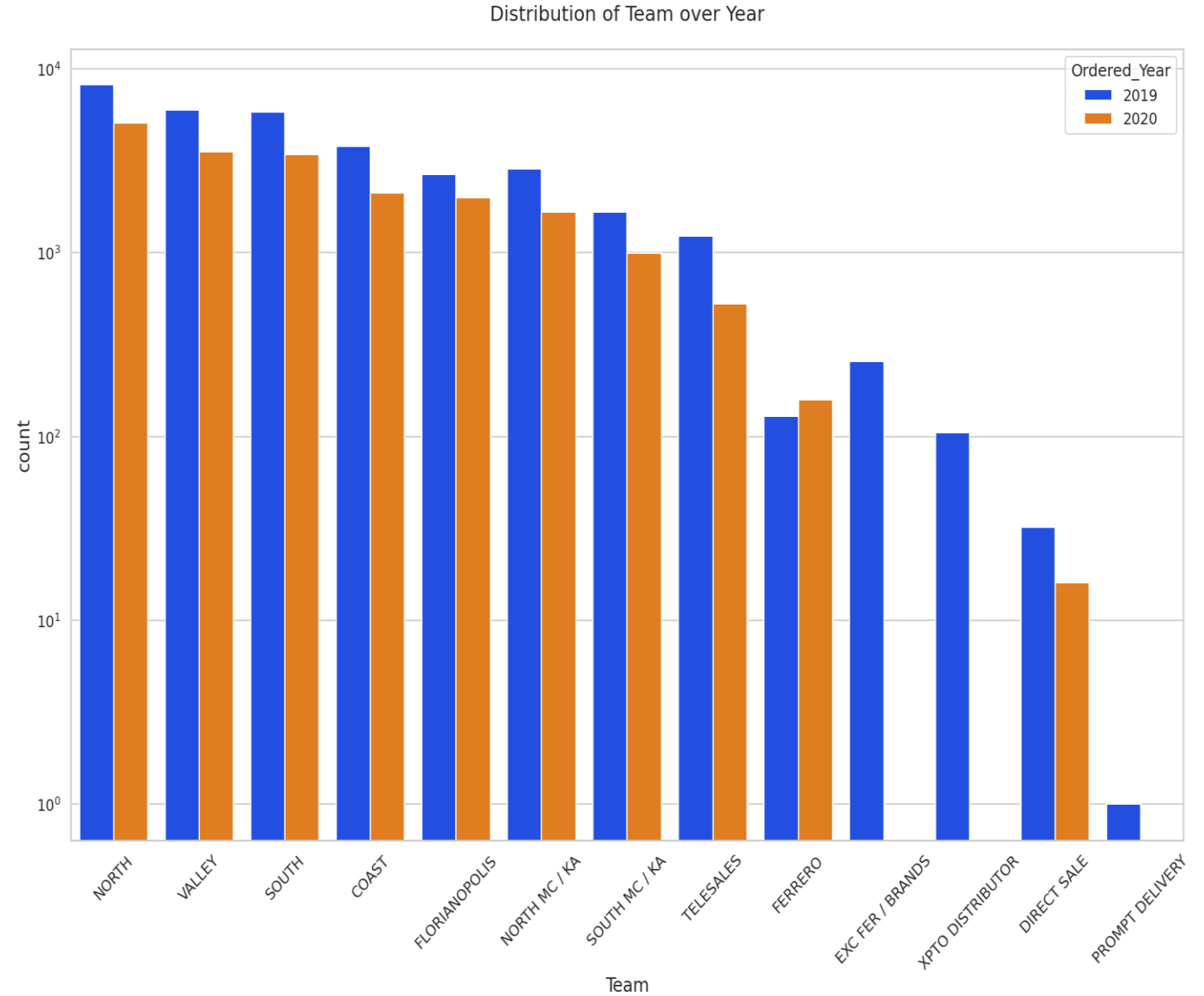
Findings:

Cities with high delay rates may be experiencing these issues due to underperforming teams in their respective regions
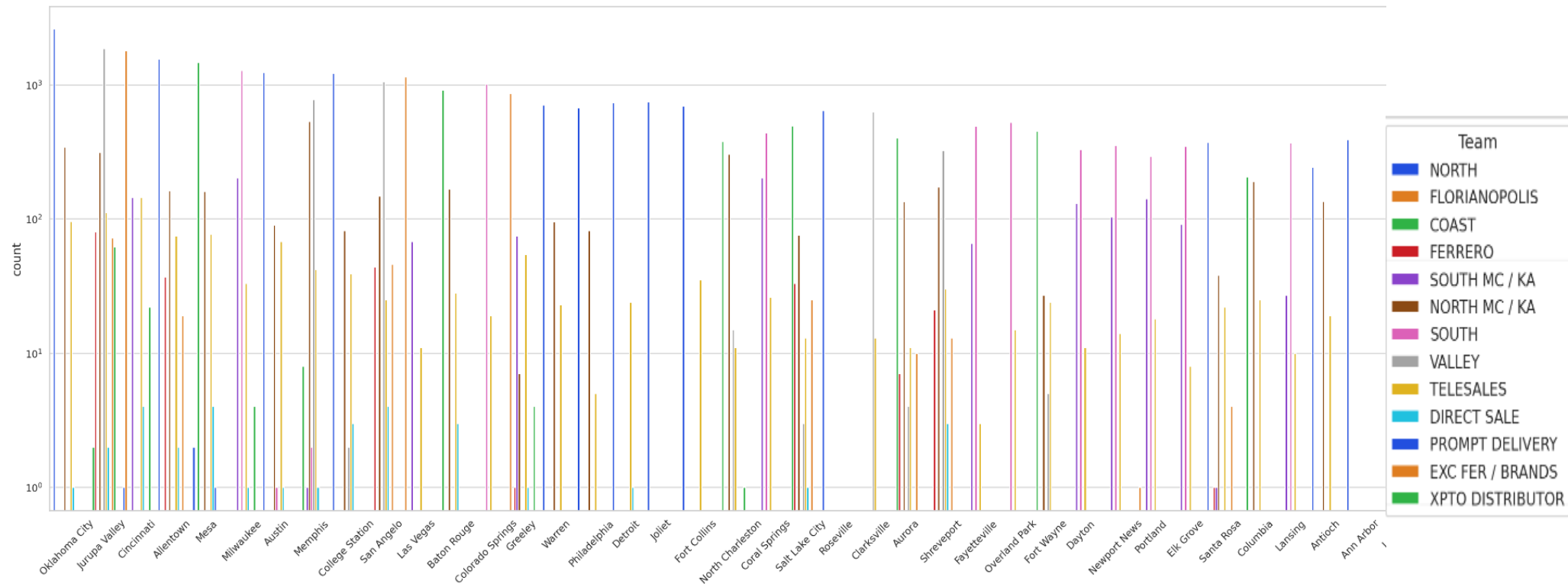
Distribution of Delayed Deliveries over Months

Findings:

Most of the teams exhibit an increase in delays during April, followed by a noticeable decline in the third quarter. However, there is a rapid rise in delays once again in the final quarter.
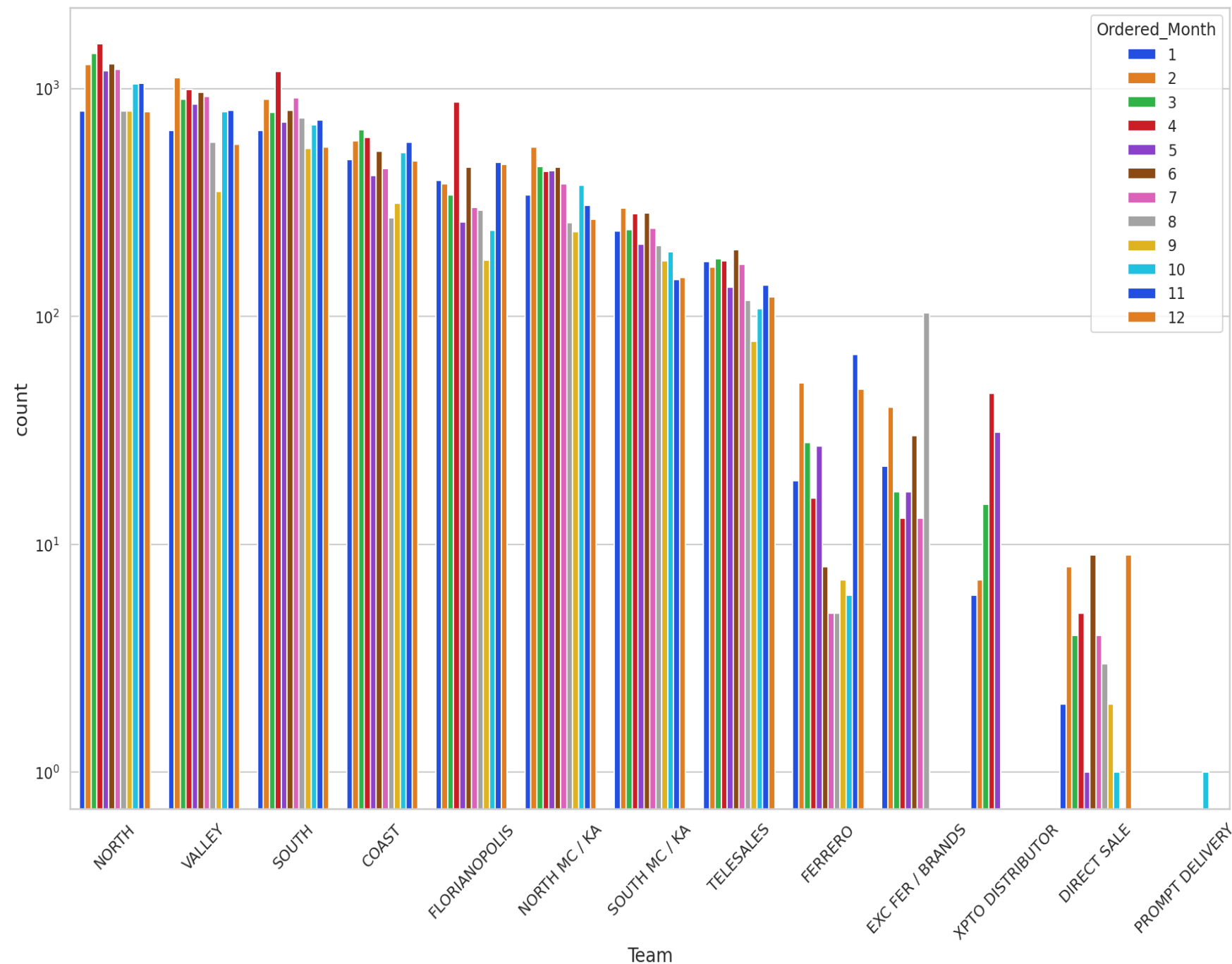
Findings:

- Highest delay month for year
  - 2019 : November
  - 2020 : April
- Lowest delay in 2020 : August

Distribution of Delayed Orders over Months
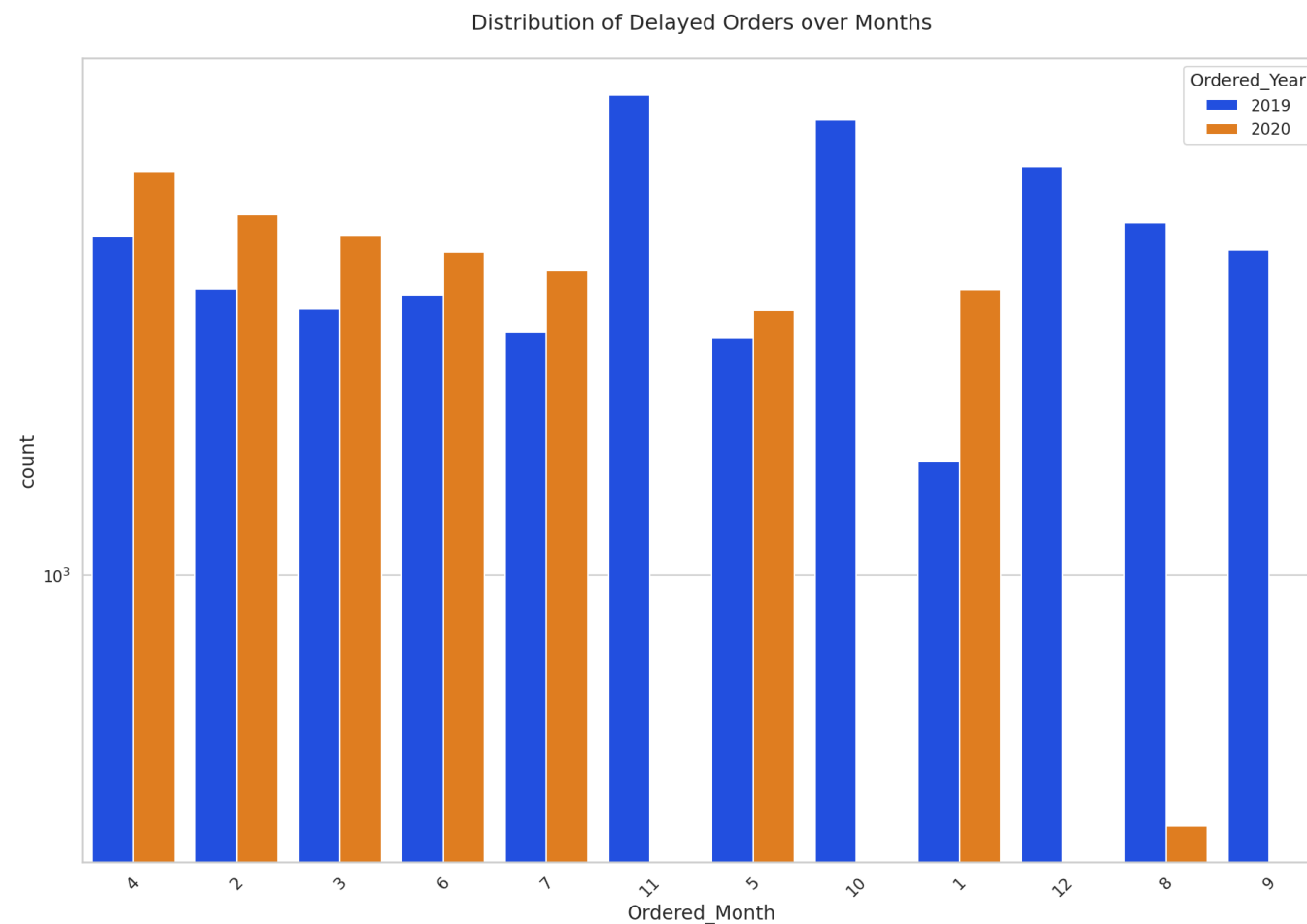
Findings:

Stores such as groceries , confectionary and small businesses with 02 to 04 check-out lanes exhibit a higher delay rate

Distribution of Delayed Orders over Months
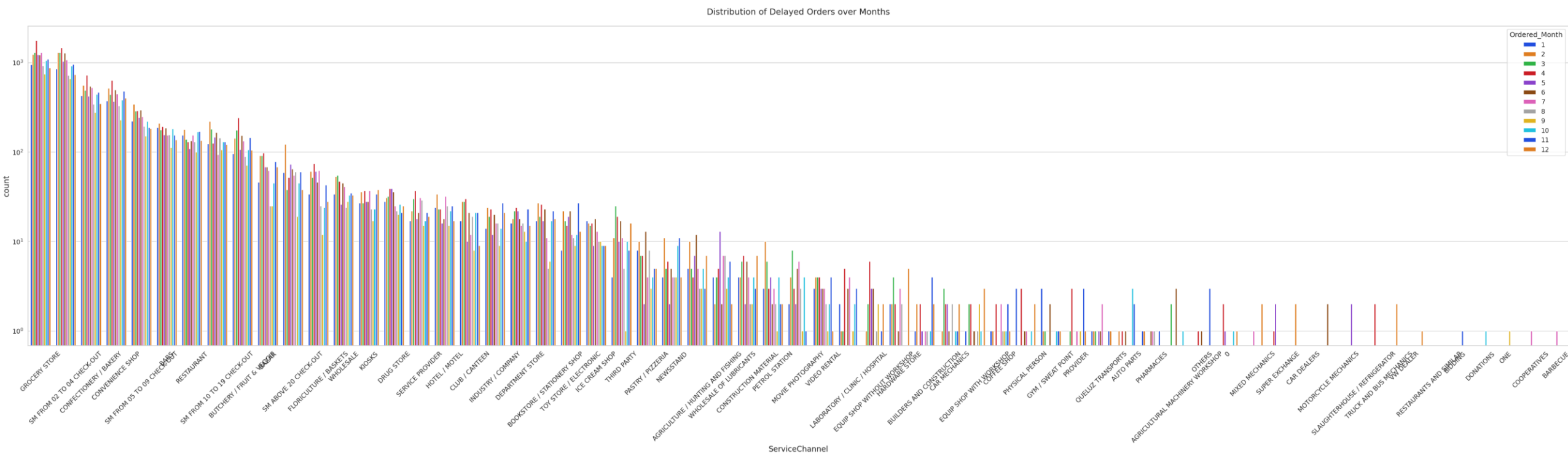
Finding: A noticeable improvement in delay rates among all service channels is seen in 2020

Distribution of Delayed Orders over Time
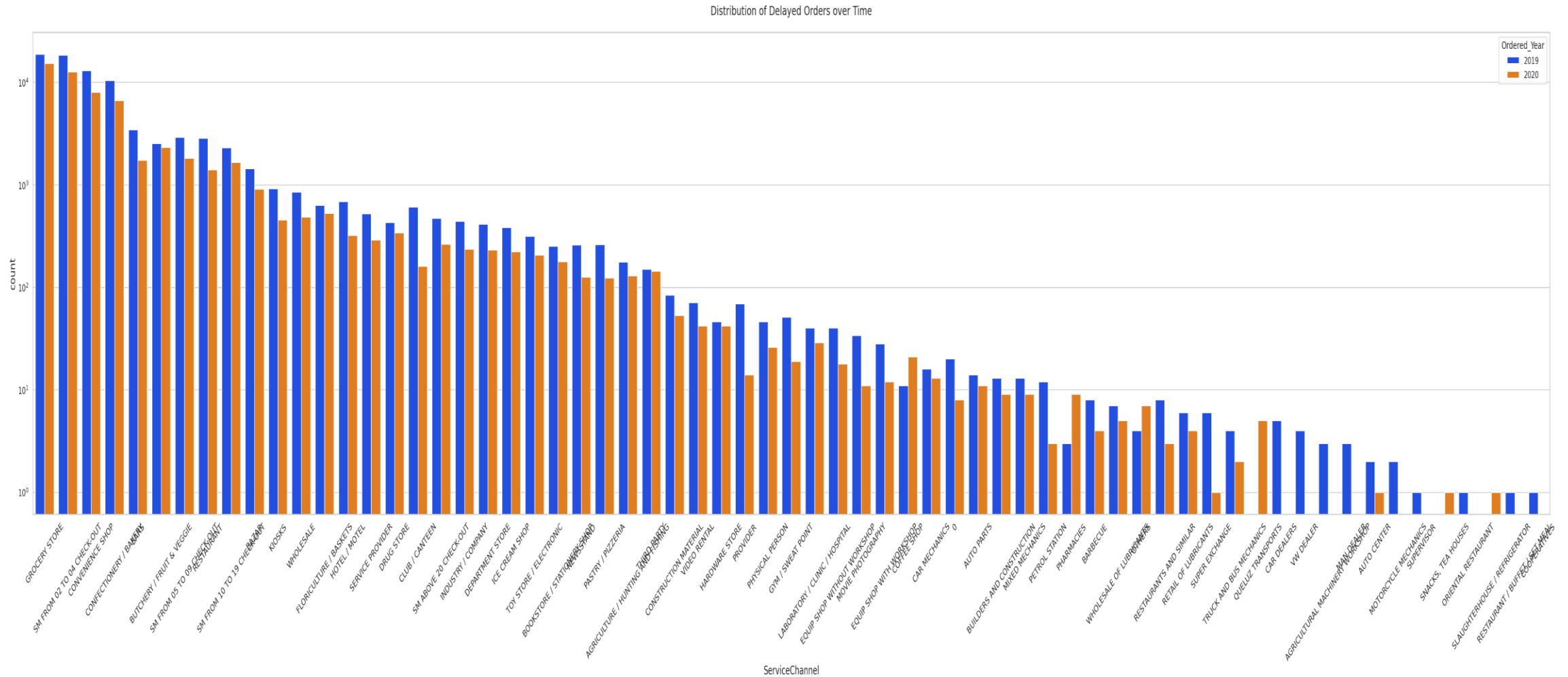
Bivariate Analysis Insights:

- It is apparent that cities with high delay rates, such as Oklahoma City, Jurupa Valley, and Cincinnati, may be experiencing these issues due to underperforming teams in their respective regions, namely North, Valley, and Florianopolis.

- All teams excluding Team Ferrero are making diligent efforts to reduce delivery delays, leading to a noticeable improvement in 2020 as compared to 2019

- Most of the teams exhibit an increase in delays during April, followed by a noticeable decline in the third quarter. However, there is a rapid rise in delays once again in the final quarter

- Stores such as groceries and small businesses with 02 to 04 check-out lanes exhibit a higher delay rate, but most of the service channels have shown improvement over the year.

- It appears that there is a noticeable delay in the month of November and April among all service channels with a noticeable decline in delay in the month of May and August

- The highest delay month for year 2019 seems to be November and for 2020, it is April

- The lowest delay in 2020 is seen in the month of August

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Power BI Performance Analysis
Dashboards

Global Logistics Performance Analysis

Total Orders
242K

Total Returns
37K

Fill Rate
100%

OTD Rate ↓
78.47%

OTIF Rate ↓
78.47%

Total Orders by Date

Total Orders (y-axis): 0K, 5K, 10K
Day (x-axis): 0, 5, 10, 15, 20, 25, 30, 35

Data labels: 4.2K, 8.7K, 7.1K, 9.7K, 8.7K, 7.3K, 7.2K, 8.9K, 2.9K

On Time Delivery

21.53%
78.47%
- Yes (green)
- No (red)
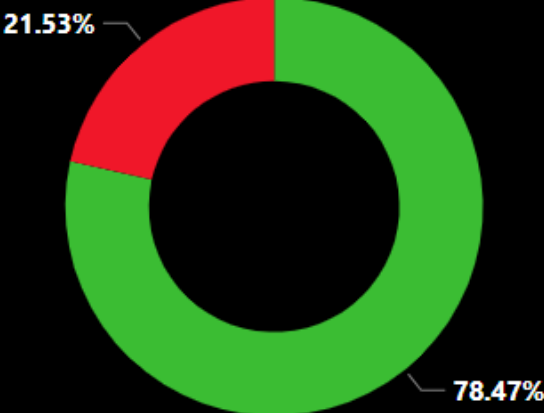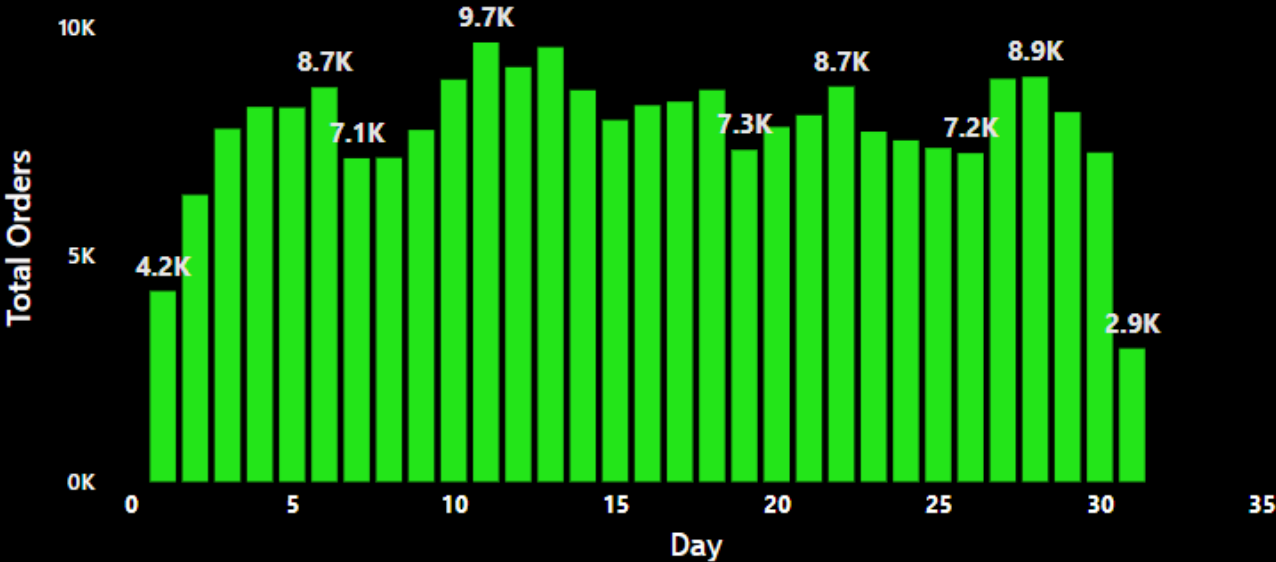
OTD
- No
- Yes

Year
- 2019
- 2020

Total Orders Vs Returns

Total Orders (y-axis): 0.0M, 0.2M
Returns (x-axis): 0, 10, 20, 30, 40, 50

Top Performers

Top Team

OTD ● No ● Yes

Team	Total Order
COAST	49K / 6K
NORTH	34K / 13K
SOUTH	35K / 9K
FLORIANOPOLIS	28K / 5K
VALLEY	17K / 9K
NORTH MC / KA	13K / 5K
TELESALES	7K
SOUTH MC / KA	5K
FERRERO	
EXC FER / BRANDS	
XPTO DISTRIBUTOR	
DIRECT SALE	
EXC BRANDS	
PROMPT DELIVERY	

Top Salesperson

100%

201	9.40K
3523	6.61K
3846	6.06K
3781	5.57K
3772	5.55K

59.1%
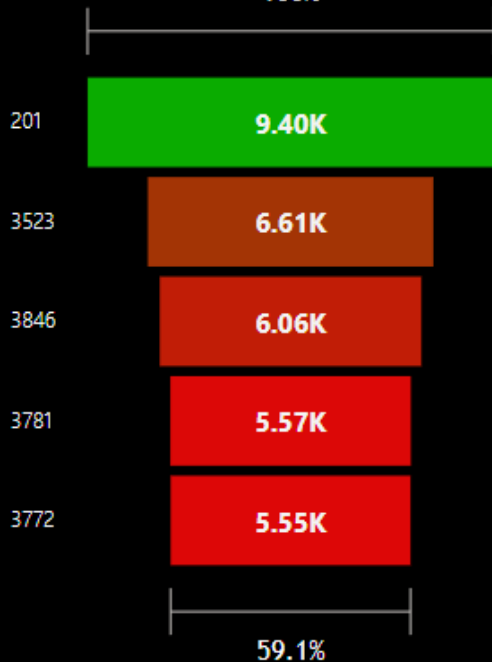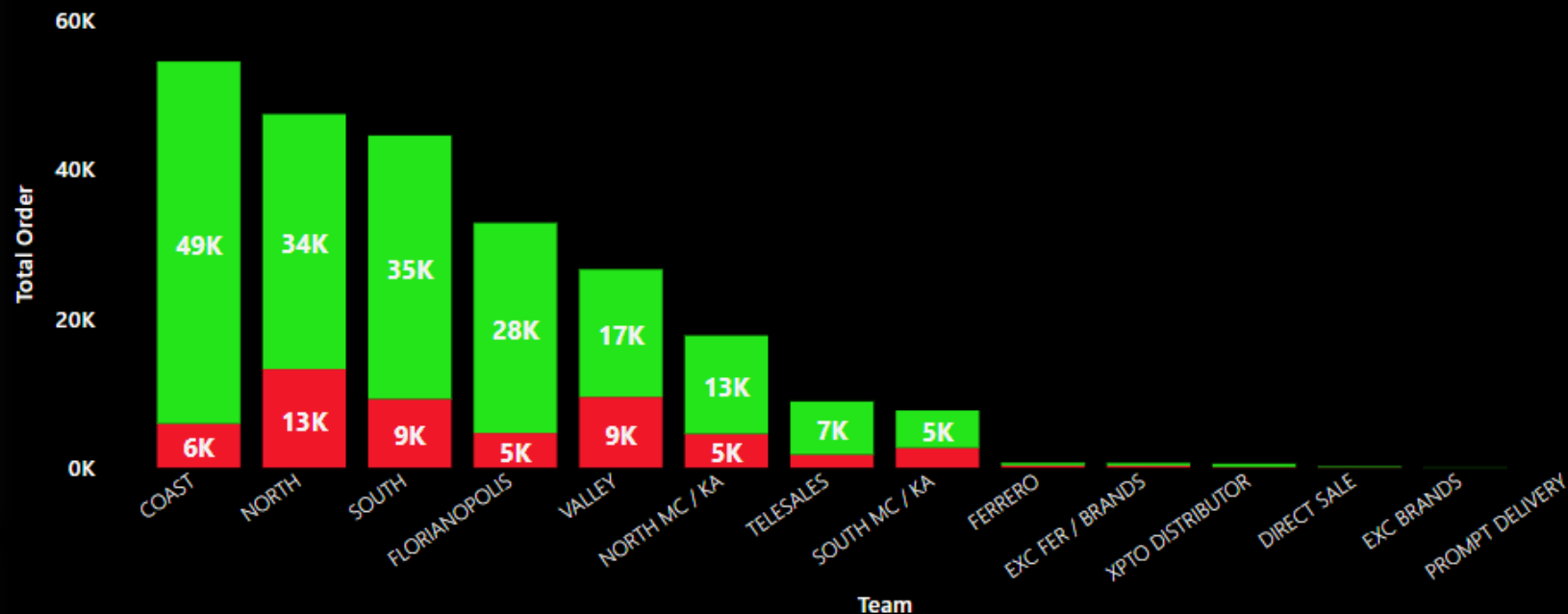
Delivery Status By City

OTD ● No ● Yes

City	Total Order
Oklahoma City	
Cincinnati	
Mesa	
Baton Rouge	
Jurupa Valley	

0K   10K   20K

Total Order

Top Service Channel

Service Channel	Total Order
GROCERY STORE	
SM FROM 02 TO 04 CHECK-O...	
CONVENI... SHOP	
CONFECTI.../ BAKERY	
SM FROM 05 TO 09 CHECK-O...	

Filters
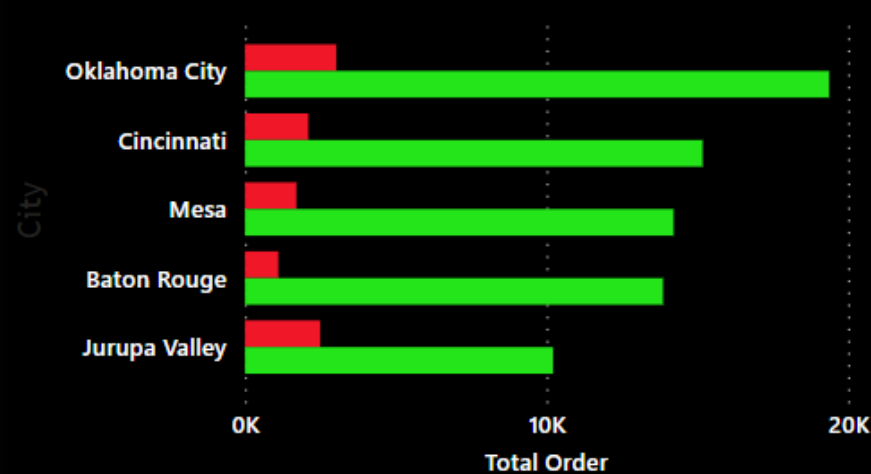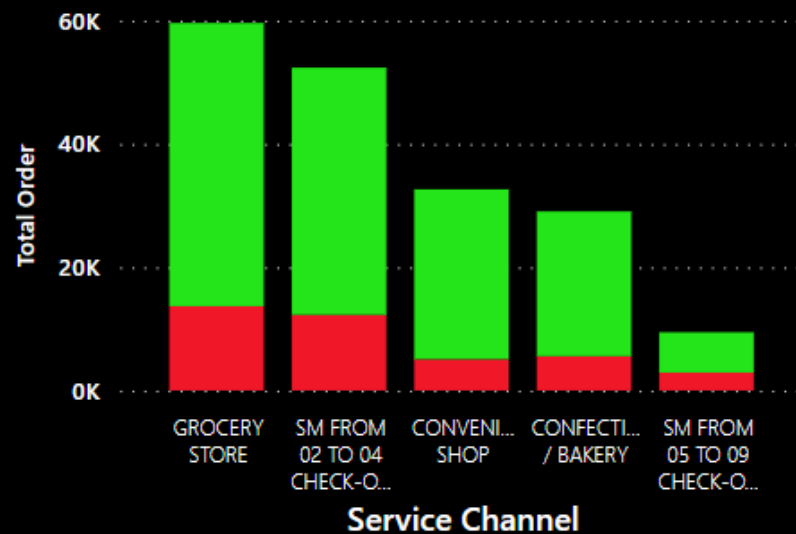
OTD
☐ No
☐ Yes

Year
☐ 2019
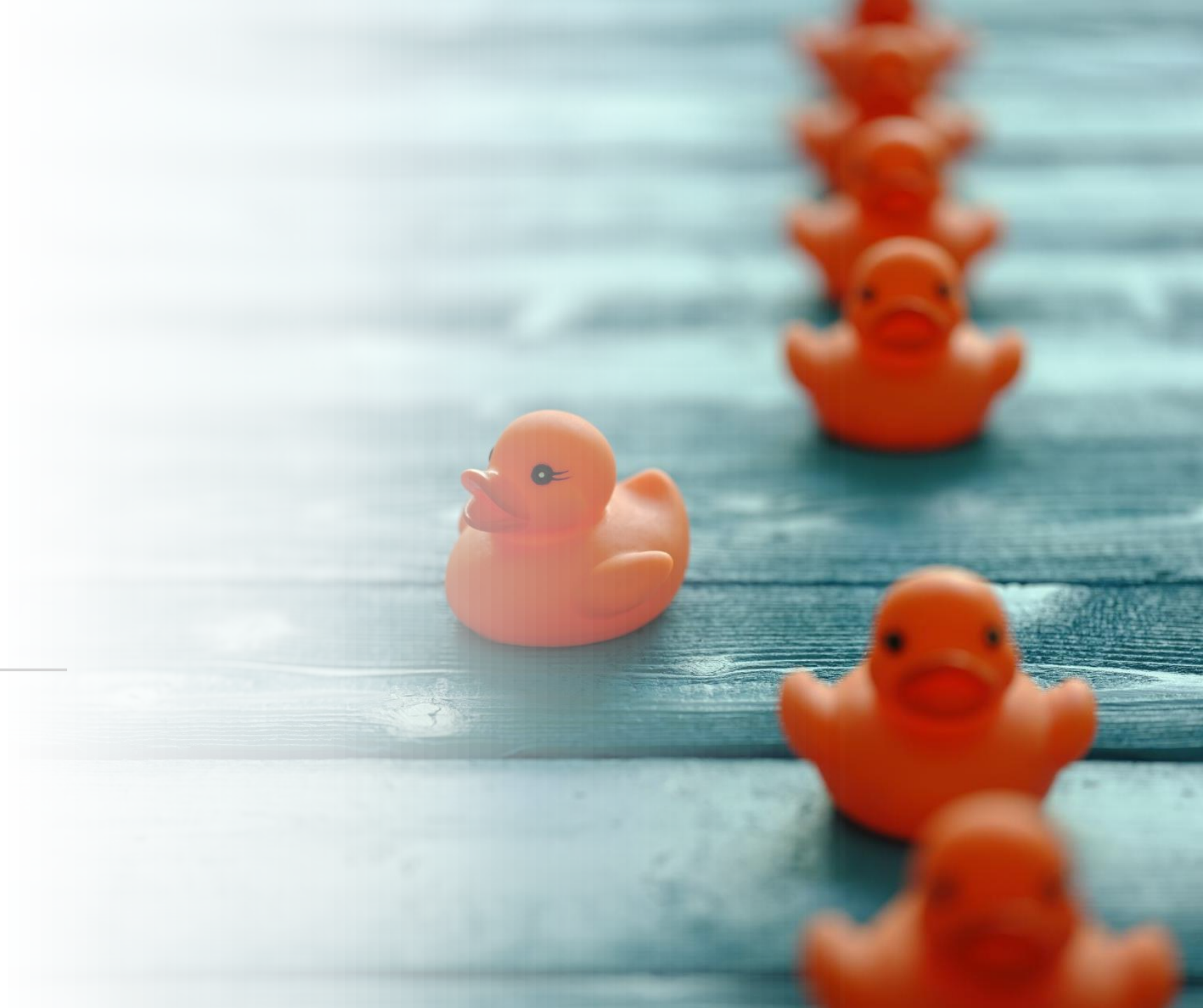☐ 2020

Team
All

City
All

Sale...
All

Servi...
All

Conclusion

Conclusion:

KPI'S

- A high Fill Rate% of more than 99.5% shows efficiency in order processing

- OTD Rate is found to be 78.5% which is very low and indicates only 78.5 % orders are delivered on time

- On-Time In-Full (OTIF) rate is 78.1%, it means that approximately 78% of orders are being delivered both on time and in full

- Return rate seem to be slightly high with On-Time deliveries but 75% of orders have 0 returns or fewer

Delay Over Time

- Delivery delays decreased from 22.32% in 2019 to 20.31% in 2020, which suggests a reduction in delay rates

- The highest delivery delay rate occurs in the month of November at 31% followed by April at 27%

Performance Analysis

- Team North has Maximum delay in delivery

- All team excluding Team Ferrero has done diligent efforts to reduce delivery delays in 2020

- Among Service channels, Grocery Store exhibits the highest incidence of delivery delays

- Most of the service channels have shown improvement over the year 2020

- Salesperson 3818 has a high rate of delayed deliveries

Most Affected

- Oklahoma City stands out as the city with the most pronounced delivery delays

- Customer identified by the ID number 52331 has encountered the highest number of delivery delays.

Future Goals:

- 78% On-Time In-Full (OTIF) rate indicates that there is room for improvement in meeting delivery expectations and ensuring that orders are complete and punctual.

- Achieving 100% OTIF is certainly difficult, however, company needs to aim to score between 90-95% which is generally considered an excellent benchmark.

Recommended Actions:

Implement effective inventory management strategies

Monitor and evaluate suppliers' performance

Implement order management software to automate

Optimize transportation and logistics processes

Set clear and realistic delivery windows

Invest in training and skill development for staff

Identify potential risks & develop contingency plans

Review customer feedback

Thank You!