

Uber Supply-Demand Gap - Assignment

SUBMISSION

By

Srinivasan Gopalakrishnan

On 02, December, 2018

PGDDS , September 2018

Uber Supply Demand Gap – Business Objective

- Uber Problem Statement – Supply shortages either by driver cancellation and non-availability of cars leading to loss of potential revenue.
- Identify and Analyze the root cause of the problem;
 - The demand and supply of trips from Airport to City (or vice versa.,)
 - High number of Cancellation
 - Non-Availability of Cars
- Based on Analysis
 - Present result of the hypothesis to the client about the root cause
 - Recommend ways to improve the problem.

Data Understanding

- The data set contains 6 attributes with each request made by the customer -;
 1. **Request id:** A unique identifier of the request.
 2. **Time of request:** The date and time at which the customer made the trip request.
 3. **Drop-off time:** The drop-off date and time, in case the trip was completed.
 4. **Pick-up point:** The point from which the request was made.
 5. **Driver id:** The unique identification number of the driver.
 6. **Status of the request:** The final status of the trip, that can be either completed, cancelled by the driver or no cars available.
- The data contains only the trips to and from the Airport to city are considered for analysis.

Assumptions

Based on the Data provided following assumption were taken for the analysis

- **Demand** – It is the total number of requests received in the given period of sample data.
- **Supply** – It is the total number of requests received for which trip status is complete.
- **Gap** – it is the total number of request for which either cars are not available or cancelled.
- **Window Time or Time Slots** – For analysis, the request time are grouped in to 5 different time slots.
 - Morning Peak Hours
 - Late Noon Hours
 - Early Evening Hours
 - Late Evening Peak Hours
 - Night Midnight Hours

Assumptions(contd.,)

Based on the Data provided following assumption were taken for the analysis ;

- **Request Timestamp** – For Analysis, Request Timestamp is split in to
 - Year, Month, Day, Hour, Minutes.
- **Drop Timestamp** – is not taken in to consideration, except to mark the trip is completed by the driver
- **Cancellation** – The case of cancellation, can be initiated from either customer or driver. But for the analysis it is assumed that call was from the driver side.
- **Driver Idle Time calculation**– For this analysis, driver idle time was not calculated as there are no enough data suffice the accuracy.
- **Day wise calculation** – In the given analysis, the day wise calculation of trips and the associated number of requests and driver information are considered irrelevant and not considered.

Data Cleansing

- There are 6745 rows and 6 columns in the data sets.
- Drive ID and Drop Timestamp contains Null Values – Ignored as not used for analysis.
- The column names are changed for readability.
- Inconsistencies in date formats are cleaned.
 - columns have mixed timestamp format such as `dd/mm/yyyy hh:mm` and `dd-mm-yyyy hh:mm:ss`
- The Request Timestamp and Drop Timestamp columns changed to Datetime objects.
- New additional column for date and time –
 - The Request Timestamp and Drop Timestamp columns are split to date and time columns for date and time wise analysis.

Data Analytics

- Analysis of Frequency of Requests & overall performance
 - Overall Percentage of Customer Serviced against Customer Denied with respect to the total number of request received with respect to;
 - Overall Service Status
 - Segment wise Service Status
- Analysis of problematic requests – Based on Pickup Locations.
 - Overall percentage of customer serviced against customer denied with respect to customer pickup location.
 - Airport to City
 - City to Airport

Data Analytics(Contd.,)

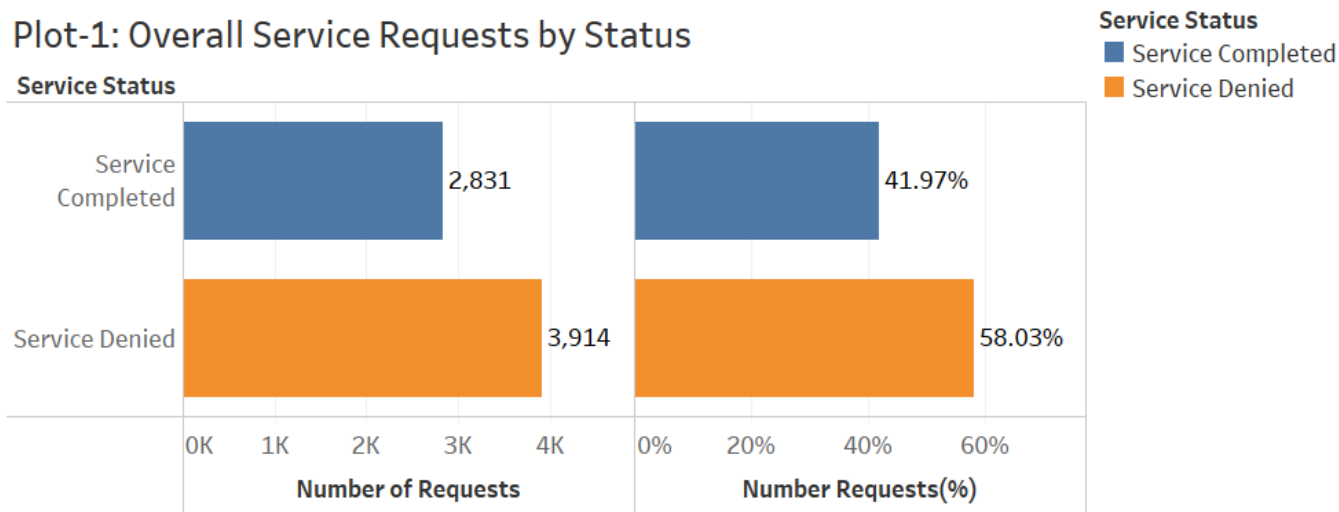
- Analysis of problematic requests – Based on Time Slots
 - Segmented service status requests status based on different timeslots.
 - Segmented service status Requests based on Time slots and Pickup point Airport
 - Segmented service status Requests based on Time slots and pickup point City
- Demand and Supply – GAP Analysis
 - Demand and Supply Gap - Hourly.
 - Demand and Supply Gap – by Timeslots
 - Demand and Supply Gap – by pickup point – From Airport to City
 - Demand and Supply Gap – by pickup point – From City to Airport
 - Reasons and Recommendations

Presentation

- The visualisation plots are drawn in both Jupiter notebook and Tableau.
- The Tableau plots are used in the presentation.
- Different Plots and sub plots are created in the below order ;
 - Analysis of Frequency of Requests & overall performance
 - Analysis of problematic requests – Based on Pickup Locations.
 - Analysis of problematic requests – Based on Time Slots
 - Demand and Supply – GAP Analysis
 - Hourly
 - Timeslots
 - Morning Peak Hours
 - Late Evening Peak Hours

Analysis of Frequency of Requests & overall performance

Plot-1: Overall Service Requests by Status

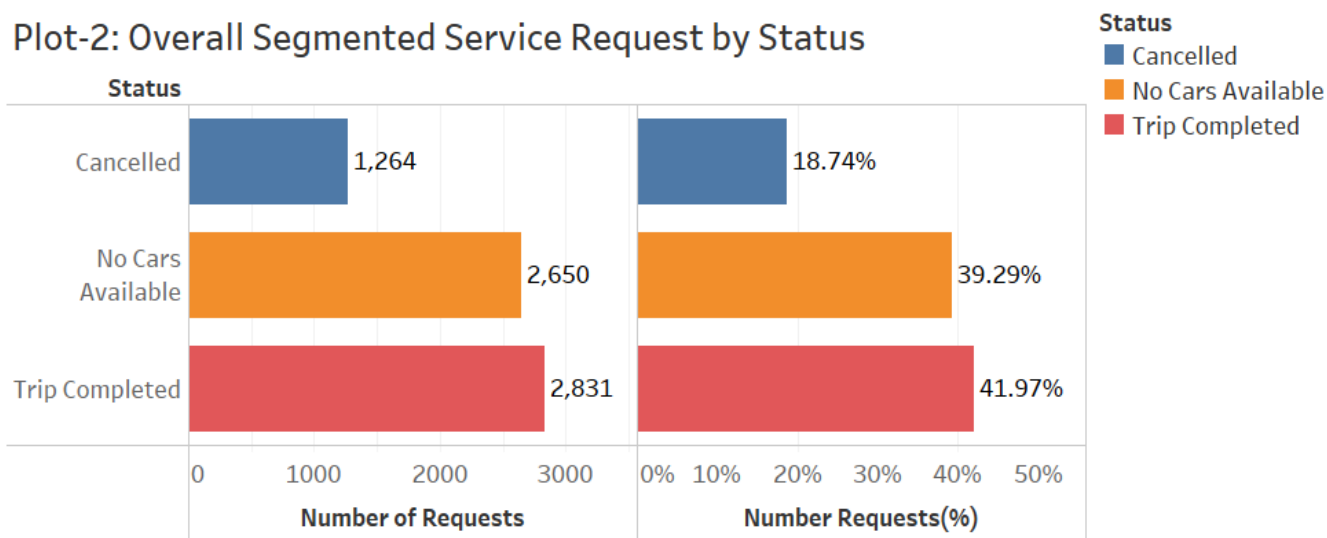


1. Plot-1 Shows the frequency and the percentage of customer services and customer denied with respect total number of request received. 58% of customers trips to and from airport are denied of service due to either request being cancelled by drivers or cars are not available.

Customer Service Rate = 41.97%

Customer Denied Rate = 58.03%

Plot-2: Overall Segmented Service Request by Status

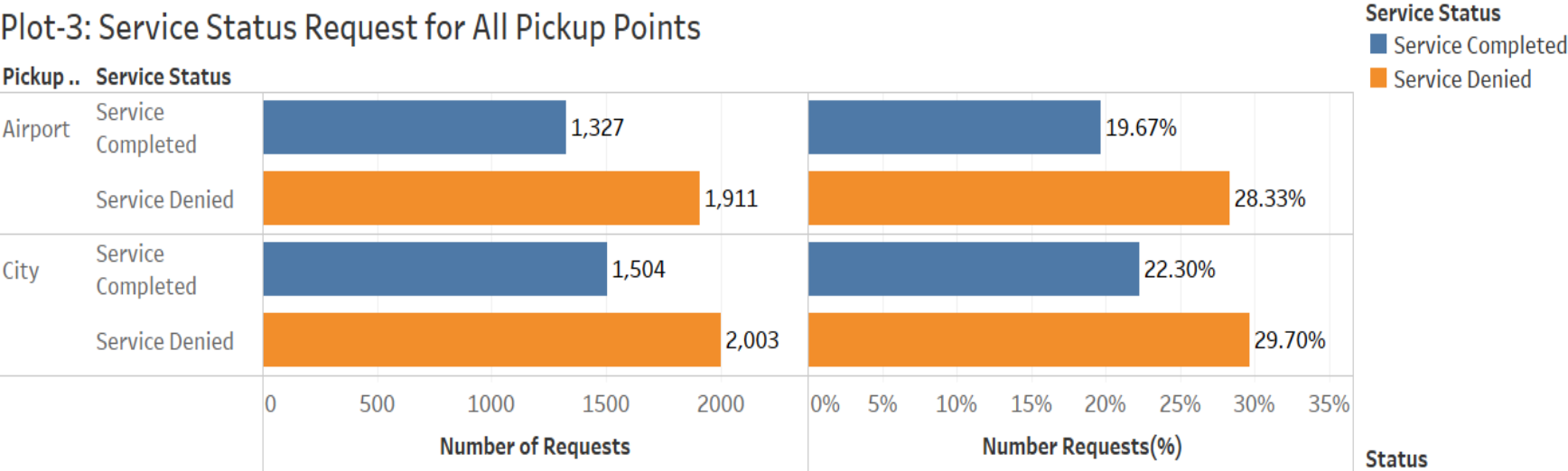


2. Plot-2 represents the segmented requests wise breakdown. i.e., out of 58.03% of service denied 18.74% due to cancellation and 39.29% due to no cars available to take the trip.

Conclusion: The percentage customer service requests were denied greater than Service request completed.

Analysis of problematic requests – Based on Pickup Locations.

Plot-3: Service Status Request for All Pickup Points

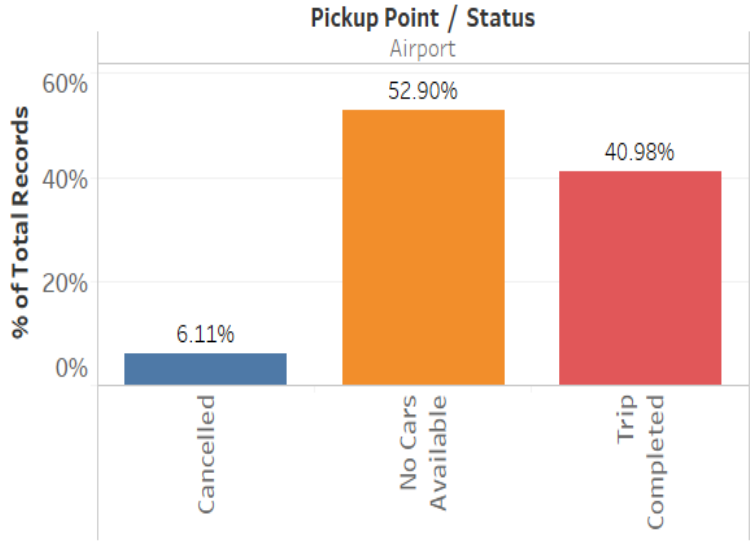


1. Plot3. shows us that a higher number of requests are denied with customer-pickup location as city than that of airport.

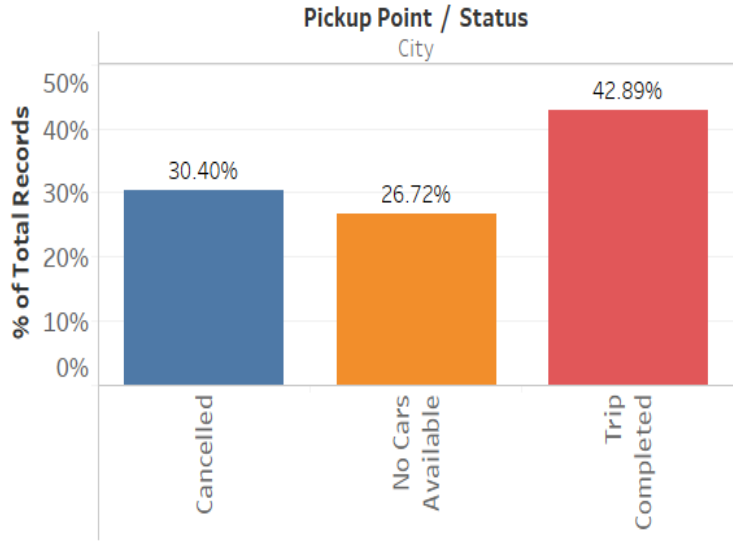
2. The plot-4 and plot-5 also indicates the percentage service denied are higher than Service completed.

However, the percentage of trip completed from city is 1.91% greater than from Airport.

Plot-4: Segmented Status Requests for Airport



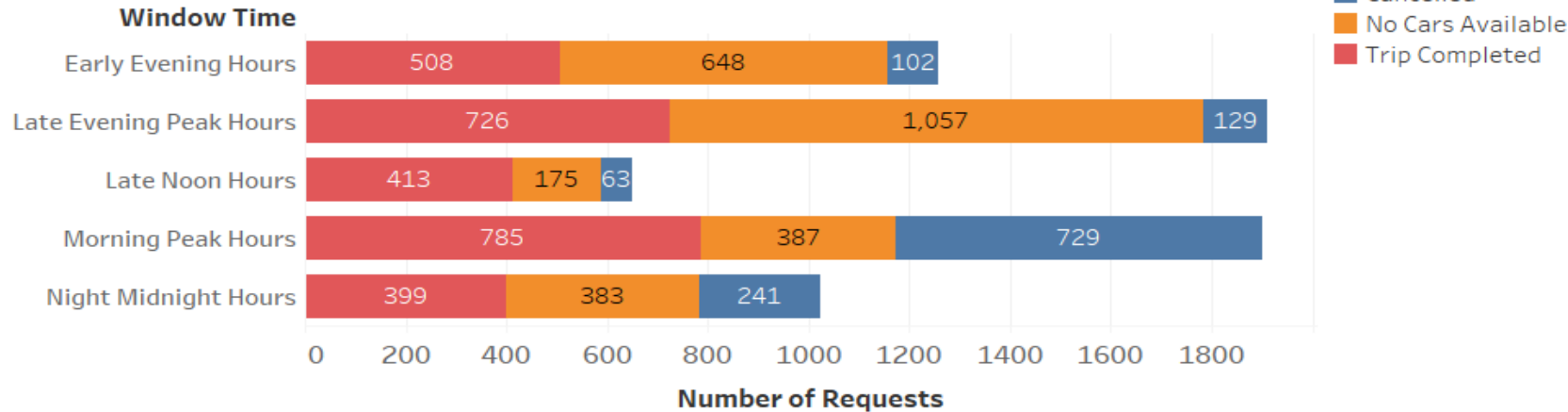
Plot-5: Segmented Status Requests for City



Conclusion: The higher percentage (59.01%) service requests are denied services from Airport. This indicates more problematic pickup location is from Airport and are more likely of denied of service. But, the highest number of Cancellation of 30.40% are from City.

Analysis of problematic requests – Based on Pickup Locations and Time slots

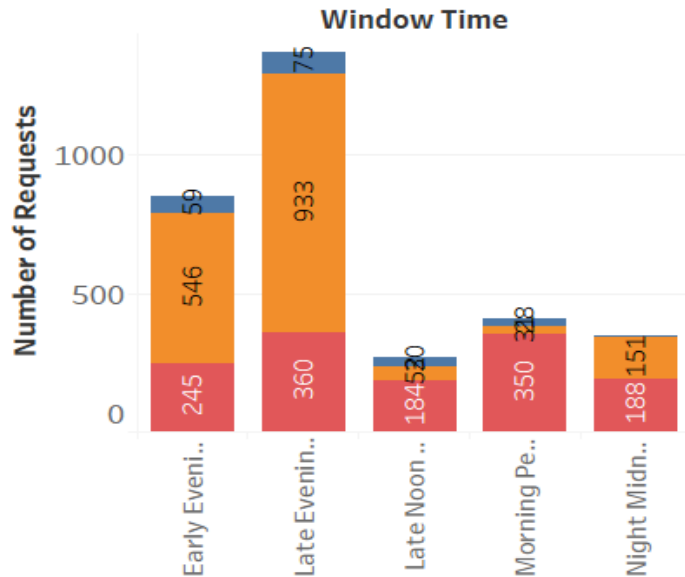
Plot-6: Segmented Request Status by Time Slots



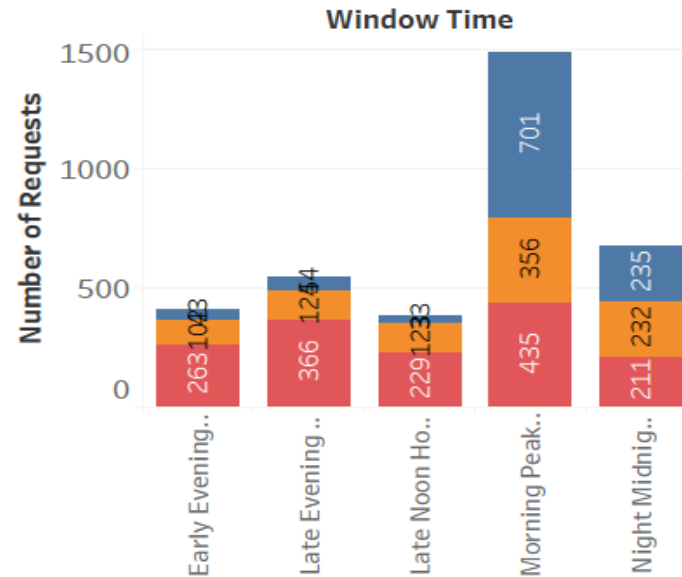
1. As plot-6 indicates the Early Morning Peak Hours and Late Evening Peak Hours are most problematic time slots.

2. The plot-7 shows from Airport, though the number of cancellation were less during Late evening hours, huge number of services were denied because of a smaller number of taxis available to take the trips from Airport.

Plot-7: Segmented Request Status by Time Slots - Airport



Plot-8: Segmented Request Status by Time Slots - City

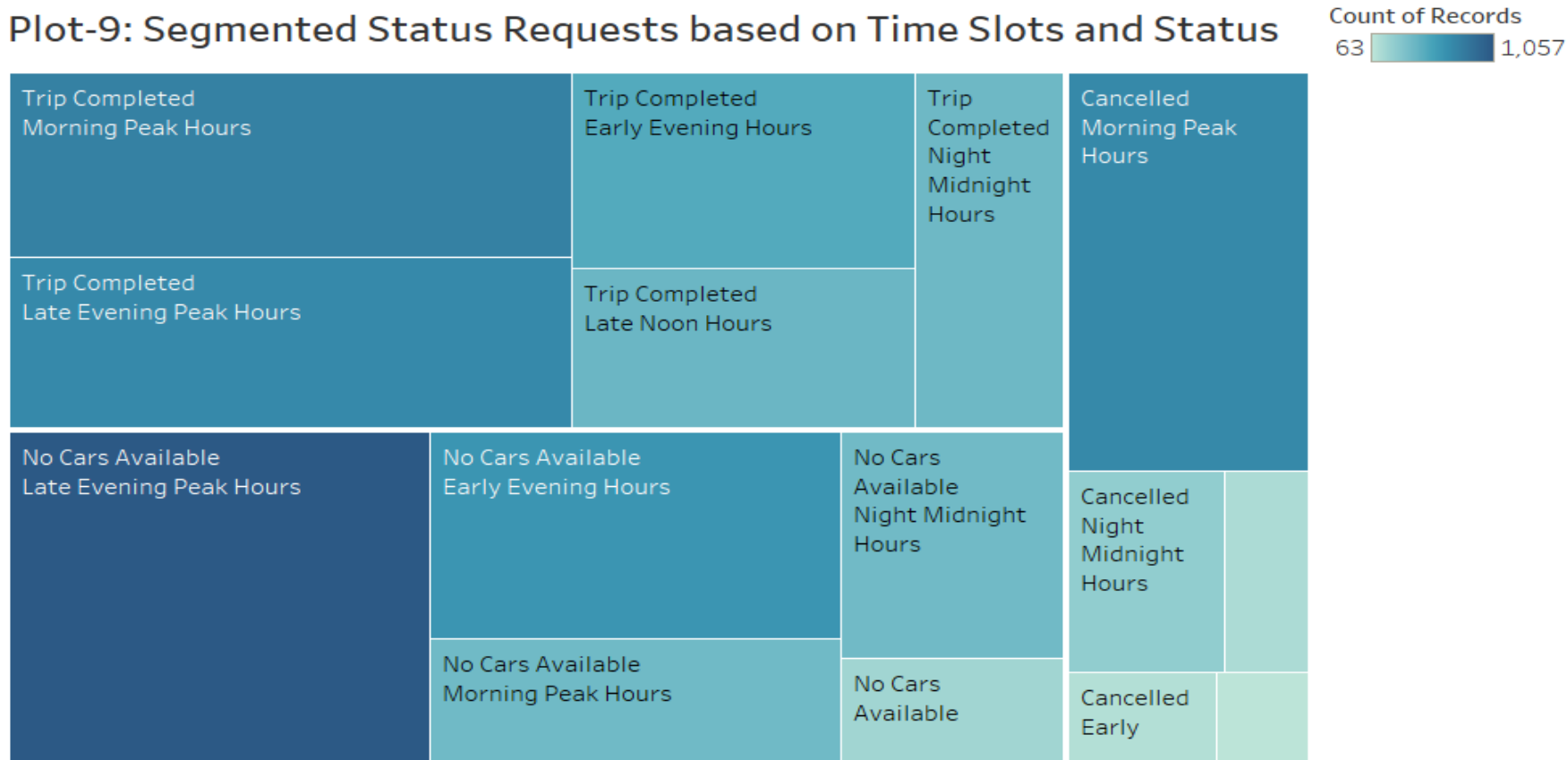


3. The plot-8 indicates the excessive number of cancellation by the drivers during the Morning Peak hours. This causes the customer travelling to Airport from city causes huge problems.

Conclusion: The Early morning Peak Hours and Late Evening Peak Hours are problematic time slots from City to Airport and Airport to City, respectively.

Analysis of problematic Segmented Service requests – Based on Time Slots and Status

Plot-9: Segmented Status Requests based on Time Slots and Status



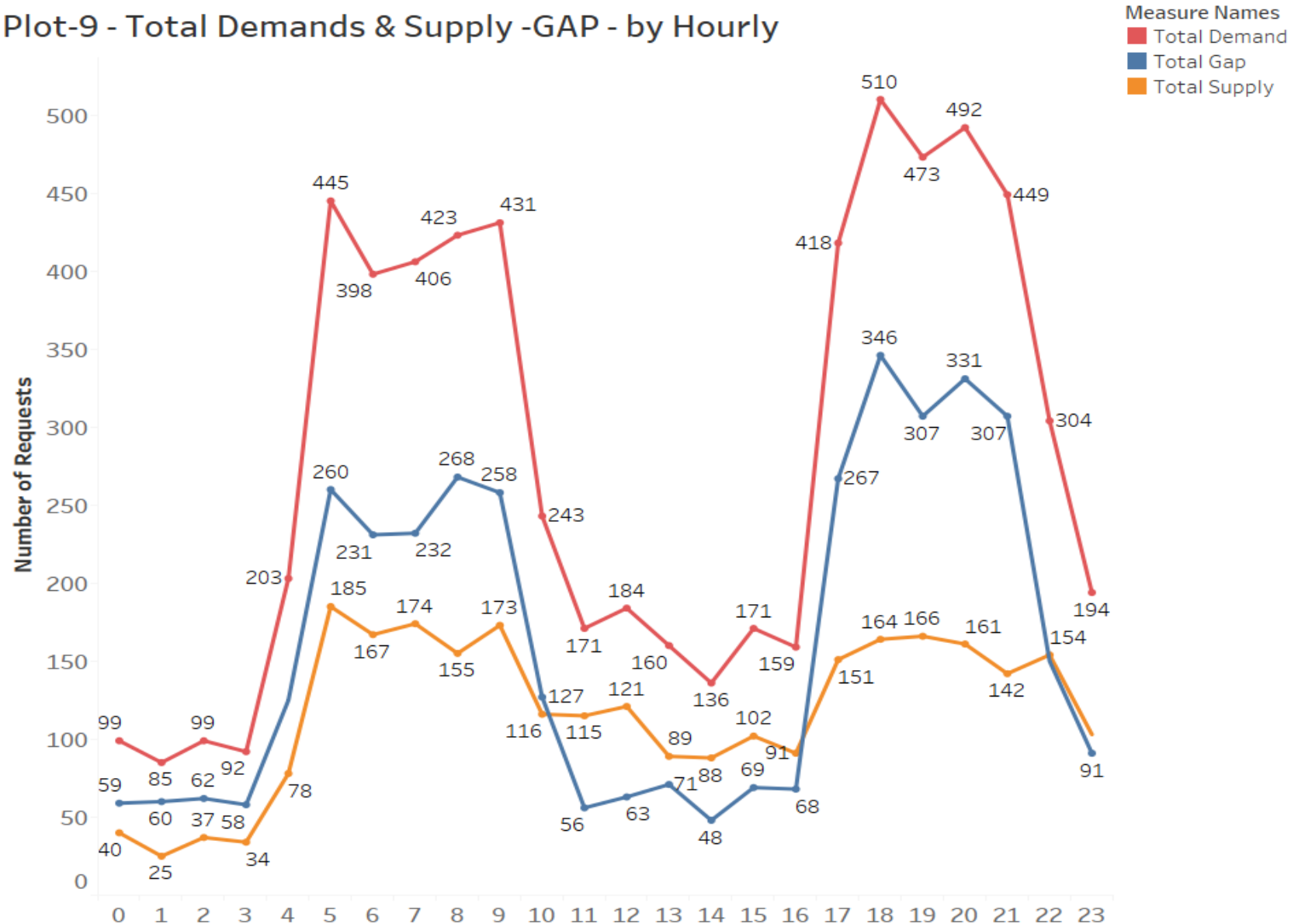
1. The Tree map indicates the service requests were denied mainly during Morning Peak Hours and Late Evening Peak Hours. Big dark rectangles indicates the problematic areas.

2. Huge of number of service requests were cancelled by the drivers during morning peak hours from City to Airport.

3. In Late Evening Peak hours the services were mainly denied due to lack of organic flow i.e. No Cars Available from Airport to city.

Demand and Supply Gap - Hourly.

Plot-9 - Total Demands & Supply -GAP - by Hourly



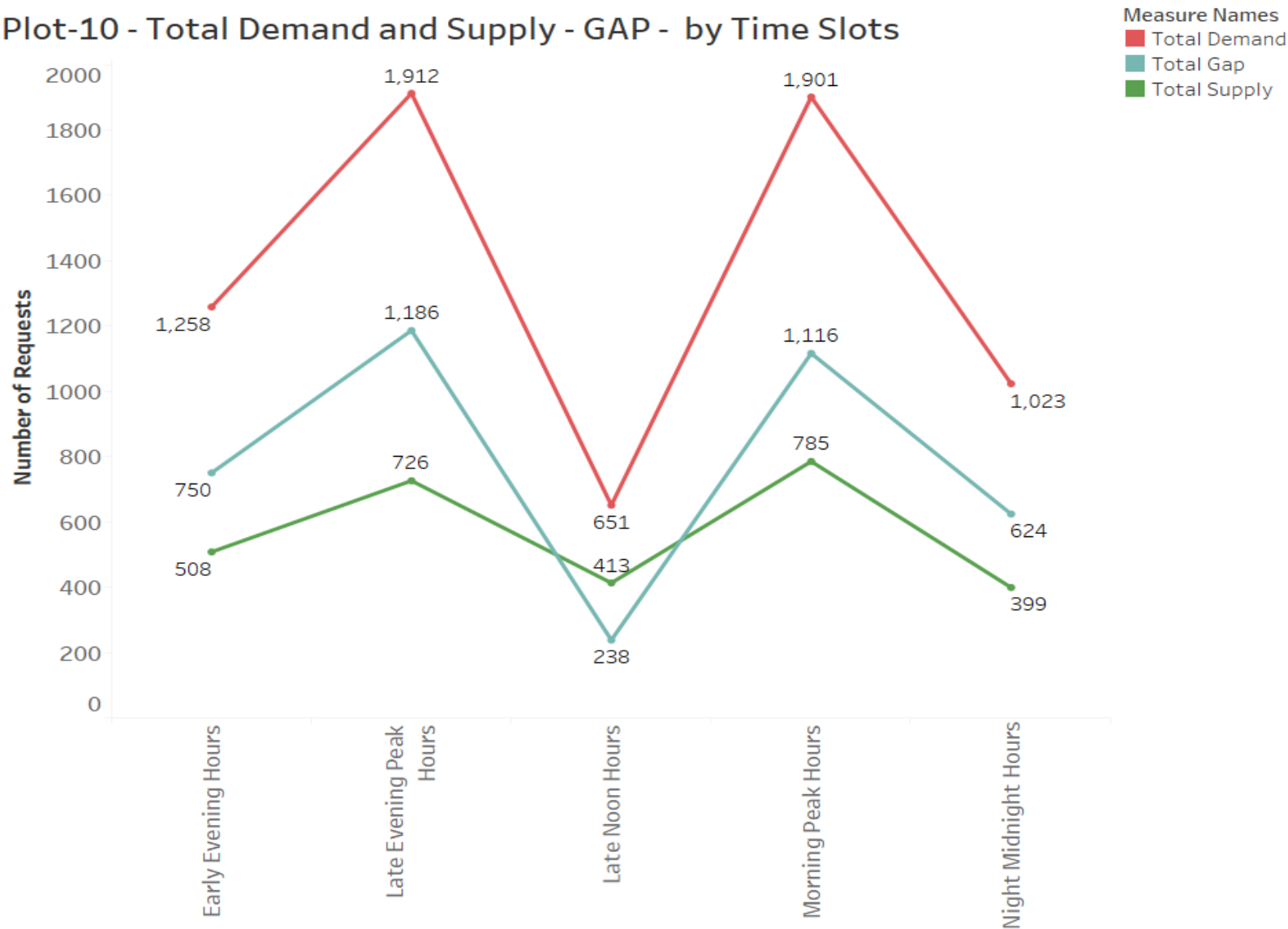
1. The line plot shows the Total Demand, Supply and the GAP trends throughout the day on an hourly basis.

2. It can be observed that demand start between approximately 99 and 200 during the initial hours of the day (between 12AM to 4AM) and suddenly surges at 5AM and peaks till 10AM (Early Morning Peak Hours) and stays below normal during 11AM and 4PM. The demand again starts rising from 4PM to 6PM (Peaks again) 9PM and drops back to normal through until midnight.

3. It is very vivid from the plot the Gap (marked Blue Line) is way below the demand during peak hours especially between morning 5 and 10AM and evening 6pm and 9pm.

Demand and Supply Gap – by Timeslots

Plot-10 - Total Demand and Supply - GAP - by Time Slots



1. The plot-10 indicates that the highest gap between overall demand and supply is between ;

- a) Morning Peak Hours
- b) Late Evening Peak Hours

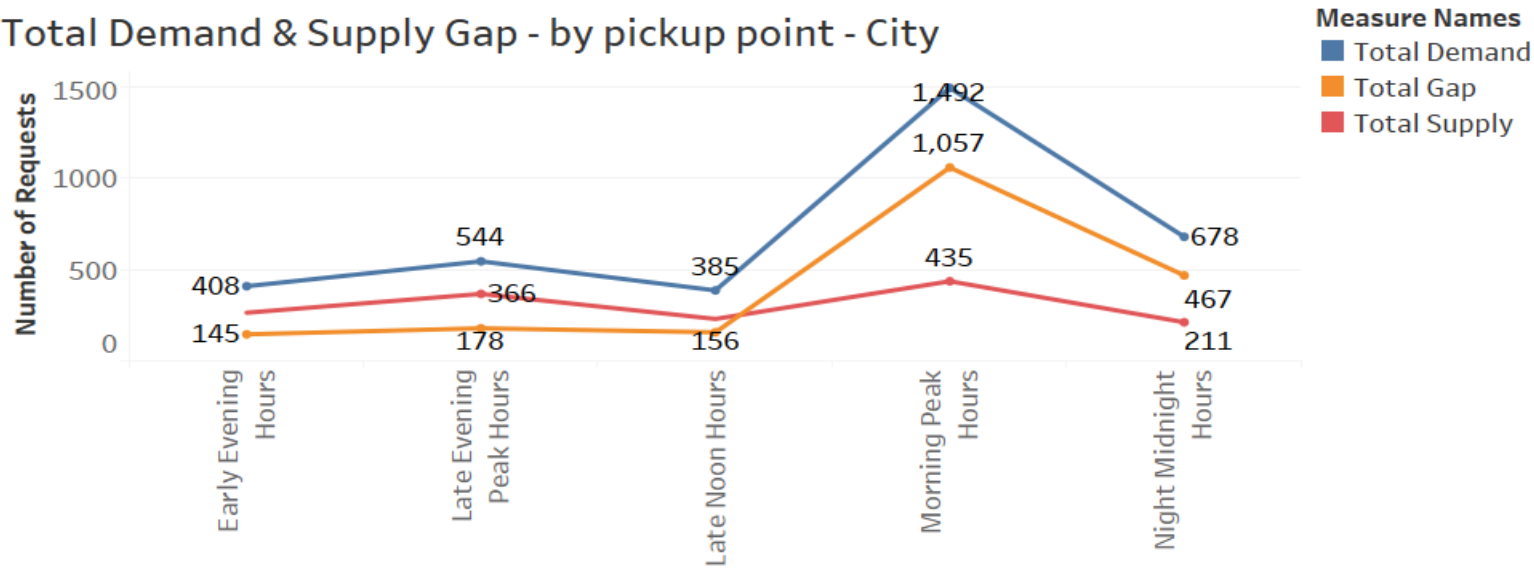
Conclusion:

1. This answers the Question-1 of the assignment - Find the time slots when the highest gap exists. **So, the problematic Time slots are Morning Peak Hours and Late Evening Peak Hours.**

2. This narrows down the further analysis to identify the pickup points City to Airport or Airport to City where the GAP is most severe in the identified time slots. (Question-2).

Demand and Supply Gap – from City – Morning Peak Hours

Total Demand & Supply Gap - by pickup point - City

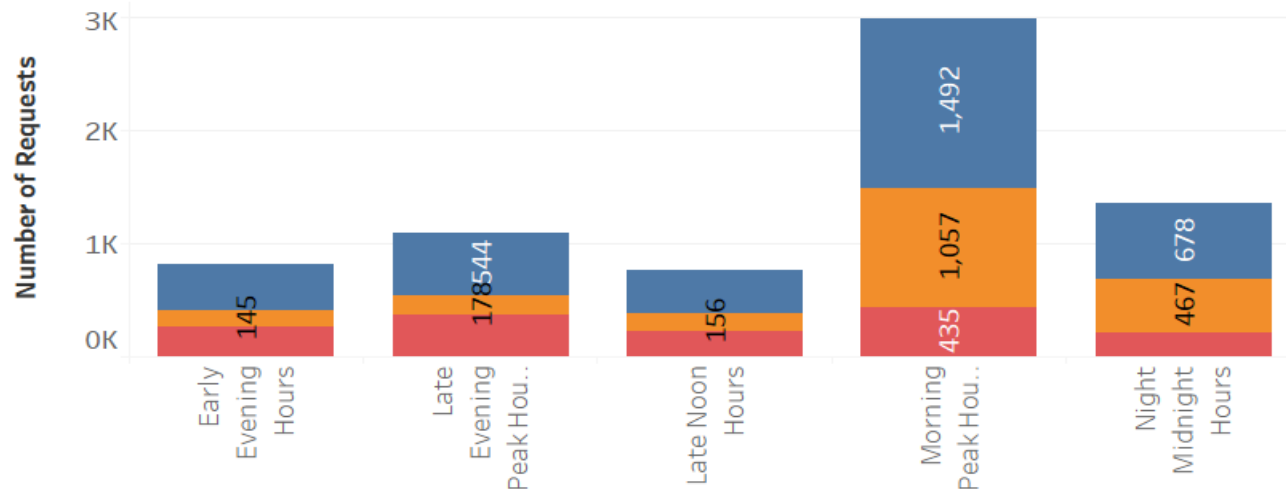


1. The plots on the left shows **Highest GAP were (either due to cancellation from City to Airport during Morning Peak Hours.**

2. The **Total Number of Request during Morning Peak Hours were 1492 while the Supply was only 435 and with the Gap of 1057 from City to Airport service.**

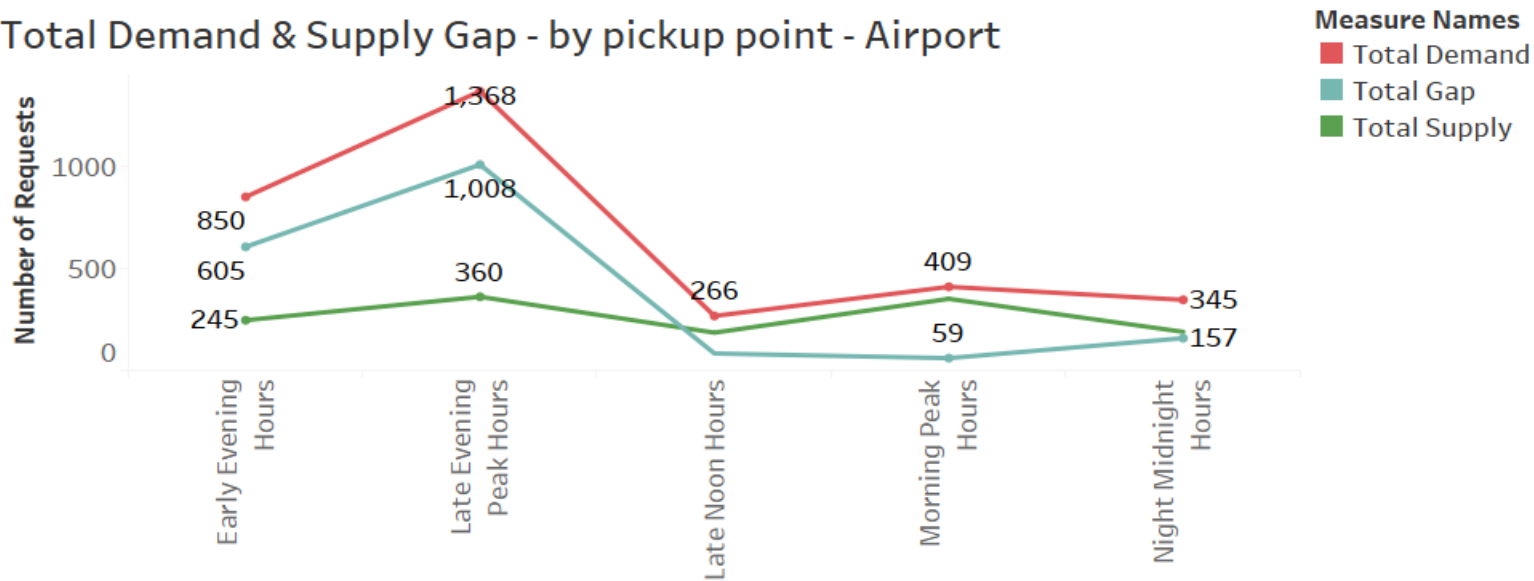
3. **% GAP in demand and supply City Airport = 70.84% .**

Total Demand & Supply Gap - by pickup point - City



Demand and Supply Gap – from Airport – Late Evening Peak Hours

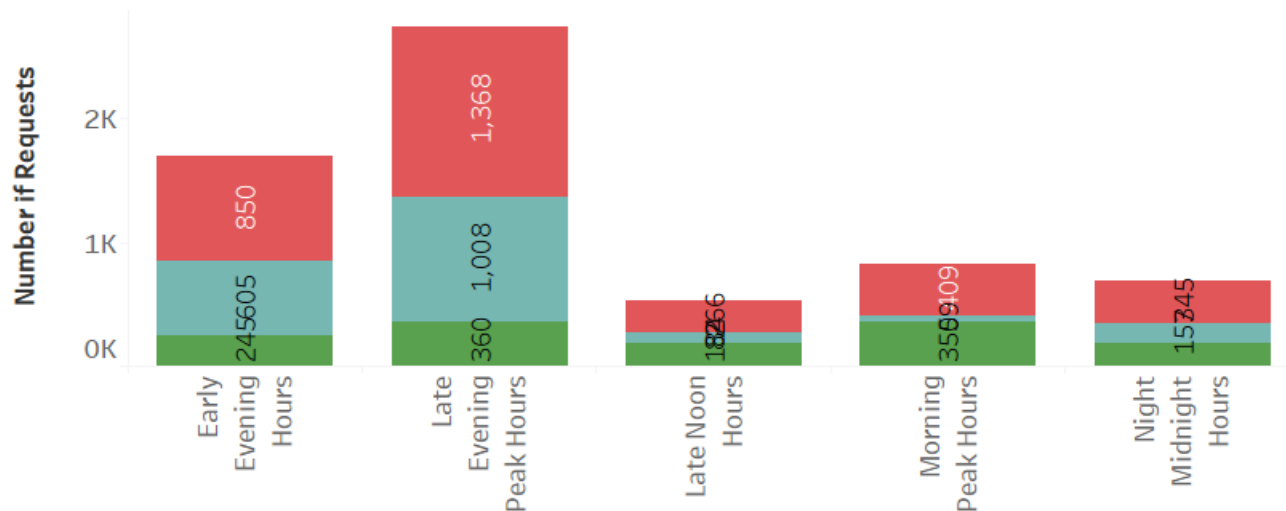
Total Demand & Supply Gap - by pickup point - Airport



1. The plots shows Highest GAP (either due to No cars available from Airport to City was during Late Evening Peak Hours.

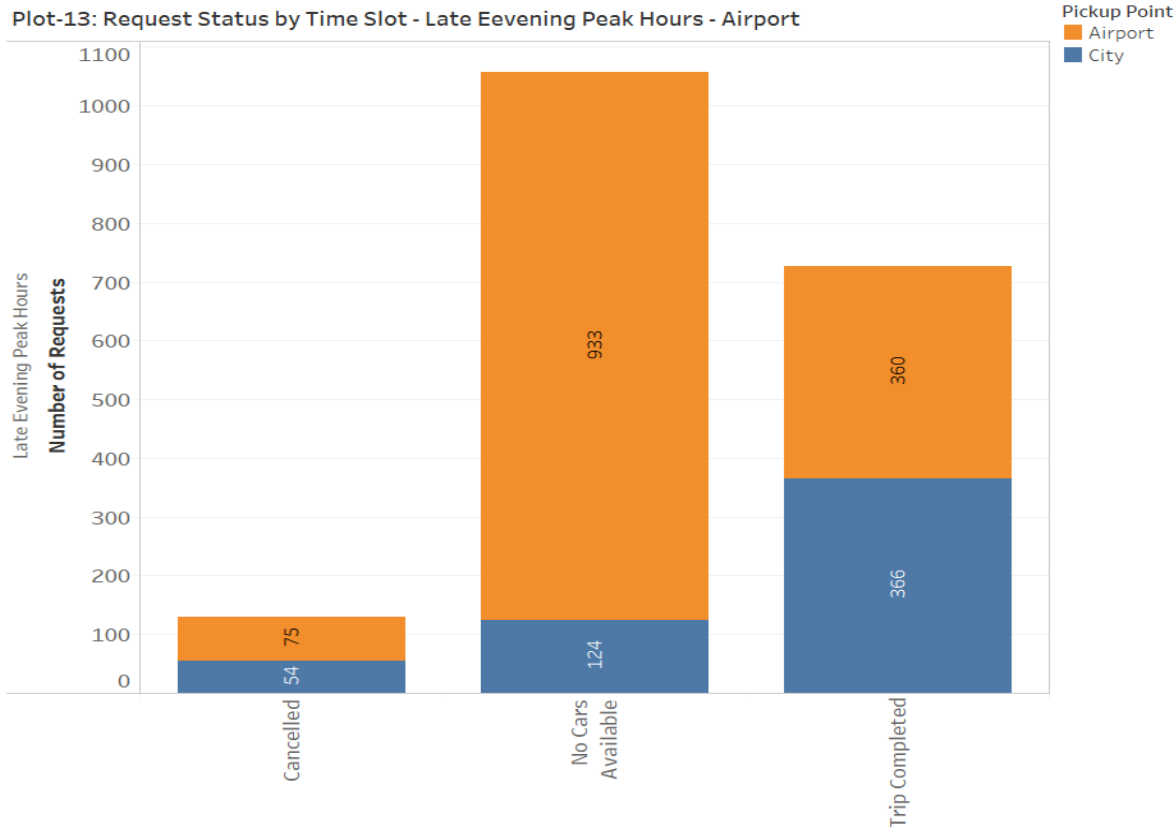
2. The Total Number of Request during Late Evening Peak Hours from Airport were around 1368, while the Supply was only 360 and with the Gap of 1008 from Airport to city service.

Total Demand & Supply Gap - by pickup point - Airport



3. % GAP in demand and supply from Airport to City = 73.68%

Plot-13: Request Status by Time Slot - Late Evening Peak Hours - Airport



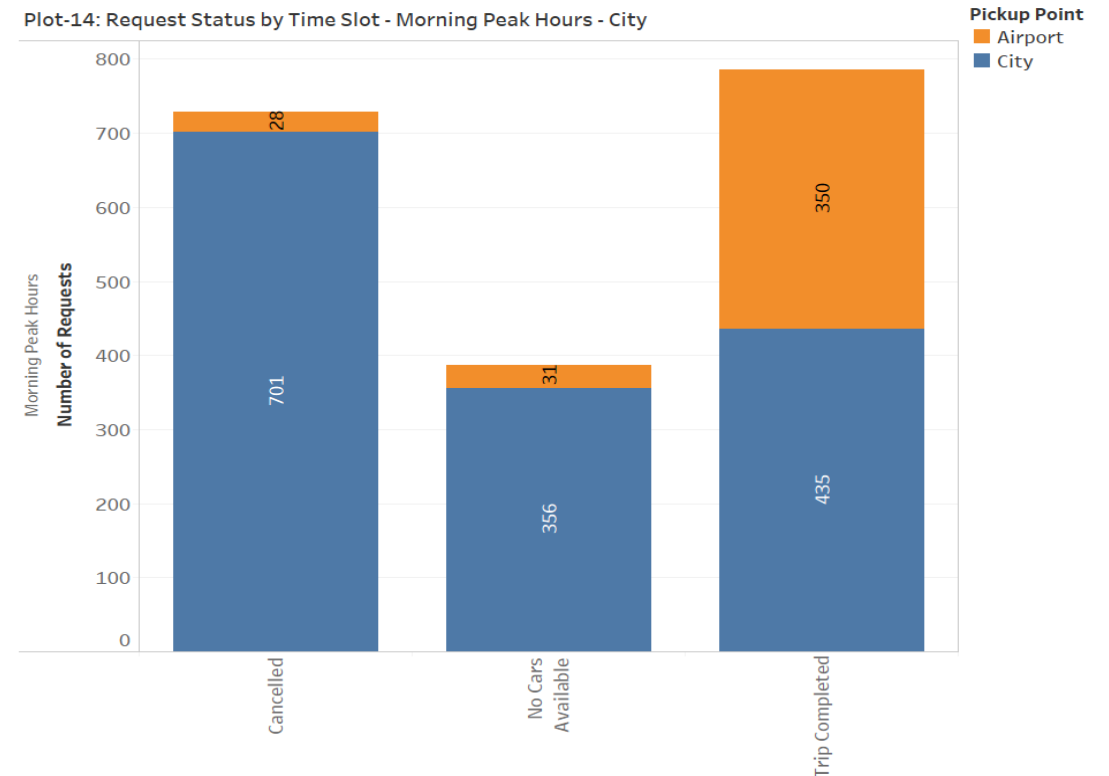
1. **Morning Peak Hour Analysis**– It is very clear from the Plot shown on the right – The highest GAP 701 exists from City to Airport was during **Morning Peak Hours** and were due to huge Cancellation.

2. The % contribution to the cause of total ;
City – 78.49%
Airport – 21.51%

1. **Late Evening Peak Hour Analysis** – It is very clear from the Plot shown on the left – The highest GAP of 933 (exists from Airport to City during **Late Evening Peak Hours** were due to **Number of Cars Not Available**.

2. The % contribution to the cause of total ;
Airport – 71.55%
City – 28.45%

Plot-14: Request Status by Time Slot - Morning Peak Hours - City



Conclusion

- **Question #1** : Find the time slots when the highest gap exists ?
- **Answer:** Based on the slides 16,17 and 18 ,

➤ **Morning Peak Hour Analysis**

- **The Demand and Supply GAP for time slot Morning Peak Hours is very high for customer service requests from City to Airport.**

➤ **Late Evening Peak Hour Analysis**

- **The Demand and Supply GAP for time slot Late Evening Peak Hours is very high for Customer Service Request from Airport to City.**

Conclusion

- **Question #2** : Find the types of requests (city-airport or airport-city) for which the gap is the most severe in the identified time slots ?
- **Answer:** Based on the slide 16,17 and 18 ,

- **Most Severe GAP in Demand & Supply were due to Cancellation from City to Airport and was during Morning Peak Hours.**
- **Most severe GAP in Demand & Supply were due to No Cars Available from Airport to City and was during Late Evening Peak Hours**

Hypothesis Reasons

- **Hypothesis Reason Demand & Supply during Morning Peak Hours from City to Airport**

- The general hypothesis is that, it is general trend there are significantly more outgoing flights than incoming flights during morning to noon hours. Hence, for a driver who makes a trip during morning peak hours to airport has to inadvertently wait for longer duration to receive a return trip back to city. This leads to increase in driver idle time, which could have been utilised for other trips within city. This could be reason why there were huge number cancellations by the drivers during Morning Peak Hours.

- **Hypothesis Reason Demand & Supply during Morning Peak Hours from City to Airport**

- Similarly, it is general trend that, there are significantly more incoming flights during Late Evening Peak Hours. The significance reduction of supply of taxi's to the airport as many of the taxi's are running within city due to Late Evening Peak rush hours. This leads to a increase in demand for cars from Airport. This leads to more number of cars not available for trip during Late Evening Peak Hours for Airport city trips.

Recommendations

- Increase the profit margin to the drivers making trips from City to Airport during Morning Peak Hours and Late Evening Peak Hours there by encouraging drivers to take more trip from city and Airport and vice versa., in the respective peak hour time slots.
- An additional rate can be fixed during the peak hours and can be collected from the customer (in a more transparent way) so that the benefits of additional revenue earned by uber can be passed on to the driver. It will encourage the drivers to take up more peak hour trips.
- Encourage uber taxi pooling to pick customers from Airport or on the way to City during Late Evening Peak hours so that non-availability of taxis can be resolved. Also, it will improve the customer serviced through fewer supply of taxis resulting in win-win situation for both customers and drivers who trip from Airport to City.