Uber Supply Demand Gap Analysis Insights

Introduction:

This project shows the findings of the Uber ride request data following a multi-phase data analysis and visualization process. The project started with data cleaning in Microsoft Excel, where missing values, inconsistent data entries, and formatting errors were addressed to prepare for data analysis. We then performed Exploratory Data Analysis (EDA) in Python by using libraries such as pandas, matplotlib, and seaborn to find out patterns, distributions, and relationships in the data. We explored in a more detailed manner for better understanding of user activity and operational issues using MySQL, by which we were able to execute complex queries to identify trends, inefficiencies, and gaps in performance. Lastly, working with the information we collected, we created an interactive and functional dashboard in Microsoft Excel with important key performance indicators (KPIs), slicers, and charts. This visualization tool provided a clear and actionable summary of Uber's supply-demand balance, service reliability, and performance by time periods and pickup spots.

Insights Found:

- Overall service performance is weak, as only approximately 42% of total ride requests are completed. The highest percentage of unfulfilled requests arises from the "No Cars Available" status (approximately 39%), followed by 19% cancellation. This shows that supply unavailability is the biggest issue compared to user dissatisfaction or system failure.

- During the early morning time period (between 5 AM and 9 AM), demand is extremely high, with 400–450 hourly ride requests. Yet, the number of fulfilled rides is significantly lower than that, never exceeding 200. This difference suggests a significant supply-demand imbalance in this time period. Cancellations are also the highest in this time period, suggesting likely delays or unreliability in service, resulting in users dropping out.

- Evening hours, and particularly 6–10 PM, drive demand even higher to more than 500 requests per hour. Finished trips, however, balance out at a consistent 160–170. During this time, the shortage of supply is around fully from "No Cars Available," i.e., there just aren't enough drivers to meet the demand, no matter what the cancellations or other service factors.

- Airport pickups have suffered a much more severe shortage of supply than the city. Although the total demand is less at the airport, the "No Cars Available" number is numerous times greater than the volume of trips taken. This indicates a persistent problem of low driver availability at the airport. In contrast, the city gets more total requests, but its primary issue is cancellations, perhaps caused by longer wait times or impatience of riders, which would be indicative of operating inefficiencies and not supply shortages.

- When demand is considered from times of day, the evening time segment has the most total requests (almost 1,900), but also the most failed trips. This segment alone represents the biggest opportunity to enhance fulfillment and capture unrealized revenue, so it should be a focus segment for overall performance enhancement.

- Even late at night, when there is less overall demand, still demonstrate an extremely high percentage of unfilled requests. With about 1,000 ride requests and a bit over one-third filled, that means there is still heavy demand off-peak that is not being properly serviced, and that may be an opportunity lost.

- At midday, i.e., 11 AM to 4 PM, completion rates are much higher at over 60–70%. It is the best-balanced and most productive service time period when demand and supply are fairly balanced against each other. It also provides a good window to plan driver breaks or vehicle servicing without compromising service quality.

- City and airport pickups have an average trip time of around 52 minutes each. This is to say that travel distance does not pose an influencing factor in the delay in completions or cancellations, and service problems are likely to be operations- or supply-related, not distance-based.

- The analysis clearly recognizes that addressing the early morning and evening peak hours problem will do the most to improve total ride satisfaction overall. Increasing prices, strategic driver assignment, or pre-booking options in such periods can especially go a great distance towards reducing supply and demand gaps. Driver availability and reliability are to be enhanced during high-demand windows, particularly at the airport and during peak hours.

Visualizations:

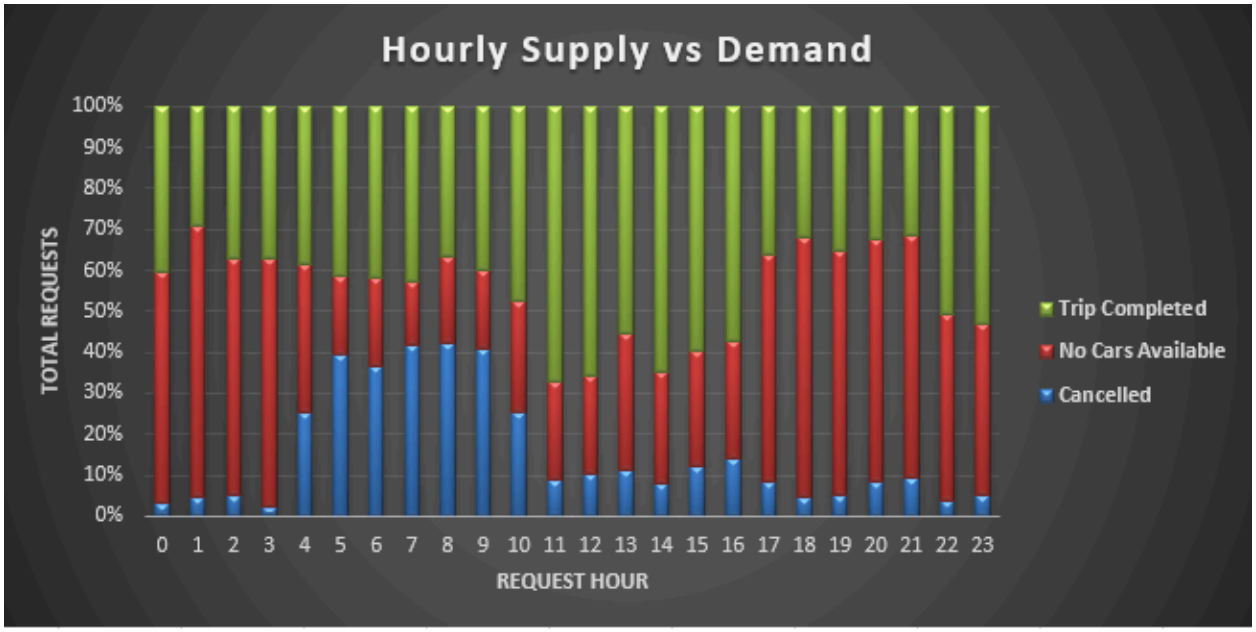


Fig-1

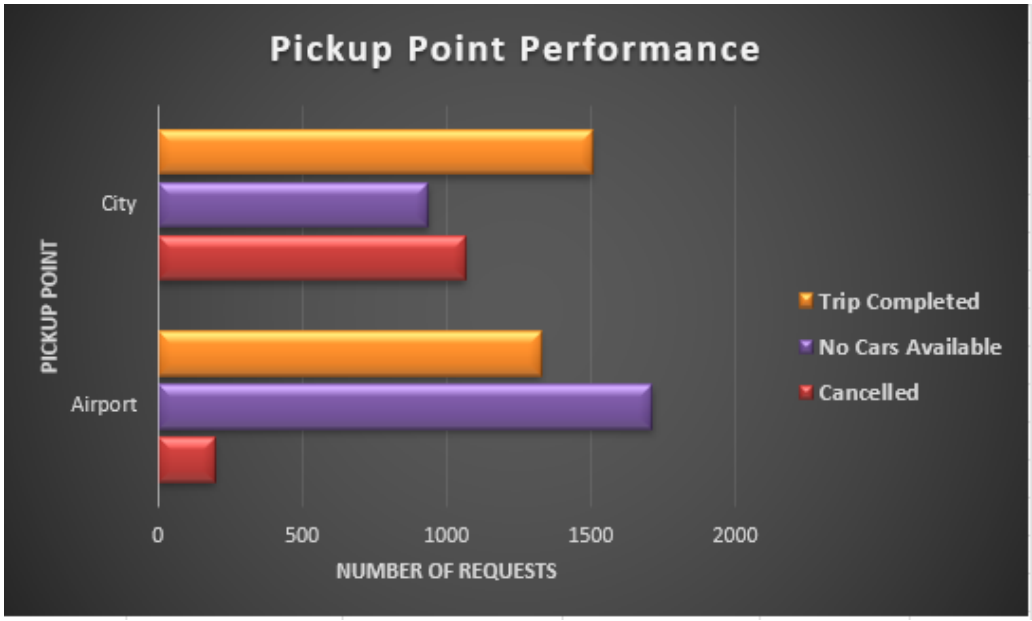

Pickup Point Performance
City
Airport
PICKUP POINT
0
500
1000
1500
2000
NUMBER OF REQUESTS
Trip Completed
No Cars Available
Cancelled

Fig-2

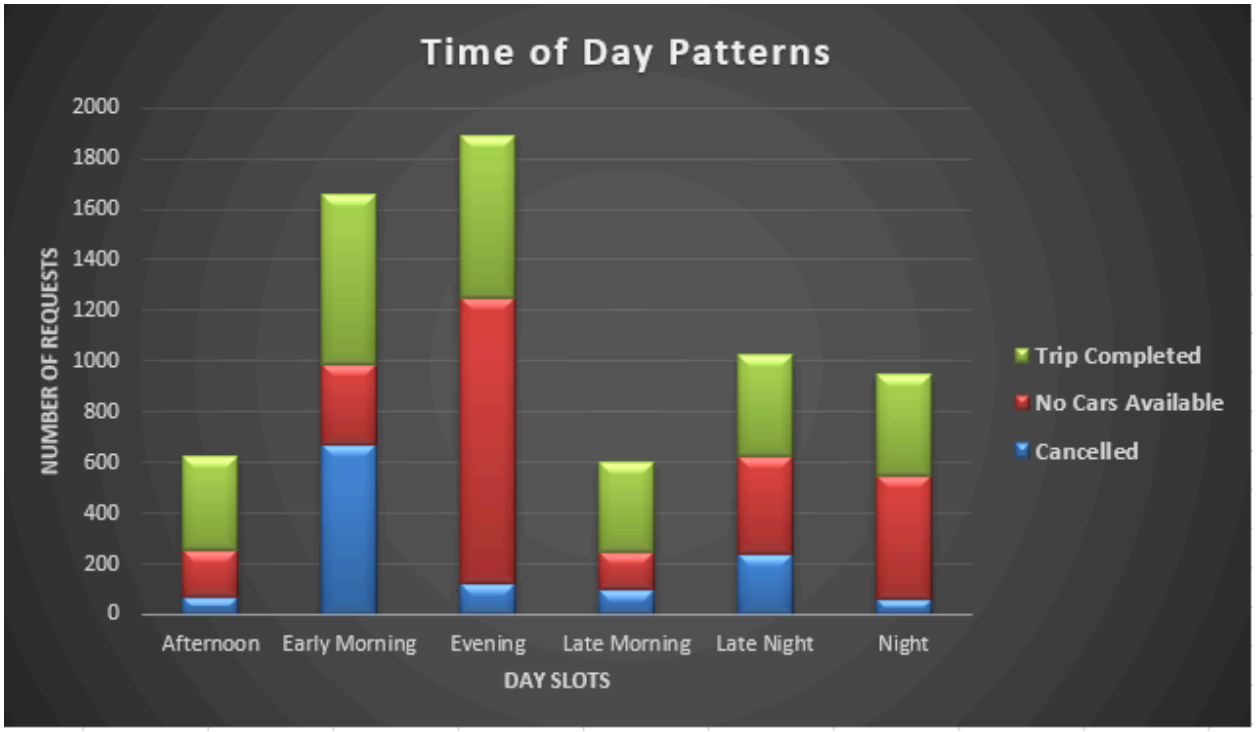

Time of Day Patterns
2000
1800
1600
1400
1200
1000
800
600
400
200
0
NUMBER OF REQUESTS
Afternoon
Early Morning
Evening
Late Morning
Late Night
Night
DAY SLOTS
Trip Completed
No Cars Available
Cancelled

Fig-3

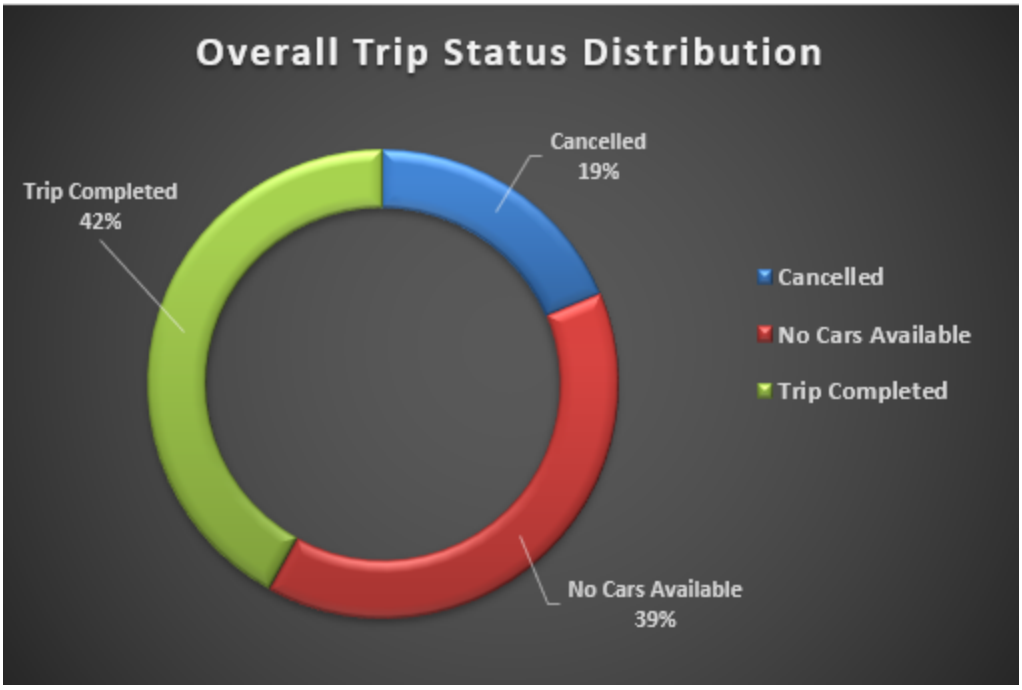

Overall Trip Status Distribution
Cancelled
19%
Trip Completed
42%
No Cars Available
39%
Cancelled
No Cars Available
Trip Completed

Fig-4

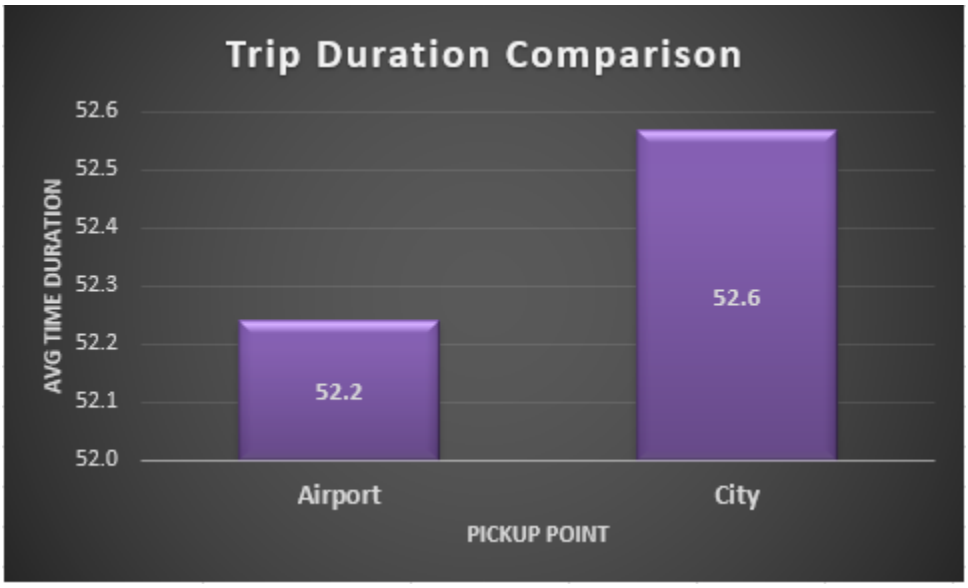

Trip Duration Comparison
AVG TIME DURATION
52.6
52.5
52.4
52.3
52.2
52.1
52.0
52.2
52.6
Airport
City
PICKUP POINT

Fig-5

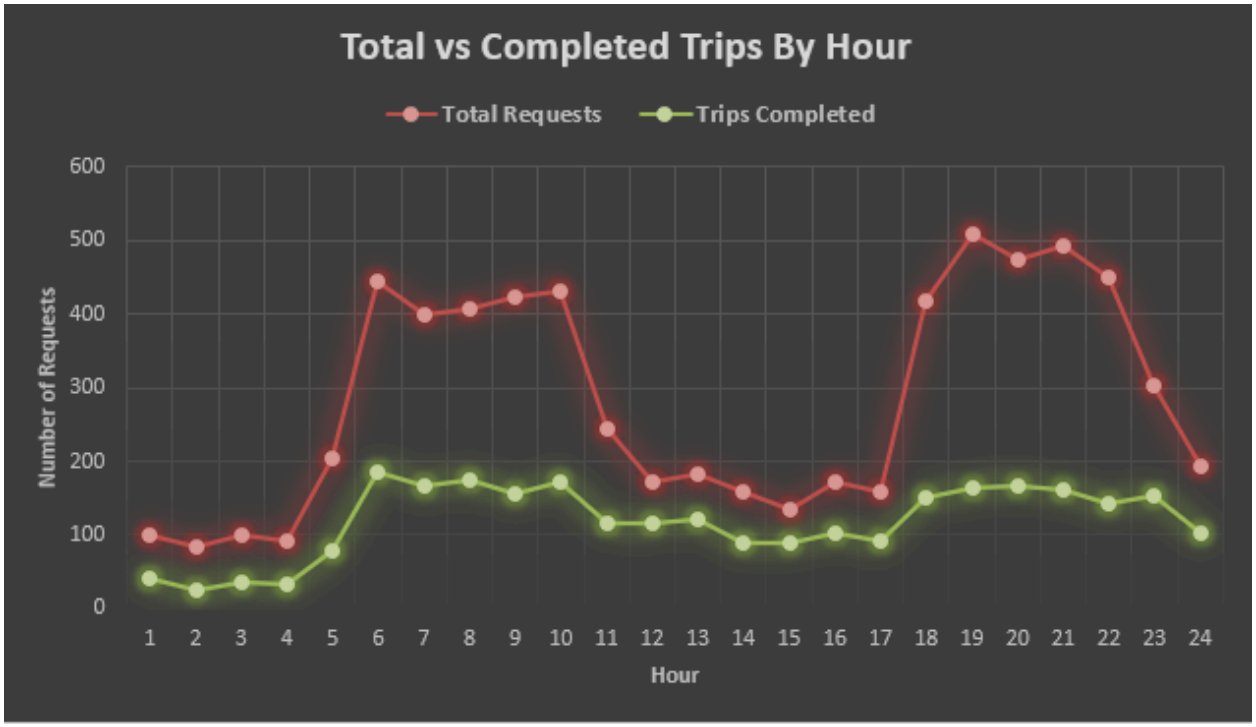
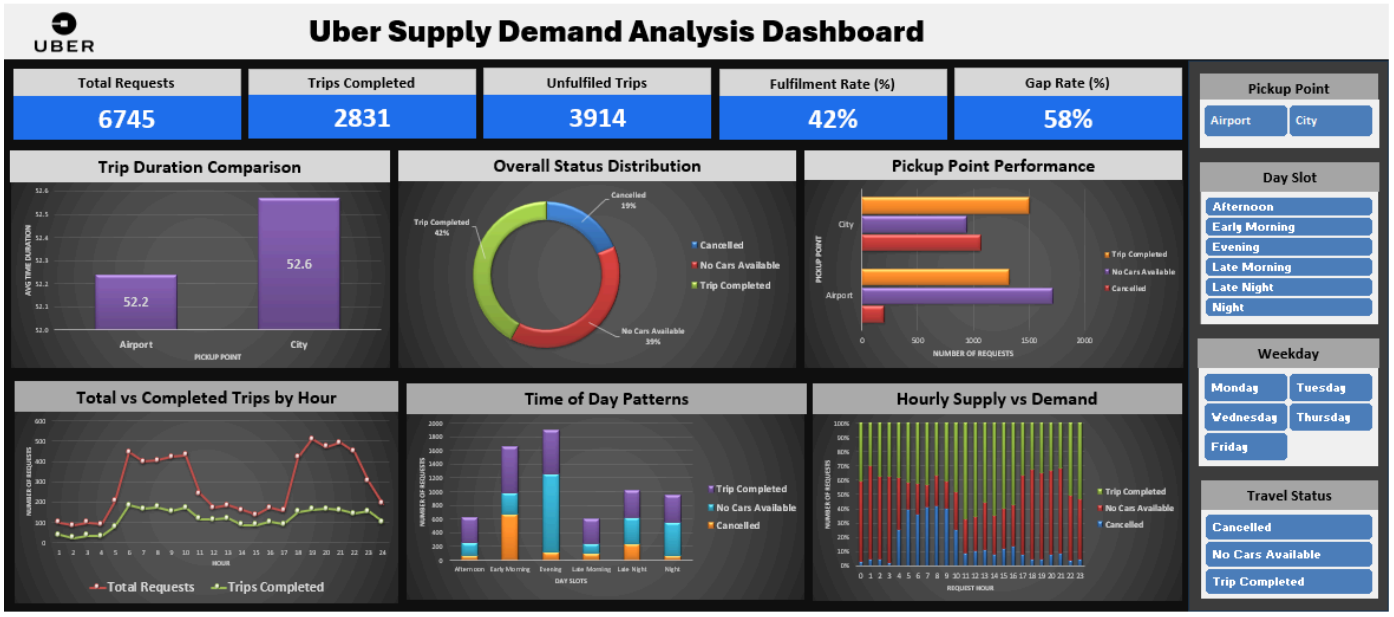


Fig-6

Dashboard:



Solutions to Achieve Business Objectives:

In order to achieve the business goals identified in the Uber Supply-Demand Analysis, the following specific solutions are suggested using the conclusions derived from the data:

1. Increase Driver Availability During Peak Hours:

The morning (5 AM–9 AM) and evening (6 PM–10 PM) time slots have very high demand with very low completion rates. Uber must apply driver incentive programs, including increased prices, bonuses, or ensured compensation during these hours so that more drivers are available at times of highest demand.

2. Redistribute Driver Supply Among Pickup Points:

The airport has suffered most from a shortage of available cars, while the city experiences higher cancellations. Uber can align car usage with efficiency by shifting more drivers to the airport during late evening peak demand hours and creating greater coverage according to real-time demand patterns.

3. Lower Cancellations in the City Through Improved Reliability:

Excessive cancellations within the city may be due to delays, rider impatience, or driver unresponsiveness. Uber must run to reduce pickup times by improving ride allocation and demand forecasting models in an effort to provide an adequate supply of drivers for high-cancellation areas.

4. Promote Driver Availability During Non-Peak Times:

Overnight time periods continue to demonstrate unmet demand, indicating potential revenue even at non-peak times. Offering a bonus for nighttime driving or flexible shifts has the potential to fill this gap in services.

5. Apply Pre-Booking or Advance Reservation of Rides:

In those peak times when fulfillment drops significantly, applying a pre-booking option can enable Uber to better anticipate demand and advance book drivers, minimizing the shortage of supply at the last minute.

6. Track and Adjust Time-Slot-Based Demand Patterns:

Afternoons and midday periods show relatively stable performance. Optically utilize the time for driver break times, vehicle service, or training, so peak performance is not compromised at high-demand periods.

These solutions, if well implemented, will have a direct impact on improving fulfillment rates, lost business opportunities, and overall rider experience, which ultimately enhances Uber's business objectives of optimizing operational efficiency and customer satisfaction.

Conclusion:

This project performed a thorough analysis of Uber ride requests data through a systematic process involving data cleaning, EDA, SQL-based in-depth analysis, and interactive dashboard creation. The results identified important issues like widespread supply shortages during peak hours, excessive cancellations during certain time slots, and noteworthy performance variability between airport and city pickups. By plotting out these trends and figures onto an effectively organized Excel dashboard, the results provide exact, data-driven recommendations for ride satisfaction improvement and operational optimization. Not only does this end-to-end analysis highlight the benefit of using software such as Excel, Python, and SQL, but it also shows the power of data to be converted into practical business insight.