UBER SUPPLY DEMAND GAP ANALYSIS

Uber is a technology platform that connects users with transportation, food delivery, and freight options through its mobile app. It's a ride-hailing service where users can book rides from independent drivers, and also offers food delivery through Uber Eats and freight services. Uber operates in numerous countries and cities worldwide, coordinating millions of trips daily and facilitating various delivery services.

Project Description:

This project deals with the detection and analysing of supply demand gap in Uber Cab Services particularly at the Airport and at the city, and recommending possible solutions to overcome the Supply Demand Gap, ensuring the smooth running of business and great user experience.

About Data:

The data used in this project is provided by the Uber stakeholder. The data has **6745** rows with **6** Columns namely:

1. Request id – Contains the generated id per request
2. Pickup point – Journey start points (Airport or City)
3. Driver id – Id of the driver assigned to request id (Unique id per driver)
4. Status – Trip Status (Completed, no cars Available, Cancelled)
5. Request timestamp – Time at which request was made by user
6. Drop timestamp – Time at which user was dropped to their destination.

Tools Used:

Data Cleaning and Processing: Excel

Exploratory Data Analysis: Python (Jupyter Notebook)

Basic Insights: MySQL

Data Cleaning:

Missing Values:

- Some missing values were found in column “drop timestamp” due to non-availability and cancellation of ride.
- Some missing values in “driver id” due to non-availability of ride were found. Removed these missing values by replacing it with No Drivers Available, since no ride contains no drivers.

Duplicate Values:

- No duplicate rows were found on the basis of Request id.

Data Processing:

- Added a column Time slot containing part of the day i.e. ‘morning’, ‘evening’ etc. on the basis of Request timestamp.
- Added Day of the Week column on the basis of Request timestamp.
- Added column Request Status containing whether the request is fulfilled or unfulfilled.
- Added column trip duration (Mins.) based on Request timestamp and Drop timestamp. (NAs were filled with 0s).

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SQL Insights:

1. Number of Users/Request Made for booking: **6745**
2. Trip Status Data:
    - Trip Completed – **2831**
    - Cancelled – **1264**
    - No Cars Available – **2650**
3. Number of Drivers: **300**
4. Number of users with unfulfilled request – **3914**
5. Percentage of users with unfulfilled request – **58.03%**
6. Overall Demand Gap Percentage by pickup point:

Pickup point	Number of Request	Number of unfulfilled request	Demand Gap Percentage
Airport	3238	1911	**59.02%**
City	3507	2003	**57.11%**

7. Demand Gap percentages on different time slots for **Airport**:

Time Slot	Number of Request	Number of Unfulfilled request	Demand gap Percentage
Morning	473	74	**15.54%**
Evening	1457	1145	**78.59%**
Night	624	421	**67.47%**
Early Morning	209	73	**34.93%**
Afternoon	339	114	**33.63%**
Late Night	136	84	**61.76%**

8. Demand Gap percentages on different time slots for **City**:

Time Slot	Number of Request	Number of Unfulfilled request	Demand Gap Percentage
Morning	1599	1098	**68.67%**
Evening	436	106	**24.31%**
Night	323	127	**39.32%**
Early Morning	531	370	**69.68%**
Afternoon	471	205	**43.52%**
Late Night	147	97	**69.99%**

9. Demand Gap Percentage for **Airport** per Day of Week

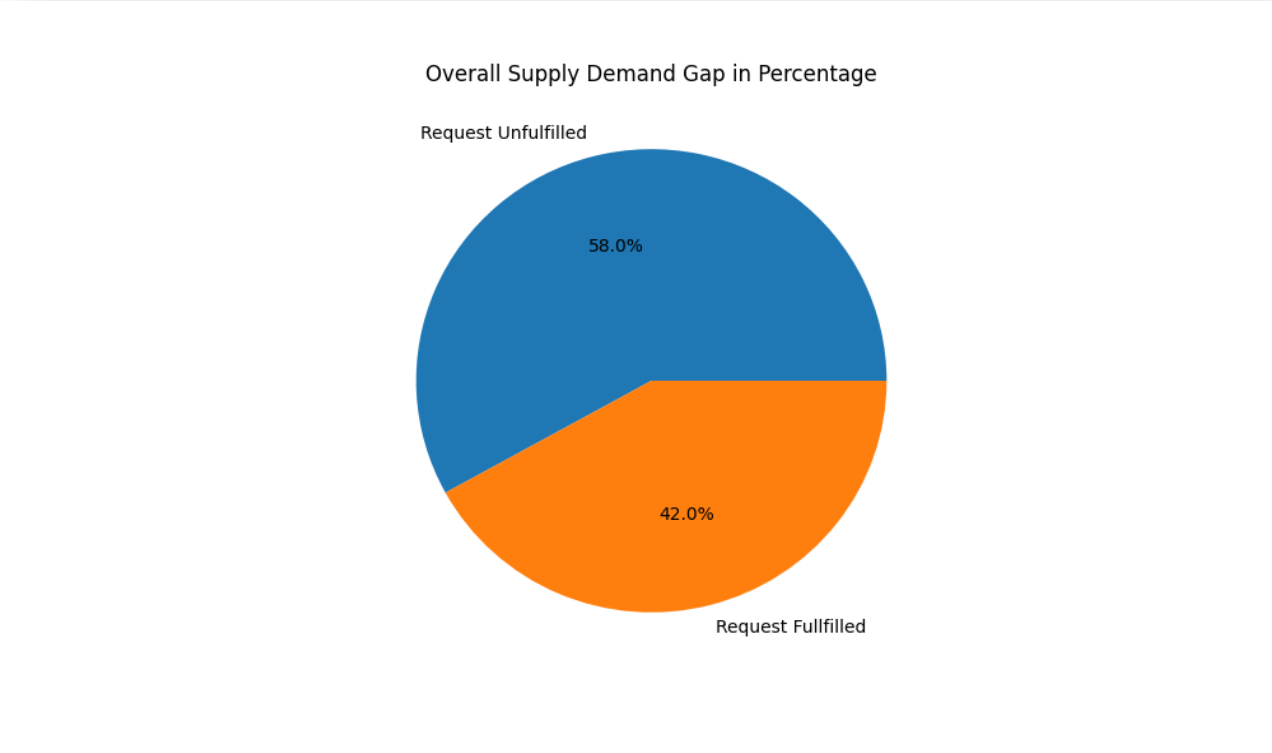
Day of Week	Number of Request	Number of Unfulfilled Request	Demand Gap Percentage
Mon	661	380	**57.49%**
Tue	684	395	**57.75%**
Wed	663	365	**55.05%**
Thu	601	410	**68.22%**
Fri	629	361	**57.39%**

10. Demand Gap Percentage for **City** per Day of Week

Day of Week	Number of Request	Number of Unfulfilled Request	Demand Gap Percentage
Mon	706	386	**54.67%**
Tue	623	350	**56.18%**
Wed	674	395	**58.61%**
Thu	752	413	**54.92%**
Fri	752	459	**61.04%**

Uber Exploratory Data Analysis:

Chart – 1



1. **About Chart**

   This pie chart shows the overall Supply-Demand Gap Percentage in the available dataset.

2. **Insights**

Request unfulfilled (Ride Cancelled by driver/Unavailability of cars) for the user.

   a. Ride Cancelled by the driver/ Unavailability of cars is about 58% of the total available data. This is more than 50% of the data. This could be due to unavailability of drivers/cars in the peak rush hour or cancelling the rides by drivers because of hesitation for long distance rides.

3. **Strategy to create positive business impact**

Insights that can lead to negative growth

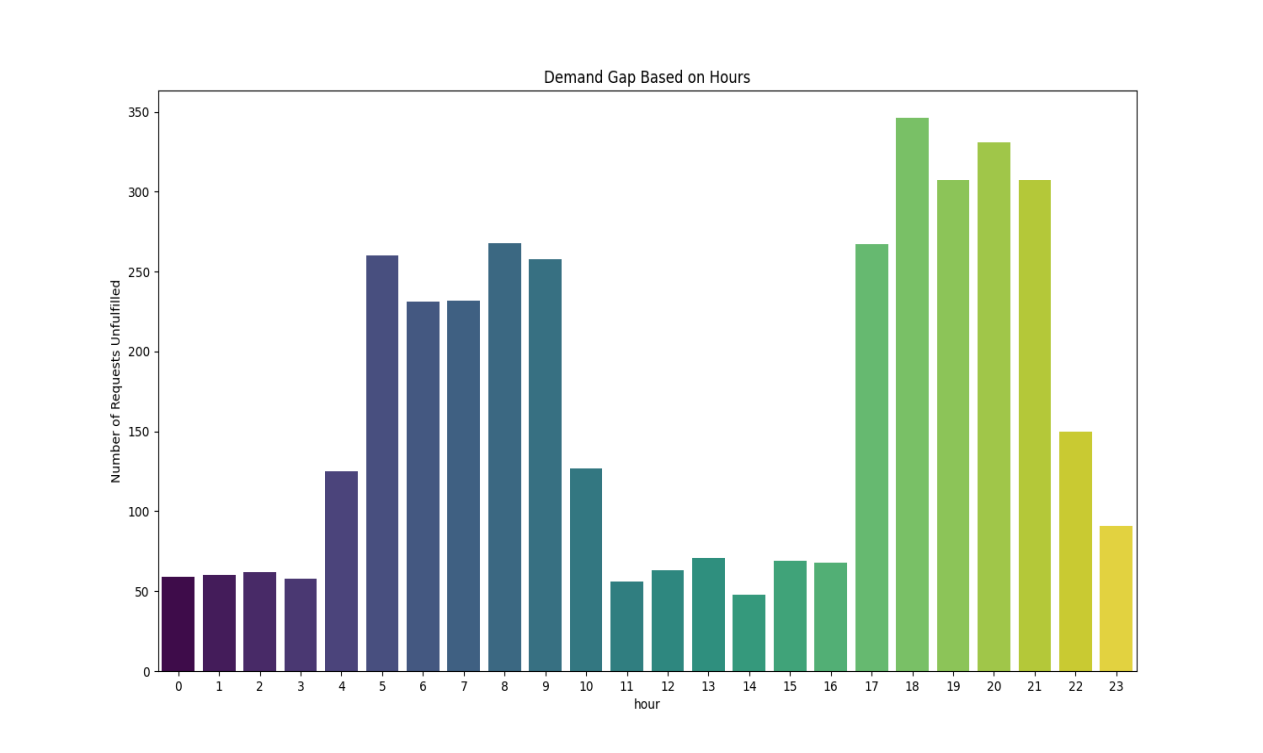
a. Significant number of unfulfilled request about 58% can lead to customer dissatisfaction and could probably result in customer churn from the platform.

Business Strategy

b. Deploying more cars if the number of cars is not enough in the peak rush hours
c. Providing incentives to cab drivers on peak rush hours or loyalty points.
d. Providing bonuses to cab drivers for long rides.

This strategies could lead to more request fulfilment and more customer satisfaction.

Chart – 2



1. About Chart

   This Bar Chart shows the Hourly Average of Demand Gap.

2. Insights

   This graph shows bimodal distributions

- First peak in Demand Gap is somewhere in Morning hours (4AM to 10AM)
- Second peak (more prominent) is somewhere in Evening Hours (5AM to 21AM)

  This could be due to peak rush hours typically in morning hours and as well as in Evening hours.

3. Strategy to create positive business impact

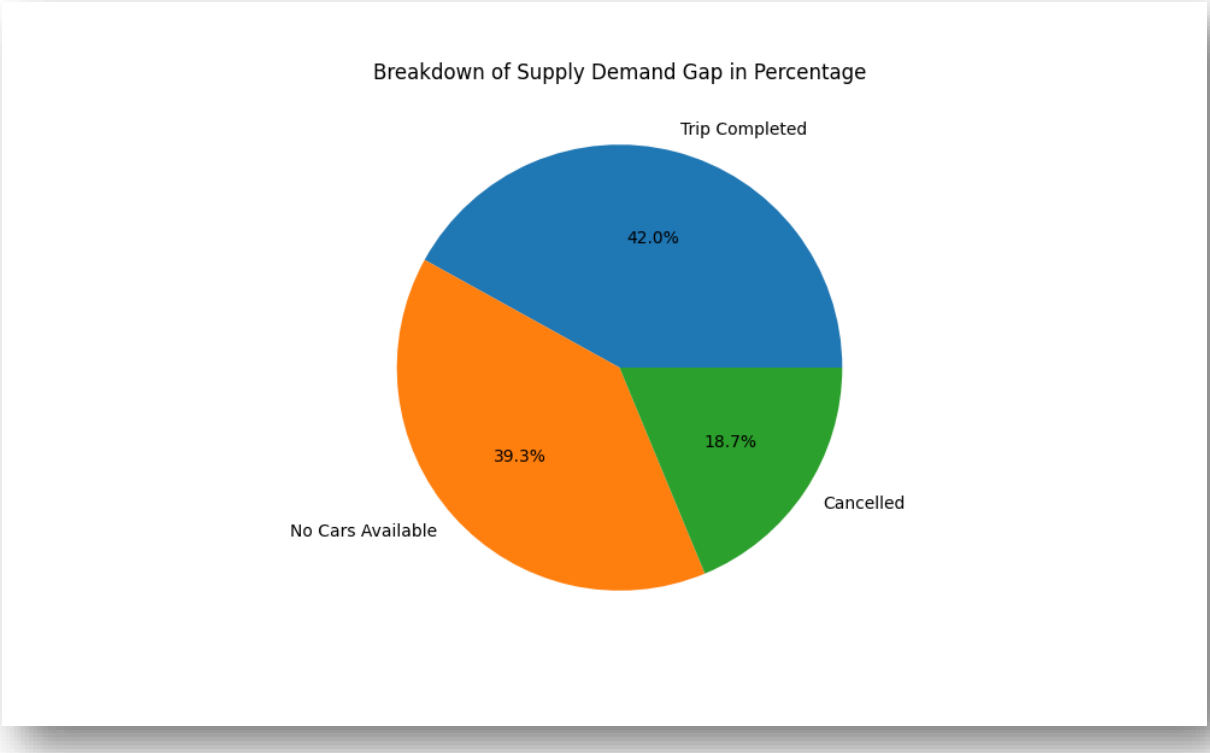
   Insights that can lead to negative growth.

   a. Unavailability of cars or frequent cancellation of cab ride by drivers could cause frustration in customer, which in turn can result in increased user churn and bad reputation of the Company/Organisation.

   Business Strategy

   b. Deploying more cars in the fields in morning hours and evening hours.
   c. Hiring more drivers.
   d. Incentivizing drivers for rush hour operation and long cab ride.
   e. Giving bonuses to drivers who engages more number customers in rush hours.

Chart – 3



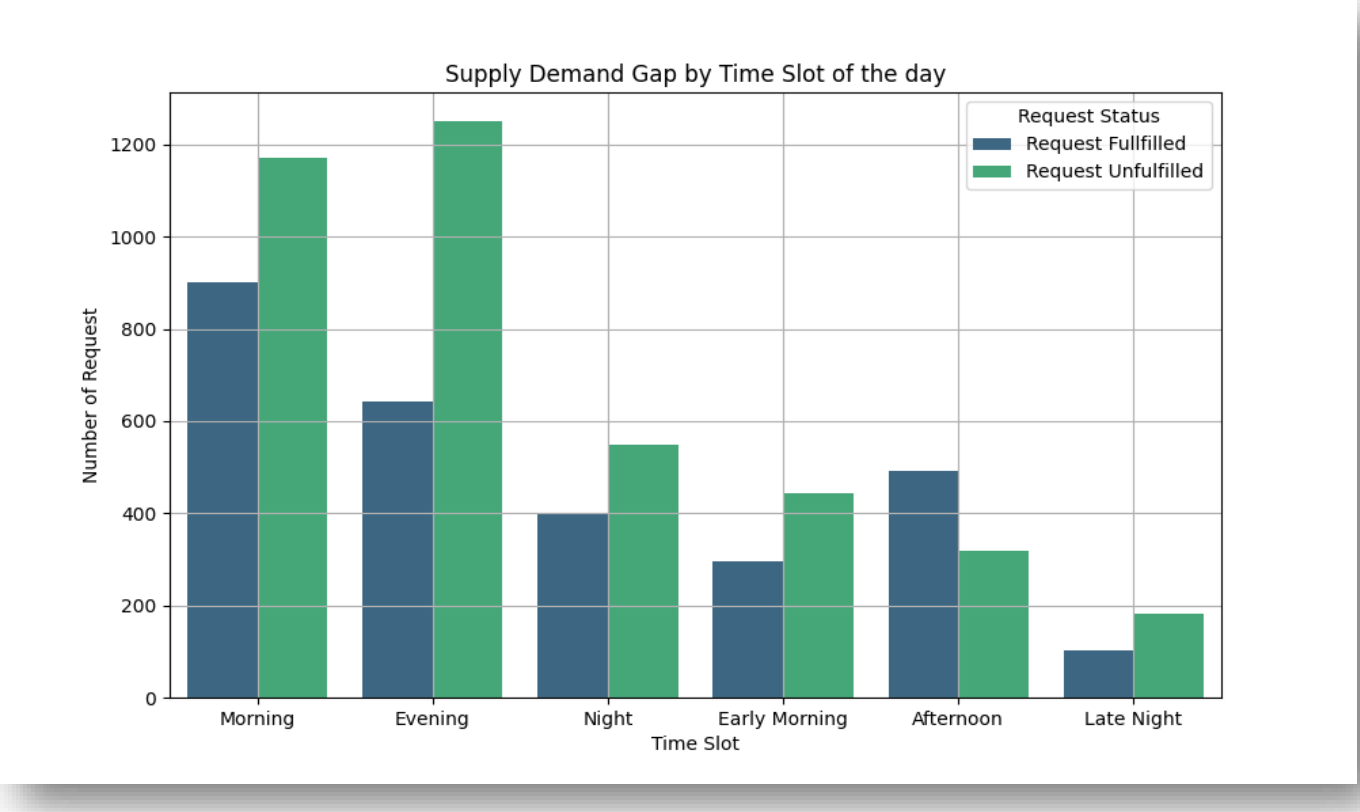
1. **About Chart**
   This Pie Chart shows the distribution of trip status in percentages.

2. **Insights**
   - High trip fulfilment but not majority
     - Only 42% of the trips were completed successfully. While this is the large segment, its still less than half, suggesting room for improvement in service reliability.
   - High Incidence of Unavailability:
     - A significant 39.3% of trip requests failed due to no cars being available, indicating supply constraints. This could reflect
       - Insufficient driver supply during peak rush hour.
       - Poor distribution of cars relative to demand hotspots.
   - Considerable Cancellations:

- 18.7% of the trips were cancelled, which is not negligible. This could be due to:
  - Long distance drive
  - Hesitation by drivers for long distance ride.

3. **Strategy to create positive business impact**
   - Insights that can lead to negative business growth
     - 39.3% of cars unavailability and 18.7% of ride cancellations can heavily lead to user dissatisfaction and user churn, resulting in business loss.
   - Business Strategies
     - Hiring more cars and drivers to fulfil the peak hours demand.
     - Distribution of cars relative to demand hotspots.
     - Incentivizing drivers for long distance drive.
     - Applying Bonus scheme for drivers for engaging more customers in rush/peak hours.

Chart – 4



Uber

1. About Chart
   This chart shows the Supply demand gap vs fulfilled demand by Time Slot of the day.

2. Insights

   In most Time Slot of the day there are more Unfulfilled requests than fulfilled requests, except Afternoon.

   There are higher number of requests in Morning and Evening, out of which most requests are going unfulfilled particularly in the Evening (highest ratio). These could be due to peak rush hour in the Evening and Morning.

   There are also some significant Unfulfilled requests in the night, Early Morning and Late Night. These could be due to drivers unwilling to drive in Night time, Early Morning or at Late Night.

3. Strategy to create positive business impact

   Insights that could lead to negative growth.

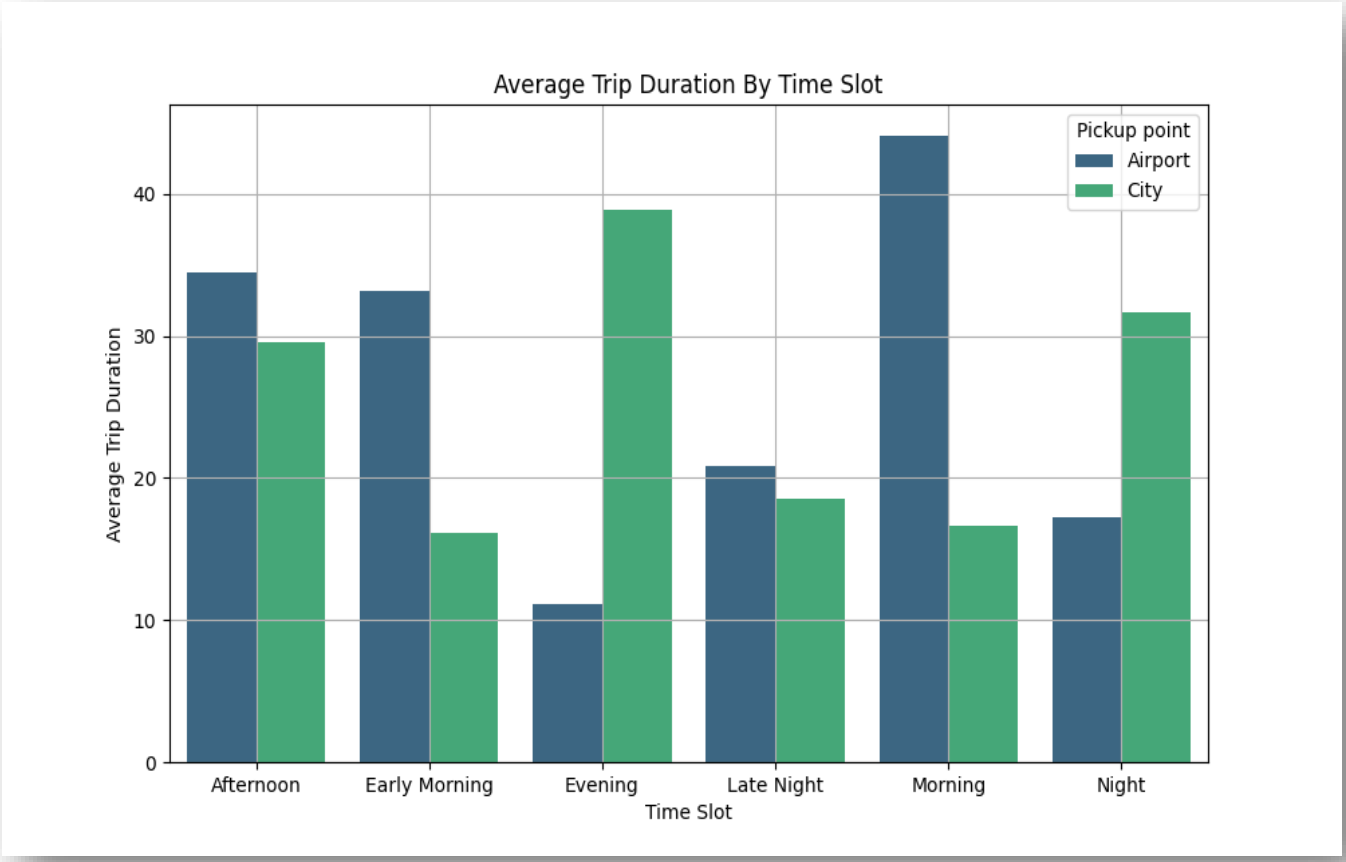
   a. Persistent higher number of unfulfilled requests could potentially damage company reputation and can cause heavy user churn and negative feedback.
   b. high unfulfilled requests in rush hour (Morning and Evening) may negatively impact business growth when people are in hurry to get to their destination.

   Business Strategy

   c. Deploying more cars and hiring more driver in the field particularly in Evening and Morning (during peak rush hour) could help fulfilling the demands.
   d. Deploying drivers and cars in the field at night shift could also help fulfilling the demands at night. Incentivizing the driver during night time could motivate the driver to do their job efficiently.

e. For early morning and Late-night driving, the drivers could be also motivated by Incentives and bonuses.

Chart – 5



1. **About Chart**
   This bar chart shows the average trip duration by time slot, separated by pickup point (Airport vs City).

2. **Insights**

Airport pickups Take longer (Generally)

a. For most time slots, trips starting from the Airport have longer durations than those from the city.

Evening Pattern is reversed:

b. In the evening, City pickups have much higher average durations (39 mins) compared to Airport (11 mins). This may include
    i. Heavy evening traffic in city areas.
    ii. Shorter airport trips possibly due to fewer bookings or off-peak demand.

Night time Disparity:

c. At night, City trips are again longer than Airport trips, possibly due to longer routes or fewer traffic interruptions enabling longer distance rides.

Late night is more balanced:

d. Both pickup points show similar durations (18-21 mins), suggesting smoother traffic during this time.

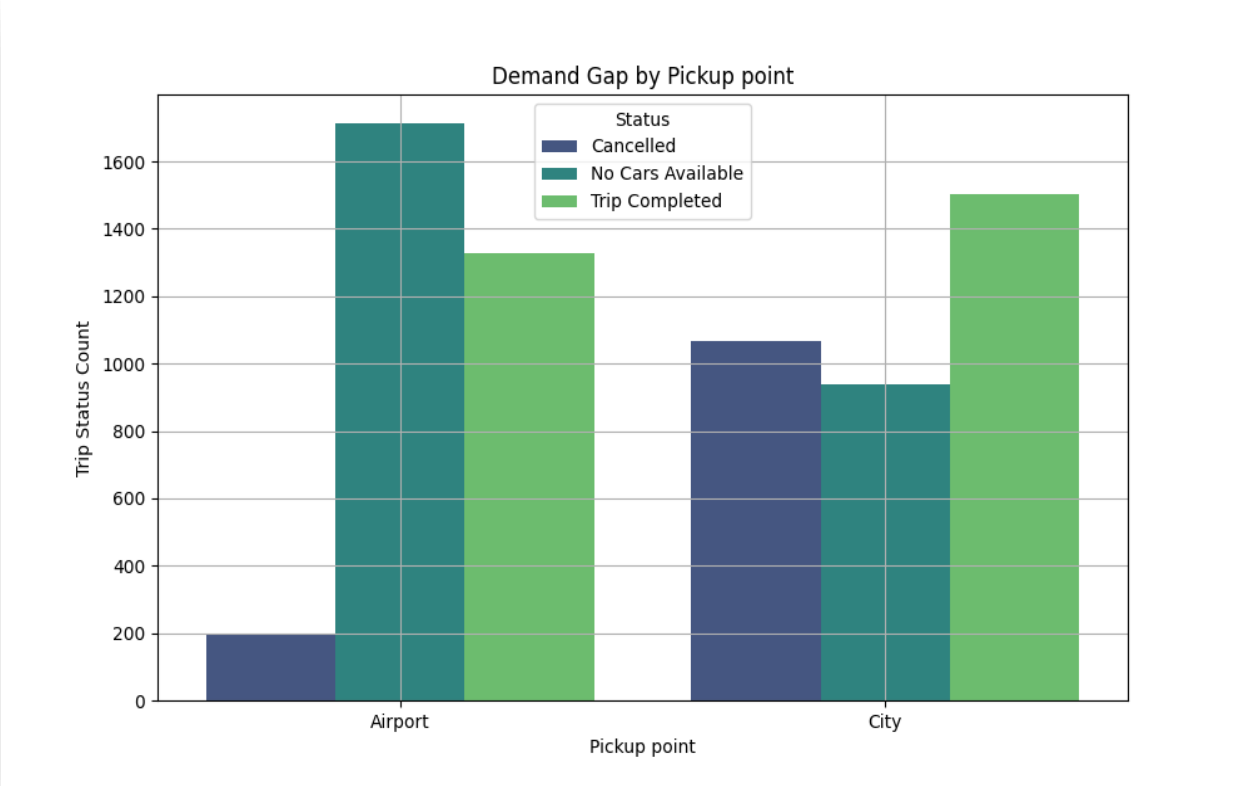
3. Strategy to create positive business impact

- Insights that could lead to negative growth.
    - Not implementing dynamic pricing based on trip duration or surge adjustments and Time Slot based dynamic pricing could lead to less revenue generation which can cause negative impact on business.
- Business Strategies
    - Dynamic pricing / Surge Adjustments:
        - Apply time slot based dynamic pricing
        - Evening: Higher rates in City due to longer trip durations.
        - Morning: Higher rates from Airport due to longer trips and likely higher demand.
- Driver Allocation Optimization:
    - Increase driver availability at the Airport during morning and Early Morning to cover long trips.

- Deploy more drivers in City areas during Evenings where trip duration and likely traffic are high.

- Customer Communication:
  - Notify users about expected longer trip times during specific time slots and pickup zones.(e.g. "Expect longer wait and trip durations in the City during Evening Hours")

Chart – 6



1. About Chart

This chart shows the trip request outcomes by pickup point across three statuses:

- Cancelled
- No Cars Available
- Trip Completed

2.Insights

Airport pickup point:

- High "No Cars Available" count(about 1700): This is the highest among all categories- indicating a serious supply shortage at the airport.
- Lower trip completions(1300) compared to unfulfilled demand.
- Very low cancellations This suugest that users are not cancelling on their own; rather trips are failing due to supply issues.

City pickup point:

- Highest trip completions (1500): Indicates better service in the city.
- Moderate "No Cars Available": Demand supply mismatch exists but is less severe than at airport.

3.Strategy to create positive business impact

- Insights that can lead to negative growth
  - Serious Supply Shortage at Airport could cause bad user experience.

A. For Airport Pickup Point.

- Severe Under-Supply:
  - Deploy a dedicated fleet or reserve a driver pool for airport pickups.
  - Use flight schedule integration to predict peak load and pre-position cars.
- Driver Incentives:
  - Provide bonuses for airport pickups, especially during peak demand hours (as shown in your earlier graphs — e.g., Evening).
  - Create short-haul ride bonuses to encourage drivers even for low fare trips from the airport.
- Passenger Communication:

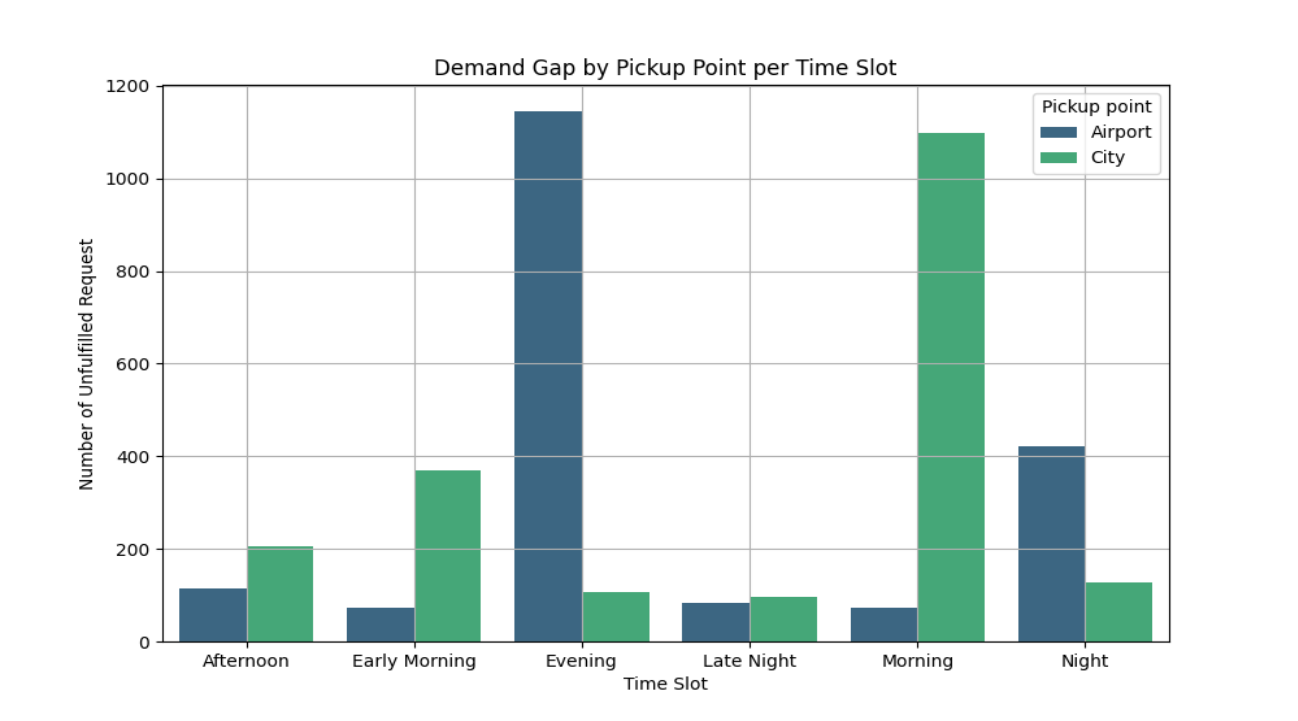
- Implement scheduled ride options at airports with guaranteed pickup.
- Notify users of wait times and options when "No Cars Available" rates are rising.

B. For City Pickup Point

➢ Driver Reliability Monitoring:
- Use analytics to detect driver behavior causing high cancellation rates (e.g., drivers declining trips).
- Provide driver accountability dashboards and incentives for high trip completion rates.

➢ Dynamic Pricing Control:
- If cancellations spike during high fares, implement price caps during certain periods to maintain demand.

Chart – 7



1. About Chart

This clustered bar chart shows the Demand Gaps by Pickup point (Airport or City) per Time Slot.

2.Insights

- major Demand Gaps at Specific Times and Locations:
  - Evening (Airport): about 1150 unfulfilled requests. (highest gap overall).
  - Morning (City): about 1100 unfulfilled requests. (Second highest)
  - These two areas are clear supply-demand mismatch hotspots.
- Early morning (City):
  - Significant unfulfilled demand (about 370 requests), which might suggest insufficient early-shift drivers in the city.
- Night (Airport):
  - Notable demand gap (about 420 requests), possibly due to reduced night shift drivers or irregular late night flight arrivals.

3.Strategy to create positive impact

- Insights that can lead to negative growth
  - Major demand gaps at Airport in the Evening hours and t the City in the morning hours indicates rush hours at Airport in the Evening and at the City in the Morning. Not addressing this issue could potentially cause customer dissatisfaction and high customer churn rate.
- Business Insights
- Supply Optimization
  - Airport - Evening:
    - Deploy more drivers at the airport during evening peak.
    - Offer incentives for drivers willing to take evening airport pickups.
    - Use flight- arrival data to align supply with demand spikes.
  - City - Morning:
    - increase city driver availability in morning hours.
    - Consider pre-scheduling or pre-booking options to smooth morning rush demand.

- City - Early Morning:
  - Adjust shift schedules so more drivers start earlier
  - Incentivize early shift drives with bonuses or higher rates.

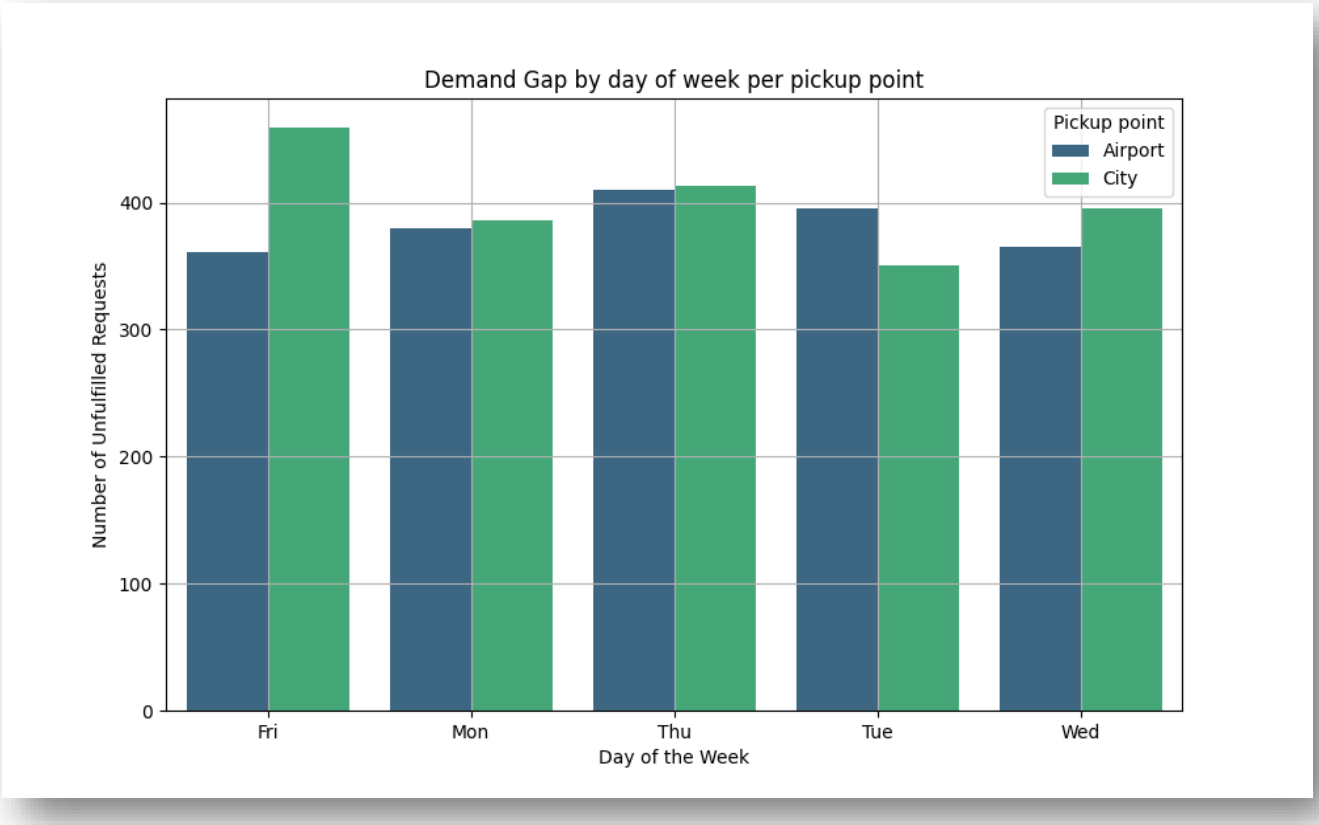
➢ Driver Incentives and Training Programs

- design targeted incentive programs to encourage drivers to work during:
  - Evening (Airport)
  - Morning (City)

➢ Customer Experience Improvement

- For time slots with chronic shortages:
  - Show users realistic wait times or suggest alternate time Slots.
  - Offer scheduled rides with guaranteed pickups if booked in advance.

Chart – 8



1.About Chart

This bar chart shows the number of unfulfilled requests by day of the week, segmented by pickup point (Airport vs City). It gives visibility into weekly demand gaps at both pickup locations.

2. Insights

- Friday Has the Highest Demand Gap for City: City requests spike significantly (~460 unfulfilled requests). Indicates higher demand before the weekend—likely due to commuters, events, or leisure travel.
- Airport Unfulfilled Demand Peaks on Thursday & Tuesday: Both days show over 400 unfulfilled requests. Possibly due to business travel cycles, which tend to peak mid-week.
- Monday and Wednesday Are Relatively Balanced: Demand gaps at both pickup points are nearly equal and moderate. Likely reflects stable weekday routines with better alignment of supply and demand.
- City Demand Gap More Volatile Across Days: City demand gaps vary more than Airport, with sharp highs on Friday and dips on Tuesday. Indicates more unpredictable and event-driven urban usage patterns.

3.Strategy to create positive business impact

- Increase City driver availability on Fridays:
    - Launch “Friday Boost” incentives for drivers in city zones.
    - Allow driver shift extensions on Friday evenings to reduce unfulfilled requests.
    - Deploy more Airport drivers on Tuesday and Thursday:
    - Match airport supply with flight arrivals mid-week.
    - Introduce airport zone bonuses for these days.
- Customer Behaviour Handling

- On high-gap days (e.g., Friday in the city):
- Send advance booking reminders to users.
- Offer discounts or loyalty points for scheduling during non-peak times (e.g., Monday/Wednesday).

Overall Insights:

1. **City Pickup Demand:**

- Friday shows the highest number of unfulfilled ride requests (~460).
- This suggests increased urban travel demand before the weekend due to work commutes, social outings, or events.
- The demand gap is highly volatile throughout the week—likely tied to unpredictable urban patterns.
- At Morning hours there are significantly more unfulfilled ride request.
- Ride cancellations in prominent during morning hours and in Early Morning hours.

2. **Airport Pickup Demand:**

- Tuesday and Thursday show high unmet demand (>400 requests), possibly due to mid-week business travel peaks.
- The airport demand pattern is more stable compared to the city, aligning with scheduled flight patterns.
- At Evenings there are significantly more unfulfilled ride request.
- Cab unavailability is prominent during Evening hours and at night hours.

Overall Business Strategy:

1.Dynamic Driver Incentives

- City (Friday Focused)
  - Implement **"Friday Boost Incentives"** to encourage more drivers to operate in City Zones specially in **Morning Hours**.

- Allow extended driving hours or relaxed shift rules on Friday

➢ Airport (Tue/Thu Focused)
- Align driver / car availability with flight arrival schedule.
- Offer zone-based bonuses for airport pickups on specific days.

2.Demand Smoothing via User – side Actions

➢ User Behaviour Management:
- **Advance Booking Reminder** for peak demand periods (e.g. Friday Mornings in City and Thursday Evenings in Airport)
- Offer **discounts or loyalty perks** for scheduling during non-peak days and non-peak hours.

3.Operational Optimization

➢ **Dynamic reallocation of idle drivers** between airport and City zones depending on real-time data.

Conclusion:

The project clearly identifies key **temporal and spatial mismatches in Uber's supply-demand ecosystem**. By applying **targeted operational strategies** such as incentive realignment and behavioural nudges, Uber can significantly reduce the demand gap, **enhance customer experience**, and **increase driver utilization and revenue**.