

# Monthly Challenge – Sep 2017

## Analyzing supply and demand to help Taximan improved operational efficiency

TAXIMAN, a cab service company, has been facing constant criticism of not being able to meet rising demand and decreasing customer satisfaction ratings.

Using the historical data, we need to understand the supply and demand pattern and help them make better business decisions and also improve its operational efficiency.

# Understanding the Data and Approach

**The dataset consists of 6068 observations.**

The following variables have been provided

- Pickup location and coordinates
- Drop location and coordinates
- Date of journey ( 1 July to 15 July)
- Time Slot (8-11 AM, 11 AM to 4 PM, 4 PM to 10 PM)
- Ride Status (Completed or Cancelled)
- Payment Mode (Cash or PayTM)
- Reason for cancellations

## **Date preparation required**

- Read dates in correct format in R
- Create new variable to provide the day of the week , convert it to factor and fix its order
- Convert timeslot to factor and fix its order.
- Create a route variable from the pickup and drop locations.

# Key areas to be explored

## Based on week day wise booking distribution

- Overview of the booking date wise
- Weekday Bookings distribution based on status
- Weekday Bookings distribution based on timeslot
- Reason for cancellation
- Drill down into reason for cancellation
- Distribution of payment mode used by customers.
- Coupon usage based on Timeslot
- Drill down to understand coupon usage, payment mode and status.

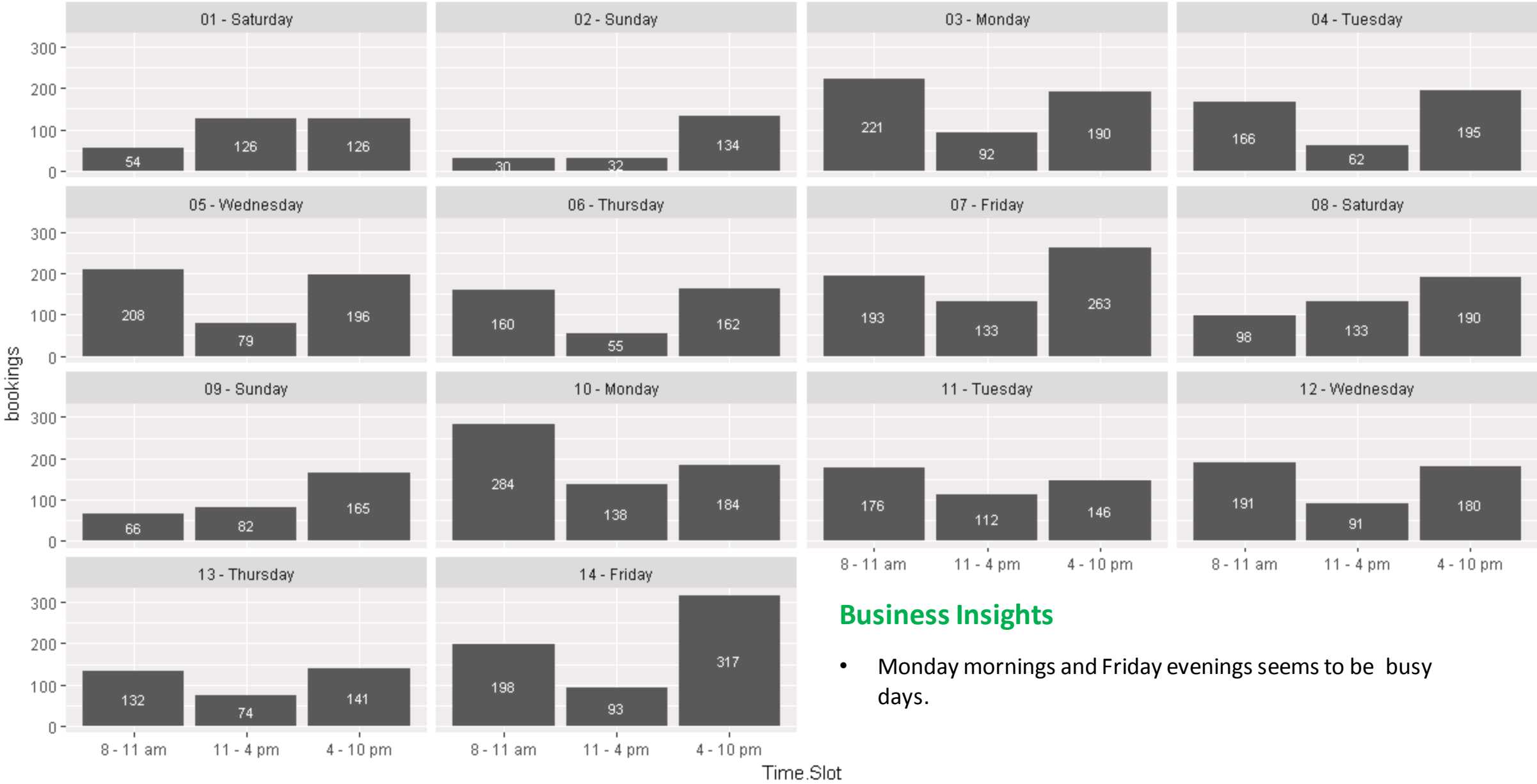
## Based on pick up location

- Top most pickup locations
- Top 5 pickup locations – deeper look
- Booking status based on pickup location
- Demand supply analysis – based on pickup location
- Digging deeper to demand supply analysis.

## Based on drop location

- Top most drop locations
- Top 5 drop locations – deeper look
- Demand supply analysis – based on drop location
- Overview of the top most routes

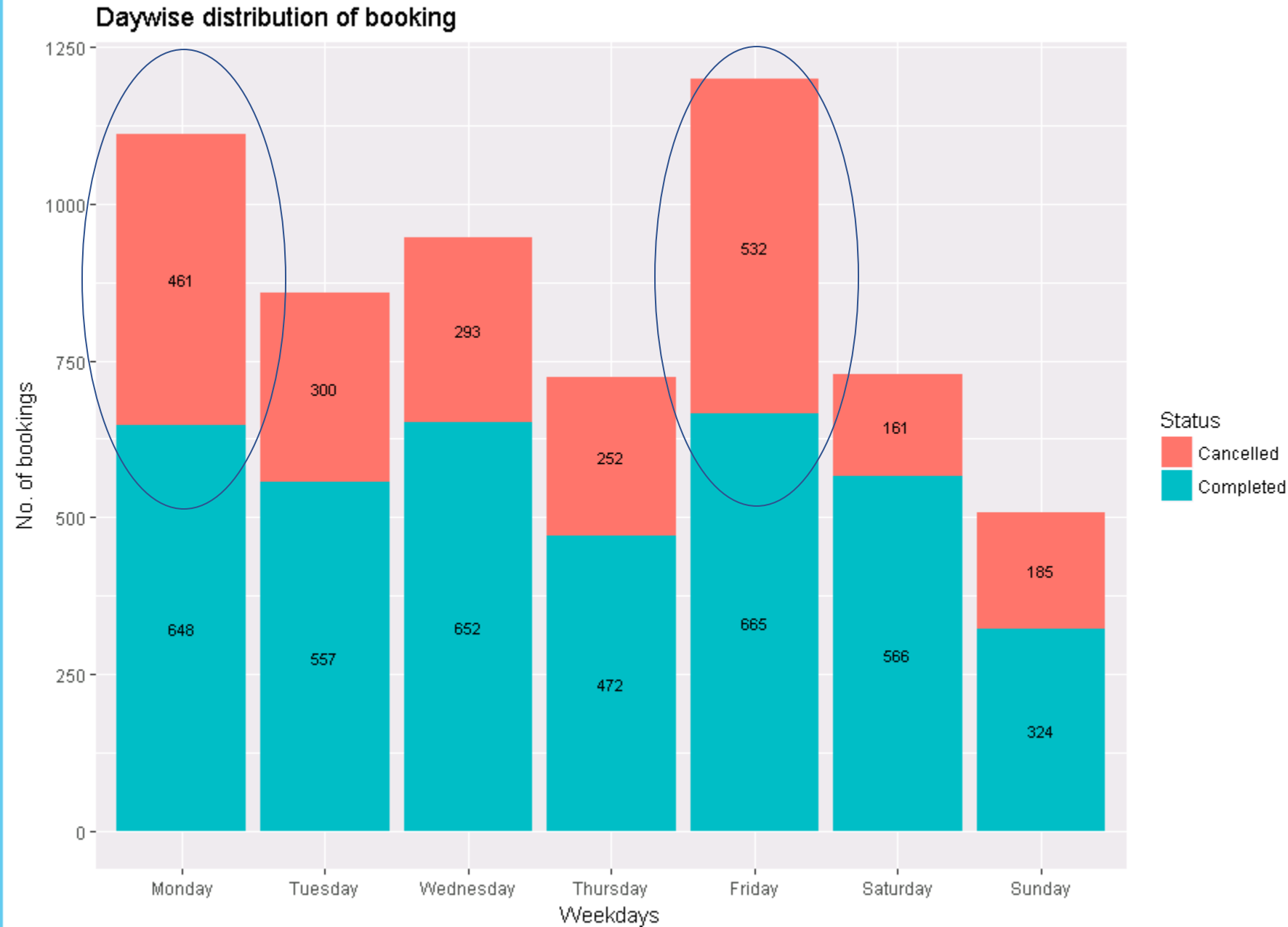
# Overview of the booking datewise



## Business Insights

- Monday mornings and Friday evenings seems to be busy days.

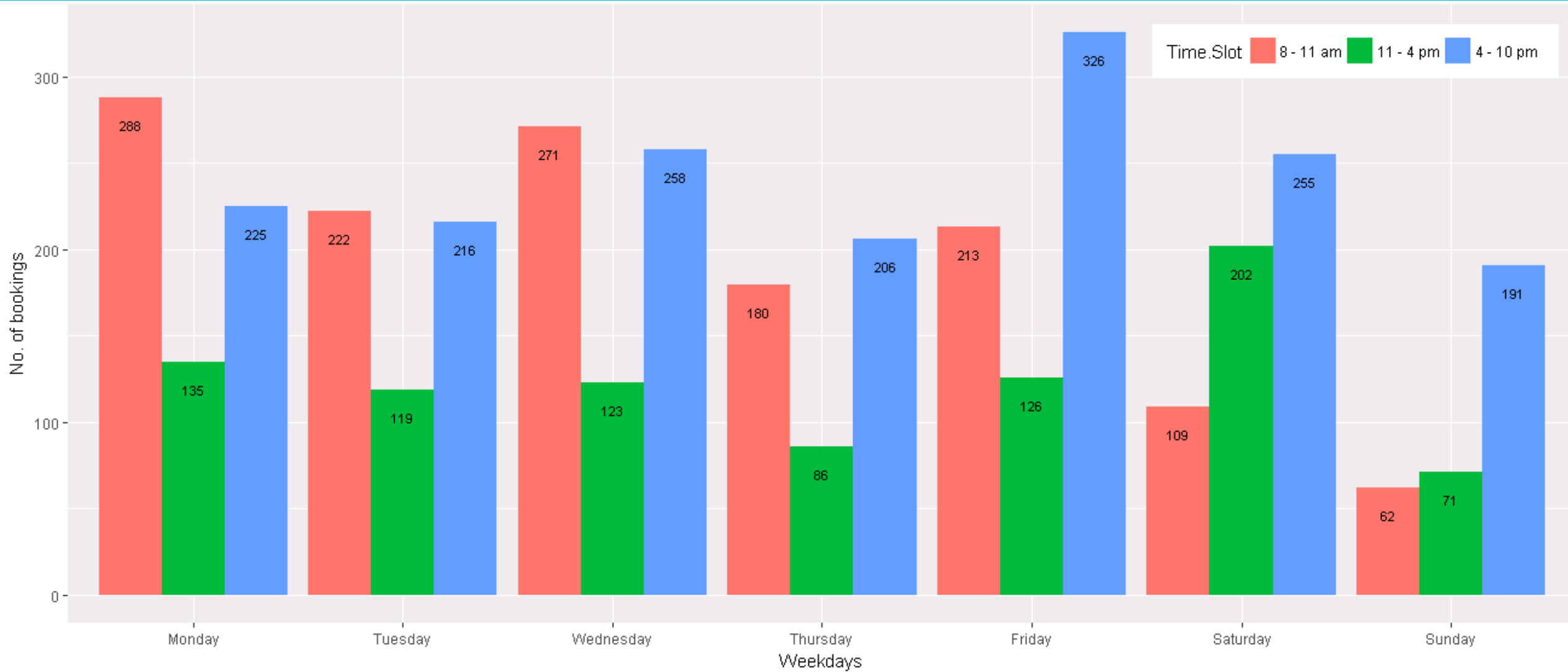
# Weekday Bookings distribution based on status



## Business Insights

- Monday and Friday seems to be the busiest days where the demand for cab service is greater.
- But on the peak days 40% of the customers are not being serviced, which is serious concern.
- Other days about 20% -30% demand is not being serviced.

# Weekday Bookings distribution based on timeslot

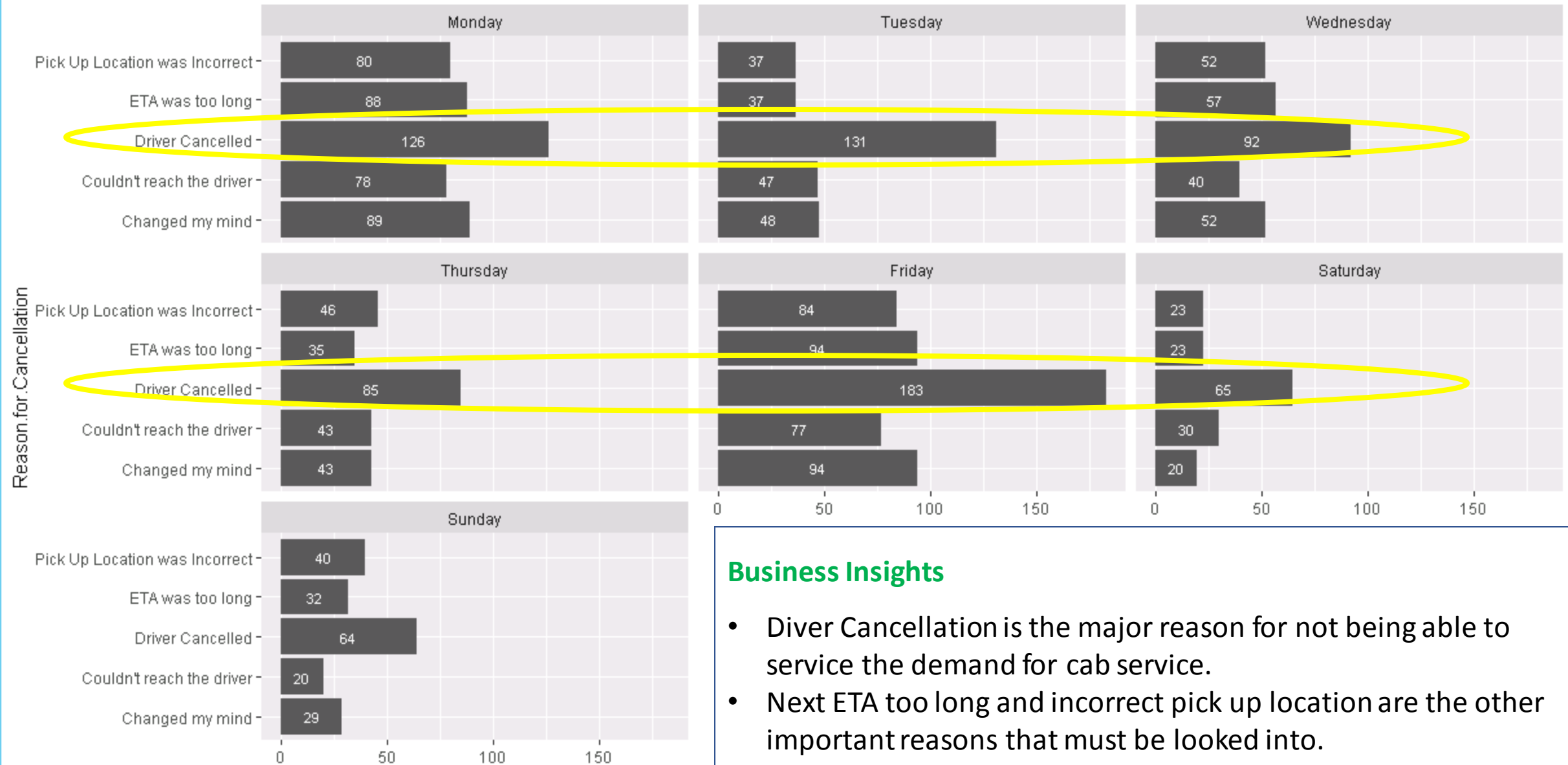


## Business Insights

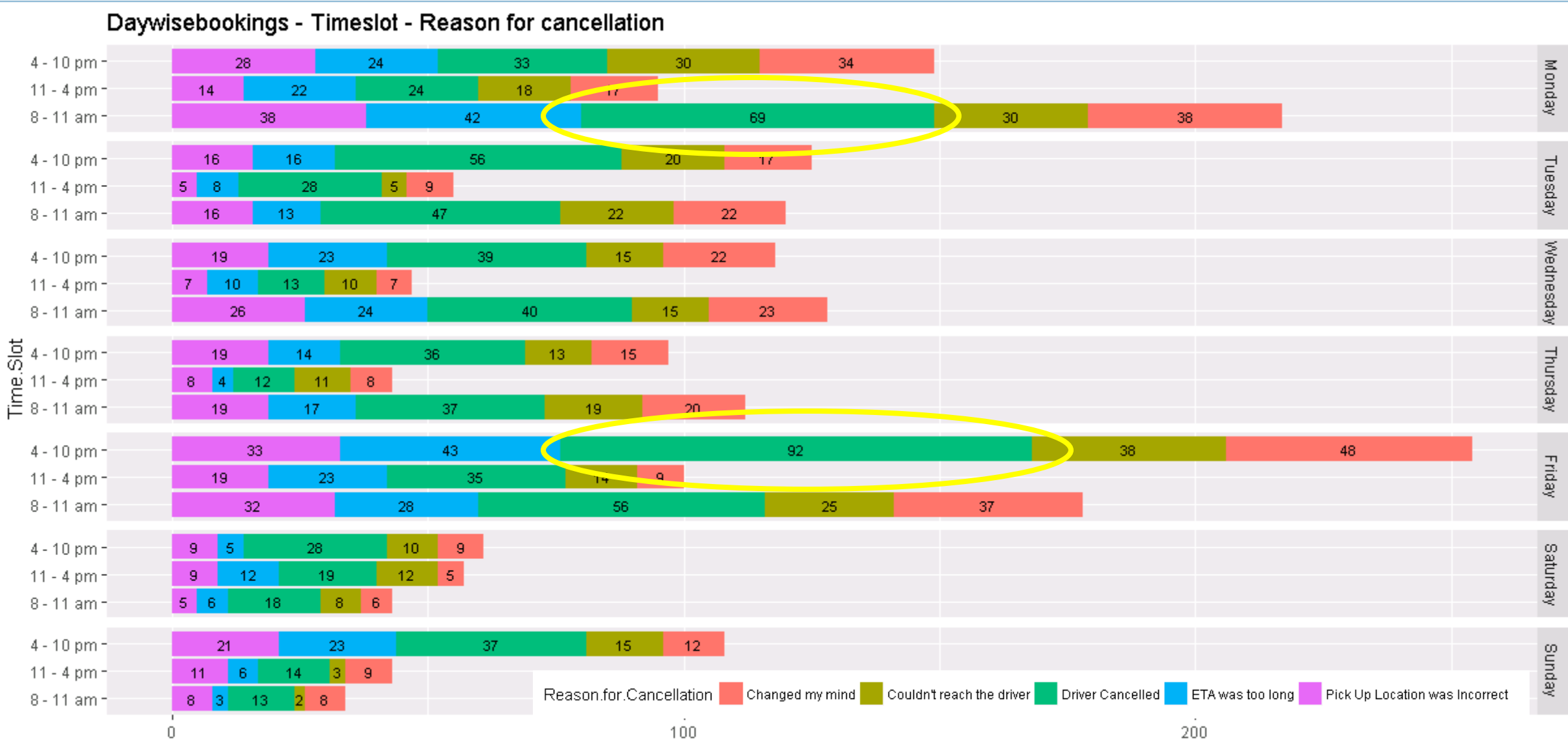
- On a daily basis, demand is high in the morning and evening timeslot.
- Only on Saturdays, demand is relatively higher in the midday timeslot

# Reason for cancellation

Daywise- Reason for cancellation



# Drill down into reason for cancellation

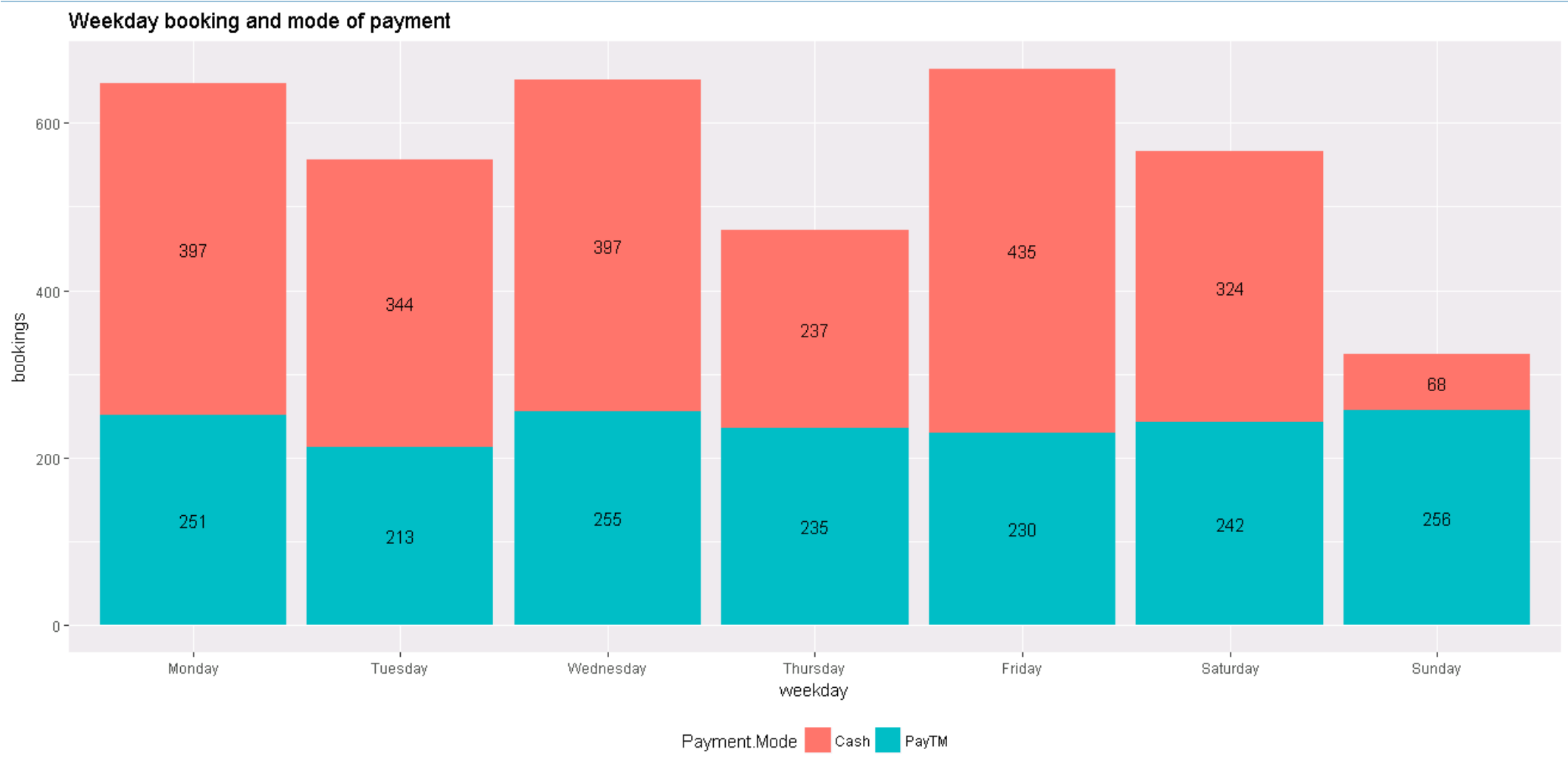


## Business Insights

- On Friday evenings and Monday mornings, drivers are not able to service demand and have been cancelling the bookings.
- Both these are rush hour, as people plan for weekend or in a hurry to get the office.



# Distribution of payment mode used by customers.



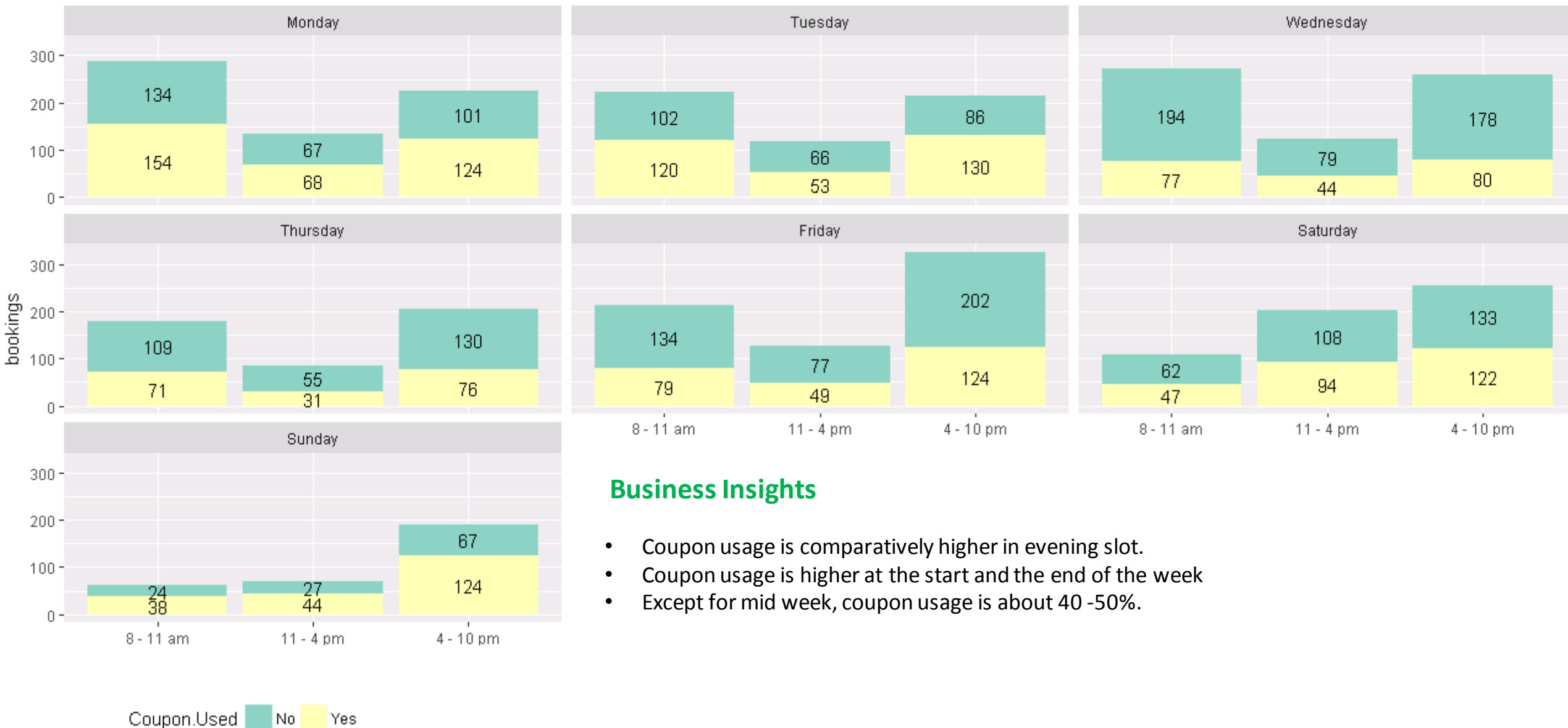
## Business Insights

- Cash payment seems to be the more popular mode of payment.
- However on Sunday, 80% of the transactions are done through PayTM

<https://github.com/Vicky-Crasto/Data-visualization-ggplot2-project>

# Coupon usage based on Timeslot

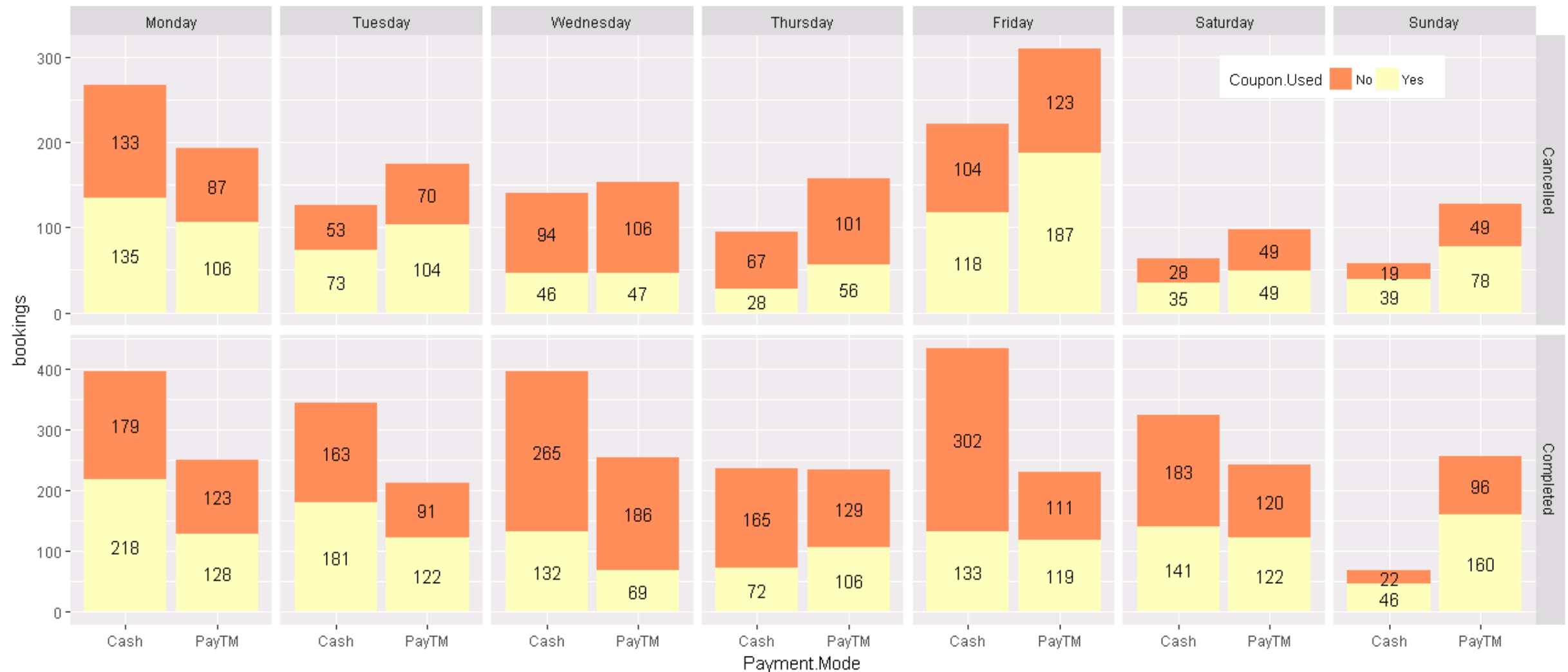
Timeslot and coupon usage



## Business Insights

- Coupon usage is comparatively higher in evening slot.
- Coupon usage is higher at the start and the end of the week
- Except for mid week, coupon usage is about 40 -50%.

# Drill down to understand coupon usage, payment mode and status.

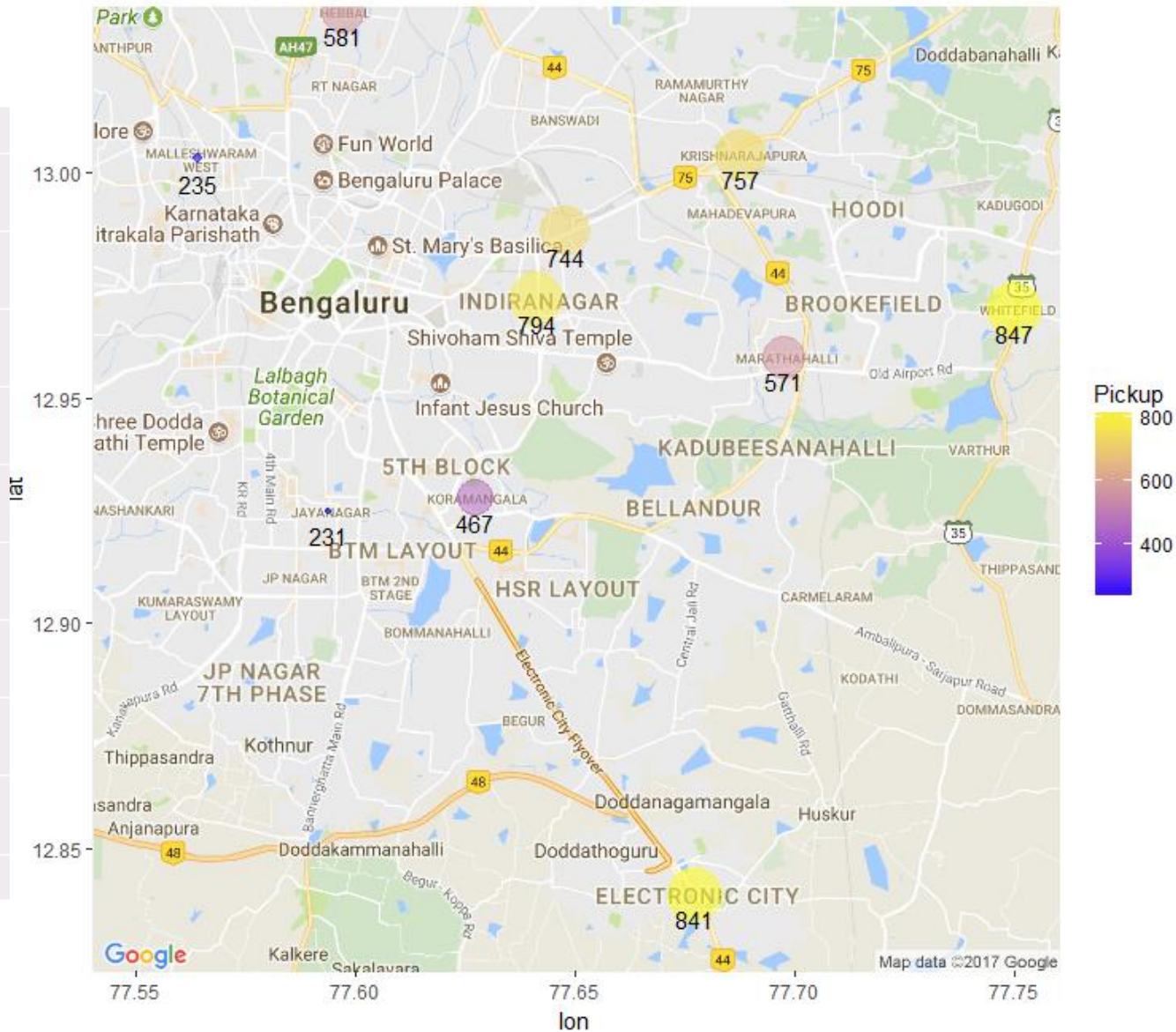
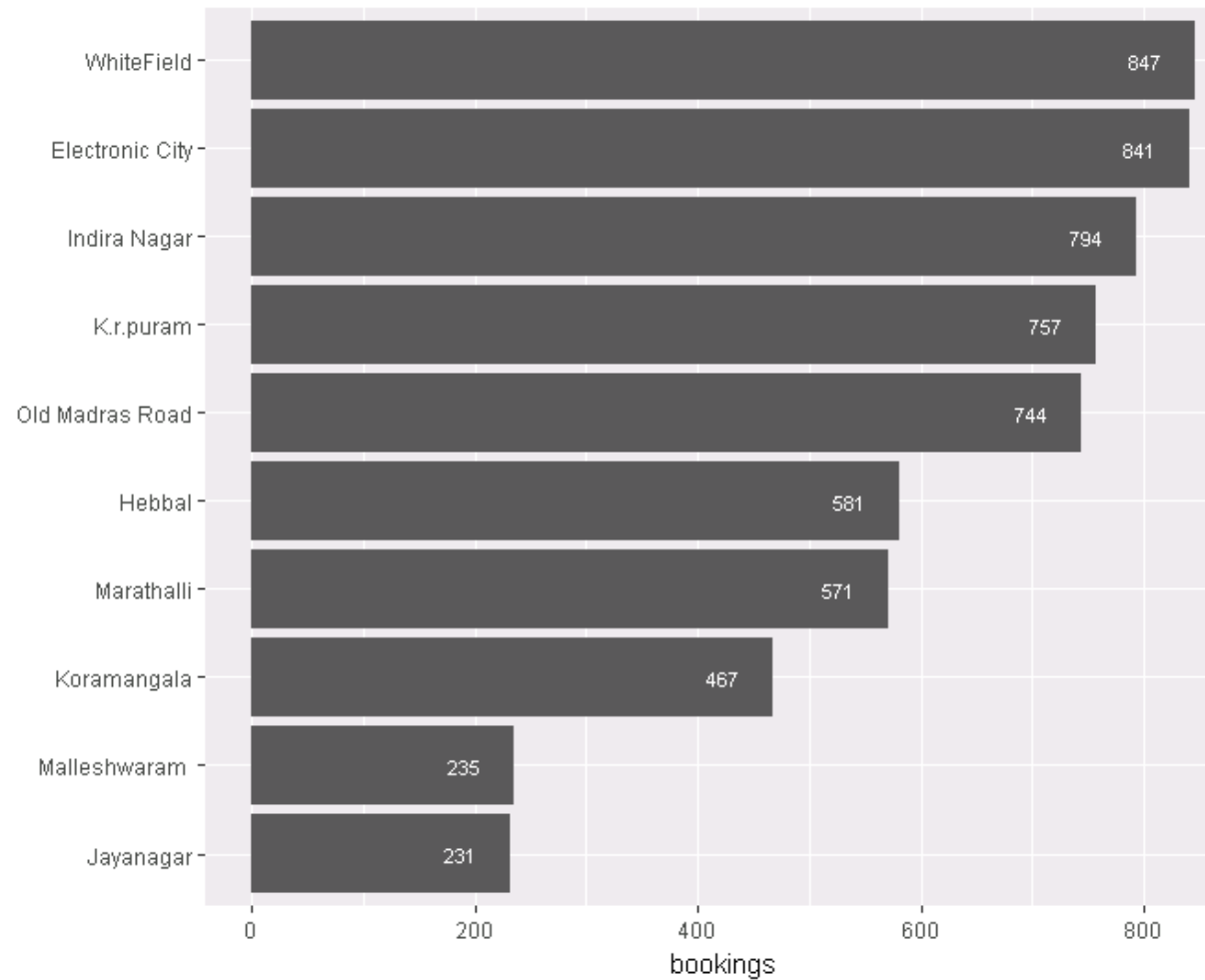


## Business Insights

- No general pattern can be seen but day wise patterns can be noted about the customer behavior
- On Mondays, coupon usage is high in both mode of payment.
- On Friday, customers who have important appointment pay by cash and don't care about the coupons, whereas customers who tend to cancel opt for online payment and use coupon. A demographic profiling of these customers could provide better insights.
- On Saturday, bookings are comparatively more planned by customers who make use of wallet money and coupon .

# Top most pickup location

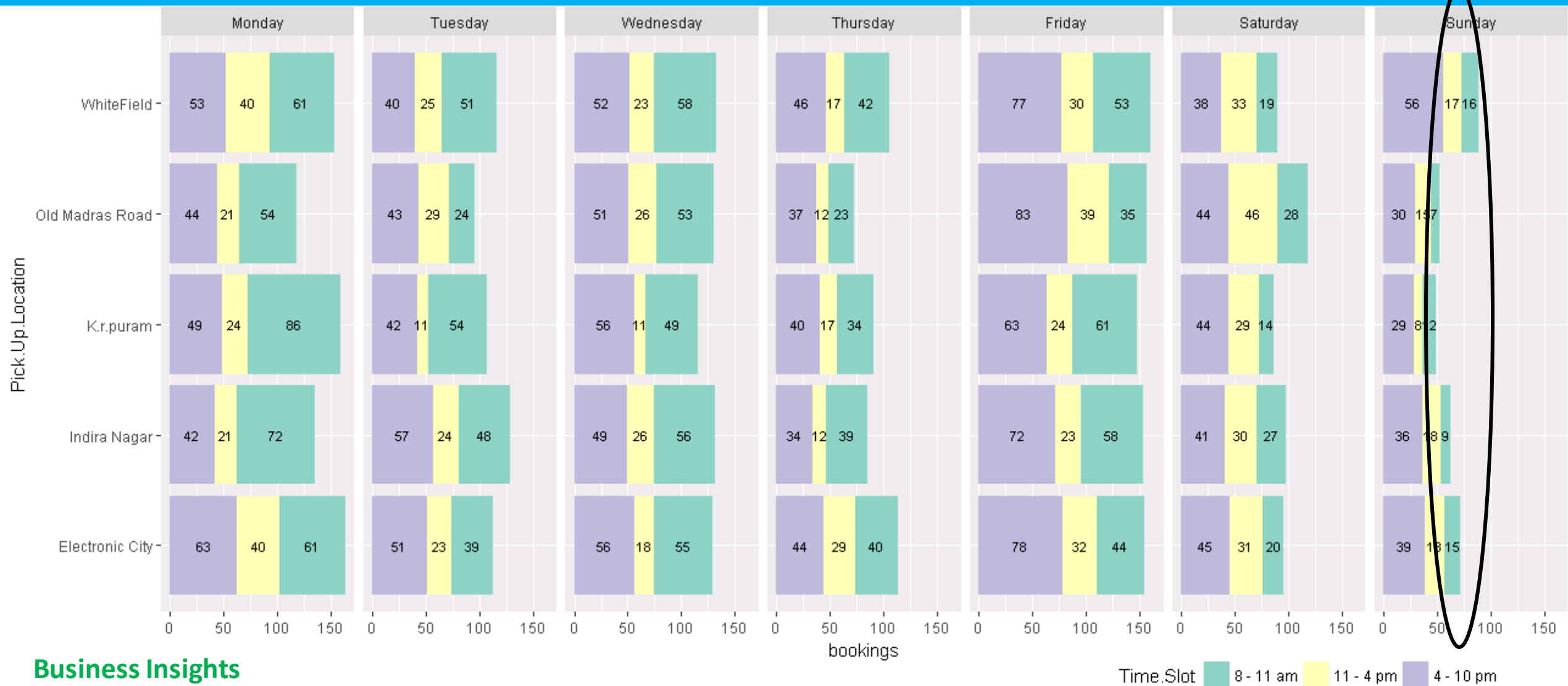
Top most pickup location



## Business Insights

Top 5 pickup locations based on bookings are as follows – 1. Whitefield -> 2. Electronic City -> 3. Indira Nagar -> 4. K R Puram -> 5. Old Madras Road

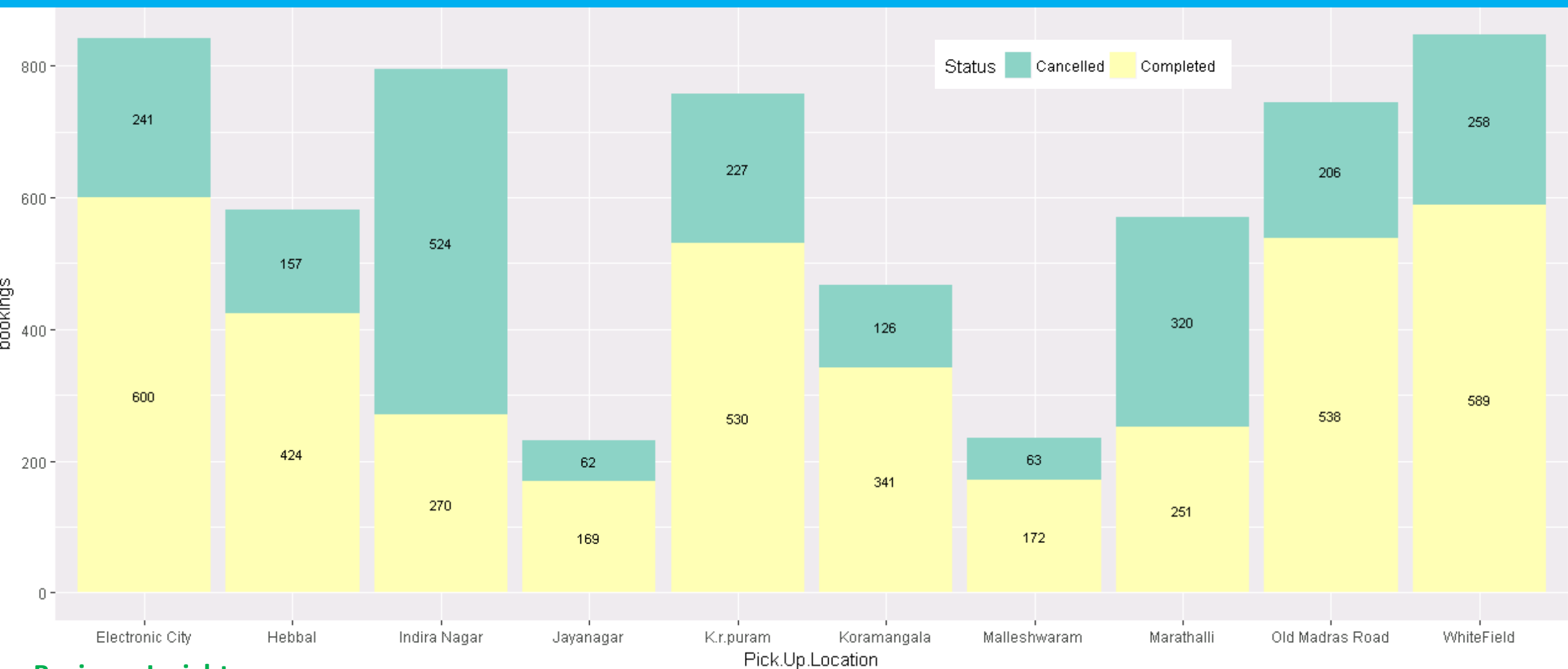
# Top 5 pickup location – deeper look



## Business Insights

- All the pickup locations, booking is high during morning and evening slots on all days.
- Bookings are low during the morning slot on Sat and Sun in all the location.
- Monday morning and Friday evening are peak day slot
- Only in Old Madras Road, there are bookings for the mid day slot on Saturday

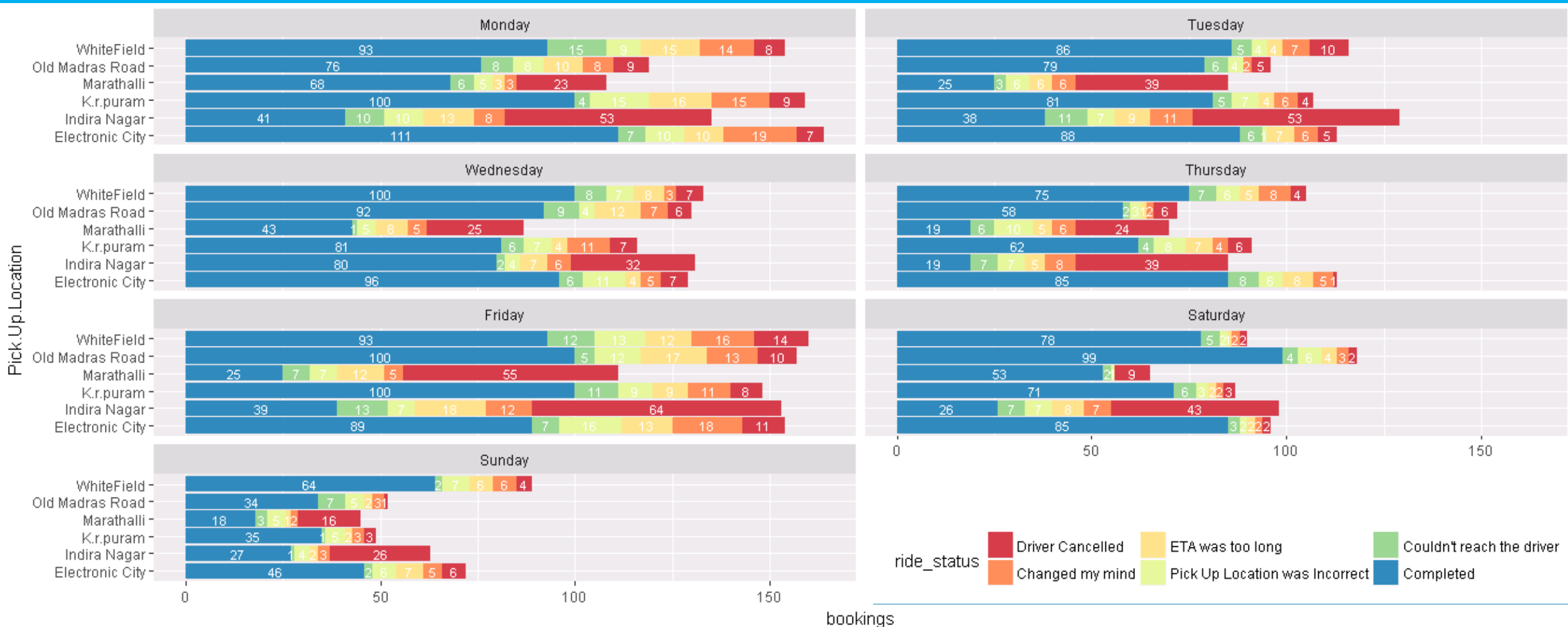
## Booking status based on pickup location



### Business Insights

- Indira Nagar has a problem, demand is high but only 34% of is serviced, which is a serious concern.
- Similarly in Marathalli, on 43% of the demand is being serviced.
- Electronic City, where the demand is high, 70% is being serviced

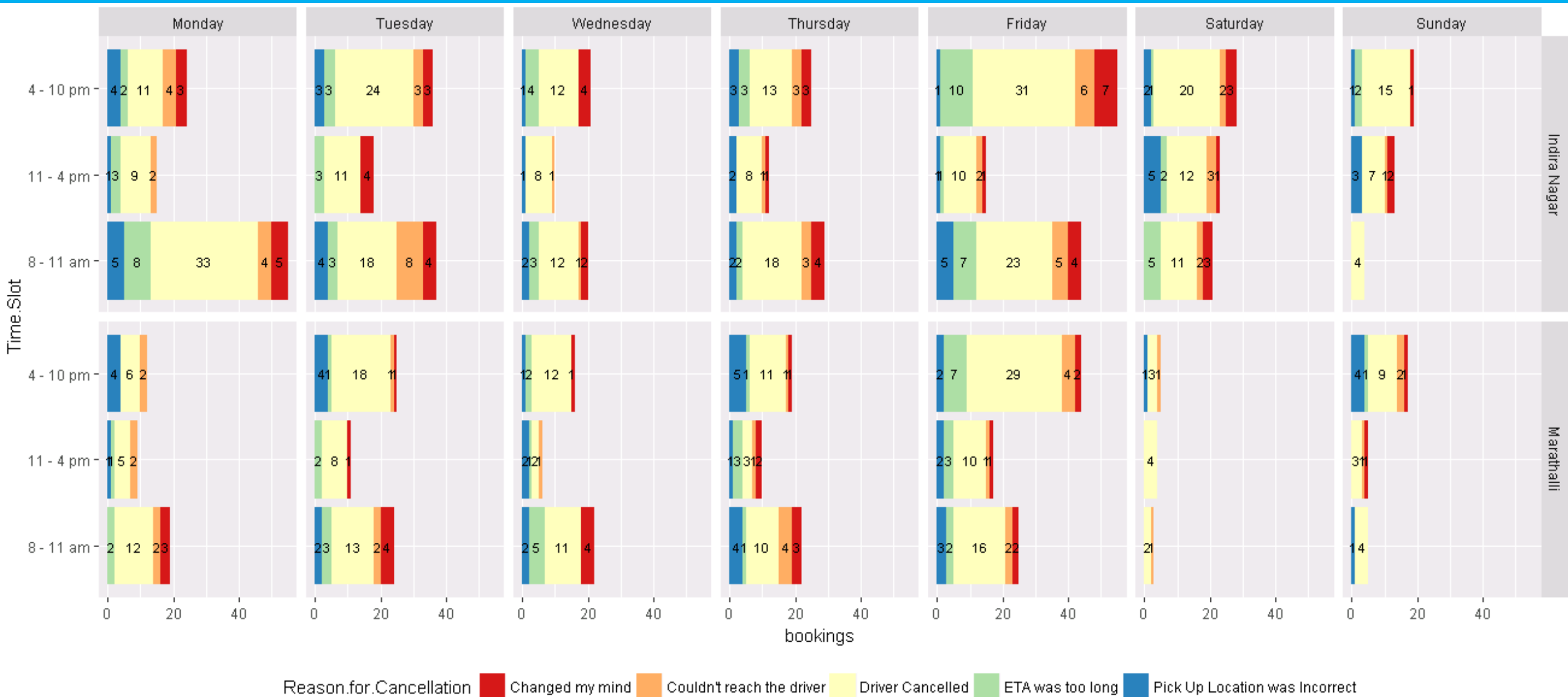
# Demand supply analysis – based on pickup location



## Business Insights

- In both Indira Nagar and Marathalli, the main reason for not being able service bookings is driver denying service. This must be explored to check the performance and ratings of the driver in these region and accordingly take corrective steps.
- Only on Saturday, bookings are being serviced properly in Marathalli. This gives an indication that on other days ,the cab drivers are engaged in servicing other private customers

# Digging deeper to demand supply analysis.



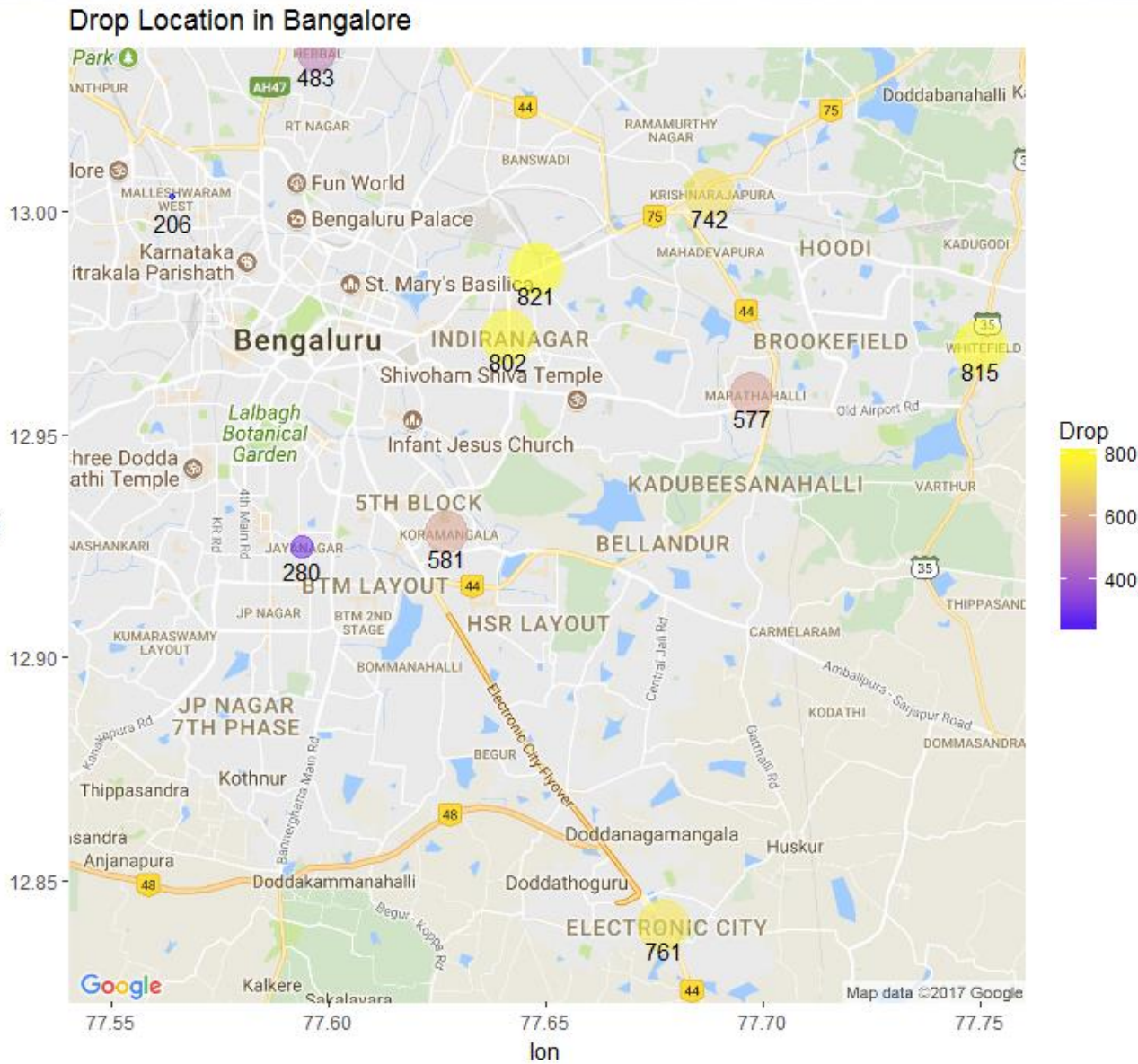
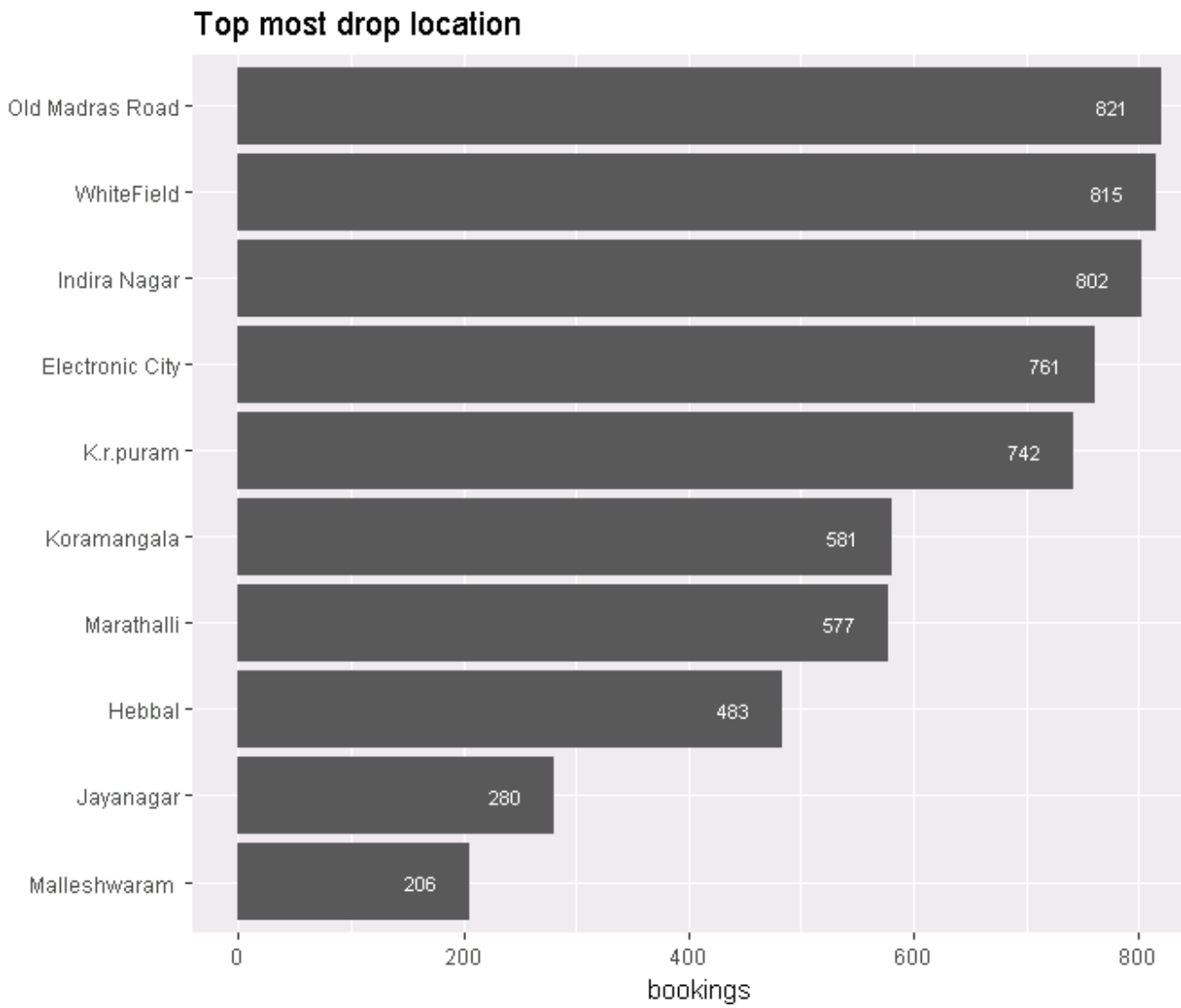
## Business Insights

A closer look at the booking distribution in Indira Nagar and Marathali , we see even in non peak hours also, drivers cancel the booking. This could be due to two reasons

- Less cabs available in these areas.
- Cab drivers are servicing other customers and denying Taximan bookings.



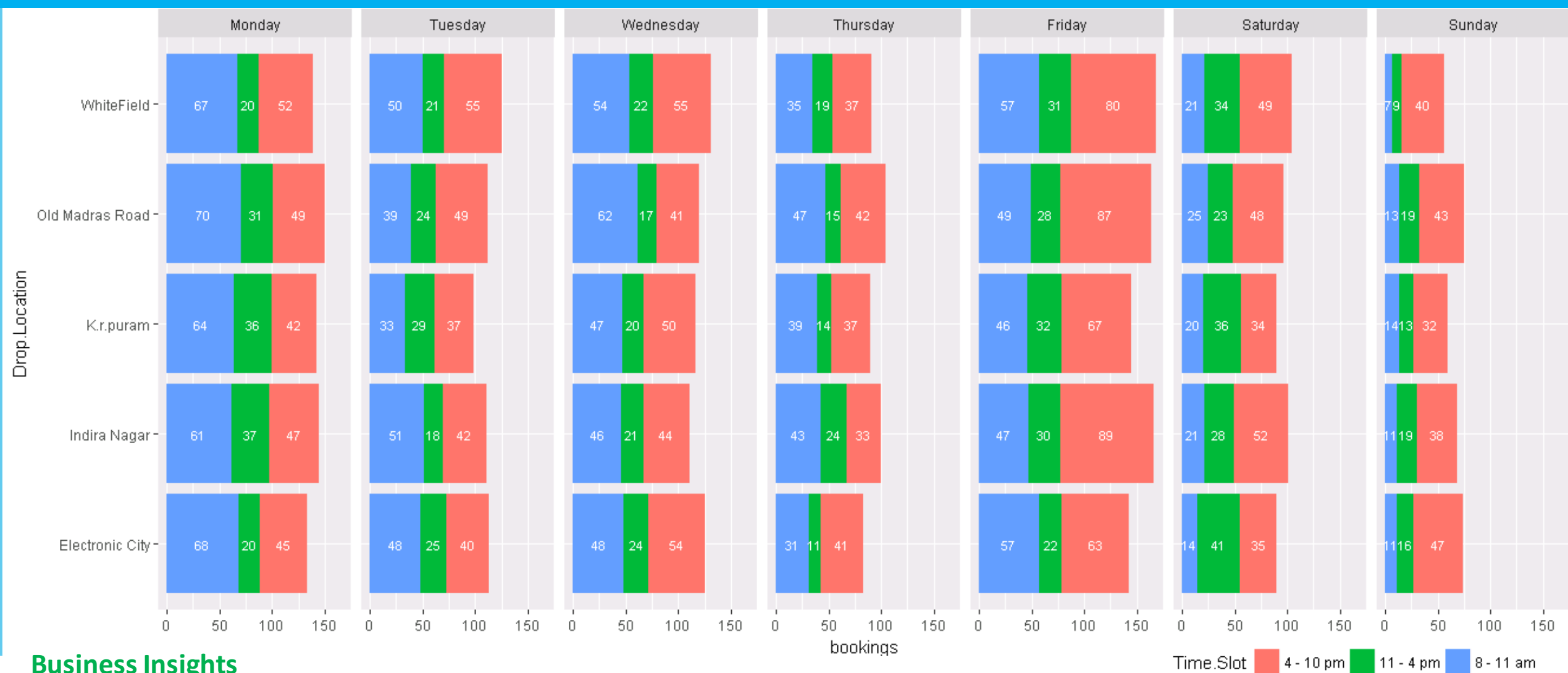
# Top most drop location



## Business Insights

Top 5 drop locations based on bookings are as follows – 1. Whitefield -> 2. Old Madras Road > 3. Indira Nagar -> 4. Electronic City- -> 5. K R Puram

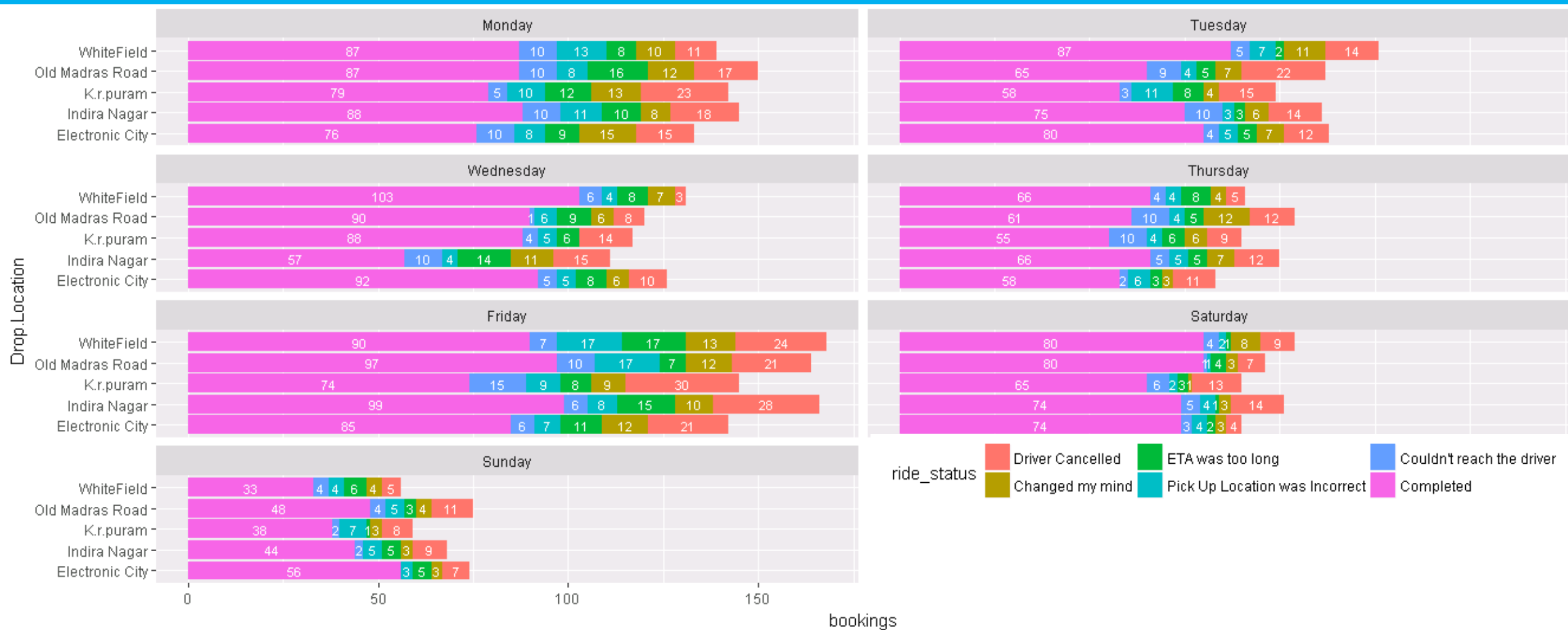
# Top 5 drop location – deeper look



## Business Insights

- Monday morning and Friday evening seem to be busy days in these locations with a greater number of drops happening.
- On weekdays the drop in these locations (morning and evening) are stable.
- Sat and Sun mornings relatively lower number of drop take place here.

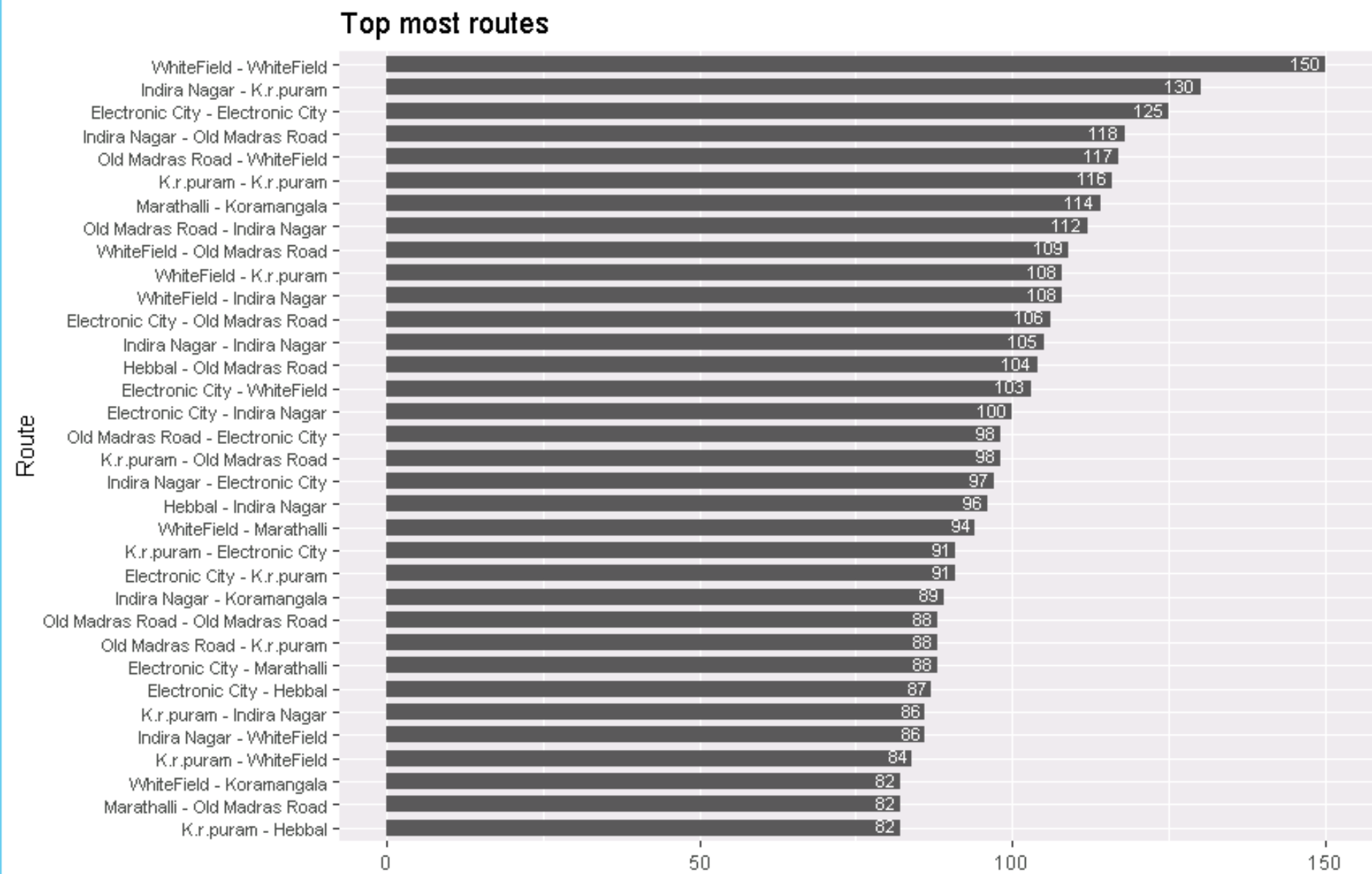
# Demand supply analysis – based on drop location



## Business Insights

- No clear pattern emerges from this visualization but it is interesting to note that at least 60-70% bookings are completed with drop locations in Indira Nagar.
- It would help operational efficiency if the demand in Indira Nagar can be matched with the incoming cabs in this location.

# Overview of the top most routes



## Business Insights

- Short travels around the pickup location seem to be top travel route.
- A deeper analysis of the route along with time slot can help to optimize the demand supply gap.

# Observed Issues and recommendations

## Supply and demand mismatch

- About 40% of the bookings on peak days are not being serviced.
- Top most reason for not being able to service the bookings
  - Diver Cancellation
  - ETA too long
  - Pick location incorrect
- Diver cancellation is highest on Monday mornings and Friday evening.
- Indira Nagar and Marathalli – High demand but low bookings serviced, only 30% bookings are serviced
- Diver cancellation (Diver denying service) major issue in these locations.

## Recommendations

- **Diver cancellation (diver denying service) could be due two reasons**
  - Shortage of cabs in location
  - Diver is servicing other customers and denying bookings from Taximan.
- **Reason for this must be further explored by collecting and analyzing the following data**
  - Ratings of the driver.
  - On duty hours logged by the driver
  - Incentives and average earning by driver from Taximan compared to other sources.

Further , providing additional incentives for driver who have lowest cancellations.

- **ETA too long and pick location incorrect**

Both the issues can be reduced by improving the technology and add features that suggest driver alternate routes with lower ETA and accurate location spotting.

Matching drop location and timings with bookings in the vicinity of the drop locations .

Also, we must explore demographic of users who cancel their bookings to understand customer behavior with regard to cancellations and put in process to reduce it.

# Observed Issues and recommendations

## Moving towards cash free transactions

- Cash payment is more popular
- Coupon usage high at the start and end the week

Encourage cashless transactions help in efficiency and increase customer's easy of doing transaction. It also increases the probability repeat business for the customer.

## Cashless transactions can be encouraged by

- Incorporating multiple wallets for payment options.
- Cashback offers on use of wallets

Also deeper discounts can be provided on non-peak hours/days to boost resource utilization and balance the demand.

## Improving operational efficiency

- Track and explore bookings based on time and drop locations to match demand at the vicinity of drop locations
- Explore distribution of booking based on location and timeslot to identify peak demand points and direct cab to those location. For example, bookings are high on Monday mornings at Electronic City. To enable supply, cabs from non demand location can be direct to these areas
- Cab sharing can be encouraged during peak hours to enable greater conversion of bookings.

## Annexure – R code used for the maps

```
taximan_pick <- read.csv(file = "pickup_final.csv", header = TRUE, stringsAsFactors = FALSE)
taximan_drop <- read.csv(file = "drop_final.csv", header = TRUE, stringsAsFactors = FALSE)

library(ggplot2)
library(ggmap)

min(taximan$Latitude)

lat <- c(12.82, 13.04)
lon <- c(77.54, 77.76)

bangalore_map <- get_map(location = c(lon=mean(lon), lat=mean(lat)), zoom = 12, maptype = "roadmap", source = "google")

ggmap(bangalore_map) + geom_point(data = taximan_pick, aes(x = Longitude, y = Latitude, alpha = 0.4, size = Pickup, color = Pickup)) +
  guides(fill=FALSE, alpha=FALSE, size=FALSE) + scale_size_continuous(range = c(1, 12)) + scale_color_continuous(high = "Yellow", low = "Blue") +
  geom_text(data = taximan_pick, aes(x = Longitude, y = Latitude, label=Pickup), vjust = 1.8) + labs(title="Pickup Location in Bangalore")

ggmap(bangalore_map) + geom_point(data = taximan_drop, aes(x = Longitude, y = Latitude, alpha = 0.4, size = Drop, color = Drop)) +
  guides(fill=FALSE, alpha=FALSE, size=FALSE) + scale_size_continuous(range = c(1, 12)) + scale_color_continuous(high = "Yellow", low = "Blue") +
  geom_text(data = taximan_drop, aes(x = Longitude, y = Latitude, label=Drop), vjust = 1.8) + labs(title="Drop Location in Bangalore")
```