Case Study: How Does a Bike-Share Navigate Speedy Success?

Scenario:

The director of marketing believes the company's future success depends on maximizing the number of annual memberships. Therefore, your team wants to understand how casual riders and annual members use Cyclistic bikes differently.

About the company:

In 2016, Cyclistic launched a successful bike-share offering. Since then, the program has grown to a fleet of 5,824 bicycles that are geotracked and locked into a network of 692 stations across Chicago. The bikes can be unlocked from one station and returned to any other station in the system anytime.

Until now, Cyclistic's marketing strategy relied on building general awareness and appealing to broad consumer segments. One approach that helped make these things possible was the flexibility of its pricing plans: single-ride passes, full-day passes, and annual memberships. Customers who purchase single-ride or full-day passes are referred to as casual riders. Customers who purchase annual memberships are Cyclistic members.

Cyclistic's finance analysts have concluded that annual members are much more profitable than casual riders. Although the pricing flexibility helps Cyclistic attract more customers, Moreno believes that maximizing the number of annual members will be key to future growth. Rather than creating a marketing campaign that targets all-new customers, Moreno believes there is a very good chance to convert casual riders into members. She notes that casual riders are already aware of the Cyclistic program and have chosen Cyclistic for their mobility needs.

Moreno has set a clear goal: Design marketing strategies aimed at converting casual riders into annual members. In order to do that, however, the marketing analyst team needs to better understand how annual members and casual riders differ, why casual riders would buy a membership, and how digital media could affect their marketing tactics. Moreno and her team are interested in analyzing the Cyclistic historical bike trip data to identify trends.

Ask

Three questions will guide the future marketing program:

1. How do annual members and casual riders use Cyclistic bikes differently?
2. Why would casual riders buy Cyclistic annual memberships?
3. How can Cyclistic use digital media to influence casual riders to become members?

Moreno has assigned you the first question to answer: How do annual members and casual riders use Cyclistic bikes differently?

You will produce a report with the following deliverables:

1. A clear statement of the business task
2. A description of all data sources used
3. Documentation of any cleaning or manipulation of data
4. A summary of your analysis
5. Supporting visualizations and key findings
6. Your top three recommendations based on your analysis

Prepare

You will use Cyclistic's historical trip data to analyze and identify trends. Download the previous 12 months of Cyclistic trip data here. (Note: The datasets have a different name because Cyclistic is a fictional company. For the purposes of this case study, the datasets are appropriate and will enable you to answer the business questions. The data has been made available by Motivate International Inc. under this license.) This is public data that you can use to explore how different customer types are using Cyclistic bikes. But note that data-privacy issues prohibit you from using riders' personally identifiable information. This means that you won't be able to connect pass purchases to credit card numbers to determine if casual riders live in the Cyclistic service area or if they have purchased multiple single passes.

Analyze

Analyze

Now that your data is stored appropriately and has been prepared for analysis, start putting it to work.

STEP 1: installing packages:

```
install.packages("tidyverse")
install.packages("ggplot2")
install.packages("lubridate")
```

librarys that is going to be needed:

```
library(tidyverse)
library(ggplot2)
library(lubridate)
```

STEP 2: collecting data

importing data

```
bici_Q1 <- read.csv("Divvy_Trips_2019_Q1.csv")
bici_Q2 <- read.csv("Divvy_Trips_2019_Q2.csv")
bici_Q3 <- read.csv("Divvy_Trips_2019_Q3.csv")
bici_Q4 <- read.csv("Divvy_Trips_2019_Q4.csv")
```

visualizing data

```
print("column names Q1")
colnames(bici_Q1)
print("column names Q2")
colnames(bici_Q2)
print("column names Q3")
colnames(bici_Q3)
print("column names Q4")
colnames(bici_Q4)
```

```
[1] "column names Q1"
'trip_id' · 'start_time' · 'end_time' · 'bikeid' · 'tripduration' · 'from_station_id' · 'from_station_name' ·
'to_station_id' · 'to_station_name' · 'usertype' · 'gender' · 'birthyear'
[1] "column names Q2"
'X01...Rental.Details.Rental.ID' · 'X01...Rental.Details.Local.Start.Time' ·
'X01...Rental.Details.Local.End.Time' · 'X01...Rental.Details.Bike.ID' ·
'X01...Rental.Details.Duration.In.Seconds.Uncapped' · 'X03...Rental.Start.Station.ID' ·
'X03...Rental.Start.Station.Name' · 'X02...Rental.End.Station.ID' · 'X02...Rental.End.Station.Name' ·
'User.Type' · 'Member.Gender' · 'X05...Member.Details.Member.Birthday.Year'
[1] "column names Q3"
'trip_id' · 'start_time' · 'end_time' · 'bikeid' · 'tripduration' · 'from_station_id' · 'from_station_name' ·
```

As we can see, Q2 has different column names, we are going to fix that:

STEP 3: transform data

```
(bici_Q1 <- rename(bici_Q1,
                     ride_id = trip_id,
                     bike_id = bikeid,
                     trip_duration = tripduration,
                     user_type = usertype))
(bici_Q2 <- rename(bici_Q2,
                    ride_id = X01...Rental.Details.Rental.ID,
                    start_time = X01...Rental.Details.Local.Start.Time,
                    end_time = X01...Rental.Details.Local.End.Time,
                    bike_id = X01...Rental.Details.Bike.ID,
                    trip_duration = X01...Rental.Details.Duration.In.Seconds.Uncapped,
                    from_station_id = X03...Rental.Start.Station.ID,
                    from_station_name = X03...Rental.Start.Station.Name,
                     to_station_id = X02...Rental.End.Station.ID,
                     to_station_name = X02...Rental.End.Station.Name,
                     user_type = User.Type,
                     gender = Member.Gender,
                     birthyear = X05...Member.Details.Member.Birthday.Year))
(bici_Q3 <- rename(bici_Q3,
                      ride_id = trip_id,
                      bike_id = bikeid,
                      trip_duration = tripduration,
                      user_type = usertype))
(bici_Q4 <- rename(bici_Q4,
                      ride_id = trip_id,
                      bike_id = bikeid,
                      trip_duration = tripduration,
                      user_type = usertype))
```

visualizing data to see if now they match

```
print("column names Q1")
colnames(bici_Q1)
print("column names Q2")
colnames(bici_Q2)
print("column names Q3")
colnames(bici_Q3)
print("column names Q4")
colnames(bici_Q4)
```

```
[1] "column names Q1"
'ride_id' · 'start_time' · 'end_time' · 'bike_id' · 'trip_duration' · 'from_station_id' · 'from_station_name' · 'to_station_id' · 'to_station_name' · 'user_type' · 'gender' · 'birthyear'
[1] "column names Q2"
'ride_id' · 'start_time' · 'end_time' · 'bike_id' · 'trip_duration' · 'from_station_id' · 'from_station_name' · 'to_station_id' · 'to_station_name' · 'user_type' · 'gender' · 'birthyear'
[1] "column names Q3"
'ride_id' · 'start_time' · 'end_time' · 'bike_id' · 'trip_duration' · 'from_station_id' · 'from_station_name' · 'to_station_id' · 'to_station_name' · 'user_type' · 'gender' · 'birthyear'
[1] "column names Q4"
'ride_id' · 'start_time' · 'end_time' · 'bike_id' · 'trip_duration' · 'from_station_id' · 'from_station_name' · 'to_station_id' · 'to_station_name' · 'user_type' · 'gender' · 'birthyear'
```

stack individual quarters into one big data frame

```
bike_trips <- bind_rows(bici_Q1,bici_Q2,bici_Q3,bici_Q4)
```

STEP 4: visualize new data frame

```
colnames(bike_trips) #show the column names
nrow(bike_trips) #show the number of rows
dim(bike_trips) #show the number of rows and columns
summary(bike_trips) #show statistical summary of data (only numerics)
str(bike_trips)
```

'ride_id' · 'start_time' · 'end_time' · 'bike_id' · 'trip_duration' · 'from_station_id' · 'from_station_name' · 'to_station_id' · 'to_station_name' · 'user_type' · 'gender' · 'birthyear'

1423624

1423624 · 12

```
    ride_id           start_time          end_time            bike_id    
 Min.   :21742443   Length:1423624     Length:1423624     Min.   :   1  
 1st Qu.:22167772   Class :character   Class :character   1st Qu.:1739  
 Median :22586728   Mode  :character   Mode  :character   Median :3469  
 Mean   :22799394                                         Mean   :3401  
 3rd Qu.:23004866                                         3rd Qu.:5091  
 Max.   :25343058                                         Max.   :6471  
                                                          NA's   :1     
 trip_duration      from_station_id from_station_name  to_station_id  
 Length:1423624     Min.   :  1.0   Length:1423624     Min.   :  1.0  
 Class :character   1st Qu.: 77.0   Class :character   1st Qu.: 77.0  
```

Adding columns day, month, year

```
                    Max.   :673.0                      Max.   :673.0
```

```
bike_trips$date <- as.Date(bike_trips$start_time)
bike_trips$month <- format(as.Date(bike_trips$date), "%m")
bike_trips$day <- format(as.Date(bike_trips$date), "%d")
bike_trips$year <- format(as.Date(bike_trips$date), "%Y")
bike_trips$day_of_week <- format(as.Date(bike_trips$date), "%A")
```

```
                                                          3rd Qu.:1991
```

visulize the new columns

```
'data.frame':   1423624 obs. of  12 variables:
```

```
colnames(bike_trips)
```

'ride_id' · 'start_time' · 'end_time' · 'bike_id' · 'trip_duration' · 'from_station_id' · 'from_station_name' · 'to_station_id' · 'to_station_name' · 'user_type' · 'gender' · 'birthyear' · 'date' · 'month' · 'day' · 'year' · 'day_of_week'

```
 $ from_station_id  : int  199 44 15 123 173 98 98 211 150 268 ...
```

Getting the time of each ride

```
 $ to_station_name  : chr  "Milwaukee Ave & Grand Ave" "Dearborn St & Van Buren St (*)" "Western Ave & Fillmore St (*)" "Clark St & Elm
```

```
bike_trips$start_time <- ymd_hms(bike_trips$start_time)
bike_trips$end_time <- ymd_hms(bike_trips$end_time)
```

```
Warning message:
“ 1 failed to parse.”
```

```
bike_trips$ride_length <- difftime(bike_trips$end_time, bike_trips$start_time)
```

converting ride_length to numeric

```
bike_trips$ride_length <- as.numeric(as.character(bike_trips$ride_length))
str(bike_trips)
```

```
'data.frame':   1423624 obs. of  18 variables:
 $ ride_id          : int  21742443 21742444 21742445 21742446 21742447 21742448 21742449 21742450 21742451 21742452 ...
 $ start_time       : POSIXct, format: "2019-01-01 00:04:37" "2019-01-01 00:08:13" ...
 $ end_time         : POSIXct, format: "2019-01-01 00:11:07" "2019-01-01 00:15:34" ...
 $ bike_id          : int  2167 4386 1524 252 1170 2437 2708 2796 6205 3939 ...
 $ trip_duration    : chr  "390.0" "441.0" "829.0" "1,783.0" ...
 $ from_station_id  : int  199 44 15 123 173 98 98 211 150 268 ...
 $ from_station_name: chr  "Wabash Ave & Grand Ave" "State St & Randolph St" "Racine Ave & 18th St" "California Ave & Milwaukee Ave" ...
 $ to_station_id    : int  84 624 644 176 35 49 49 142 148 141 ...
 $ to_station_name  : chr  "Milwaukee Ave & Grand Ave" "Dearborn St & Van Buren St (*)" "Western Ave & Fillmore St (*)" "Clark St & Elm
 $ user_type        : chr  "Subscriber" "Subscriber" "Subscriber" "Subscriber" ...
 $ gender           : chr  "Male" "Female" "Female" "Male" ...
 $ birthyear        : int  1989 1990 1994 1993 1994 1983 1984 1990 1995 1996 ...
 $ date             : Date, format: "2019-01-01" "2019-01-01" ...
 $ month            : chr  "01" "01" "01" "01" ...
 $ day              : chr  "01" "01" "01" "01" ...
 $ year             : chr  "2019" "2019" "2019" "2019" ...
 $ day_of_week      : chr  "Tuesday" "Tuesday" "Tuesday" "Tuesday" ...
 $ ride_length      : num  6.5 7.35 13.82 29.72 6.07 ...
```

removing "Bad Data", the negatives and when the bike was only taken out for quality

```
bike_trips <- bike_trips[!(bike_trips$from_station_name == "HQ QR" |
                              bike_trips$ride_length < 0),]
```

transforming day of week from spanish to english

```
bike_trips <- bike_trips %>%
  mutate(day_of_week = recode(day_of_week,
                              "domingo" = "Sunday",
                              "lunes" = "Monday",
                              "martes" = "Tuesday",
                              "miércoles" = "Wednesday",
                              "jueves" = "Thursday",
                              "viernes" = "Friday",
                              "sábado" = "Saturday"))
```

STEP 5: Analysis

analysis on ride_length

```
summary(bike_trips$ride_length)
```

```
     Min.   1st Qu.    Median      Mean   3rd Qu.      Max.      NA's 
     1.02      6.50     11.10     21.22     20.07 177200.37         1 
```

comparison Subscriber vs. Customer by ride_length

```
bike_trips <- bike_trips %>%
  mutate(user_type = recode(user_type,
                            "Custumer" = "Customer",
                            "Subscri" = "Subscriber"))
```

```
print("====> AVERAGE <====")
aggregate(bike_trips$ride_length ~ bike_trips$user_type, FUN = mean)
print("====> MEDIAN <====")
aggregate(bike_trips$ride_length ~ bike_trips$user_type, FUN = median)
print("====> MAX <====")
aggregate(bike_trips$ride_length ~ bike_trips$user_type, FUN = max)
print("====> MIN <====")
aggregate(bike_trips$ride_length ~ bike_trips$user_type, FUN = min)
```

```
[1] "====> AVERAGE <===="
                A data.frame: 2 × 2
```

average ride_length by each day for Subscriber vs. Customer

```
aggregate(ride_length ~ user_type + day_of_week, data = bike_trips,
          FUN = mean)
```

```
              A data.frame: 14 × 3
 user_type  day_of_week  ride_length
     <chr>        <chr>        <dbl>
  Customer       Friday     53.95632
Subscriber       Friday     13.63973
  Customer       Monday     44.01760
Subscriber       Monday     14.16801
  Customer     Saturday     53.21835
Subscriber     Saturday     15.53885
  Customer       Sunday     49.78904
Subscriber       Sunday     15.99974
  Customer     Thursday     56.37257
Subscriber     Thursday     13.38286
  Customer      Tuesday     56.08842
Subscriber      Tuesday     13.41938
  Customer    Wednesday     59.01896
Subscriber    Wednesday     13.22730
```

ordering the days of the week

```
bike_trips$day_of_week <- ordered(bike_trips$day_of_week,
                                    level=c("Sunday","Monday", "Tuesday",
                                            "Wednesday", "Thursday", "Friday",
                                            "Saturday"))
```

lets drop out na and empty rows

```
bike_trips <- subset(bike_trips, user_type != "")
```

now let's run again the code to see if it worked

```
aggregate(ride_length ~ user_type + day_of_week, data = bike_trips,
          FUN = mean)
```

A data.frame: 14 × 3

user_type	day_of_week	ride_length
<chr>	<ord>	<dbl>
Customer	Sunday	49.78904
Subscriber	Sunday	15.99974
Customer	Monday	44.01760

let's make a table about the numbers of ride and average duration between customer vs. subscriber

Customer	Tuesday	56.08842

```
bike_trips %>%
  mutate(weekday = wday(start_time, label=TRUE)) %>%
  group_by(user_type, weekday) %>%
  drop_na() %>%
  summarise(rides_number = n(),
            avg_duration = mean(ride_length)) %>%
  arrange(user_type, weekday)
```

```
`summarise()` has grouped output by 'user_type'. You can override using the
`.groups` argument.
```

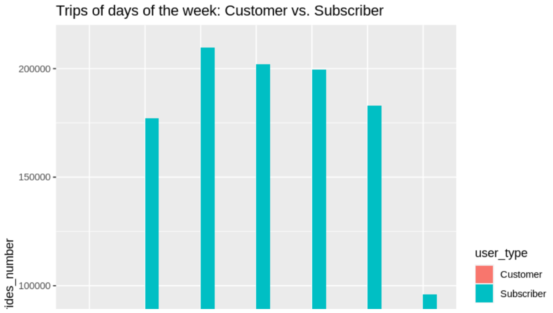
A grouped_df: 14 × 4

user_type	weekday	rides_number	avg_duration
<chr>	<ord>	<int>	<dbl>
Customer	Sun	15285	41.05570
Customer	Mon	11278	43.14198
Customer	Tue	9953	49.31286
Customer	Wed	9832	39.51078
Customer	Thu	11732	40.32451
Customer	Fri	12409	58.49054
Customer	Sat	16018	41.76479
Subscriber	Sun	88905	15.97866
Subscriber	Mon	176719	14.15854
Subscriber	Tue	209104	13.40555
Subscriber	Wed	201405	13.21605
Subscriber	Thu	199116	13.35962
Subscriber	Fri	182513	13.62715
Subscriber	Sat	95634	15.49874

visualization to see better about the numbers of ride and average duration between customer vs. subscriber

```
bike_trips %>%
  mutate(weekday = wday(start_time, label=TRUE)) %>%
  group_by(user_type, weekday) %>%
  summarise(rides_number = n(),
            avg_duration = mean(ride_length)) %>%
  arrange(user_type, weekday) %>%
  drop_na() %>%
  ggplot(aes(x=weekday, y=rides_number, fill=user_type)) +
  labs(title = "Trips of days of the week: Customer vs. Subscriber") +
  geom_col(width = 0.5, position = position_dodge(width = 0.5)) +
  scale_y_continuous(labels = function(x) format(x, scientific = FALSE))
```

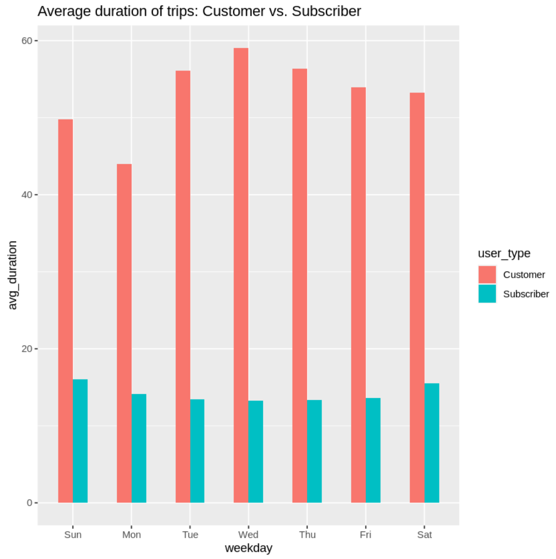
```
`summarise()` has grouped output by 'user_type'. You can override using the
`.groups` argument.
```



now lets make about trip_duration

```
bike_trips %>%
  mutate(weekday = wday(start_time, label = TRUE)) %>%
  group_by(user_type, weekday) %>%
  summarise(rides_number = n(),
            avg_duration = mean(ride_length)) %>%
  drop_na() %>%
  arrange(user_type, weekday) %>%
  ggplot(aes(x=weekday, y=avg_duration, fill=user_type)) +
  labs(title = "Average duration of trips: Customer vs. Subscriber") +
  geom_col(width = 0.5, position = position_dodge(width = 0.5)) +
  scale_y_continuous(labels = function(x) format(x, scientific = FALSE))
```

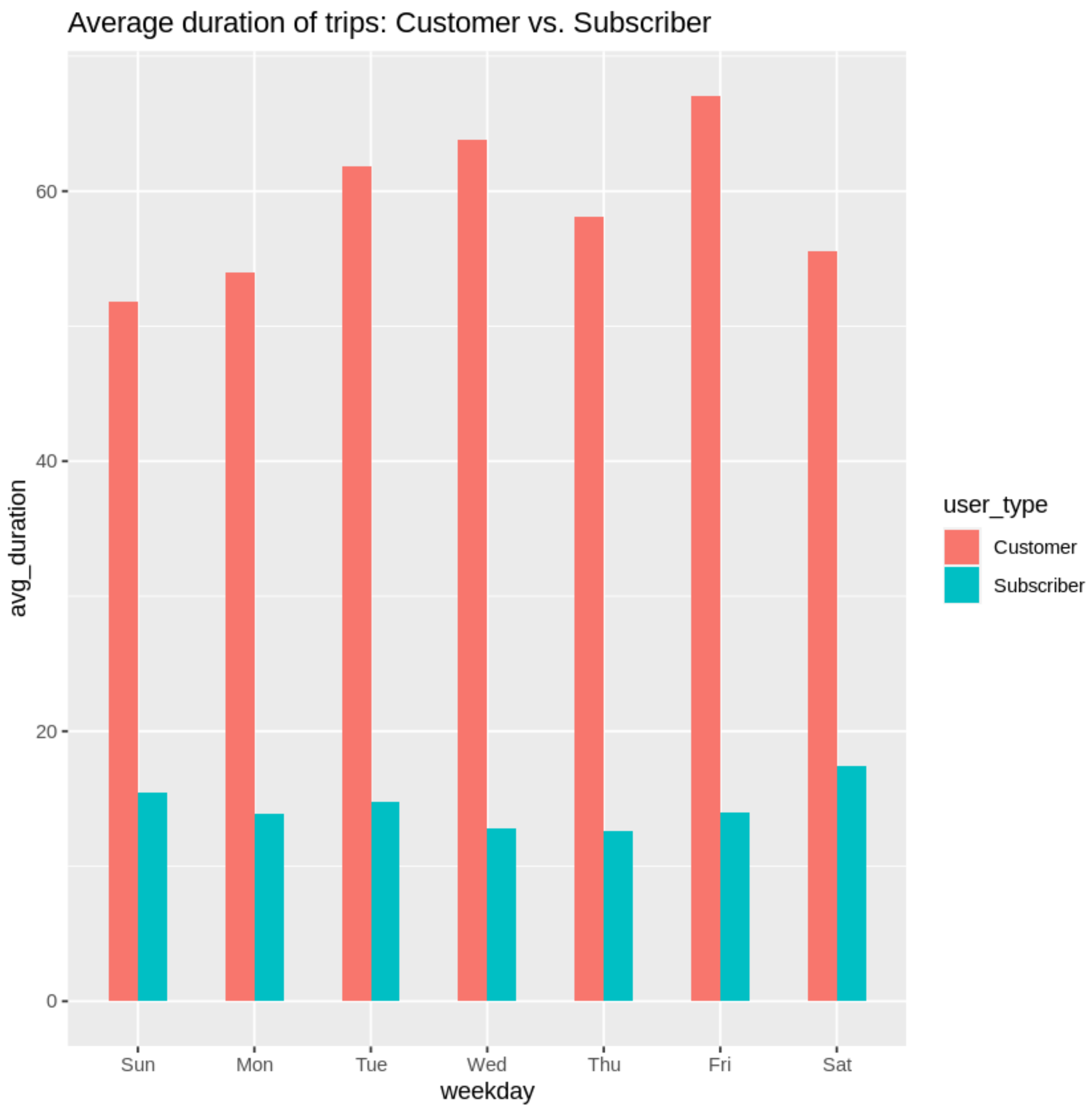
```
`summarise()` has grouped output by 'user_type'. You can override using the
`.groups` argument.
```

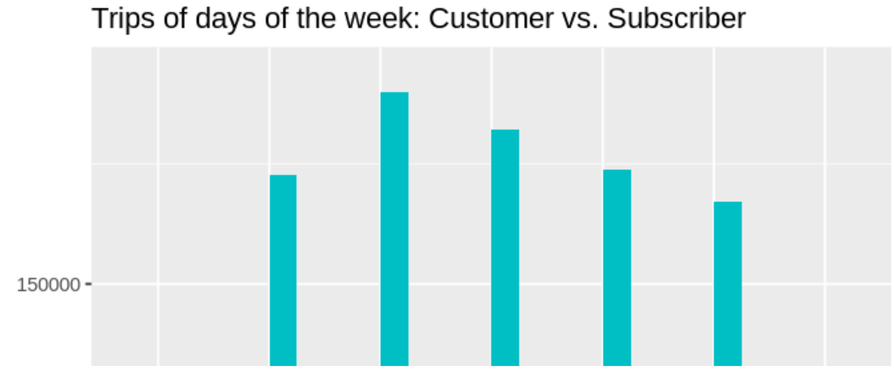


now lets see in months

Share

Now that you have performed your analysis and gained some insights into your data, create visualizations to share your findings. Moreno has reminded you that they should be sophisticated and polished in order to effectively communicate to the executive team


Average duration of trips: Customer vs. Subscriber
avg_duration
60
40
20
0
Sun
Mon
Tue
Wed
Thu
Fri
Sat
weekday
user_type
Customer
Subscriber



Insights

How do annual members and casual riders use Cyclistic bikes differently?

- **Graphic 1** -> as we can see, Customers (non subscribers) has an average time of 50min up to 60min of rides. That's almost the triple of time that Subscribers has.

  Customers -> 50 to 60 minutes ride

  Subscribers -> 10 to 15 minutes ride

- **Graphic 2 ->** in the second graphic we see that Subscriber has a lot more number of trips then Customers.

  Customers -> around 50.000 rides on weekends and during the week this numbers decay in half.

  Subscribers -> in other hand, the subscribers has less rides on weekends, but still is more then customers, they have around 80.000 rides on weekends and on week day around 175.000 rides

Recomendations

Even though Subscriber has a lot more rides then Customers, the Customers uses the bike more time then Subscriber during weekends.

- Make offer for Customers to become Subscribers during the weekends, since its when he have more Customers.
- Offer a discount to new Subscribers and offer them first year clear of membership fee