BIXI PROJECT DELIVERABLE 1

BUSINESS REPORT

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MAY 30TH, 2022

INTRODUCTION

As requested by BIXI MONTRÉAL (Bixi), this report has been made to identify a high-level understanding of how people use Bixi bikes, as well as the factors that influence the volume of usage, the identification of popular stations, and considerations for the overall business growth. Data received by Bixi includes information on stations and trips for eight (8) months (April to November) for the year of 2016 and 2017. Insights and findings in this report is solely based on the analysis of the data received. Provided in this report is the analysis of the data to understand the overall view of the volume of usage and influencing factors for the Bixi bikes, including the difference between the usage by members and non-members, with recommendations on how to increase membership in the users of Bixi bikes. All queries used to prepare this report have been provided in a separate file for reference.

ANALYSIS, INSIGHTS AND FINDINGS

VOLUME OF USAGE AND INFLUENCING FACTORS

In order to understand the overall view of the volume of usage and influencing factors for the Bixi bikes, the total number of trips and average number of trips for each year and month were determined based on the data received. The total number of trips for 2016 and 2017 was determined by filtering the data based on the specific year and grouping the total number of trips for the corresponding year.

The results have been identified below:

- The total number of trips for the year of 2016 was 3,917,401 trips.
- The total number of trips for the year of 2017 was 4,666,765 trips.

The total number of trips for 2016 and 2017 broken down by month was retrieved by grouping the data based on the months in the database for the specific year.

- The total number of trips for the year of 2016 broken down by month is provided in Table 1 below.

Month	Total Number of Trips for 2016
April	189,923
May	561,077
June	631,503
July	699,248
August	672,778
September	620,263
October	392,480
November	150,129

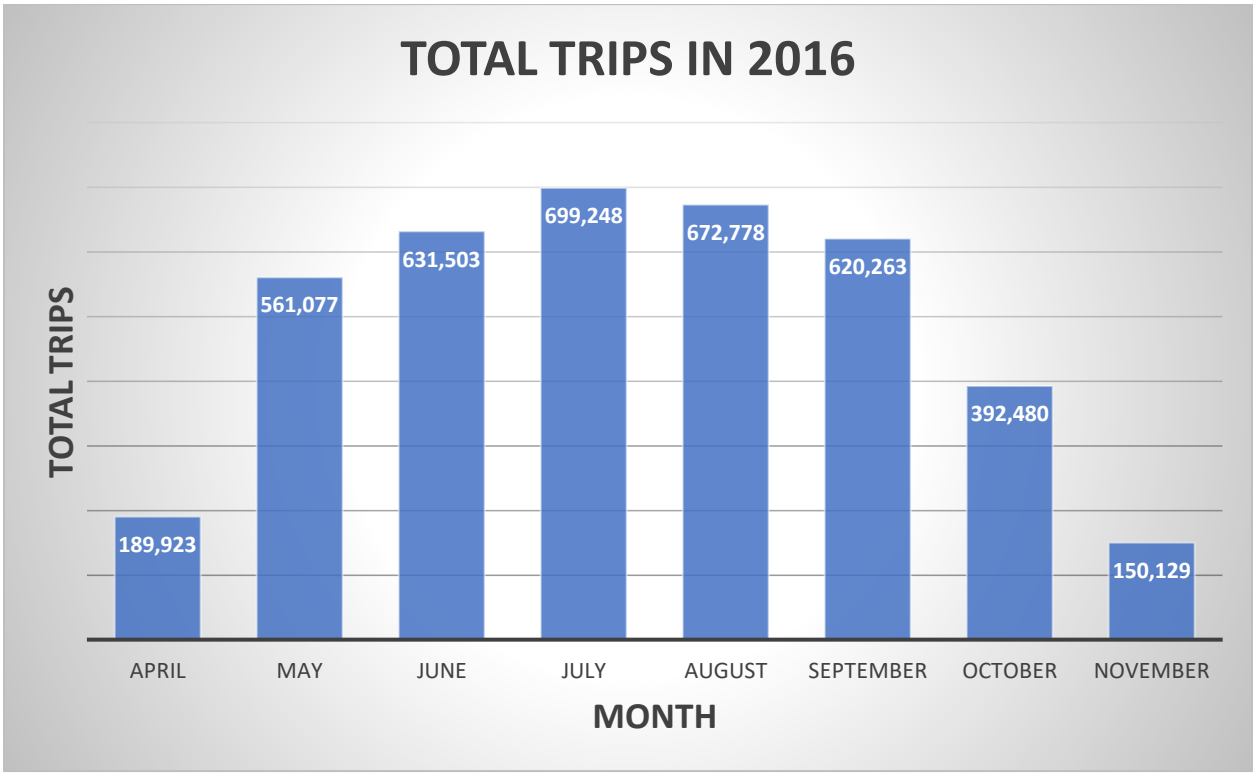
Table 1 - Total Number of Trips for 2016

- The total number of trips for the year of 2017 broken down by month is provided in Table 2 below.

Month	Total Number of Trips for 2017
April	195,662
May	587,447
June	741,835
July	860,732
August	839,938
September	731,851
October	559,506
November	149,794

Table 2 - Total Number of Trips for 2017

The figures below show the visualization of the data, identifying the total number of trips in 2016 and 2017, broken down by month. Based on the data, Bixi bikes are used the most in the summer months, with a drastic drop in usage in the winter months, specifically November and April.



- The average number of trips a day for each year-month combination in the dataset is provided in Table 3 and Table 4 below.

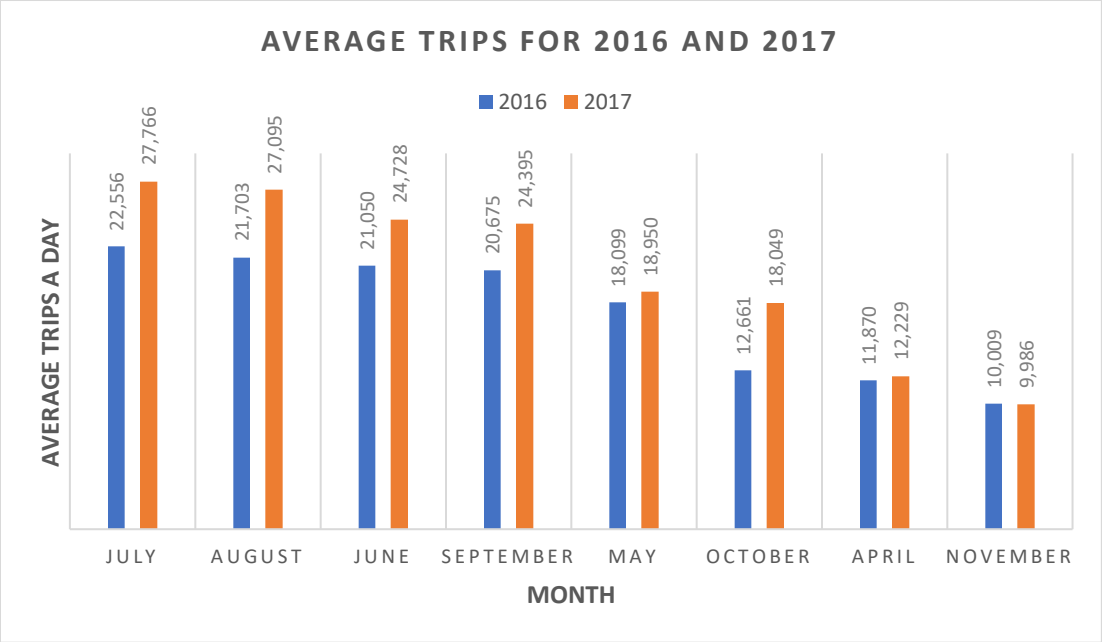
Year	Month	Average Trips Per Day
2016	July	22,556
2016	August	21,703
2016	June	21,050
2016	September	20,675
2016	May	18,099
2016	October	12,661
2016	April	11,870
2016	November	10,009

Table 3 - Average Number of Trips a Day for 2016

Year	Month	Average Trips Per Day
2017	July	27,766
2017	August	27,095
2017	June	24,728
2017	September	24,395
2017	May	18,950
2017	October	18,049
2017	April	12,229
2017	November	9,986

Table 4 - Average Number of Trips a Day for 2017

The data shows that the average trips a day in 2017 is generally higher than the average trips a day in 2016, except in November where the average trips a day was slightly higher in 2016. The figure below shows the average trips a day for 2016 and 2017, identifying the months with the highest average and comparing the averages for both 2016 and 2017.



TOTAL TRIPS BASED ON MEMBERSHIP STATUS

In order to understand the difference between how non-members and members use Bixi bikes in 2017, the total number of trips in the year was broken down by membership status, and the percentage of total trips by members was determined to identify what months in the year the non-members use Bixi bikes the most. The total number of trips in the year 2017 broken down by membership status (member/non-member) is identified below in Table 5.

Membership Status	Total Trips
1	3,784,682
0	882,083

Table 5 - Total Number of Trips in 2017 by Membership Status

In Table 5 above, under 'Membership Status', '1' indicates members, and '0' indicates non-members. As seen in the table, the total number of trips in the year 2017 is significantly higher for members than non-members. Overall, 81% of trips were conducted by members in 2017, and 19% of trips were conducted by non-members. The percentage of total trips by members for the year 2017 broken down by month is shown in Table 6. As seen in the table, members use Bixi bikes more than non-members in every month of the year. However, the percentage of total trips by non-members increases in July, August, and June – where the percentage of total trips by members is the lowest.

Month	Percentage of Total Trips by Members (%)
April	84
May	82
June	81
July	76
August	78
September	83
October	86
November	92

Table 6 - Percentage of Total Trips by Members in 2017

IMPROVING MEMBERSHIP STATUS

Based on the results of the analysis of the volume of usage of the Bixi bikes during the year, the usage of the bikes is at its peak in July, August and June, in that order. The results showing the percentage of total trips by members in Table 6 shows that the percentage of non-members increase in the months where the usage of bikes is at its peak (July, August, and June). This information tells me that non-members use the bikes more during these summer months than the rest of the months of the year, based on the data received.

Knowing this, I would offer non-members a special promotion during the months of July, August and June, in an attempt to convert them to members. I would consider offering a percentage off the original price during the months of July, August, and June with the condition that non-members sign up to be members.

Simply put, if non-members were to sign up to be members, I would give them a discount on the original price for July, August, and June. The specific discount would be dependent on the cost of operation and maintenance of the Bixi bikes, to ensure that Bixi is still able to operate and maintain the bikes at a profit or at the very least, break even, while providing an incentive to non-members to become members, resulting in the increase of Bixi members and in return, the growth of the business.

ANALYSIS FOR STATION POPULARITY

In order to understand which stations have the most trips, the names of the five (5) most popular starting stations were determined by counting all the trips in the database and grouping them based on the station name and its corresponding code.
The names of the most popular starting stations are provided in the table below.

Station Code	Station Name	Total Trips at the Station
6100	Mackay / de Maisonneuve	97,150
6184	Métro Mont-Royal (Rivard / du Mont-Royal)	81,279
6078	Métro Place-des-Arts (de Maisonneuve / de Bleury)	78,848
6136	Métro Laurier (Rivard / Laurier)	76,813
6064	Métro Peel (de Maisonneuve / Stanley)	72,298

Table 7 - Top 5 Popular Stations

Table 7 above shows the 5 most popular stations. This result was retrieved without the use of a subquery. Another query was conducted to retrieve the same results but with the use of a subquery. There was a difference in query run time between the use of a subquery and without a subquery. The run time for the one with a subquery was seconds less than the one without a subquery. This is due to the order by which the queries run. Queries run from the FROM statement first, not the SELECT statement. With the subquery being in the FROM statement, the subquery runs first rather than the aggregate function in the SELECT statement for the one without a subquery.

DISTRIBUTION OF STARTS AND ENDS FOR MACKAY / DE MAISONNEUVE STATION

Knowing that the most popular station based on the highest total number of trips, is Mackay / de Maisonneuve, more analysis was conducted to determine how the number of starts and ends are distributed for this specific station throughout the day. This was done by assuming that morning is between 7AM and 11AM, afternoon is between 12PM and 4PM, and evening is between 5PM and 9PM. The number of starts and ends distributed for the station, Mackay / de Maisonneuve throughout the day is presented in Table 8 below.

Time of Day	Total Number of Starts	Total Number of Ends
Morning	17,384	26,390
Afternoon	30,718	30,429
Evening	36,781	31,983

Table 8 - Number of Starts and Ends for Mackay / de Maisonneuve Station

The number of starts and ends distributed for the Mackay / de Maisonneuve throughout the day shows that in the morning, the number of ends is higher than the number of starts; the number of starts and ends in the afternoon is relatively the same; and the number of starts is significantly higher than the number of ends in the evening. In the overall grand of things, the number of starts in the evening is significantly higher than the number of starts in the morning. These results indicate that users are likely to start their journey at the Mackay / de Maisonneuve in the evening.

Based on external research, it could be that due to the location of the station being in downtown Montréal, where there is major traffic of people and businesses, Bixi users start their journey to their respective homes at this station in the evening after work which is why the total number of starts is high, and other users starting at a different station, end their journey in the evening at the Mackay / de Maisonneuve station after work to get to their respective homes.

HIGH FRACTION OF ROUND TRIPS

The number of starting trips per station was determined by counting all the trips in the data base based on the starting station code and grouping it by the starting station code. In a separate query, the number of round trips was determined by including that the results should only show trips where the starting station code is equal to the end station code.

The fraction of round trips to the total number of starting trips for each station was then determined by dividing the number of round trips by the total number of starting trips and multiplying by 100 to get the fraction in percentage. Using the results of this query, the stations were filtered down to where there were at least 500 trips originating from the stations and having at least 10% of their trips as round trips. The result of this is identified in Table 9 below.

Starting Station Code	Fraction of Round Trips (%)
6501	30
7048	23
6428	20
7015	20
6736	19
6359	18
7007	18
6714	15
6502	14
6109	14
6026	11
6016	11
6429	11
5006	10

Table 9 - Stations with at Least 10% as Round Trips

Based on the names of the stations having at least 10% of their trips as round trips, I would expect to find stations with a high fraction of round trips at metro stations for central trains and buses. This is because users will take the train/bus to a central metro station and start their Bixi rides to get to their final destination. When they are ready to go back to their starting location, they end their Bixi ride at the central bus or train stations, to catch a ride to their respective homes/starting locations. Therefore, it is likely that high fractions of round trips would occur at central train and bus stations.

CONCLUSION

This report presented the overall high-level understanding of how people use Bixi bikes. The data showed that people use the bikes more in the summer months of the year, and more trips are conducted in the evenings, specifically between 5PM and 9PM. It was also realized that 81% of the total trips in 2017 were by members, and 19% of the total trips in 2017 were by non-members. It was understood that factors that influence the volume of usage includes the weather/temperature, location of the stations, membership status, and the time of day (more trips in the evenings). Included in the analysis was a recommendation on how to potentially convert non-members to members. A proposed incentive was to offer a discount to non-members in the months where trips were at its peak, with the condition that they become members. Doing this encourages non-members to become members.