

Bixi Deliverable

As a non-for-profit bicycle sharing service, Bixi provides commuters with a healthy means of transportation that offers the convenience of being able to start and end their trip at any of the available stations scattered across Montreal and surrounding cities.

This report presents a greater level of insight into how a focus on non-member engagement and development of more stations in commercial and tourist areas of the city can offer more business growth. This was accomplished by answering and clarifying the following points to provide a deeper understanding into how the usage of the service is affected by the above-mentioned factors:

- 1) Attempt to gain an overall view of the volume and factors that affect the overall usage of Bixi Bikes;
- 2) What effect does membership status have on the overall usage of the service?;
- 3) Determine the time of year when the usage volume is at its peak and from this conclude at what point in the year is optimal to promote the service to non-members;
- 4) Determine which stations are the most popular in terms of starting a new trip;
- 5) Further understand how the time of day can affect the number of trips starting and ending at different stations;
- 6) Determine which stations have a relatively high proportion of round-trips.

Data Analysis

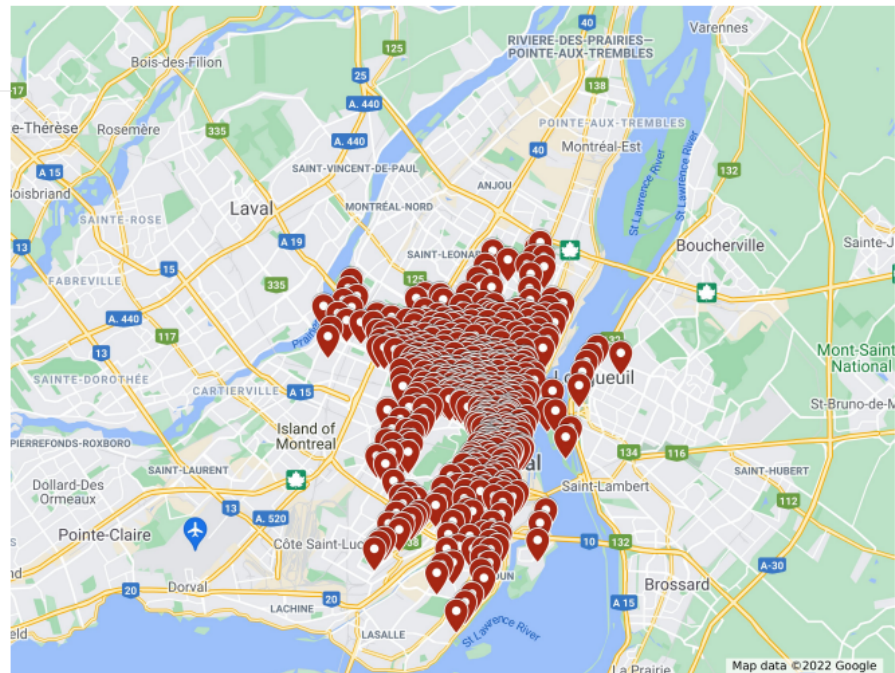
The dataset is primarily a collection of information pertaining to individual trips, the stations in which they began and ended as well as the time of day and season in which they occurred. Modelling the data involved filtering and aggregating the values so as to get a clearer idea of each trip's effect on the overall volume of the service. The data includes information on 8,584,166 trips and 540 stations.

One key observation made using the coordinates provided for each station is that the data is based primarily on the service in the greater Montreal area. By using the longitude and latitude values to generate the following map, we can see where each individual station from the study is situated.

Bixi Stations

Bixi Station Coordinates
All items

This map shows the locations of all stations provided in the Bixi dataset.



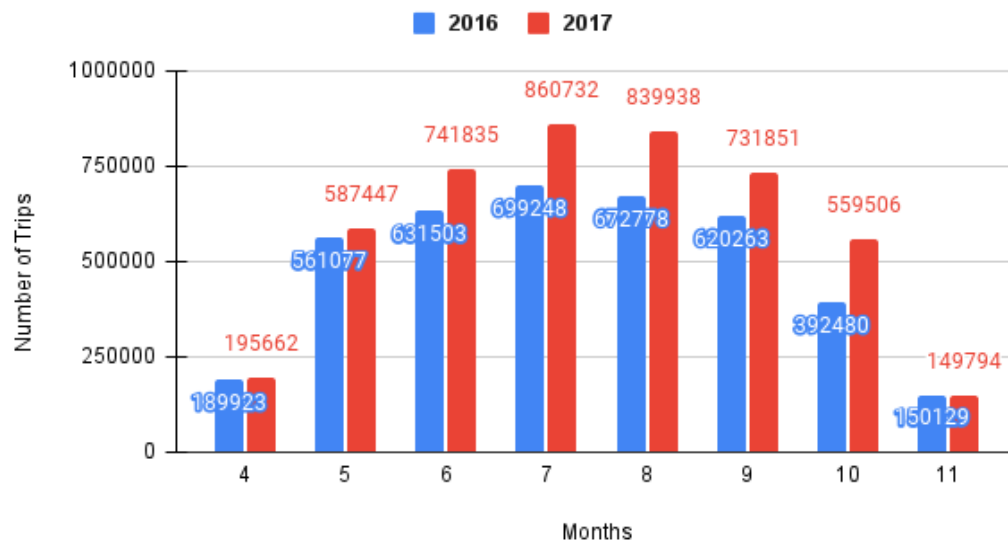
While the Bixi website indicates that the service is offered across different areas of Montreal including Laval, Montreal East and Longueuil, the image above depicts that very few, if any, stations can be found in these specific locations. This is worth noting as the data provided may be skewed to imply a greater proportion of stations in non-suburban or residential areas. This is further reinforced by the fact that there are a total of 540 stations in the dataset, but 680 advertised by the organization on their website's home page.

Results

Question 1

A simple filter of the data showed that there were a total of 3,917,401 in 2016 and 4,666,765 in 2017. This increase of approximately 19% demonstrates increasing popularity of the service year-over-year. Furthermore, a monthly breakdown and visualisation of these figures below shows that there's an increased usage of the service throughout the summer months of July and August given the higher temperatures in the city. Volume can then be seen decreasing quite significantly towards the beginning and end of the winter months of November and April respectively.

Monthly trips in 2016 & 2017



The above chart also coincides with the results gained by calculating the average number of daily trips in each given month, reinforcing the increased usage of the Bixi bikes during the warmer summer months. Provided this trend, the organization can continue to expect the same increased usage during the summer months for future years to come.

Question 2

This section of the analysis aimed to better understand member and non-member involvement in the service. In 2017, a total of 3,784,682 trips were by individuals with active memberships whereas 882,083 trips were travelled by non-members. In addition to this, the proportion of trips by members to that of the total number of trips in each month was calculated. This showed that the percentage of trips travelled by members actually decreased in the summer months with a lower value of 76.43%, but would increase in both the spring and the fall with values of 83.52% and 92.46% respectively. These fluctuating proportions may therefore indicate that non-members are likely to use the Bixi service in the warmer summer months due to leisure rather than as a necessity for travel.

Question 3

It is clear based on the results answered in Questions 1 and 2 that there is an increased volume of usage during the summer months, specifically in July and August. The popularity of the service during this time is exhibited by the fact that the proportion of trips by members has decreased during this peak season, indicating that non-members are also using the service to travel. In contrast however, the higher proportion of member usage during the spring and fall indicate that non-members are less likely to use the service during the service's off-season.

Given the results obtained thus far, a strategy that the management team of Bixi Bikes can deploy would be to offer a membership discount to non-members during the spring and fall to not only increase overall volume, but also increase demand for the segment of the market with a lower demonstrated need for the service. Given non-members are less likely to use the bikes during this time of year, offering a spring and fall discount, specifically in April and November, can incentivize non-members to use the service more often.

Question 4

A simple analysis of the stations determined that the following locations were the most popular based on the frequency that each was used as a trip's starting point:

- 1) *Mackay / de Maisonneuve*
- 2) *Métro Mont-Royal (Rivard / du Mont-Royal)*
- 3) *Métro Place-des-Arts (de Maisonneuve / de Bleury)*
- 4) *Métro Laurier (Rivard / Laurier)*
- 5) *Métro Peel (de Maisonneuve / Stanley)*

It is not surprising that 4 of the top 5 stations are located in front of metro stops, the city's underground transit system. These locations are likely meant to promote use of the local public transit system not only for residents in the area, but also for tourists visiting the city.

Question 5

Trips that began and ended at the station *Mackay / de Maisonneuve* were further categorized based on whether the station was used in the morning, afternoon, evening or night. The most notable difference in frequency of trips at this station occurred either in the morning (between 7AM and 11AM) or the evening (between 5PM and 9PM). Based on the information collected, this station sees a considerable increase in trips that end at this station in the morning and an increase in trips that start in the evening. It can therefore be deduced that this station is likely in close proximity to a commercial or business area of the city where riders arrive for work in the morning around 9AM, but leave at the end of their work day at about 5PM.

Question 6

The final section of this analysis ultimately determined which stations were observed to have at least 500 trips start at their location, but of which 10% were also round-trips and therefore ended at these locations. It is likely that these stations are situated in areas that experience high amounts of tourism and sightseeing such as parks, famous architecture or public squares. Riders will essentially start their trips in order to go for a leisurely ride in a given area that may have a limited boundary. For example, the popular Old Port of Montreal

where we can find the station *de la commune / Place Jacques-Cartier* and riders can travel along the pier, or St Helen's Island where there is the popular Parc Jean Drapeau and the corresponding stations at *Métro Jean-Drapeau* and *Quai de la navette fluviale*. These popular tourist attractions offer riders the convenience of returning their bikes to the initial starting point of their "tour".

Conclusion

The findings discussed in this report provide clear recommendations on how the management team at Bixi Montreal can make clear data-driven decisions to increase the growth of their service. One area of focus is to provide non-members the incentive of joining the program through a discounted membership at the beginning and end of the operating season. By promoting usage to non-members specifically between April through May and October through November, the organization can expect to see an increase in both memberships and overall volume of usage.

Furthermore, this analysis provides guidance on where to place future stations to increase usage of the service based on the city sector and surrounding attractions. Based on the location of the most popular stations, the organization can expect to see greater usage in commercial areas of the city, specifically around other public transit options. These areas experience the greatest number of trips given the added convenience they provide local residents and tourists alike.