Bixi Project – Part 1

Introduction

Bixi is a public transportation-sharing company, specifically focused on bicycles. It is currently located within the Greater Montreal area and is one of the largest bicycle-sharing companies in North America.

Bixi provides anonymized trip data to the public, mainly with the intention of providing real-time station statuses for users and transportation partners. However, the availability of this data also enables the public to analyze historical trip data to identify trends and potential areas of growth.

The goal of this report is to gain a high-level understanding of overall Bixi Bike usage, sliced by user types, usage patterns, and seasonality. By better understanding each individual factor and how these factors may relate to one-another, we can begin to achieve more clarity into riding behavior and applicable business opportunities.

Insight Overview

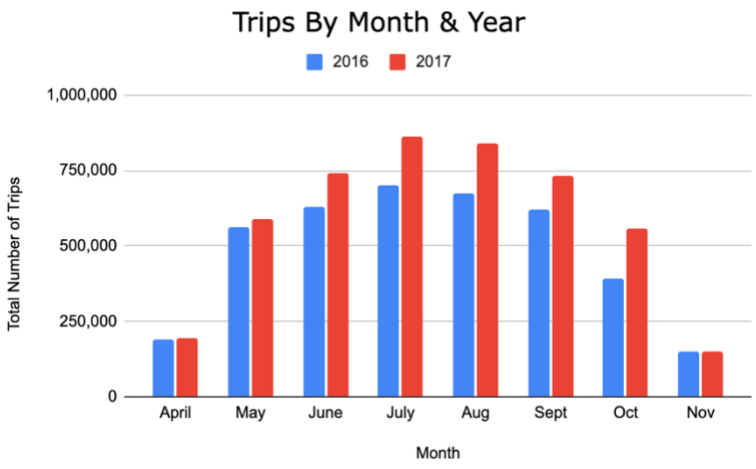
The following report performs analyses on two key assets of Bixi: Users and Stations. Overall trip numbers and trends will first be analyzed and will set the foundation for proceeding topics, such as membership versus non-membership usage patterns, station utilization patterns, and important business considerations and recommendations related to the findings. A summation of these insights, recommendations, and limitations of the analyses and datasets are provided at the end of this report.

Overall Trips & Growth of Trips

Prior to attempting to answer any of the above business questions and topics, we must first understand the overall number of trips that have occurred.

In 2016, Bixi saw a total of 3.9 million trips taken. Just a year later, in 2017, that number grew to 4.66 million, a 19% increase year-over-year.

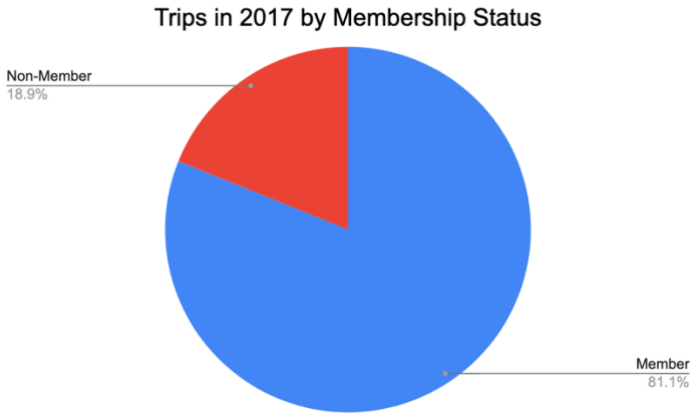
When breaking down trip numbers by month, Bixi has seen the largest increase in riders within the highest utilization months (June through September), with negligible differences in April & November. October saw the highest YoY growth rate at 42%.



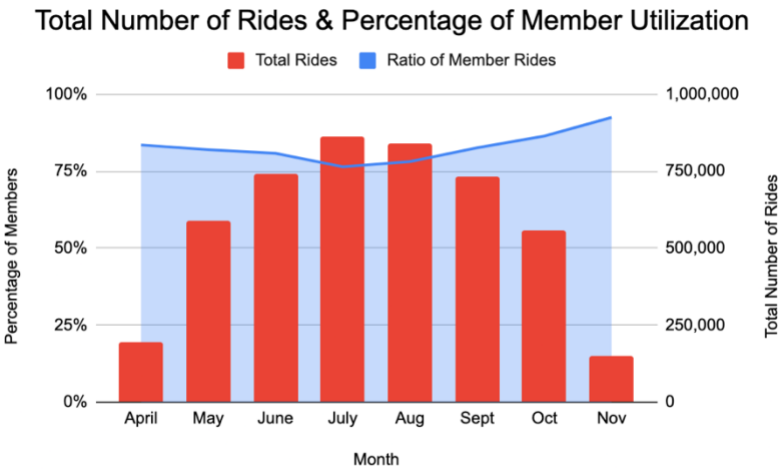
Membership & Usage Pattern Relationships

Bixi generates a bulk, if not all, of its revenue from membership subscriptions. These subscriptions allow riders to use Bixi's bicycles on an unlimited per-month basis, as opposed to paying per-ride. Bixi has also partnered with various public and private services to provide a range of perks to its members.

To better understand the current utilization of membership riders, the pie chart to the right provides a breakdown of the total number of trips in 2017, sliced by members and non-members.



Out of the 4.66 million rides in 2017, 3.78 million were performed by riders that held membership statuses, or about 81%. While there are opportunities to grow that percentage, such high membership utilization paired with growing trip numbers validates the value that Bixi's membership offers.



With memberships being such a core part of Bixi's business, an essential business question is how to optimally grow its subscribership.

The bar and area chart to the left attempts to answer this question by overlaying the previously analyzed rider numbers by month with the percentage of those rides being taken by members.

Perhaps unsurprisingly, the percentage of member utilization of Bixi rides is inversely correlated with the total number of rides taken by all riders. We've already noted how seasonality plays an essential role to ridership trends, but we now see how membership impacts trip numbers in months with less utilization.

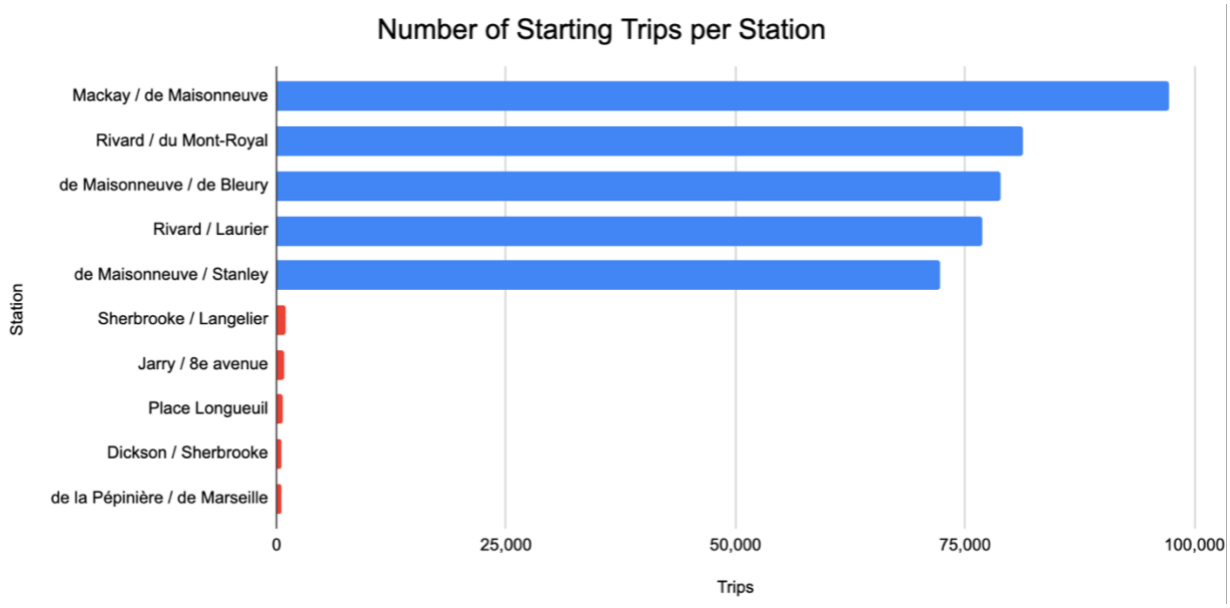
This finding leads to two important points regarding business sustainability and growth. Firstly, growing the number of memberships can directly impact the usage of Bixi in its off months, specifically April-May and October-November. Secondly, if Bixi was to move forward with marketing or promotional offerings of its membership to non-members, doing so in June, July,

and August will lead to the highest likelihood of exposure and conversion to its non-member customers.

Station Trends & Daily Usage Patterns

Another important usage metric for Bixi, outside of trip patterns and user behavior, is station utilization.

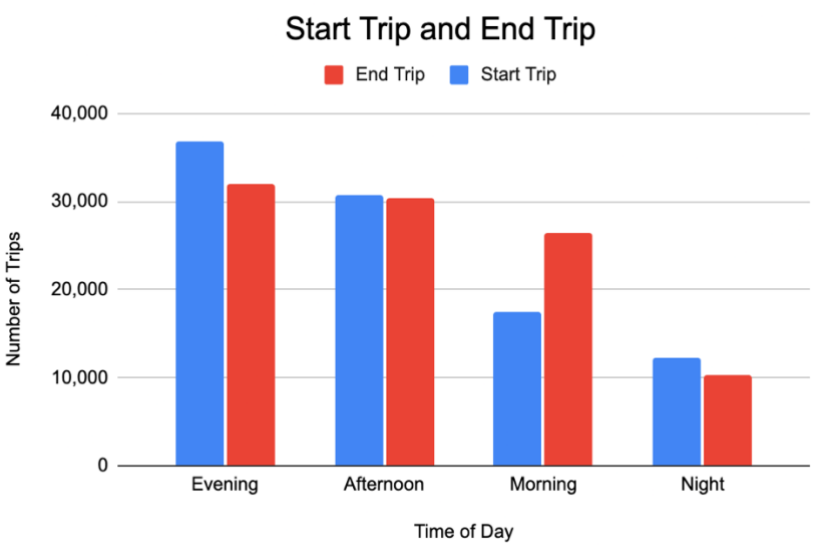
By the end of 2017, Bixi had 540 different stations, where users could pick-up and drop off their Bixi bicycles. However, not all 540 of those stations are used equally. The average number of starting trips per station is 15,809 over the course of 2016 & 2017. The below chart shows the number top 5 and bottom 5 stations by starting trips.



This wide discrepancy does beg the question of if all 540 stations under Bixi's purview should continue to be supported. This report is unable to make such a decision due to the lack of financial data regarding the cost to maintain a given station, but it is a point that is worthy of further analysis.

Given the question of prioritizing stations, an important aspect to analyze for a transit company are the specific usage patterns of a given station. Since it would not be possible to present such an analysis on every station within this report, the Mackay / de Maisonneuve station will be used as the example case.

The column chart below represents the start and end times for all trips to and from the Mackay / de Maisonneuve station. As seen above, this station is Bixi's most popular station, so usage is high regardless of the time of day. However, there are noticeable differences between Evenings and Mornings. Please notes that the time-of-day buckets are defined as the following: Mornings - 7AM to 11AM, Afternoon -12PM to 4PM, Evening - 5PM to 9PM, Night - 10PM to 6AM.



Bixi has seen about 9,000 more trips ending at the station than starting in the mornings, and almost 5,000 more trips starting than ending in the evenings.

This could lead to the assumption that the Mackay / de Maisonneuve station is primarily used as a work commute hub, with more riders commuting to their place of work in the area in the morning, and the inverse in the evening.

Another data point that was not accessible via the publicly available dataset was the supply of bicycles at or near a specific station at a given time of day. Those data points, combined with an understanding of rider usage throughout the day, can assist Bixi with logistical optimization regarding bicycle availability, which can lead to more trips.

A key piece of that supply question can be discerned from the data we have via rider patterns. If a rider frequently used Bixi to and from their destination—and returning to the same destination—there could potentially be more predictability regarding the number of bicycles available at a given time.

Unfortunately, the rate of round trips relative to all trips is low. The average rate of round trips across all stations is 2.7%. Only 9 stations that have a total trip count of over 500 trips has seen a round-trip rate of 10% of more, and with an average trip total of 15,809 per station, only 2 of those 9 exceed that average.

Station	Round Trip Rate	Total Trips
Métro Jean-Drapeau	**30%**	**28,672**
Métro Angrignon	23%	2,398
Berlioz / de l'Île des Soeurs	20%	5,246
LaSalle / 4e avenue	20%	2,991
Parc Plage	18%	6,201
Casino de Montréal	14%	6,138
Quai de la navette fluviale	14%	6,417
de la Commune / Place Jacques-Cartier	**11%**	**50,822**
Place du Commerce	11%	8,569

Summary Findings

The goal of this report and analysis was to better understand how riders use Bixi, the factors that influence this usage, how this usage impacts station utilization, and potential opportunities for business growth.

To summarize, the table below provides the key findings and potential opportunities for each of the above business concepts, specific to Bixi.

Goal	Key Finding	Opportunity
Rider Usage & Growth	• 19% YoY Growth in trips • 42% YoY Growth in trips in Oct • 81% of trips from Members	• Best time to promo to non-members is June-Aug due to maximum exposure
Influential Factors	• Temperature is the biggest factor regarding utilization • Membership is a large driver to trip volume, especially in low-usage months	• Converting members can lead to larger off-month utilization
Station Utilization	• Wide range utilization across stations • Some stations have been seen to serve as key work commute hubs • Usage of Bixi as a round-trip mode of transport is low	• Potentially downsize number of stations due to low usage • Optimize supply at popular / predictable locations

Limitations

Throughout the report were call-outs regarding analysis opportunities pending additional datasets. Specifically, within Station Utilization, understanding the cost of maintenance can inform the impact of the decision to downsize low-usage stations.

Additionally, knowing the number of Bixi bicycles throughout the sharing network, as well as the number of bicycles at or near a Bixi station at a given time of day, would help inform potential supply and logistical optimizations. This could better ensure bicycles are available at popular stations and potentially reduce the cost of supplying more bicycles into the Bixi network.