Bixi Project - Part 2 - Visual Analytics in Tableau
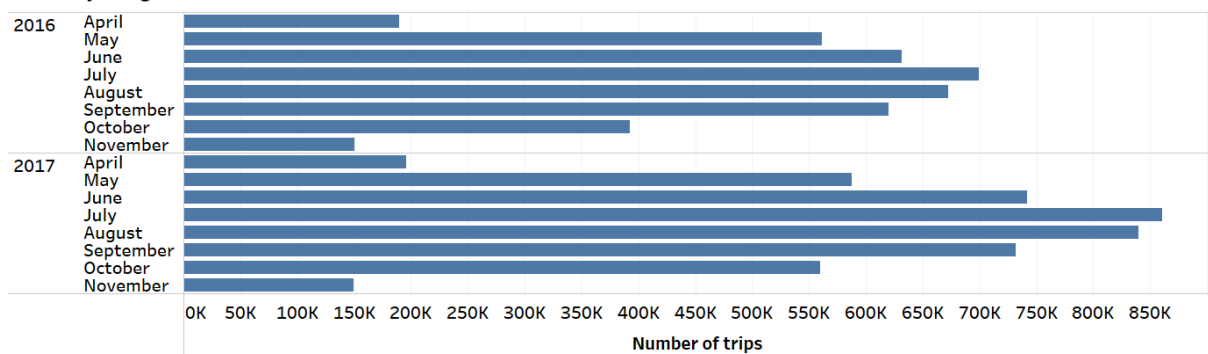**Cheung Pang (Jason) Wong**

Introduction

BIXI Montréal is a non-profit organization to manage its bike-sharing system. The BIXI network has more than 10,000 bikes (Bixi Bikes) and 800 stations in different areas around Montréal. This report aims to understand the overview of the usage of Bixi Bikes in 2016 and 2017, how people use individual stations, and to explore a revenue model. Finally, the report summarizes our findings with recommendations for business growth.

Key Questions
Comparing the monthly trips in 2016 to 2017

Graph 1 compares the total number of monthly trips for 2016 and 2017 by month. In general, monthly usage in 2017 is higher than 2016, and the monthly usage patterns are similar between the two years, with highest usage in the summertime (May to September) and lower usage in the winter time (October to April). (See Graph 1 and Worksheet Q1.1)
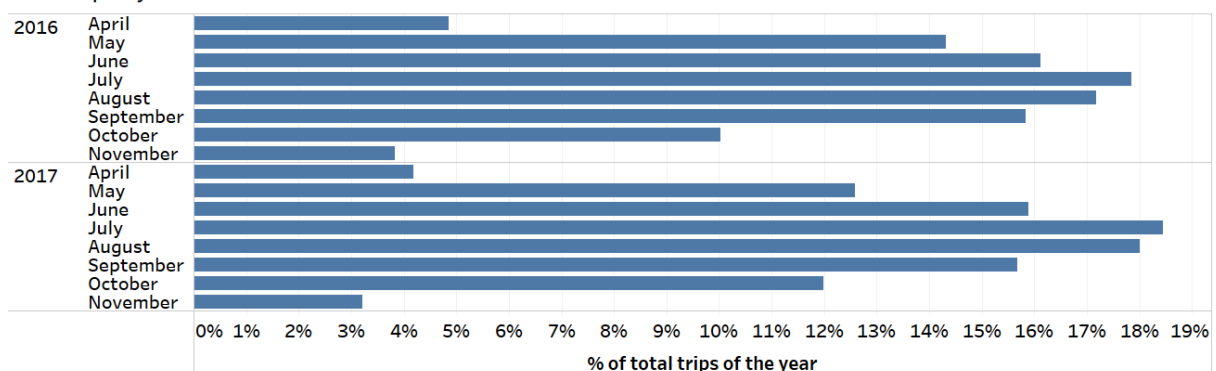

Graph 1

Graph 2 compares the proportional monthly usage between 2016 and 2017. In general, the percentage usage in the two years is similar, with higher percentage usage in July, August, and October in 2017 than that in 2016. (See Graph 2 and Worksheet Q1.2)

Graph 2

Trips by members

Graph 3 shows that on average 80% of the trips were taken by our members in
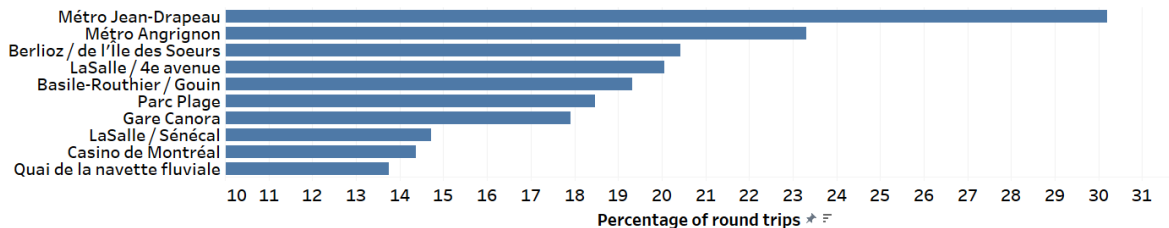
2017 . (See Graph 3 and Worksheet Q1.3)

Graph 3

Graph 4 shows the top 10 stations by percentage of round trips. Remarkably, Métro Jean-Drapeau has more than 30% of round trips, possibly resulting from its proximity to Métro station. (See Graph 4 and Worksheet Q1.4)

Top 10 stations by % of round trips

Graph 4

Behavior of Bixi service usage

In order to further investigate how people used the Bixi service, we investigated the relationship between percentage of round trips and percentage of member trips by station. Results in Graph 5 shows that there is no correlation between these two variables, suggesting there are other factors affecting the number of round trips per station. (See Graph 5 and Worksheet Q2.1)
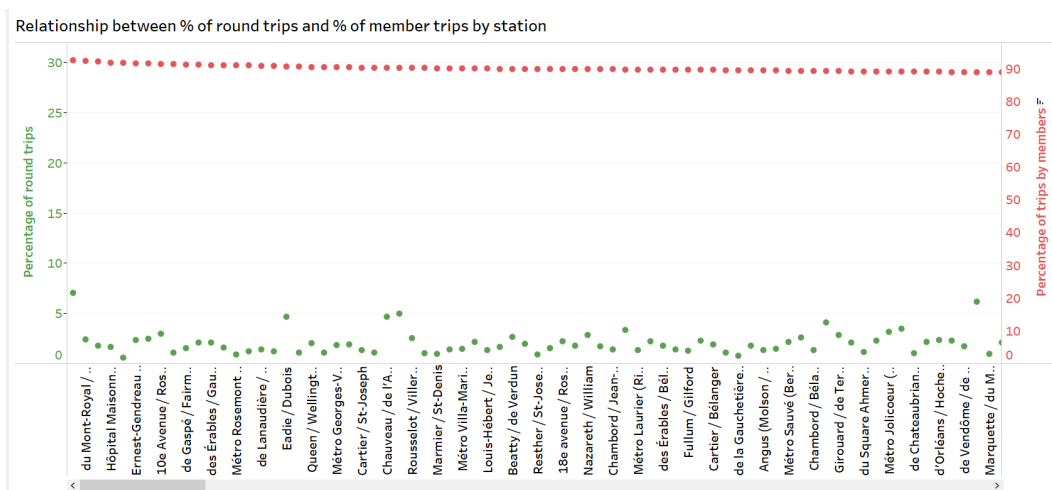
Graph 5

Graph 6 shows the distribution of all trips by duration in minutes, and contrasted this between member and non-member trips. Results show that the majority of trips last for less than 60 minutes. Member trips are in general shorter than non-member trips.

Distribution of all trips by minutes
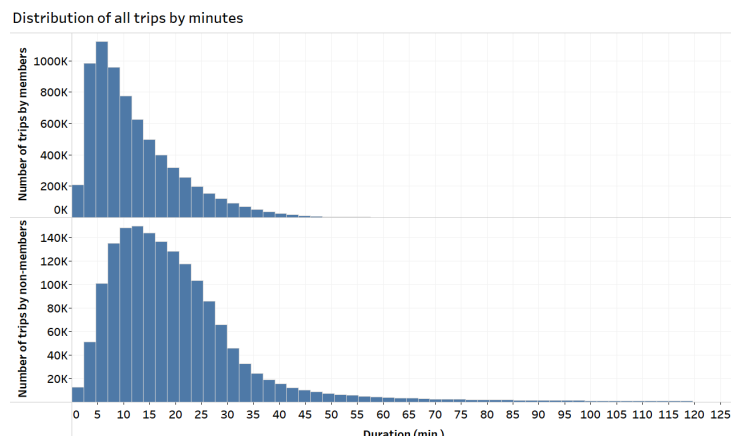
Most member trips finish in 5-10 minutes while most on-member trips finish in 10-15 minutes. (See Graph 6 and Worksheet Q2.2)

Graph 6

We are also interested in understanding the relationship between the geographical locations and the duration of trips. Map 1 reveals that shorter trips start from the downtown/Business area and longer trips start in areas near parks/residential areas. Possible explanations for that include users leveraged on the flat rate for the first 30 minutes in the downtown area and users in the park use longer to explore the park areas. (See Map 1 and Worksheet Q2.3)
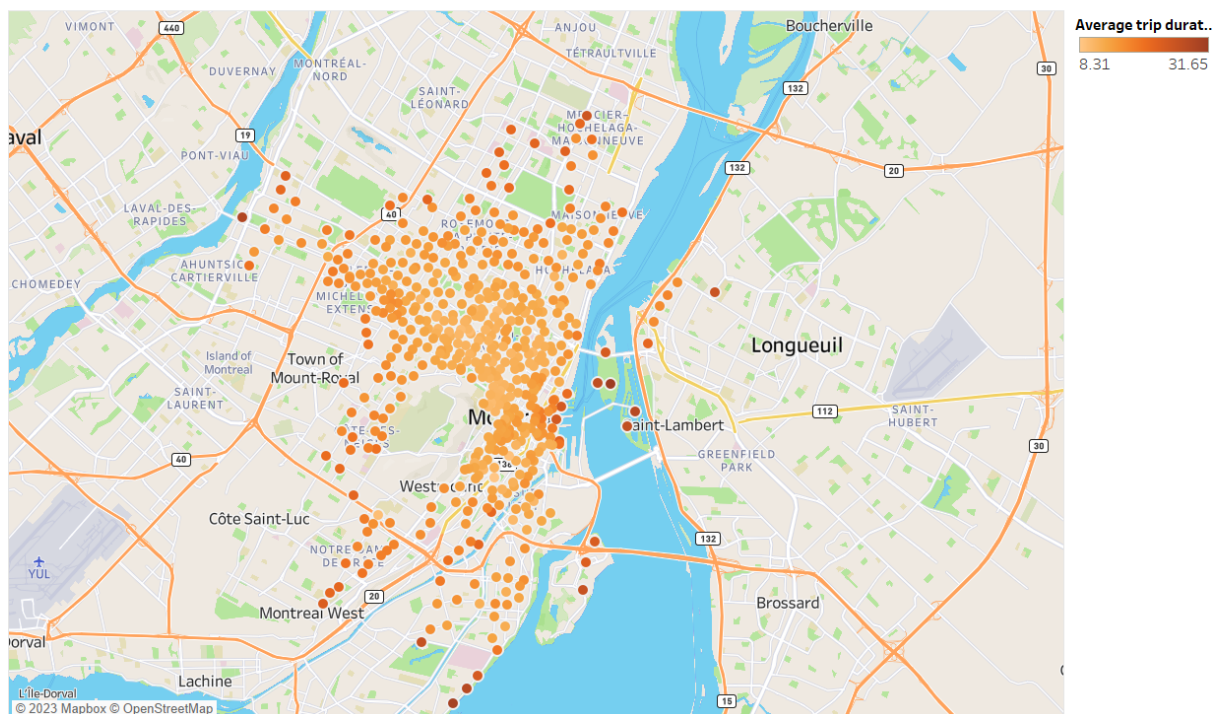
Map 1

Closer look at the revenue generated by infrequent users who make single, shorter trips an hour long or less

By using the following pricing model for non-member, single trips, we investigated the revenues generated.

Rate	Duration of trips
$2.99 flat rate	30 minutes or less

$4.79 ($2.99 + $1.80)	greater than 30 minutes, up to 45 minutes
$7.79 ($2.99 + $1.80 + $3)	greater than 45 minutes, up to 60 minutes

We found that the total revenue generated is $ 4,463,133. The relative percentages to total revenues are 95.7%, 3.4% and 0.8% for single trips< 30 mins, 30-45 mins, and 45-60 mins respectively. (See Table 1 and Worksheet Q3.2)

Total Reveune from <60 min single trips

Single Trips <30 min	$3,985,086.95
Single Trips 30-45 min	$141,944.00
Single Trips 45- 60 min	$36,103.00
Single Trips (<60 min) - Total Revenue	$4,163,133.95

Table 1

Total amount of flat rate revenue for single trips of 30 minutes or less is $ 44,007 in 2016 and $54,678 in 2017. In order to investigate exactly when they are seeing the most revenue from them, we break it down into hours and 7 days of a week. Table 2 shows that the highest total amount of flat rate revenue was generated on Sunday between 15:00 and 17:00 in 2016 and 2017. Revenues generated on Wednesday were $5,532 and $7,469 in 2016 and 2017 respectively, and a total revenue of $14,881 and $17,467 were generated between 15:00 and 17:00 in 2016 and 2017 respectively. (See Table 2 and Worksheet Q3.3)

Revenue from flat rate charge by days and times

Year of S..	Hour of S..	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Grand Total
2016	15	1,029	622	568	646	583	685	945	5,077
	16	1,202	619	463	616	481	682	1,008	5,071
	17	978	553	481	613	443	640	1,026	4,733
	14	730	446	449	451	404	529	792	3,800
	18	825	481	362	410	422	446	715	3,660
	13	625	481	368	401	416	502	765	3,558
	12	595	535	371	359	329	356	565	3,110
	19	679	377	296	443	347	350	493	2,984
	11	380	293	269	296	206	173	419	2,036
	20	466	329	206	248	209	266	290	2,015
	21	514	132	66	203	132	164	212	1,423
	22	395	21	48	45	39	248	305	1,100
	10	209	120	120	138	147	111	147	990
	8	54	161	152	194	173	147	72	954
	23	212	18	18	48	12	206	302	816
	9	111	132	132	117	93	114	120	816
	7	33	123	206	147	135	117	45	804
	6	33	69	78	84	72	105	36	475
	0	87	18	9	18	33	15	66	245
	1	30	9	15	18	33	30	9	144
	5	6	3	18	15	12	9	6	69
	4	3	9	6	18	6	6	0	48
	2	9	3		3	3	9	15	42
	3	6	12	3	3	9	0	6	36
	Total	9,209	5,564	4,700	5,532	4,736	5,908	8,357	44,007
2017	16	1,576	676	628	837	685	559	1,486	6,446
	17	1,357	610	688	765	628	469	1,262	5,780
	15	1,354	556	517	553	562	622	1,076	5,241
	14	1,348	559	616	655	526	523	978	5,206
	18	999	490	419	649	425	410	915	4,306
	13	960	449	532	511	368	469	795	4,084
	12	724	416	478	508	416	389	640	3,570
	19	819	419	440	463	338	323	661	3,462
	11	490	206	398	353	341	287	446	2,521
	20	673	218	320	326	242	212	320	2,311
	8	120	335	392	466	472	407	111	2,302
	21	487	126	173	161	182	135	254	1,519
	10	335	117	227	215	218	138	203	1,453
	7	48	182	284	359	281	212	36	1,402
	9	150	138	173	164	212	161	105	1,103
	22	269	63	117	167	84	194	203	1,097
	23	167	78	72	69	69	164	341	960
	6	21	114	150	173	173	164	45	840
	0	117	39	15	21	72	24	60	347
	1	60	21	33	24	36	45	39	257
	2	69	3	36	15	6	18	33	179
	5	6	24	15	12	18	12	27	114
	3	33	27	3	0	18	24	9	114
	4	36	3	3		9	6	6	63
	Total	12,217	5,866	6,728	7,469	6,381	5,968	10,049	54,678
Grand Total		21,426	11,431	11,428	13,001	11,117	11,876	18,406	98,685

Single Trips <30 ..
0   1,576

Table 2

Business Strategy Recommendations

1. ***Doubling down on summer promotions***
   a. Results from graphs 1 and 2 show that the peak of the usage takes place in summer time. In addition, membership is crucial for Bixi service as they made up more than 80% of the total usage in 2017. Promotion campaigns should focus on member retention in summer time and around downtown areas where density of stations is higher.
2. ***More competitive rate for longer trips***
   a. Both members and non-members prefer to use Bixi for shorter trips (<30 minutes) (Graph 6). Lower rates for longer trips (> 30 minutes) may attract more users to use for a longer time.
3. ***Flexible rates by days and hours***
   a. Currently the rate is determined by the duration of trips. Table 2 shows that the usage is much lower during weekdays and times in the morning and evening. Flexible rates for different days in the week and times in the day may attract more users and generate higher revenue.