SITE LOCATION RECOMMENDATION

The project is used to help Company ABC determine the location

for their first branch in Canada

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CONTENTS

Internal

1. INTRODUCTION

1.1 Background

Company ABC (the "Company") is a China-based Express Delivery Company who started their business about 5 years ago. With the rapid expanding trade between Canada and China, they foresee the potential profitability to open an international branch in Canada. Currently the Express Delivery Market is mainly lead by big corporate (e.g. FedEx, Canada Post, etc.). Considering the high shipping cost for individual or small business orders, the company built a strategy to only focus on China – Canada delivery and provide a friendlier rate to attract customer with small orders from the market. The company plans to open the first business in Ontario, and then depends on how the P&Ls within next 5 years. The main reason they choose Ontario as for it"s being Canada"s leading manufacturing province, and also tourism contributes heavily to the economy.

1.2 Business Problem

Currently, the Company had determined to open a new international Express Delivery branch in GTA, Ontario, with main focus on providing products & services to both individual and small business owners, and also thinking offering door-to-door service that will attract customers that would require more assistance. The Company now has two places in mind: Markham or Mississauga. They need to determine which City and where they should open the branch that will allow them to attract more business. The ideal site location should take the following requirement into consideration (if not all, as much as possible):

 a. Target customer availability

 b. Inventory place which is secured

 c. Easily accessible to transportation options (e.g. near highway)

 d. Ideal no or minimum competing business nearby

 e. Parking space and public-transit friendly

 f. Public service and neighbourhood enviroment

 g. Cost of the rent

1.3 Interest Audience

The use of FourSquare API and analysis combined with data analysis will help resolve the key questions arisen. The final result will be presented to the key stakeholders in the company to help them determine whether they will proceed opening a new branch in the recommended area. Further adjustment could lead to next round of deeper analysis based on the feedback received from the board.

2. DATA PREPARATION

2.1 CENSUS data (2016) for Markham & Mississauga

A national census in Canada is conducted every five years by Statistics Canada, which provides demographic and statistical data to plan public services including health care, education, and transportation, determine federal transfer payments. Two csv files has been created for Markham and Mississauga 2016 CENSUS result, which will be read in order to create a data frame. The csv file "CENSUS_Markham.csv"[1] (*figure 1*) and "CENSUS_Mississauga.csv"[2] (*figure 2*) has the following below data structure. The file will be directly read to the Jupiter Notebook for convenience and space savings.

	Category	Sub_Category	Total	Male	Female
0	Age characteristics	0 to 4 years	17085	8715.0	8370.0
1	Age characteristics	5 to 9 years	19085	9905.0	9180.0
2	Age characteristics	10 to 14 years	19220	9950.0	9270.0
3	Age characteristics	15 to 19 years	21095	10910.0	10185.0
4	Age characteristics	20 to 24 years	21455	11225.0	10230.0

Figure 1: Data frame created from 2016 Markham CENSUS data

	Category	Sub_Category	Total	Male	Female
0	Age characteristics	0 to 4 years	35460	17880.0	17585.0
1	Age characteristics	5 to 9 years	41485	21220.0	20270.0
2	Age characteristics	10 to 14 years	43980	22805.0	21180.0
3	Age characteristics	15 to 19 years	49205	25670.0	23535.0
4	Age characteristics	20 to 24 years	53645	27795.0	25850.0

Figure 2: Data frame created from 2016 Mississauga CENSUS data

2.2 Crime data for Markham & Mississauga

In this report, I will use 2017 data to compare between Markham and Mississauga due to the data accessibility limitation. Two csv files has been created which will be read in order to create a data frame. The csv file "Crime Markham.csv"[3] (*figure 3*) and "Crime_Mississauga.csv"[4] (*figure 4*) has the following below data structure. The file will be directly read to the Jupiter Notebook for convenience and space savings.

	Category	2017Actual	2017Percent Cleared	2017Rate Per 100,000 Population	2018Actual	2018Percent Cleared	2018Rate Per 100,000 Population
0	Crimes Against Persons	1,598	76.4	447.97	1,831	72.6	525.07
1	Violations Causing Death	1	200.0	0.28	2	50.0	0.57
2	Attempt Capital Crime	4	75.0	1.12	3	100.0	0.86
3	Sexual Violations	136	68.4	38.13	155	68.4	44.45
4	Commodification of Sexual Activity	33	90.9	9.25	15	86.7	4.30

Figure 3: Data frame created from Markham Crime data

	Category	2016Number	2016Percent Solved	2016Rate per 100,000	2017Number	2017Percent Solved	2017Rate per 100,000
0	Crimes Against Persons	3524	0.759	466.1	3876	0.727	511.3
1	Homicide	6	0.500	0.8	9	1.000	1.2
2	Attempt Murder	15	0.467	2.0	9	0.667	1.2
3	Robbery - Total	423	0.414	56.0	480	0.381	63.3
4	Robbery - With Weapons	246	0.407	32.5	261	0.356	34.4

Figure 4: Data frame created from Mississauga data

2.3 Geographical Information for Markham & Mississauga

Import the library to handle the request as well as the module to convert an address into latitude and longitude values. Result see below table:

Table 1: Geographical information for Markham & Mississauga

City	Latitude	Longitude
Markham	43.854336	-79.326782
Mississauga	43.590338	-79.645729

2.4   Neibourhood Information for both Markham & Mississauga

The csv file "Postalcode_Markham.csv"[5] (*figure 5*) and " Postalcode _Mississauga.csv"[6] (*figure 6*) has the following below data structure. The file will be directly read to the Jupiter Notebook for convenience and space savings.

	Postalcode	Borough	Neighbourhood
0	L6C	Markham	Berczy Village, Cachet, Angus Glen, Cathedralt...
1	L3S	Markham	Markham Southeast, Armadale, Legacy, Rouge Fai...
2	L3R	Markham	Outer Southwest, Crosby, Milliken Mills, Brown...
3	L3P	Markham	Central, Markham Village, Mount Joy, Bullock, ...
4	L6G	Markham	Downtown Markham, Markham Centre

Figure 5: Data frame created from Markham Neighbourhood data

	Postalcode	Borough	Neighbourhood	
0	L6C	Markham	Berczy Village, Cachet, Angus Glen, Cathedralt...	
1	L3S	Markham	Markham Southeast, Armadale, Legacy, Rouge Fai...	
2	L3R	Markham	Outer Southwest, Crosby, Milliken Mills, Brown...	
3	L3P	Markham	Central, Markham Village, Mount Joy, Bullock, ...	
4	L6G	Markham	Downtown Markham, Markham Centre	

Figure 6: Data frame created from Mississauga Neighbourhood data

2.5   How the data will be used to solve the problem

The data will be used as follow: First, compare the demographical data (using 2016 CENSUS data for Markham and Mississauga) as well as the Crime data, provide analysis and determine which city would be the recommended city to choose to open the new branch. Then based on the city selected, using foursquare and geopy data to explore the venue among neighbors. Finally based on the result from last step, recommend the area the company to rent and as the new site location.

3. METHODOLOGY

3.1   Age Group

Started with exploring the CENSUS data for both Markham and Mississauga. With the pre-generated data frame (as shown in figure 1 and figure 2), a separated data frame (*figure 7*) was created which included the comparison of resident between two cities. The first analysis was done based on the total number of resident and was plotted into a bar graph. The height of the bar represent the percentage of each age group within the total number of resident.

Let's focus on the age group 25 – 40 now. The reason why I select this age range because people within this ranges seems have stronger shopping power and less time due to the busy working schedule. From the bar chart (*figure 8*) we can see that Mississauga (in color blue) has a higher % compare to the Markham (in color red). Also, Also considering there are major differences between female and male in shopping habit and buying decisions and female tend to do shopping more often than male, and they usually take care of the grocery. If we use the same data frame but only look at the female part for a moment (*figure 9*) and we can also tell from the chart that Mississauga has a higher % compare to the Markham. Mississauga has a slightly higher percentage than Markham, but not major difference.

Age Group	Markham_Total	Mississauga_Total
0 to 4 years	17085	35460
5 to 9 years	19085	41485
10 to 14 years	19220	43980
15 to 19 years	21095	49205
20 to 24 years	21455	53645
25 to 29 years	21170	47170
30 to 34 years	20385	44695
35 to 39 years	20345	45050
40 to 44 years	23535	48505
45 to 49 years	24860	54770
50 to 54 years	25980	59925
55 to 59 years	23510	53435
60 to 64 years	21325	42485
65 to 69 years	18215	34385
70 to 74 years	11865	24400
75 to 79 years	8645	18130
80 to 84 years	5885	12775
85 to 89 years	3395	7780
90 to 94 years	1475	3395
95 to 99 years	390	805
100 years and over	60	120

Figure 7: Data frame created for total resident in both Markham and Mississauga
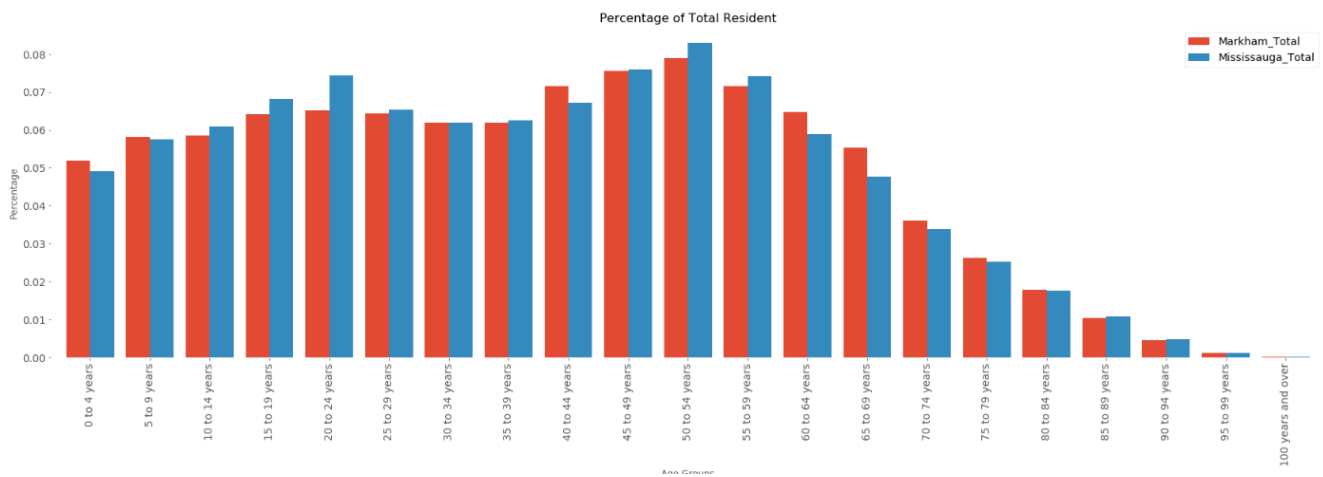
Internal

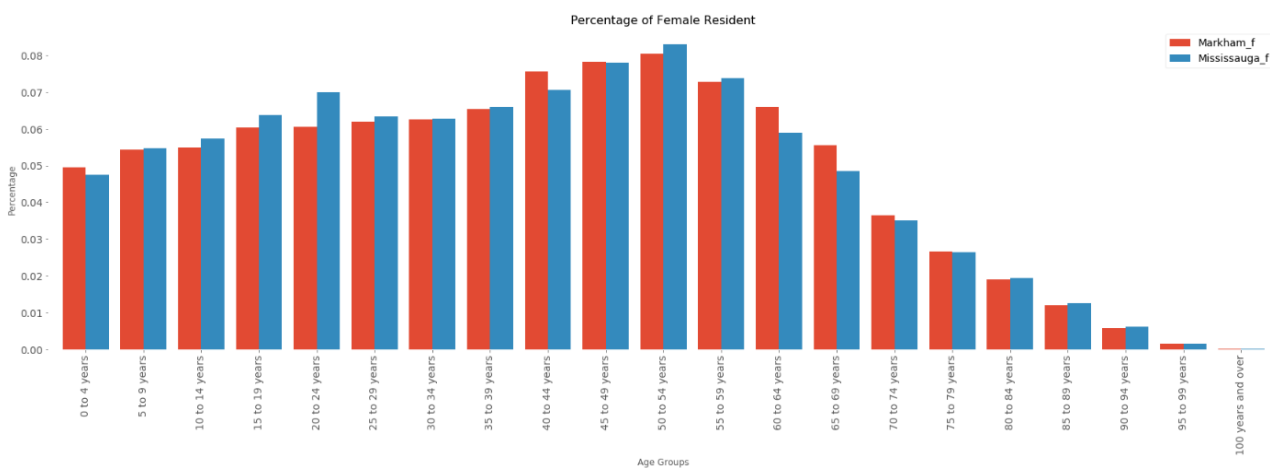Figure 8: Percentage of different age groups in total resident in both Markham and Mississauga

Figure 9: Percentage of different age groups in female resident in both Markham and Mississauga

3.2 Crime Rate

Secondly, with exploring the crime rate data for both Markham and Mississauga. Due to the data limitation that I was only able to get 2017 as the most common year which has the crime data for both cities, the 2017 result will used as a foundation for the analysis. With the pre-generated data frame (as shown in figure 3 and figure 4), a separated data frame (*figure 10*) was created which only retrieve 5 main category (including "Crime Against Persons", Crimes Against Property"s, etc.) to show comparison between two cities. The first analysis was done based on the total count of cries happened and was plotted into a bar graph. The height of the bar represent the count of crimes within the 5 main categories.

From the bar chart (*figure 11*) we can tell that Mississauga has a higher count of the crime happened in 2017 than Markham, in all of the crime category. However, consider the population difference between the two cities, another chart (*figure 12*) was plotted based on the % among total resident in two cities. From the chart we can see Mississauga has a higher

percentage of crime rate among the total population, and the "Crimes Against Property" which is more related to the safety to a building / inventory has the most difference. So Markham will consider as a better choice when talks to safety concern.

Category	Mississauga	Markham
Crimes Against Persons	3876	1598
Crimes Against Property	14135	4614
Other Criminal Code Offences	2233	595
Drugs	1201	574
Traffic Offences	2778	1077

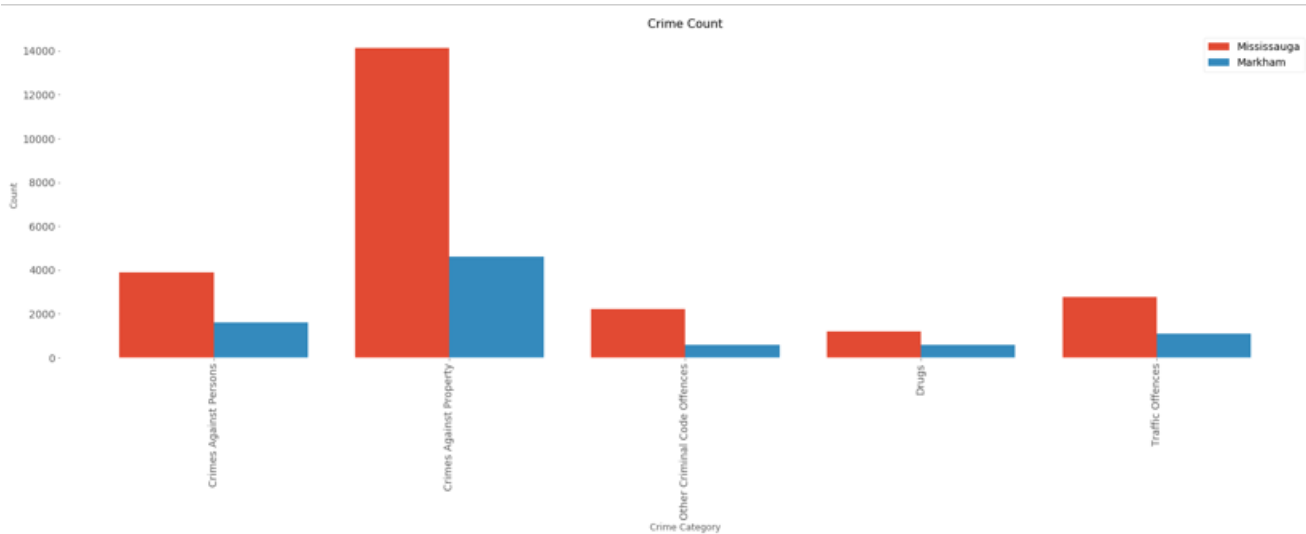Figure 10: Count of Different Crime occurrence in both Markham and Mississauga for 2017

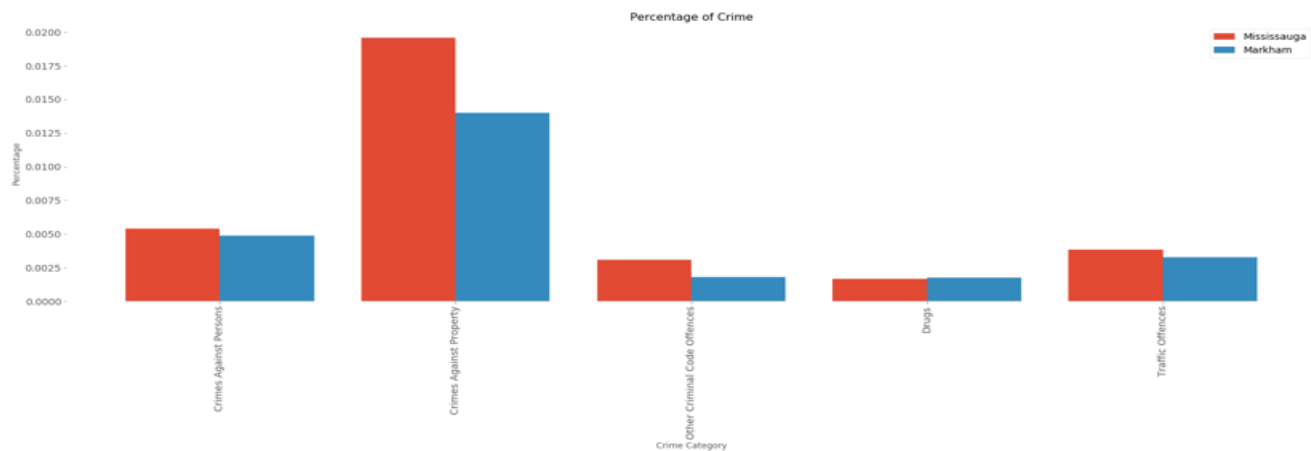Figure11: Count of Different Crime occurrence in both Markham and Mississauga for 2017

Figure 12: Percentage of different Crime occurrence in both Markham and Mississauga for 2017

3.3 Visible Minority Population

Again we use the CENSUS data for both Markham and Mississauga. With the pre-generated data frame (as shown in figure 1 and figure 2), a separated data frame (*figure 13*) was created which included the comparison of visible minority population between two cities. After exploring the visible minority population data in both Markham and Mississauga (*figure 14*), we can see that Markham has much higher Chinese population than Mississauga. Thinking that the company is a China-based Express Delivery company and want to mainly focus on Canada – China international business, Markham seems a better city to choose.

Visible minority population	Markham_Total	Mississauga_Total
South Asian	58270	165765
Chinese	147725	54090
Black	9655	47005
Filipino	8905	36570
Latin American	1750	16110
Arab	3250	36200
Southeast Asian	2520	14795
West Asian	7910	7910
Korean	4355	6095
Japanese	995	1965
Visible minority; n.i.e.	2920	9050
Multiple visible minorities	6895	13370

Figure 13: Count of visible minority population in both Markham and Mississauga

Figure 14: Count of visible minority population in both Markham and Mississauga

3.4 Household income

Again we use the CENSUS data for both Markham and Mississauga. With the pre-generated data frame (as shown in figure 1 and figure 2), a separated data frame (*figure 15*) was created which included the comparison of visible minority population between two cities. If we take a look into the general household income for 2015 (figure 16), we can see Markham has a higher population distribution % among the "<10k" and ">100k" group, while Mississauga has a higher population distribution % between "10k - 100k".

Income Group	Markham_Total	Mississauga_Total
Under $5,000	2280	4765
$5,000 to $9,999	1295	2665
$10,000 to $14,999	1780	4320
$15,000 to $19,999	2615	6755
$20,000 to $24,999	2805	7805
$25,000 to $29,999	3660	8340
$30,000 to $34,999	3820	9050
$35,000 to $39,999	3850	9975
$40,000 to $44,999	4010	10700
$45,000 to $49,999	3850	10800
$50,000 to $59,999	7830	20795
$60,000 to $69,999	7400	19370
$70,000 to $79,999	7295	18445
$80,000 to $89,999	6755	16565
$90,000 to $99,999	6220	14630
$100,000 to $124,999	12615	28485
$125,000 to $149,999	9070	18660
$150,000 and over	15535	28770

Figure 15: Household income count for 2015 distribution for both Markham and Mississauga
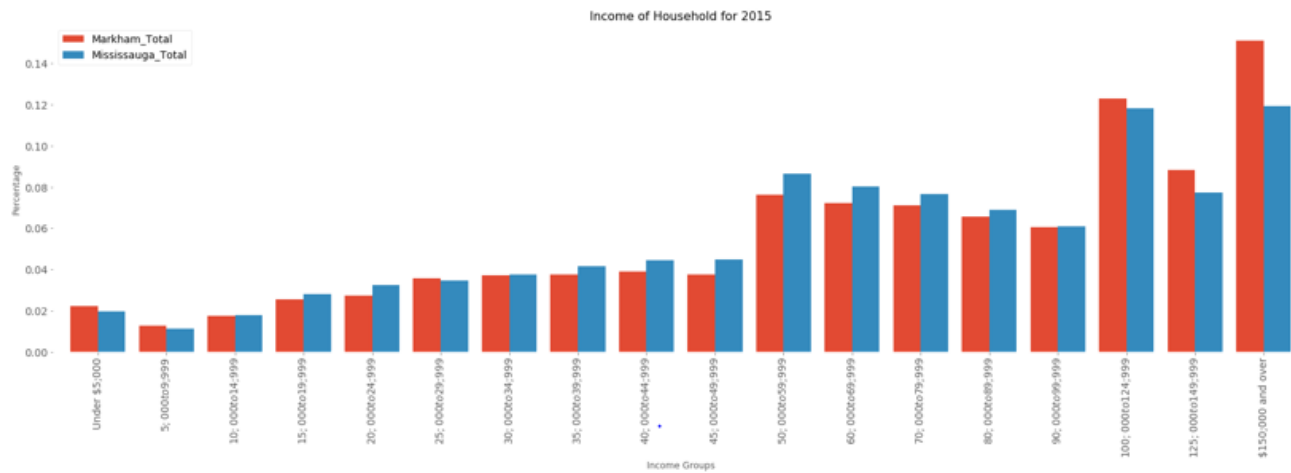
Figure 16: Household income for 2015 distribution for both Markham and Mississauga

Internal

3.5   Competitor

Started with city Markham by creating a map (figure 17) and plotted the neighbourhood on the map. Using Foursquare API to explore the venues within Markham, but only focus on the competitors (figure 18; the method I took is to add the categoryid in the URL when I connect the API). Then repeat the same steps but for city Mississauga (figure 19 and figure 20). By reading the venue list for both cities, we can see they both have the common "big" brand post office like "Canada Post", "Fedex", "UPS", etc. distributed in neighbourhoods. So from a "No or less competitor" perspective, two cities are similar to each other. It will depends on how the company end up determining which certain location they will open the branch to have a further analysis.
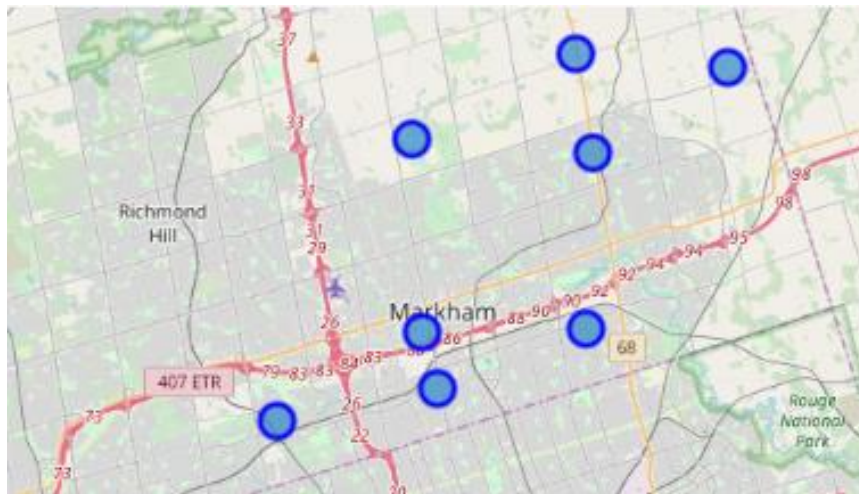

Figure 16: Markham Map

Figure 17: Markham venue information

Figure 18 Mississauga Map

	Neighbourhood	Neighbourhood Latitude	Neighbourhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Mississauga Valley, East Cooksville	43.588405	-79.609455	Canada Post	43.592398	-79.644408	Post Office
1	Mississauga Valley, East Cooksville	43.588405	-79.609455	Canada Post	43.581112	-79.849925	Post Office
2	Mississauga Valley, East Cooksville	43.588405	-79.609455	Fedex	43.604690	-79.574148	Post Office
3	Mississauga Valley, East Cooksville	43.588405	-79.609455	Canada Post	43.598877	-79.660821	Post Office
4	Mississauga Valley, East Cooksville	43.588405	-79.609455	Shoppers Drug Mart	43.629622	-79.604745	Pharmacy
5	West Cooksville, Fairview, City Centre, East Cre....	43.576945	-79.602699	Canada Post	43.581112	-79.849925	Post Office
6	West Cooksville, Fairview, City Centre, East Cre....	43.576945	-79.602699	Canada Post	43.592398	-79.644408	Post Office
7	West Cooksville, Fairview, City Centre, East Cre....	43.576945	-79.602699	Canada Post	43.598877	-79.660821	Post Office
8	West Cooksville, Fairview, City Centre, East Cre....	43.576945	-79.602699	UPS Store #14	43.615035	-79.661722	Post Office
9	West Creditview, Mavis, Erindale	43.562002	-79.651714	Canada Post	43.581112	-79.849925	Post Office
10	West Creditview, Mavis, Erindale	43.562002	-79.651714	Canada Post	43.592398	-79.644408	Post Office
11	West Creditview, Mavis, Erindale	43.562002	-79.651714	Canada Post	43.592800	-79.672900	Post Office

Figure 19 Mississauga venue information

4. RESULT

4.1 Markham vs Mississauga

We can see from the Winner table (*figure 20*): First, when it comes to the total population reside in both Markham and Mississauga, Mississauga has a slightly higher percentage of population who is within 25-40 age (from both total count and only count female residents) than Markham. However, we can also tell from the bar chart that the difference is not material. Second, when we compare the crime rate (data as of 2017) between both Markham and Mississauga, we can see that Mississauga has a higher percentage of crime rate among the total population, So Markham will consider as a better choice when talks to safety concern.

Next, from a visible minority population perspective, as we already know the company is a China-based company and the main focus of their service / product will be Canada - China express delivery, it make more sense for them to place the new branch in the city which has the higher population of Chinese people, which in this case will be Markham. Furthermore, if we take a look into the general household income for 2015, we can see Markham has a higher population distribution % among the "<10k" and ">100k" group, while Mississauga has a higher population distribution % between "10k - 100k". Last but not least, both cities have the common "big" brand post office like "Canada Post", "Fedex", "UPS", etc. is accessible to the resident. So from a "No or less competitor" perspective, two cities are similar to each other.

In conclusion, Markham will be a better choice for the company to place the first branch

Methodology Category	"Winner"
Age Group Distribution	Mississauga
Crime Rate	Markham
Visible Minority Population	Markham
Household Income	Markham
Competitor Around	Both

Figure 20 Winner table

4.2 Further Explore

As we can see Markham seems a better site location choice, let's take a closer look into this city. We can see from the information that each neibourhood have tons of venues around, and from the Venue name we can tell lots of place are Chinese Restaurants or companies (*figure 21*). Since the company focus is on China – Canada shipping and their target customer is individual and small business owners, Markham is a better choice. And I also generated the top 10 venue *(figure 22)* for each neighbourhood for the reference to help the company determine a further detail location to open the company. A cluster map has also been generated to show neighbours with commonality.

	Neighbourhood	Neighbourhood Latitude	Neighbourhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Berczy Village, Cachet, Angus Glen, Cathedralt...	43.904525	-79.339338	Angus Glen Golf Club	43.902117	-79.324863	Golf Course
1	Berczy Village, Cachet, Angus Glen, Cathedralt...	43.904525	-79.339338	Angus Glen Community Centre & Library	43.894548	-79.335758	Community Center
2	Berczy Village, Cachet, Angus Glen, Cathedralt...	43.904525	-79.339338	Toogood Pond	43.870701	-79.313803	Park
3	Berczy Village, Cachet, Angus Glen, Cathedralt...	43.904525	-79.339338	Old Firehall Confectionary	43.867126	-79.312084	Dessert Shop
4	Berczy Village, Cachet, Angus Glen, Cathedralt...	43.904525	-79.339338	Wonton Chai Noodle 雲吞仔	43.885312	-79.372231	Asian Restaurant
5	Berczy Village, Cachet, Angus Glen, Cathedralt...	43.904525	-79.339338	Main Street	43.867774	-79.311948	Road
6	Berczy Village, Cachet, Angus Glen, Cathedralt...	43.904525	-79.339338	Cosmo Music - The Musical Instrument Superstore!	43.890410	-79.393270	Music Store
7	Berczy Village, Cachet, Angus Glen, Cathedralt...	43.904525	-79.339338	Next Door	43.865531	-79.310234	New American Restaurant
8	Berczy Village, Cachet, Angus Glen, Cathedralt...	43.904525	-79.339338	Old Country Inn	43.867994	-79.312518	German Restaurant

Figure 21 Markham neighbor venue information

	Postalcode	Borough	Neighbourhood	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	L6C	Markham	Berczy Village, Cachet, Angus Glen, Cathedralt...	43.904525	-79.339338	1	Coffee Shop	Bank	Fast Food Restaurant	Golf Course	Pharmacy	Pizza Place	Sandwich Place	Park	Other Great Outdoors	Supermarket
1	L3S	Markham	Markham Southeast, Armadale, Legacy, Rouge Fai...	43.849285	-79.269179	0	Bakery	Chinese Restaurant	Bubble Tea Shop	Asian Restaurant	Italian Restaurant	Supermarket	Hakka Restaurant	Noodle House	Dessert Shop	Vegetarian / Vegan Restaurant
2	L3R	Markham	Outer Southwest, Crosby, Milliken Mills, Brown...	43.831860	-79.328545	4	Bakery	Chinese Restaurant	Japanese Restaurant	Dessert Shop	Caribbean Restaurant	Gym	Hotel	Tea Room	Bubble Tea Shop	Noodle House
3	L3P	Markham	Central, Markham Village, Mount Joy, Bullock, ...	43.929105	-79.273375	3	Coffee Shop	Sandwich Place	Pizza Place	Fast Food Restaurant	Bank	Sushi Restaurant	Pharmacy	Beer Store	Café	Breakfast Spot
4	L6G	Markham	Downtown Markham, Markham	43.848375	-79.334748	3	Bakery	Chinese	Hotel	Dessert Shop	Japanese	Bubble Tea	Noodle House	BBQ Joint	Gym / Fitness	Cantonese

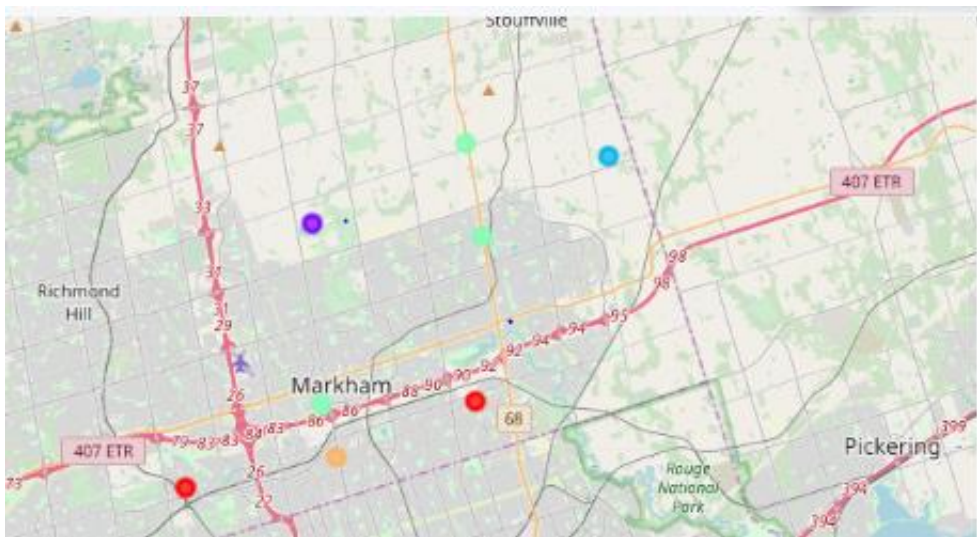Figure 22 Markham top 10 venues within each neighbourhood

Figure 22 Clustered neighbourhood map in Markham

5. DISCUSSION

Based on the analysis above, I will recommend the company to open their first international branch in Markham, considering it's safer neighbour environment and larger Chinese resident population. We can also see from the map that Markham has an Airport and also it's has pretty advance public transportation network through the city. Also, always consider that the company mainly focuses on China - Canada international shipping so the Chinese population size plays a key part in the decision fact.

6. CONCULSION

In this report, I explored multiple data for both Markham and Mississauga first. And then identified from a population, crime information, geographical exploration perspective etc. and then based on the analysis result, provided the recommendation that Markham will be a better choice over Mississauga to be the location for the first international site. Those component can also be part of the consideration when company decide to open another branches in the future, or identifying their marketing strategy. Of course there are more component the company need to think of before they actually determine which location they will pick, but with the base of the analysis in this report it should provide them a good solid starting point to continue the conversation.