Private Banking Advisers at BCB Edmonton

Project Report

Team:

Pankaj Suresh Kumar

Raja Ranjan Bobba

Scott Andrew Schwager

Sushma Reddy Mandhadapu

Introduction:

Canadian banking was viewed as one of the most secure banking systems on the planet. The nation had not encountered any huge financial disappointments since the 1920s. The Royal Bank of Canada (RBC), the country's greatest bank, had delivered normal offer profits (meaning it was productive) in consistently starting around 1870, when it accepted its financial contract, and the Canadian dollar was laid out as an official cash.

By the 2010s, the Canadian financial scene was overwhelmed by the supposed "Big Five"- the biggest banks that during the 1980s and 1990s obtained all huge trust and business firms before additional consolidations were precluded by the public authority. From that point forward, they had extended globally, principally to the United States and Central and South America, where part of the way or completely possessed auxiliaries of Canadian banks had twofold digit pieces of the pie. Wallace's BCB was one among those “Big Five” banks.

BCB is a major bank in the Edmonton metro area with an operating network of 35 Branches. The manager at BCB, Canada, is thinking about managing her new private bank adviser's practice in her region. Her first concern is to find the total number of PBA's required in that specific region and second concern is to decide where these PBAs (Private Banking Advisers) should be located.

Data Description:

Exhibit 1:

Branch ID: Every branch has given with a designated ID.

Postal Code: Postal Code is the geographical location identifier given to every branch

Average Volume, Dollars/month: This variable represents the contribution of PBA to average turnover made by respective branches.

Average Time Required, days: This variable represents the number of days that a PBA requires to be work at respective branch.

Average Number of Trips/months: This variable represents the number of visits that a PBA makes to respective branch.

Exhibit 2:

A Matrix of one-way travel time between different branches. This matrix contains travelling time between all combinations of branches.

Problem Statements

The following are the questions that we need to answer to find the solution for the given problem

1. How many PBAs to hire?
2. Which branches should be visited by which PBA?

Observations

Based on observing the given data we found that

1. Each PBA Costs $40 Per Hour
2. Generates Revenue of $2000 Per Hour Regardless of Branch

Goal:

Minimize the ratio of Travelling Time/Branch-Time while not leaving out any branch.
Since the cost is fixed for PBA and his productivity is uniform among all the branches

Approach to deal with this case:

- Use linear programming to optimize the number of PBAs.
- Divide locations into clusters using GPS co-ordinates.
- Use the clusters to assign home branches to each PBA.
- Find the most optimum allocation of PBAs time across branches.

The Linear programming problem -
We have used a variant of the supply- demand problem. With demand being the branch hours required by each of the 35 branches. The supply being the number of hours available with each PBAs.
The objective is to minimize the overheads while covering the entire demand for time at each branch.

Demand and Supply -

	Monthly hours
PBA1	17X8 hours
PBA2	17X8 hours
PBA3	17X8 hours
PBA4	17X8 hours
PBA5	17X8 hours

	Branch Time	Cluster #
Branch 1	202	3
Branch 2	694	8
Branch 3	742	8
Branch 4	356	5
Branch 5	403	5
.....	.....	....
Branch 34	774	8
Branch 35	403	5

Overheads -

Travel Time	Branch 1 T8A 5V9	Branch 2 T8N 3L3	Branch 3 T7X 2K6	Branch 4 T5T 5L5	....	Branch 34 T6E 2A3	Branch 35 T5M 3L7
T5T 1K8 - Home Branch 1	16	27	28	29	.....	43	17
T6T 0C2 - Home Branch 2	34	24	17	13	.....	36	35
T7X 2K6 - Home Branch 3	31	15	0	7	.....	36	38
T6H 5T1 - Home Branch 4	25	18	19	19	.....	38	32
T8A 4N5 - Home Branch 5	38	37	32	29	.....	38	39

*in minutes

Decision Variables and constraints -

Time invested at branch	Branch 1	Branch2	....	Branch35
Agent1	T1-1	T1-2	....	T1-35
Agent2	T2-1	T2-2	....	T2-35
Agent 3	T3-1	T3-2	....	T3-35
Agent 4	T4-1	T4-2	....	T4-35
Agent 5	T5-1	T5-2	....	T5-35

Resource constraints

17X8 hours
17X8 hours
17X8 hours
17X8 hours
17X8 hours

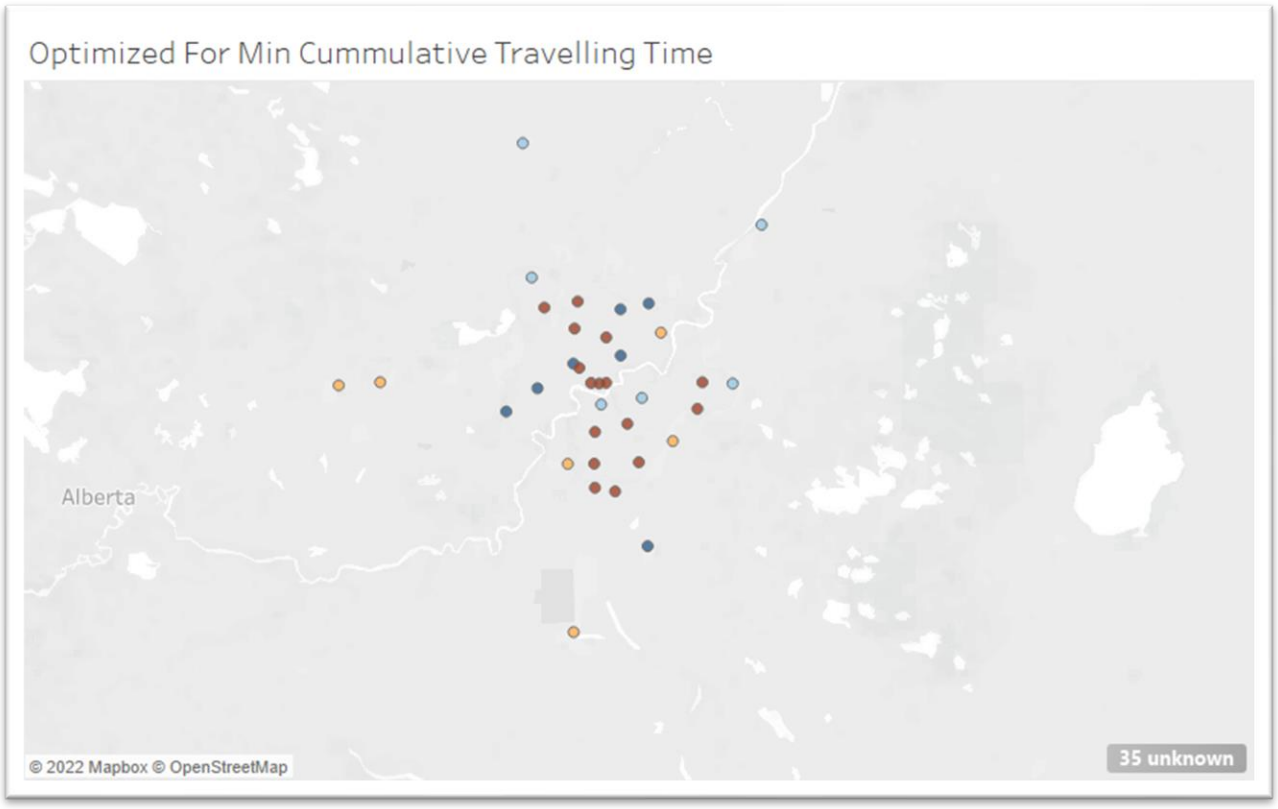
Demand Constraints	Branch Time 1	Branch Time 2	....	Branch Time 35

Optimization function -

$$Minimize\ (\sum_{i=1}^{5}\sum_{j=1}^{35}(Travel\ time)ij * 1/(Branch\ time)ij))$$

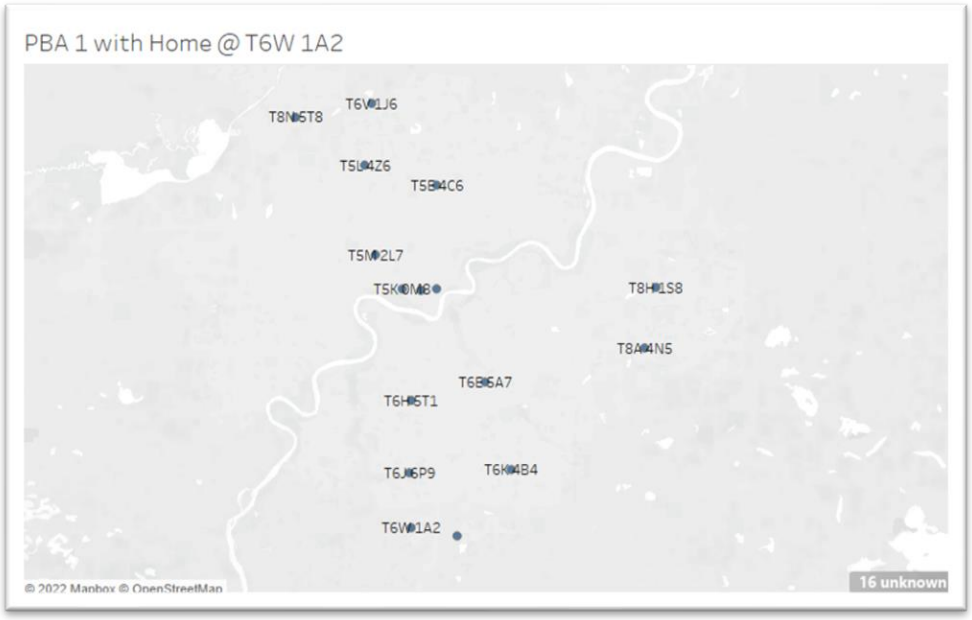
Results – using the PuLP package

		T4X 0B6	T5A 5C1	T5B 0S1	T5E 4C6	.....	T6K 4B4	T6R 0G4	.....	T8R 1R4	T9E 6Z7
Home Branch	Branch #	1	2	3	4	.....	20	21	.....	34	35
T6W 1A2	Agent 1	0	0	0	356	.....	2166	0	.....	0	0
T5M 3L7	Agent 2	0	694	0	0	.....	0	2445	.....	0	403
T5B 0S1	Agent 3	0	0	0	0	.....	0	0	.....	774	0
T8A 5V9	Agent 4	202	0	742	0	.....	0	0	.....	0	0

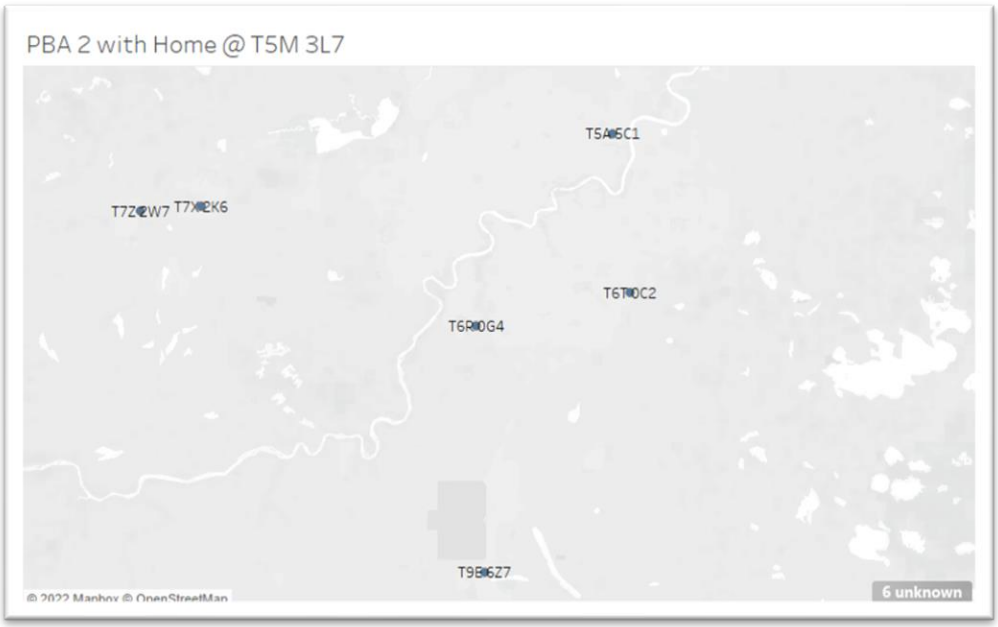


If we see the above clusters, we can see four clusters with four different colors formed based on our optimization model; if we observe closely, for obvious reasons, they are pretty different from what we got in K-means. These clusters formed on optimizing PBA travel time with multiple constraints.

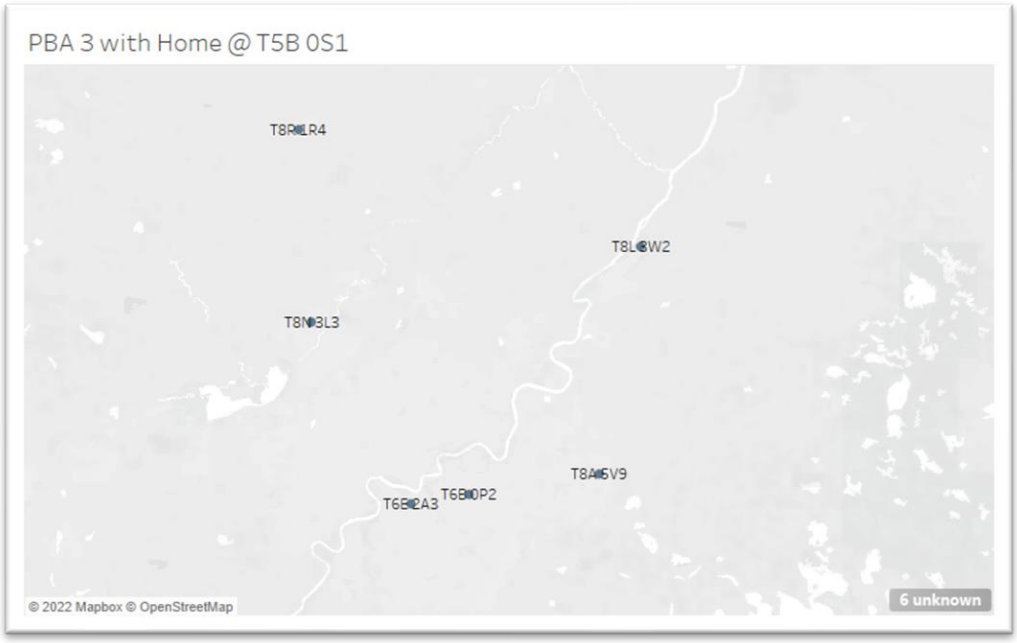
Now, let's see Clusters separately and more closely to observe the home branches of first PBA and his respective satellite branches.



We can see overall 16 branches in this cluster. Out of these 16, the T6W 1A2 branch is our first Adviser home branch, and the remaining 15 branches are the satellite branches.



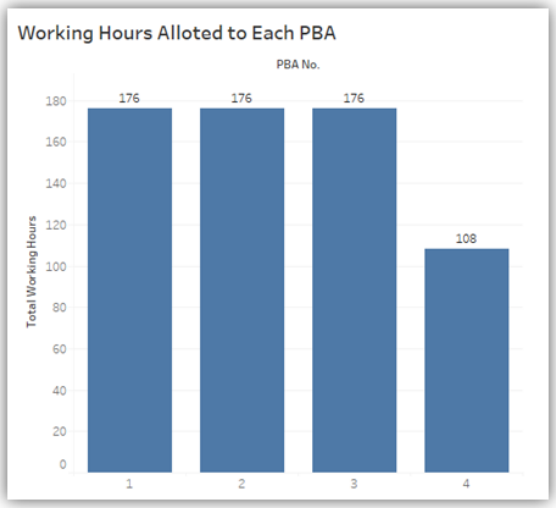
Now moving forward, we see six branches in this cluster. Out of these six branches, we have the T5M 3L7 as the second PBA home branch, and the remaining five branches are his satellite branches.



Similarly, we see six branches in cluster 3; out of these six, the T5B 0S1 represents the home branch for our third PBA, and the remaining five branches are his satellite branches.

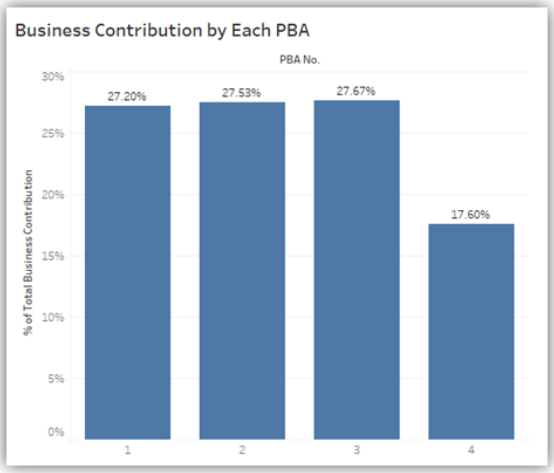
Finally, we see our fourth cluster with overall seven branches. Out of these seven branches, we have T5A 5V9 as the home branch for our PBA 4, and the remaining branches are his satellite branches.

Now let's see some numbers.

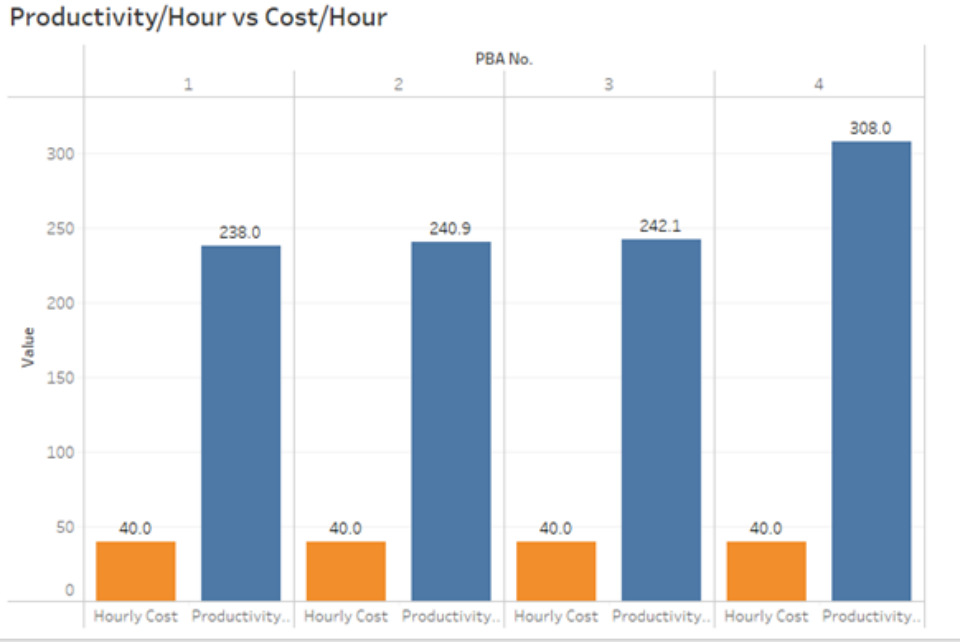


This graph shows the total number of hours worked by each PBA in his respective home branch and satellite branches.

The lesser working hours for Adviser 4 also show the efficiency of our Optimization model. It not only brought down the number of PBAs required to four but also left one of the PBAs with a significant number of available working hours.



In the Above graph, we broke down the overall turnover based on the contribution made by the respective PBA. We can observe that almost 60% of the business is contributed by the first two Advisers alone, followed by 27% contribution from PBA 3.



Though Overall business Contribution made by PBA 4 is less than other PBAs, when it comes to productivity, PBA 4 stands highest among everyone.

Conclusion:

The target here is to minimize the traveling time spent by PBAs, maximize the time spent by PBAs. The goal here is to cover all the 35 branches as all the branches were generating the same amount of revenue. Based on the approach we followed we could achieve all the goals. We used only 4 PBAs time to complete all the work and cover all the branches. This way we minimized the amount spent on PBAs while they were not making any money, that is, while the PBAs were travelling the company is paying them the salary but there was no revenue generated in that period. So, we minimized that overhead to best. By this approach we generated one nineteen thousand dollars revenue by spending only twenty-eight thousand dollars on PBAs. So, we consider this as the best approach to solve this problem.

PS: Finally, we thank you for giving us this opportunity, and we uploaded our code for this optimization on git, and the link for the same is given below. You can reach us by contacting our project manager (shown below), and We are happy to answer any questions you have.

Reach us at: rbobba@okstate.edu

GitHub Repository: https://github.com/Pankaj-sk/BCB-Edmonton-Case-Study---Linear-Programming-